

Abstract Thinking of Practicum Students at Najran University in Light of Piaget's Theory and Its Relation to Their Academic Level

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Abstract

The present study aimed to identify the stage of thinking of practicum students at Najran University in light of Piaget's theory and its relationship to their academic achievement in the scientific disciplines they were studying at the college of science, mainly mathematics, physics and chemistry disciplines. The sample consisted of (50) female student teachers who were practicing teaching mathematics, physics and chemistry at the public schools in Najran. Piaget test was used as a main instrument to determine participants' thinking stage. Results showed that only 10% of participants were in the stage of abstract thinking, 46% were in the transitional stage and 44% were in the stage of concrete operations. Results also revealed statistically significant differences ($\alpha=0.05$) between the academic cumulative averages of participants in the concrete thinking and transitional thinking stages in favor of participants in the transitional stage. Moreover, results indicated that there were significant differences between the cumulative academic averages of participants in the concrete and abstract thinking stages in favor of participants in the abstract thinking stage. Nevertheless, there were no statistically significant differences between the cumulative averages of participant students in both transitional and abstract stages. Significant differences were revealed between mathematics and physics student teachers in favor of participants of mathematics discipline. On the opposite, no significant differences were noticed between mathematics and chemistry student teachers, on one hand, and between physics and chemistry student teachers. In addition, there was no significant effect for the interaction between participants' stage of thinking and cumulative average.

Keywords: Piaget, abstract thinking stage, student teachers, practicum students, academic cumulative average, Najran University

1. Introduction

Constructivism is one of the modern educational trends that have gained widespread popularity and increasing concern in all cognitive fields and mainly in the fields of science and mathematics. Its roots go back to the 80s of the last century where Piaget introduced its main principles based on five main components namely: activating previous knowledge; acquiring and understanding new knowledge; using and employing the newly acquired knowledge; and reflection, i.e. thinking about it (Zaitoun, 2010). Learning, according to constructivism, is viewed as an active process of interaction where students use their previous ideas to understand the meanings of subsequent experiences in order to form new concepts or modify old ones and distinguish new relations. Moreover, constructivism asserts that knowledge exists within individuals. Therefore, self- process and personal arrangement cause the person to adjust continuously and actively his own knowledge in light of new ones. Previous knowledge should not contradict data of modern science; otherwise, it will constitute a barrier in front of correct scientific knowledge (Al Khalifah & Mutawa, 2015). Constructivism is not just a process of transferring knowledge and information to learners. It is a process for developing students' mentality, emotions and skills. It seeks to develop all aspects of students' personality and so its main task is to teach students how to think not to recite, empower them to understand relations and discover ways of applying them in life (Shabib, 2012). In addition, constructivism is an educational theory through which students' previous knowledge and experience can be developed by building new ones that help them much in their lives (Abo Daqah, 2017).

Constructivism, in many related educational studies has many varied definitions where each one reflects the

intellectual current to which it belongs. For instance, constructivism is a theory of learning and development where the learner should be always active while building his own thinking patterns in order to understand the result of the interaction between his innate abilities and experience (Zaitoun, 2007). Others claim that it is a theory that emphasizes the active role of the learner who by the help of his teacher correctly builds meaning in an environment that fosters learning (Qitami, 2005). Hence, the interest in this theory has encouraged education scholars to try improving the teaching and learning process and start searching for new teaching strategies that set teachers and learners free from the restrictions of traditional ones and lead them to meaningful learning advocated by constructivism (Al Omari, 2014). In this sense, it can be claimed that Piaget's theory was of the first theories to track the individual's cognitive development in an organized way. It has attracted the attention of researchers in the field of psychology, more specifically in the psychology of growth field, because of its comprehensive interpretation of human cognitive development (Glaserfeld, 1996). It is true that Piaget was not the first to point out that people construct their concepts and images about the world around them but he was the first to say that this construction had a developmental approach. Consequently, the focus of teaching shifts from outside factors like the teacher, school, curriculum, peers ... etc. to internal factors that affects learning itself. That is, focus was shifted to what takes place in the learner's mind when exposed to educational situations like, his previous knowledge, ability to remember, ability to process information, motivation, thinking styles, and all factors making learning meaningful. Therefore, constructivism focuses of learner preparation to solve problem in vague contexts (Mohammed, 2004). Therefore, the present study seeks to identify the stage of thinking of students enrolled in a course titled "Practicum" at Najran University in light of Piaget's theory and to reveal the kind of relation between this thinking stage and students' cumulative averages.

