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The Understanding of Graduate Students at Yarmouk University of the Principles of Brain-Based Learning and their Attitudes towards them

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Abstract--- *This study aimed at evaluating graduate students' understanding of brain-based learning principles at Yarmouk University and their attitudes towards them. The study targeted two stratified random samples, the size of each was (85) graduate students of the Department of Curricula and Teaching Methods at the Faculty of Education, Yarmouk University, Jordan. Two pilot-structured tools, a test and a scale, were built to evaluate, respectively, the understanding of BBLP and the attitudes towards them. The results showed an intermediate mean level of understanding of BBLP among the whole study sample. In addition, the levels of understanding of BBLP were found significantly associated ($\alpha < 0.05$) to the program level and to the field of specialization, with higher levels of understanding being found among PhD students and students of science curricula and teaching methods compared to master's students and students of other fields of specialization, respectively. With regards to the attitudes towards BBLP among the students, the results revealed a high mean level of attitude among the whole sample towards BBLP. Similar to their effects on the students' understanding of BBLP, the program level and the field of specialization were both found significantly associated ($\alpha < 0.05$) to the attitudes towards BBLP; PhD students and students of science curricula and teaching methods showed higher trending towards BBLP compared to their counterparts. In the view of above the study recommends paying more attention to the theory of BBLP through conducting further research by graduate students on how to reap benefits from the theory in teaching and learning, and it encourages the teaching staff at the Faculty of Education to give more attention to the teaching of BBLP to the students of the faculty.*

Keywords--- *Brain-based Learning Principles, the Understanding of the Brain-based Learning Principles, the Attitude towards Brain-based Learning Principles, Graduate Students, Faculty of Education, Yarmouk University.*

I. INTRODUCTION

There are several studies and research conducted for discovering the variations among other people brain and the brain of famous physician Einstein. The neuroscientist Sandra Witelson, who indicated in Shtewe (2003), was able to know such variation which is represented in specific area in cerebral cortex. She noticed that such area is not only has a different shape, but also has a larger size which could be the reason behind that the half brain of Einstein's brain abnormally large with an amount of 14%-16% than the brain of average people (Falk, Lepore and Noe, 2013). Also, she found that Einstein's brain mass was less than (12%) comparing with other people's brain such area is known as parietal lobe (Restivo, 2020) (McGilchrist, 2019).

As a result of scientific and technological breakthrough, the neuroscientists were given the opportunity to study

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with all its aspects(Genius, no date). Thus, it becomes easier to understand tough and complicated processes that occur in neuron

First: Central Nervous System

It consists of brain and spinal cord

1-Brain: it is one of the largest body organs which weigh nearly three pounds. However, brain is smaller in women than men. It continues growing until age (18) years:

The brain consists of:

Cerebrum: it serves as a center of process which is located in the cranial cavity. It surrounds and protects it the watery liquid.

Brain stem which includes:

- Mid Brain.
- Pons.
- Medulla Oblongata.

Mid brain: is located above Pons and Medulla Oblongata which connects the spinal cord.

Cerebellum: it is located behind mid brain, pons, and medulla oblongata. Maintaining body balance is considered one of the most important functions.

The most important functions of brain, namely: composing sensory and motor to and from neuron. It is responsible of responses and reactions that are regarded one of the most important foundations of the educational process success. Brain stem contains medulla oblongata which consists of various reactions and responses centers. Pons is located in brain stem on the nucleus of the cranial nervous fifth, sixth, seventh, and eighth. It contains Pneumotaxic centers. Mid brain contains nucleus of the cranial nervous third and fourth.

The Significance of the Study

To the best of the researcher's knowledge, particularly after reviewing the previous studies on BBL which does not address the comprehension of post graduate students in the University to the BBLP and their attitudes towards it. The importance of the study lies in opening avenues for researchers and educators for further studies and drew their attention to the importance of the researched subject and the necessity to make research and studies for enhancing educational and vocational efficiency for postgraduate students which could positively impact on their society and contribute to better educational and learning process. (The Search for meaning is innate in the brain).

