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An Analysis of the Preparatory School Questions for in the Biology Books on the Basis of the Brain-based Learning

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Abstract--- *The study aims to reveal the extent to which the book chapter questions consider the mental skills of the students according to the brain-based learning theory. The researchers used content analysis; they constructed a tool which was proved to be authentic and consistent in three fields including twenty-three mental skills. The right and left lobes of the brain each includes eight mental skills and seven skills in the lateral sides of the brain together. Then, the questions were analyzed. The results showed the skills in the left side of the brain were most frequent while the mental ones were the least. It was noted that some abilities were outstanding such as the critical and oral, while some others were neglected such as the symbolic and metaphoric. The researchers provide some recommendations and suggestions for further studies.*

Keywords--- *Biology Books, Preparatory Schools, Learning based Theory.*

I. PROBLEM OF THE STUDY

Clearly analyzing and evaluating the questions is purposeful because they shed the light on the nature of the questions and in turn on the nature of the book itself. On their importance, the importance of the books emerges. This agrees with Seguin's (1989) idea which is that the course book plays a big and vital role in the learning process and its success. Therefore, it is important to spend all efforts to form an excellent level and quality of its contents, aims, activities and questions. It is preferred that the evaluation questions develop the learners' ability on thinking and the level of difficulty increases as the book proceeds (Talafha, 2005: 7). This is clearly similar to the up-to-date theory of learning- the theory of brain-based learning. This theory proved its qualification and validity in making a change in the educational and learning fields. It is the result of the interconnections among different fields such as physiology, neurology, computer sciences, chemistry, biology etc. A strong motivation to study these questions using this theory is created because of the researchers' experience in teaching in preparatory schools, their discussions of the nature of the chapter questions, the different opinions and because there are no content analyzing studies which study the nature of the questions of the books according to the brain-based theory,.

Importance of the Study

The course book is one of the important resources for the learners. It includes the syllabus for each subject, in addition to home works, supports and questions. Therefore, the process of learning requires good books and syllabi for the leaners as it is considered the veins which includes the learning materials and enables the learners to achieve

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the required aims of the syllabus (Al-Agha, 1990:143). The questions are one of the book contents which is very important in the process of teaching and learning. It helps the students to think, discuss and encourages them to answer correctly which is a tool to measure students' understanding for the study topic (Hamdan, 2001: 134). The researches think that because of the importance of the book questions, it is important to analyse and evaluate them every now and then to diagnose the weaknesses and strengths which is done according to national and international tools or phenomena or according to new educational and teaching theories which accord to the abilities of the learners. One of these theories is the theory of brain-based learning. It prepares an inclusive syllabus in the process of learning and is based on the structure and function of the brain. It is supported by the neurologists, genetics and the studies of the cognitive psychology (Kofalek and Walson, 2004:23). Leawfala and Faesal (2014:529) state that it is important to find a sort of balance among the questions and homework's given to the learners to develop the processes and the two sides of the brain. This theory how to get use of it, and meeting the requirement of the learners have become an important part of the modern educational literature. Its results have provided more on the process of learning and on how the brain works during the process of learning. It stipulated learning practices and for the process of evaluation and made a difference in the programs provided for the learners to provide better results (Hasanein, 2011: 112).

As learners are the focus of the process of learning and they are different in their abilities, some of them have good lecture hearing. Others need more means to form a correct understanding. Others need more explanations which are close to their life and more concrete examples etc. (Amer and Rabe'e, 2008:94). Researchers believe that through the brain-based learning, it is possible to take care of the process of the learning through the learner as s/he is the focus of the learning process. As the brain-based learning is important, many studies dealt with the importance of this theory as a program of learning (Al-Sulti, 2002) whose aim was to identify the effect of this program-educational based on the learning formed by the function and structure of the brain to develop active learning. It was based on four factors (transference of effect of learning, the degree, the inclusive and analytic cognitive mode and modes of learning. They inferred effects of preferring one or the other of the following learning modes: personal or body movement. Abo Atayah and Ahmed Abd al-Qader's (2007) study aims to define the validity of the program in developing the cognitive aspect in the science subjects by the pupils in the ninth grade and was formed using the brain-based learning theory. The study showed the validity of the of the program in the cognitive aspects of the pupils. Gultekin and Ozden (2008) conducted a study aiming to identify the application of the program on the achievement and storing what is learned by the fifth primary year pupils. The study showed the validity of the brain-based learning in the development, achievement and storing the information of the pupils. Other analytical studies were conducted such as Shiff and Wajdan (2017) which applied the brain-based theory from the perspective of the teacher of the biology in the secondary schools. The sample was 30 male teachers in the Dewnaya city of Iraq. The researchers found that the books took into consideration the principles of the learning theory. Al-Farsi (2010) used the analytical-descriptive syllabus for the years 2011-2017.