Findings of most studies addressing constructivism in the Arab world have confirmed the effectiveness of using the constructivist learning and the constructivist learning-based models and strategies in developing the educational process outputs. Results of these studies asserted the importance of constructivism in developing students' achievement and skills of mathematical thinking, higher order thinking, problem solving and innovative thinking (Al Zaboun, 2013) and (Hamada, 2005). On the local level, findings of studies conducted in Saudi Arabia indicated the clear impact of adopting constructivism in teaching mathematics on developing the mathematical thinking skills and positive attitudes towards mathematics, developing students' achievement and inferential thinking, developing students' mathematical thinking skills and decreasing their level of anxiety (Al Sarhani, 2014), (Al Ajmi, 2012) and Al Juaid (2010).

Internationally, studies showed that utilization of constructivist approach in teaching has made a shift in teachers' performance and the way they view students' learning approaches. Constructivism helped the learner to actively take part in the learning process and have a main role in constructing his own knowledge by integrating his previous and new knowledge together. Thus, the teacher's role has to help students discover what they learn and think of their performance and provide them with feedback when needed. (Mercer & Miller, 2004).

1.1 Theoretical Framework

Thinking is one important topic that contributes to refining the learner's personality and developing him in all different areas of life. It is a mental activity that includes numerous different processes or skills that are capable of growth, development and learning. It is a successive series of symbolic meanings and concepts raised by a problem and aims at a specific goal. It consists of several personal factors, cognitive and metacognitive processes, and knowledge specific for the subject being thought about. It depends largely on induction and deduction processes of (Shehata and Jarwan, 2003). In addition, thinking is characterized by several specific a characteristic among which is the fact that it is a continuous and developmental process. Its degrees and levels differ according to the individual's growth and accumulation of experiences. It is not aimless and does not take place in vacuum. Moreover, it can be learnt by training and occur by integrating all environmental elements like place, time, and thought-provoking context. It has verbal, symbolic, quantitative, logical, spatial, and formal patterns (Mahmoud, 2006). Newman's classifications of thinking patterns are perhaps of the most important classifications (Al Otoum, Al Jarrah, and Bisharah, 2015). These classifications are of two main categories:

- Basic thinking skills, which are concerned with the individual's daily routine work where he uses his mental processes in a limited manner such as: knowledge acquisition, retention, observation, comparison, classification, concrete and practical thinking. These skills also involve some of the lower order thinking skills like knowledge, comprehension, and application, which are essential to be mastered before moving to higher order levels of thinking.

- Compound thinking skills, which require broad and complex use of mental processes that take place when an individual interprets, analyzes, and processes information to answer a question or solve a problem that cannot be solved by using lower order thinking skills. These skills involve the skills of abstract critical, creative; metacognitive; inferential and reflective thinking.

Abstract thinking is, therefore, one of the compound thinking types that comes out of Piaget's theory for cognitive growth and, in the same time, constitutes the fourth and final stage of growth. Thus, abstract thinking can be defined as a mental process aiming to conclude results and extract abstract meanings of things and relationships by means of hypothetical thinking through symbols, generalizations, and ability to make assumptions and validate them (Al Otoum, et. al., 2015). Furthermore, there are two main functions for thinking, which are thinking and adaptation. Thinking is the individual's tendency to organize cognitive activities interactively. Adaptation, on the other hand is his tendency to be in harmony with the external environment. Nevertheless, it will not be achieved without two sub-processes, i. e. personification and comprehension. Personification is the integration of one's knowledge within his cognitive structure to arrive at understanding and perception. Comprehension is the individual's tendency to change his cognitive structures to meet the demands of external environment (Qitami, Hamdi, Subhi, & Abu Talib, 2011). So thinking in Piaget's cognitive theory is a series of invisible cognitive activities along with specific system where the brain plays a direct role in organizing them and meanwhile develop along with the individual's cognitive growth according to experience and maturity factors. In this sense, there are four main stages, through which the individual's thinking goes from birth until mental cognitive maturity (Abed Al Mo'ati & Qenawi, 2010):