II. REVIEW OF RELATED LITERATURE

Several study aimed at investigating the impact of learning design, according to BBLT, on the achievement of eighth grade of in physician concepts and their scientific mode of thinking (Franzosi, 2017). The sample consisted of (177) students and divided into two groups, namely: experimental group consisted of (90) students which examined light and optics unit by educational BBLT. On the other hand, control group consisted of (87) students which examined the above mentioned unit, but by ordinary method. For this objective, the study used both achievement

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test in physician concepts and scientific thinking skills scale. The findings revealed the success of experimental group students (high achievement and medium achievement) in each of scientific achievement concerning both physician concepts and scientific thinking skills.

In addition, Shahrore and Jbarah (2015) study aimed at knowing teachers' perspectives on the efficiency of using BBL strategy on training students to solve their problems. Besides(Morgan, 2019)(Solihatin and Syahrial, 2019), the impact of gender, experiences, and qualifications on teachers' perspectives(Wlodek, 2018)(Al-Shammari, 2015). The sample consisted of 370 male and female science teachers in governmental schools in Hail area in Saudi Arabia. The researchers developed a questionnaire for measuring teachers' perspectives on the efficiency BBL on training students to solve their problems(Alblaihed, 2016). The findings showed teachers' perspectives were positive regarding the efficiency of BBL strategy. Also, the positive attitudes among male teachers are lower than female teachers(Albaqawi, Maude and Shawhan-Akl, 2016). In addition, there is a statistically significant difference attributed to experience variable which exceeds five years and above.

Also, Al-Shaweesh (2016) conducted a study on the impact of training brain-based learning program in improving academic achievement for seventh grade students in teaching science subject. The study adopted quasi-experimental approach. The sample consisted of (60) students selected randomly from a school in Ma'an city in Jordan, and then the sample was divided into two groups, namely: experimental group and control group. The researcher conducted a test. The findings revealed that there are statistically significant differences in the averages of the students' marks between experimental group and control group concerning brain-based method. In addition, there is a statistically significant differences between the two groups in sensory skills exam in science.

However, (Saleh, 2016)study aimed at acknowledging one suggested efficiency in science based on BBLT for developing optical thinking skills, scientific tendencies, and achievement for the average first grade (46) students in the Kingdom of Saudi Arabia. Optical thinking skills in science, achievement test in suggested unit subject, and scientific tendencies scale have been prepared and pre and post application of the research group. The study deduced that there is a statistically significant correlation between the averages first grade students' grades in the pre-application for optical thinking skills test, scientific tendencies scale, and achievement test in science subject and their grades in the post-application.

Moreover, Shneev and Awdah (2017) study concentrated on employing BBLP in biology books for intermediate level from their teachers' perspectives. The sample consisted of (30) male and female teachers from Al Diwaniyah governorate in Iraq. The researchers prep; pared questionnaire for data collection. The study found that intermediate level books have considered the guidance and modern educational theories one of which BBL.

It is clearly obvious that the above mentioned studies have been conducted, on the one hand, in Arab countries, such as Jordan, Palestine, Iraq, Saudi Arabia, United Arab Emirates, and Oman Sultanate. On the other hand, in foreign countries, such as America, Malaysia, Turkey, Brazil, and Canada. Also, the previous studies included various academic levels, namely: primary, secondary, university, and teachers which, in turn, indicates the importance of this subject. Also, they revealed the efficiency of BBL and its positive impacts on various variables such as school achievement.

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To illustrate, various studies (Anazifa and Djukri, 2017),developing the skills of optimal thinking and scientific tendencies such as Saleh (2016), creative thinking skills and scientific culture such as Al-Aseme (2016), and creative thinking and orientation towards science subject.

III. METHODOLOGY

This section tackles study community and its sample. It includes description to the study tools in terms of its structure, verifying its credibility, practical procedures. In conclusion, this chapter contains statistical treatments provided by the researchers to come with the findings. Detailed description of the above mentioned features is illustrated below:

Paper Design

The researcher adopted descriptive approach for determining the extent of postgraduate students understanding of BBLP and their attitudes towards it.

Population of the Study

The population of the study consisted of (561) postgraduate students from curricula and teaching methods at the Faculty of Education. Table (1) shows the statistics of postgraduate students in the faculty of education at Yarmouk University for the first academic semester 2018/2019.