Within the basic education in (second series) in Batna in Oman towards the strategies of brain-based learning, the study found out averages believe of the female teachers towards the strategies was 4.24 which is a high belief. There were other studies such as the Ministerial General questions by AL-nawafla and Faesal (2014). Their study

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aimed at analyzing the question for the subject of physics in the diploma stage according to brain-based learning theory. It used a descriptive-analytical approach for the years 2007-2011. It stated that the processes involved in the left hemisphere of the brain in setting the questions was first in frequency followed by the process involved in both sides and then the process of the right side. There are studies of the questions of the book such as Abd_lqader (2017). It aimed to study the question of mathematics books in Palestine according to the activities involved in both sides of the brain together and for each side alone for secondary schools. The tools consisted of twenty-five brain activity while the sample included the two mathematics books for the eleventh and twelfth secondary schools in the left hemisphere which was first followed by the right side brain activities.

In the light of what was mentioned, the researchers believe that the study can achieve the importance and application of the theory such as:

- Directing the specialized educators particularly the syllabus designers to manipulate the brain-based learning theory in setting the home works, the chapter questions, the units of the books and the topics of study.
- Contributing to enrich the Iraqi library with studies which uses brain-based learning activities particularly in biology.

Aims of the study

The study aims to show to what extent the preparatory books take into consideration the mental activities for both sides together and for each side alone. The aims can be achieved by answering the following:

- To what extent do the biology books take into consideration for the fourth preparty schools the mental activities in left and right sides of the brain?
- What is the extent of taking into consideration of the biology books of the fifth preparatory schools the mental activities in left and right sides of the brain and for both sides together?
- What is the extent of taking into consideration of the biology books of the six preparatory schools the mental activities in left and right sides of the brain and for both sides together?
- What is the extent of taking into consideration of the biology books of the six preparatory schools the mental activities in left and right sides of the brain and for both sides together?

Limits of the study

The study is limited to analysis of the questions for the preparatory schools in Iraq using the following books:

The fourth year preparatory biology books 9^{th} ed (2018)

The fifth year preparatory biology books 9^{th} ed (2018)

The six year preparatory biology books 9^{th} ed (2018)

The mental activities according to brain-based learning theory which are mental activities (for each side of the brain alone and for both sides together).

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II. DEFINITIONS OF TERMS

A. Analysis

Webster defines analysis as an inclusive study and deep analysis for a thing to understand how it works and determine its details (1972:77).

The researchers define it from procedural perspectives as a group of procedure the researchers conduct to determine the extent to which the biology book chapter questions in the preparatory stage consider the skills in each side of the brain and in both sides together using the model prepared for that.

B. The brain-based learning theory

It is a learning theory with the presence of the cognition, the real consultation, fund, thrill, eager and the absence of threat. The educational system and others are features of brain-based activities (Jensen, 2000:2).

The researchers illustrate it from a procedural perspective as a theory which involve the left side of the brain (serial, athlete, technical, analytical, detailing, quantity and oral). They are different from the right side of the brain (understanding, aggregation, organizing, authentic, over permeant, short term, and emotional). There are procedures in both sides together (creative, critical, practical, logical, metaphorical and locational). They are used in the analysis of the book questions of the preparatory schools.

Theory and Model of Analysis

Educators were interested in the brain-based learning in attempt to get use of the studies related to human brain. This has led to new educational and scientific systems in the third millennium which will have its effect in the policy of education (Mahmood, 2006:284). Based on the neurological studies, the brain-based learning theory emerged with its pioneer Caine and Caine. This theory is based on the brain and its structure and function. It also shows that each person is able to learn in a different way. It has importance to create a good atmosphere for learning and this allows active and valid process of information. It also links learning with real life situations (Alkhalefa, 2013:208). It is considered as a complete system and based on it, the processes of learning are determined. However, it does not solve all the problems, nor does it act as an educational system with solutions for all obstacles. It is not tricks for teaching. However, it is a collection of diverse principles which form the bases of the skills and cognitions according to which we can make better decision on learning (Jensen, 2007:2).

The Brain-Based Learning Theory

The literature of this theory provides many concepts and definitions to this theory. Zaytoon defines it as a strategy of the brain theory which requires from the learners and the students the concentrated interest to improve learning. It includes a group of teaching techniques connected to brain (2001:17).