- i. The kinesthetic stage, which extends from birth until about the age of two years. During this stage, the child acquires some simple behavioral skills and compatibility through interaction between his innate reflections and external environment.
- ii. The pre abstract cognitive operations stage (Symbolic Thinking) which extends from the age of two to about the age of seven. During this stage, a set of important changes in the individual's thinking and behavior begin.
- iii. The concrete processes stage (Physical Procedures), which extends from the age of seven to approximately the age of eleven. During this stage, the individual's thinking begins to be similar to the thinking of adults. He begins to be free from centering on himself, and takes into account others' point of view.
- iv. The mock operations stage (Formalities) which extends between eleven and fifteen years of age. During this stage, the adolescent's ability to abstract thinking grows and reaches the level of adult thinking in the end. His ability to solve problems and set default images begins to grow (Zahran, 2005).

1.2 Questions of the Study

The present study aims to identify the thinking stage of practicum students in light of Piaget's theory. Moreover, it aims to reveal what kind of relation exists between the students' thinking stage and cumulative averages. Mainly, it seeks to answer these questions:

- i. In light of Piaget's theory, what are the stages of thinking among female students of Practicum at Najran University?
- ii. In light of Piaget's theory, to what degree is the difference between students' cumulative average significant according to the different thinking stages among Practicum students at Najran University?
- iii. In light of Piaget's theory, to what degree is the difference between students' academic discipline significant according to the different thinking stage among Practicum female students at Najran University?
- iv. In light of Piaget's theory, what is the effect of interaction between the stage of thinking and academic discipline among Practicum female students at Najran University?
- v. In light of Piaget's theory, what kind of relation is between the stage of thinking and cumulative average among Practicum female students at Najran University?

1.3 Literature Review

Findings of most studies addressing constructivism in the Arab world have confirmed the effectiveness of using the constructivist learning and the constructivist learning-based models and strategies in developing the educational process outputs. Results of these studies asserted the importance of constructivism in developing students' achievement and skills of mathematical thinking, higher order thinking, problem solving and innovative thinking (Al Zaboun, 2013) and (Hamada, 2005). On the local level, findings of studies conducted in Saudi Arabia indicated the clear impact of adopting constructivism in teaching mathematics on developing the mathematical thinking skills and

positive attitudes towards mathematics, developing students' achievement and inferential thinking, developing students' mathematical thinking skills and decreasing their level of anxiety (Al Sarhani, 2014), (Al Ajmi, 2012) and (Al Ju'aid, 2010).

Internationally, related studies showed that utilization of constructivist approach in teaching has made a shift in teachers' performance and the way they view students' learning approaches. Constructivism helped the learner to actively take part in the learning process and have a main role in constructing his own knowledge by integrating his previous and new knowledge together. Thus, the teacher's role has to help students discover what they learn and think of their performance and provide them with feedback when needed. (Mercer & Miller, 2004).