Table 1: The Statistics of Postgraduate Students in the Faculty of Education at Yarmouk University for the First Academic Semester 2018/2019

Variable	Number	Percentage
Postgraduate program		
Master	294	% 52.41
Doctoral	267	% 47.59
Major		
Science Curricula and its Teaching Methods	85	% 15.15
Mathematics Curricula and its Teaching Methods	97	% 17.29
English Language Curricula and its Teaching Methods	83	% 14.80
Arabic Language Curricula and its Teaching Methods	114	% 20.32
Vocational Education Curricula and its Teaching Methods	45	% 8.02
Social Studies Curricula and its Teaching Methods	84	% 14.97
Education Techniques	53	% 9.45
Total	561	%100

Sample of the Study

The findings of the pilot study revealed students' responses weakness in both tools, namely, a test that measure students understanding to the BBLP and a questionnaire that measure their attitudes towards BBLP due to their lack of time. It is worth mentioning that the researcher applied the study on two independent samples in order to obtain accurate and precise responses from the students. Each sample consisted of (85) male and female students who constituted (15%from the community) which has been selected randomly to guarantee that the sample represents the population of the study from postgraduate students in curricula and teaching methods department at the faculty of education, Yarmouk University. Students' understanding of the BBLP on the first sample and students' orientation of the BBLP on the first sample were studied. Table (2) shows both samples and their distribution according to the study sample.

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Table 2: Both Samples and their Distribution According to the Study Sample

Variable	*First Sample		** Second Sample	
	Percentage	Frequency	Percentage	Frequency
Gender				
Female	68.24%	58	%68.24	58
Male	% 31.76	27	%31.76	27
Postgraduate program				
Master	% 55.29	47	%52.94	45
	% 44.71	38	%47.06	40
Major				
Science Curricula and its Teaching Methods	% 17.65	15	%17.65	15
Mathematics Curricula and its Teaching Methods	% 15.29	13	%12.94	11
Arabic Language Curricula and its Teaching Methods	% 11.76	10	%15.29	13
English Language Curricula and its Teaching Methods	% 15.29	13	%16.47	14
Vocational Education Curricula and its Teaching Methods	% 11.76	10	%11.76	10
Social Studies Curricula and its Teaching Methods	% 12.94	11	%14.12	12
Education Techniques	% 15.29	13	%11.76	10
Total	100%	85	%100	85

*The sample that responded to the postgraduate students understanding to the BBLP.

**The sample that responded to the postgraduate students' attitudes to the BBLP.

Study Tools

The researcher developed a test for measuring postgraduate students understanding to the BBL process, and then she developed a questionnaire for measuring their attitudes towards BBLP. Appendix (A) indicates the primary image of the measurement, whereas appendix (B) indicates the primary image of the test. The following describes the validity and reliability of study tools as well as the adopted methods for correcting each one of them:

First: a test understanding BBLP.

The validity of the test

Study Variables

The study included the following variables:

1. Independent Variables

- Gender both (males and females).
- Postgraduate program both (master and doctoral).
- Major (Science Curricula and its teaching Methods, Mathematics Curricula and its Teaching Methods, Arabic Language Curricula and its Teaching Methods, Vocational Education Curricula and its Teaching Methods, Social Studies Curricula and its Teaching Methods, and Education Techniques).

2. Dependent Variable

- The understanding of postgraduate students to the BBLP.
- The attitudes of postgraduate students towards BBLP.

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IV. FINDINGS

This chapter demonstrates study findings that are ordered according to the questions of the study which revolves around determining postgraduate students understanding to the BBLP and their attitudes towards them and the impact of the following variables (gender, major, and postgraduate program) on both understanding and attitude towards these principles.

First: the degree of postgraduate students understanding to the BBLP.

Table 4: Arithmetic Averages and Standard Deviations to the Degrees of Postgraduate Students understanding to the BBLP

			The degree of understanding brain-based learning	*level*
The entire sample (number=85)		S A	7.15 2.519	Medium
Gender	Female	S A	7.40 2.675	Medium
	Male	S A	6.63 2.097	Medium
Postgraduate program	Master	S A	6.98 2.506	Medium
	Doctoral	S A	7.37 2.551	Medium
Major	Science Curricula and its Teaching Methods	S A	9.53 3.159	Medium
	Mathematics Curricula and its Teaching Methods	S A	6.77 2.088	Medium
	Arabic Language Curricula and its Teaching Methods	S A	5.90 1.663	Low
	English Language Curricula and its Teaching Methods	S A	5.46 2.025	Low
	Vocational Education Curricula and its Teaching Methods	S A	7.10 2.234	Medium
	Social Studies Curricula and its Teaching Methods	S A	6.64 1.963	Low
	Education Techniques	S A	7.92 1.656	Low

S= arithmetic average **A=**standard deviation

Second: the impact of the following variables (gender, major, and postgraduate program) on the understanding of postgraduate students to the BBLP.