Erckson states that it is a theory about learning which includes harmony and organization to the learning environment which is lively. It is rich with experiences which are suitable for the learners. The learners and students treat the experiences they have in a way which helps them to deduct the meanings from these experiences (2001:202).

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However, Afana and Yousif (2009:129) believe that the theory contributes in raising and improving the cognitive abilities of the students through syllabi and programs built according to brain procedures.

From what went before, it became clear to the researchers that the theory is an inclusive explanation to the process of learning which accords with different sciences the most important of which is neurology. It manipulates the processes which the brain conducts in learning.

Features of brain-based learning theory

The brain-based learning theory has different features. Mahmood (2006: 32) mentions them:

- Learning happens based on the structures and functions of the brain
- Learning based on this theory is supportive and positive which helps to improve the ability of the learners in teaching and learning.
- It depends on the features of the brain to make decision and learning.
- Through human brains, thinking and accomplishing a specific action is done.
- Learning through this theory is a system which was not formed before.

The Mental processes of the brain

Al-Qurani (2010: 42) revealed that each side of the brain has its own activities. The left side does things which are different form the ones of the right side. However, they together share a group of activities as in table (1):

Table 1: The processes in each side of the brain and the ones they share

The processes in the left side	The processes in the right side	The processes in the both sides
Serial	Understanding	Creative
Technique	Imaginary	Metaphoric
Sport	Aggregation	Practical
Plan	Structure	Critical
Quantity	Art/ authentic	Innovative
Problem solving	Organized	Logical
Thinking	Emotion	Learning/training
Oral	Temporal/permeant	Symbolic
Detail	Integration	Mental

The affective factors in the brain-based learning

There are many factors which affect learning based on the brain:

- The genetic factor- it plays a big role because of the effect of the genetic factors and the inherited features on the abilities of the brain.
- The biological factor- It stipulates the existence of pure environment for this type of learning and the teachers should be aware of the functions and structure of the brain.
- The environment factor- Here the learners are affected by the outside environment features.
- The emotional element- The emotional experience which is accompanied by strong and acute agitation affects the brain through the inability of the learner to focus, pay attention, concentrate and memorize and vise versa.

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- The nutrition factor- The brain like other body parts needs nutritious foods which are rich with vitamin
- The sense/movement factor-Through the senses the brain receives different and diverse types of information. The intact senses send correct information to the brain (Al-Salti, 2009:44).

The requirement of brain-based learning.

There are requirements through four axes:

First- syllabus related requirement

The syllabus should take into consideration the intelligence and personal differences which are diverse with experience such as learning with trail and guessing formed according to the brain-based learning and the strategies linked to it. It is connected with cognition and its content is built to take consideration of the cognitive and skillful structure of the learners. The activities are formed through scientific method backing memory such as mind maps and moving activities. It provides diverse sources such as financial or human to perform it. It forms an executive guide including clear instruction to help the learners. The process of evaluating the syllabi should be performed consistently by the specialist.

Second - teacher related requirement

The teacher should be able to be creative and takes consideration of personal differences and has the ability to use a variety of methods of teaching. S/she should be able to use different activities which back up memory. Also, the teacher should be able to give the learners enough time to contemplate and imagine. S/he should also encourage to socialize and use different methods in the process of evaluation.

Third – learners related requirement

The learners should have the wish to learn and actively participate in the activities which back memory. They should also be able to use different skills such as memorizing, reading, writing and express their opinion and thoughts. They should follow classroom procedures and are sociable with their colleagues.

Fourth-Learning environment related requirement.

The diverse environment should include the existence of safe environment and contains lab related credits and workshops suitable for the learners (Al-Talhi, 2015:24-26).

The are many principles related to brain-based learning which Kiedinger (2011: 28) refers to:

1. The social mind
2. The process of learning involves (sub)consciousness
3. Learning is associated with physiology
4. Emotions have a big role in forming patterns
5. Through patterns meaning is searched
6. Brain processes whole and parts together
7. There are at least two ways to organize memory
8. Searching for meaning is intuitive

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9. Learning includes emotional realization and concentrated focus
10. Brain/mind is formed peculiarly

Previous studies

Al-nawafla and Faesal conducted a study using the analytical- descriptive approach. The study aimed to analyze the exam questions for the diploma in physics for the years (2006/2007-2010/2011) according to the processes in the left side, right side and in both sides together. Each side has eight processes. The results showed that the ratio of the processes in the exam questions for all the year were less in the right side and higher in the left side. The study revealed the questions did not include some mental processes (2014:523-557).