With regard to the advantages of using constructivism in teaching, Al Sayyed (2018) concluded that using constructivism in teaching mathematics improved students' academic achievement and critical thinking skills. There was a positive correlation between academic achievement in mathematics and critical thinking. That is, the more the student uses his ability to think critically, the better his mastery of skills becomes and the deeper he deals with his information and knowledge, the better he understands and interprets them and consequently infers logical relationships between them with the result that his academic achievement becomes better. Oadeh (2016) also found significant relation between mathematical thinking skills, inferential, creative, critical and abstract due to academic achievement in favor of high achievement students because high achievers always seek to develop their skills by using all kinds of thinking skills. On the opposite, Ahmed, Hussein, Sittar & Malik (2016) concluded that students in the abstract thinking stage are characterized by high levels of achievement. They also think logically and have the ability to solve problems better than others have. Jarwan (2007) found that thinking skills promotes students' academic achievement while Sbeitan (2010) claimed that the higher the student's IQ is, the higher his achievement level is. Besides, one's academic achievement does not significantly affect his IQ scores.

Other studies like Ghazi, Khan and Shazada (2014) found that the academic achievement of urban students is better, in comparison with the academic achievement of rural students, because social and cultural differences affect the stage of students' abstract thinking. Al Abdullah (2012) revealed that (23%) of participant students were in the stage of concrete thinking, (64%) of them were in the inferential thinking stage, while (13%) of them could reach the abstract thinking stage. Whilst, no statistically significant differences due to age and discipline whether scientific, humanitarian were noticed. Moreover, Abed Al Haloul & Abu Jahjough (2011) showed that participant students' thinking level did not reach the abstract thinking level. Besides, there were no significant differences in the logical reasoning levels between students of first and fourth academic levels. Nevertheless, there were significant differences due to academic disciplines in favor of mathematics, science, and English language in comparison with basic learning, Arabic language, social studies, and psychological counseling disciplines. With regard to directing teachers to the importance of students' cognitive growth, Joubish & Khurram (2011) concluded that each stage of cognitive development has its own characteristics that appear at different times but with the same order. Moreover, cognitive stages are closely related to the person's mental more than chronological age. The academic achievement level varies in each stage from one person to another due to certain individual differences and environmental conditions. Al Zoubi, Al Shara & Al Salamat (2009) indicated that (56%) of participants were at the transitional reasoning level, while the rest (44%) were at the hypothetical reasoning level. Students of mathematics followed by students of physics were superior to colleagues of biology and chemistry disciplines. None was in the descriptive level and no individual differences due to gender were found. With regard to students' abstract/ concrete thinking style, Barakat (2007) revealed significant differences due to their variation in the abstract/concrete thinking level in accordance to their academic achievement and creative thinking in favor of students with abstract thinking.

2. Methodology

2.1 Approach

The descriptive approach, which cares about describing the phenomenon to be studied and collecting descriptions and information about it (Obeidat, et al., 2011) was used in the present study.

2.2 Instrument

The main instrument in the present study was a reviewed and arbitrated test of (21) issues in the field of logical and inferential reasoning according to Piaget's theory. It is, in fact, a factor analysis test used in both Arab and foreign environments. Classification of participants into stages of thinking was according to the total degree each participant got in this test. Accordingly, participants who got (9) points or less were classified in the concrete thinking, participants who got (15) points or less were in the transitional stage, whereas participants who obtained (16) points or above were

in the abstract.

2.3 Test Validity and Reliability

The test was presented to a number of specialists to ensure the appropriateness regarding the scientific content and language. After that, it was applied to a pilot sample of the same study population. Using Cronbach Alpha, reliability coefficient was calculated and was (0.879).

2.4 Population

The population of the present study consisted of (102) female student teachers who were all enrolled in Practicum course offered by Najran University in the first semester of the academic year 2019/2020.

2.5 Sample

The sample of the present study consisted of (50) female student teachers selected randomly out of the study population. Participants were distributed to three scientific disciplines, Physics (N=14), mathematics (N=14) and chemistry (N=22). All of them were practicing teaching in real contexts at various public schools in Najran.

2.6 Statistical Analysis

To analyze collected data, Chi Square, Mann-Whitney test, Kruskal-Wallis test, MANOVA, and Gamma coefficient were used.