Table 5: Three-way ANOVA for the Impact of Gender, Postgraduate Program, and Major Variables on the understanding of Postgraduate Students to the BBLP

Variance source	Least Squares	Degrees of Freedom	Mean Squares	F value	Statistical Significance
Gender	3.205	1	3.205	.679	.413
Postgraduate	.87621	1	.87621	.6314	.035
Major	.976156	6	.16326	.5395	.000
Error	.980358	76	.7234		
Total	.0004882	85			

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Table 6: Post Hoc Comparisons by Scheffe' Test for the Impact of Major Variable on understanding of Postgraduate Students to the BBLP

Major	Science Curricula and its Teaching Methods	Mathematics Curricula and its Teaching Methods		Arabic Language Curricula and its Teaching Methods		English Language Curricula and its Teaching Methods		Vocational Education Curricula and its Teaching Methods		Social Studies Curricula and its Teaching Methods	
	Δ	*P*	Δ	*P*	*P*	*Δ*	*P*	*Δ*	*P*	*Δ*	*P*	Δ
Science Curricula and its Teaching Methods		.096										
Mathematics Curricula and its Teaching Methods	2.76	.016										
Arabic Language Curricula and its Teaching Methods	3.63	.001	.87	.988								
English Language Curricula and its Teaching Methods	4.07	.289	1.31	.882	1.000	.438						
Vocational Education Curricula and its Teaching Methods	2.43	.095	-.33	01.00	.956	-1.20	.780	-1.64				
Social Studies And its curricula Teaching Methods	2.90	.700	.13	1.000	.966	-.74	.940	-1.17	1.000	0.46		
Education Techniques	1.61		-1.15	.932	.561	-2.02	.230	-2.46	.991	-.82	.909	-1.29

=The difference between averages (vertical-horizontal)**Δ**

***P*=** Statistical significant

Table (6) indicates the following:

Third: the attitudes of postgraduate students towards BBLP

For the purpose of answering third question "what are the attitudes of postgraduate students towards BBL". Table (7) shows the findings of this question:

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Table 7: Arithmetic Averages and Standard Deviations for Postgraduate Students' Attitudes towards BBLP

			The attitude degree towards BBLP	*Level*
The entire sample (number=85)		S A	4.15 .431	High
Gender	Female	S A	4.17 .418	High
	Male	S A	4.10 .464	High
Postgraduate Program	Master	S A	4.00 .330	High
	Doctoral	S A	4.32 .470	High
Major	Science And its curricula Teaching Methods	S A	4.77 .220	High
	Mathematics And its curricula Teaching Methods	S A	3.81 .163	High
	Arabic And its curricula Teaching Methods	S A	4.18 .410	High
	English And its curricula Teaching Methods	S A	3.91 .226	High
	Vocational And its curricula Teaching Methods	S A	4.30 .230	High
	Social Studies And its curricula Teaching Methods	S A	4.02 .476	High
	Teaching Techniques	S A	3.89 .149	High

S= arithmetic average **A=**standard deviation

Fourth: the impact of the following variables (gender, major, postgraduate program) on the students' attitudes towards BBLP in order to answer the fourth question of the study "are the students' attitudes towards BBLP vary according to gender, postgraduate program, and major variables?" the following null hypothesis emanated from it: "there are no statistically significant differences at the significant level (a-0.05) in the degree of postgraduate students' attitudes towards BBLP are attributed to study variables, namely: gender, major, and postgraduate program.