Also, Abudul-Qader (2017:66-81) in Palestine used the analytical syllabus to analyse the questions and units of the math books for the eleventh and twelfth year in the secondary school according to brain-based learning. The tool was of three dimensions: the left and right side each consists of nine mental activities. The dimension of both sides together involved seven mental processes. The study discovers that the processes in the left side was first in frequency while the ones the right side was last.

Method of research

The researchers used a descriptive approach to achieve the aim of the study which they think is a suitable approach to analyses the questions of the book and discover the extent to which they pay attention to the mental processes in the brain-based learning.

The data

The data is all the biology book chapter questions for the preparatory stage for the last edition approved by the Ministry of Education in Iraq. The fourth yearbook for the scientific branch consists of ten units, the fifth of seven unites for the biology branch and the sixth stage book is five units.

The tool of the study

To achieve the aim of the study and answer its research question, there should be a tool the researchers depend upon in the analysis which is twenty-two skills in this study. It is of eight processes in each of the right and left side of the brain. The processes for both sides together are seven. After reviewing the previous study and literature of the brain-based learning such as Al-nawfala and Faesal (2014), and Abdul-Qader (2007) and after the consultation from such teachers which are specialized in the psychology and education sciences, the tools were selected.

The authenticity of the approach

It refers to the ability of the approach or criterion of what is put for through the measurement of the variable to be studied (Al-Khayat, 2010:7). To show the tools in its first shape to a group of experts from the specialized people in sciences of education and psychology, the researchers agreed 80% upon the validity of the tool and its suitability to measure what it was put for.

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Consistency of the tool

The consistency of the tools was confirmed in two ways though measuring the consistency by another researcher and the consistency rate was 0,91. After four weeks, the researchers replicate the analysis and the rate of consistency was 0.89. The Hwlwasty equation was used to count the consistency after identifying part of the material involving five units form the fourth-year preparatory school of the scientific branch:

Statistics tools

Percentage and repetitions to measure the results of book chapter questions

The Hwlwasty equation

$$R = \frac{2(C1 + 2)}{C1 + C2}$$

Imam et al (1990: 168).

III. RESULTS AND DISCUSSION

The researchers answered the questions through analyzing the biology book chapter questions for the preparatory schools through:

Answering the first research question which is *To what extent do the biology books take into consideration for the fourth preparatory schools the mental activities in left and right sides of the brain?*

It is clear from table (2) the results of the analysis of the questions for the fourth year preparatory schools show that the processes in left side were analyzed the highest 47.01% followed by the processes in the right 35.04%. However, in the last is skills in both sides together 17.95%. It is noted that there was interest in the mental, analytical, oral, understanding and critical while there was no interest in the quantity and synchrony. Most of the mental skills are in both sides together such creativity, logic, space, metaphor and symbol. The researchers can see that these ratios are normal in the nature of the questions of the biology books which are analytical, reasoning, detailing and oral.

Table 2: Mental processes in each side of the brain and for both sides together in the fourth preparatory school book.

The left side mental skills	No. of questions	Percentages	The right side mental skills	No. of questions	Percentages	Both sides mental skills	No. of questions	Percentages
Serial	5	9.09%	aggregation	2	4.88%	Creative	-	85.71
Athlete	3	5.045%	understanding	14	34.14%	Critical	18	14.29
Techniques	2	3.64%	Organizing	2	4.88%	Praticial	3	
Analytic	21	38.18%	Art/authentic	9	21.95%	Logical	-	
Problem solving	1	1.82%	Structure	2	4.88%	metaphorical	-	
Detailing g	9	16.36%	integration	12	29.27%	Spatial	-	
Quantity	-		Temporal/ permanent	-		symbolic	-	
Oral	14	25.45%	emotion	-				
Total	55	100%		41%	100%		21	100%

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Answering the first research question which is *What is the extent of taking into consideration of the biology books the firth preparatory schools the mental activities in left and right sides of the brain and for both sides together?*

Table 3 shows that the process of the left side of the brain were used most frequently in the questions of the fifth preparatory school of the biology branch 50.38%. In the second order comes the processes in both sides of the brain together 27.48%. The last was the right side brain process 22.14%. It is clear that there are repeated activities such as critical, analytical, oral etc. Yet, others were not reordered such as athletics, quantity, symbol and metaphors. This is because of the nature of the content of the fifth-year biology book which deals with physiological issues such as nutrition, digestion, excretion and breeding:

The left side mental skills	No. of questions	Percentages	The right side mental skills	No. of questions	Percentages	Both sides mental skills	No. of questions	Percentages
Serial	2	3.03%	Aggregation	1	3.45%	Creative	-	-
Athlete	-	-	understanding	19	65.52%	Critical	28	77.77%
Techniques	2	3.03%	Organizing	6	20.79%	Practical	1	2.78%
analytic	25	37.88%	Art/authentic	-	-	logical	1	2.78%
Problem solving	-	-	Structure	-	-	metaphorical	-	-
Detailing	15	22.73%	Integration	3	10.34%	Spatial	6	16.67%
quantity	-	-	Temporal/ permanent	-	-	symbolic	-	-
Oral	22	33.33%	emotion	-	-			
Total	66	50.38%		29	22.14%		36	27.48%

Table 4 explains the answer to the third research question *What is the extent of taking into consideration of the biology books the six* preparatory *schools the mental activities in left and right sides of the brain and for both sides together?* The processes in the left part of the brain is the first 48.86%, the second is both sides together which is 37.02% while the last is 14.12%. The mental skills of criticism, analysis, oral and practical were most repetitive while other skills were not present at all such as problem solving, symbolism, logic etc. The researchers think that these percentages came in accordance with the nature of the six year book which deals with cell, tissue, breeding, and the genetics formation of the embryo.

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The left side mental skills	No. of questions	Percentages	The right side mental skills	No. of questions	Percentages	Both sides mental skills	No. of questions	Percentages
Serial	11	8.59%	Aggregation	6	16.22%	Creative	-	-
Athletic	-	-	Understanding	19	51.35%	Critical	67	69.07%
Technical	1	0.78%	Organizing	3	8.11%	Practical	28	28.78%
analytic	54	42.19%	Art/authentic	5	13.51%	logical	2	2.06%
Problem solving	-	-	Structure	2	5.41%	metaphorical	-	-
Detailing g	8	6.25%	integration	1	2.70%	Spatial	-	-
quantity	-	-	Temporal/ permanent	-	-	symbolic	-	-
Oral	54	42.19%	emotion	1	2.79%			
Total	128	48.86%		29	14.12%		97	37.02%

Table five below illustrates the answer to the question *What is the extent of taking into consideration of the biology books the six* preparatory *schools the mental activities in left and right sides of the brain and for both sides together?* The whole mental activities are ordered in terms of quantity as follows: left side 48.82%, both sides together 30.20% and last the ones in the right side 20.98%. This confirms Abdul-Qader's (2017) findings and Al-Nawafla and Faesal's (2014). The skills of criticism, analysis oral and understanding were in a good proportion while the emotional skills happened only once in the fifth-year preparatory book as the emotional skills are difficult to measure. However, other skills such as creativity, metaphor, symbolism and quantity did not happen and that is because the nature of the set questions at the end of each chapter which include definitions and reasons.

The left side mental skills	No. of questions	Percentages	The right side mental skills	No. of questions	Percentages	Both sides mental skills	No. of questions	Percentages
Serial	18	7.23%	aggregation	9	8.41%	Creative	-	-
Athletic	3	1.21	understanding	52	48.60%	Critical	113	73.38%
Technical	5	2.02%	Organizing	11	10.28%	Practical	32	20.78%
analytic	10	40.16%	Art/authentic	14	13.08%	logical	3	1.95%
Problem solving	1	0.40	Structure	4	3.74%	Metaphorical	-	-
Detailing g	32	12.85%	integration	16	4.95%	Spatial	6	3.89
quantity	-	-	Temporal/ permeant	-	-	symbolic	-	-
Oral	90	36.14%	Emotion	1	0.94%			
Total	249	48.82%		107	20.98%		154	30.20%

IV. RESULTS

The study has come up with the following results:

1. The skills of the left side were the most frequent in all book questions

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2. The skills in the right side were the second in the fifth-year preparatory schools of the biology branch and were the last in the fourth- and sixth-year books
3. The skills of both sides were the second in the fourth and sixth-years books and the third in the six-year book.
4. The criticism skill was first in frequency, followed by the analytical and oral ones while others such as symbolism, creativity, quantity etc. were absent totally.

Recommendations for further studies.

A similar study to analyze the biology book questions in other school stages, such as secondary or primary is recommended.

Conducting a study of the general (Ministerial) questions for the biology subject in either secondary or preparatory stages.

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