Table 8: Three-way ANOVA Regarding the Impact of Gender, Major, and Postgraduate Program variables on the Attitudes of Postgradute Students to the BBLP

Table (8) indicates the following:

Variance Source	**Least Squares**	**Degrees of Freedom**	**Root mean square**	**F Value**	**Statistical Significance**
Gender	.180	1	.180	2.603	.111
Postgraduate program	1.509	1	1.509	.81321	.000
Major	.6207	6	1.270	.35718	.000
Error	.2585	76	.069		
Total	.9601479	85			

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Table 9: Post Hoc Comparisons by Scheffe' Test for the Impact of major Variable on understanding of Postgraduate students on the BBLP. This Table Shows the Findings and Recommendations

Major	Science Curricula and its Teaching Methods	Mathematics Curricula and its Teaching Methods			Arabic Language Curricula and its Teaching Methods		English Language Curricula and its Teaching Methods		Vocational Education Curricula and its Teaching Methods		Social Studies Curricula and its Teaching Methods	
	Δ	*P*	Δ	*P*	*P*	*Δ*	*P*	*Δ*	*P*	*Δ*	*P*	Δ
Science Curricula and its Teaching Methods												
Mathematics Curricula and its Teaching Methods	.95	.000										
Arabic Language Curricula and its Teaching Methods	.58	.000	-.37	.080								
English Language Curricula and its Teaching Methods	.85	.000	-.10	.988	.27	.322						
Vocational Education Curricula and its Teaching Methods	.47	8.00	-.49	.011	-.12	.981	-.39					
Social Studies And its curricula Teaching Methods	.75	.000	-.21	.735	.16	.875	-.11					
Education Techniques	.88	.000	-.08		.29	.325	.02					

Δ =The difference between averages (vertical-horizontal)

***P*=** Statistical significant

The chapter tackles the findings of the study that have been reviewed in chapter four, and explaining them in the light of educational literature and previous studies. In addition, to provide number of concerned challenges that are related with these findings.

First, discussing the problems that are related with Table (4) concerning medium level of understanding of the brain-based learning principles among postgraduate students in the Department of Curricula and Teaching Methods at the faculty of education, Yarmouk University.

The finding indicates that some postgraduate students who work as teachers in schools and its impact on the educational process, which is certainly reflects on their practices that are manifested in their understandings and beliefs about these strategies as well as their educational practices. Similarly, postgraduate students who did not

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practice the profession of education yet in the Department of Curricula and Teaching Methods who are not adequately familiar with brain-based learning principles.

Second, Discussing the Findings Related with the Second Question

The findings indicated in Table (5) concerning the degree of postgraduate students' understanding to the brain-based learning principles, pointed out that there are no statistically significant differences at (a=0.05) for gender variable, On the other hand, there are statistically significant differences at (a=0.05) for postgraduate program such differences were for the interest of doctoral students. Similarly, there are statistically significant differences at (a=0.05) for major variable. Likewise, there are statistically significant differences at (a=0.05) among science and its curricula teaching methods students and Arabic and its curricula teaching methods students such findings were for the interest of former group students. In addition, there are statistically significant differences of (a=0.05) concerning the degrees of understanding brain-based learning principles among science curricula and teaching methods students and Arabic and its curricula teaching methods students such findings were for the interest of former group students.

Third, Discussing the Findings Related with Third Question

The findings indicated in Table (7) show a high level attitude towards brain-based learning principles among postgraduate students of the Department of Curricula and Teaching Methods in the faculty of education at Yarmouk University. It is clearly obvious in Table (7) high levels of attitudes towards students to BBLP among the whole taxonomic groups of the sample.

Fourth, Findings Related with Question Four

The findings of postgraduate students' degrees concerning the brain-based learning principles in Table (8) indicate that there are no statistically significant of (a=005) for gender variable. However, there are statistically significant differences of (a=005) for postgraduate program variable such difference were for the interest of Ph.D. students. Similarly, there are statistically significant differences of (a=005) for major variable. In addition, there are statistically significant differences of (a=005)

V. RECOMMENDATIONS

In the light of the study findings the female researcher recommends the following:

Giving BBLP much research interest, conducting various research and studies in this field by postgraduate students, making training workshops to take advantage of brain-based learning theory in order to stimulate new creative thoughts for further educational studies.

Demanding faculty members in the Department of Curricula and Teaching Methods in education faculty at Yarmouk University for greater attention to BBLT for master and Ph.D. programs.

Creating an exam by faculty members for postgraduate students to pinpoint the biggest part of their brain to determine the degree of agreement on the employed methods of teaching.

Acknowledging the mechanism for making postgraduate students' brain performs better to facilitate knowledge

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acquisition, accomplish educational tasks precisely and easily, enhance teachers' performance, and to stimulate their minds. Providing an opportunity for building a smart curriculum that improves the capacity of the brain.

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