3. Results and Discussion

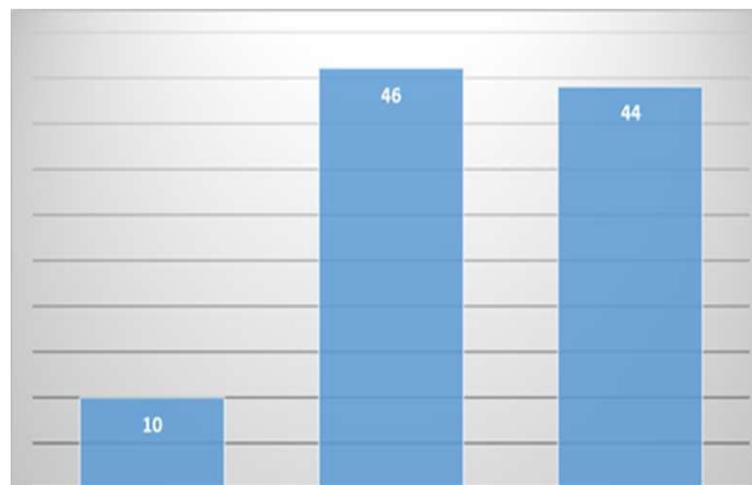
3.1 Results Related to the First Question

To answer the first question, "In light of Piaget's theory, what are the stages of thinking among female students of Practicum at Najran University?" Frequencies, percentages and Chi Square were calculated. Results are presented in Table 1.

Table 1. Distribution of Sample According to Piaget's Cognitive Development Stages

Stages of inferential thinking	N	Proportion	Chi Square	Significance level
Concrete thinking stage	22	44%	12.28	0.002
Transitional thinking stage	23	46%		
Abstract thinking stage	5	10%		

Results in Table (1) indicate statistically significant differences between Practicum female student teachers with regard to their stages of thinking in light of Piaget's theory. Figure (1) shows the percentages of participants' numbers distributed to according to the stages of inferential thinking.



Column1= Abstract stage Column2= Transitional stage Column3= Concrete stage

Figure 1. Percentages of Participants' According to Inferential Thinking Stages

Percentages in figure 1 reveal that the majority of the study sample did not reach the stage of abstract thinking despite the fact that they were all university students. Percentages, according to Piaget's theory, show that only 10% of them were classified in the stage of abstract thinking. The thinking types of other participant students teachers fell in the concrete and transitional ones. These results can, to a certain extent, corroborate the findings of Shabib (2012); Al Ajmi (2012) and Oadeh (2016). One interesting interpretation for this result might be in the fact that thinking, as a cognitive activity, includes many different processes or skills that are subject to growth, development and learning. In addition, thinking is a successive series of symbolic meanings and concepts. It consists of several personal factors, cognitive and metacognitive processes, besides the special knowledge about the subject being thought about. It depends heavily on the processes of induction and deduction, hence, participant students might lack or suffer from a shortage in these skills. Moreover, the result can be explained in light of the fact that inferential (reasoning) thinking is a continuous and growing process. Its degrees and levels vary according to the individual's growth and cumulated experience. It is not aimless and does not take place in vacuum nevertheless it can be learnt by training and occur as a result of integration between environment elements like place, time, context ...etc.

3.2 Results Related to the Second Question

To answer the second question "In light of Piaget's theory, to what degree is the difference in students' cumulative average significant according to the different thinking stages among Practicum students at Najran University? Kruskal-Wallis test was used. The Z calculated value was (11.374) and the significance level was (0.003). That is, results of Kruskal-Wallis test proved that there were statistically significant differences ($\alpha=0.05$) between Practicum female students' cumulative averages due to their stage of inferential thinking. To determine the directions of these differences, Mann-Whitney test was used. results are shown in Table 2.

Table 2. Mann-Witney for the Directions of Differences in Participants' Cumulative Averages According to Their Different Thinking Stages

Thinking stage	Concrete	Transitional	Abstract
Concrete	---	12.658*	18.136*
Transitional	12.658*	---	5.478

Table 2 indicates that there were significant differences ($\alpha=0.05$) between participants academic cumulative averages in both concrete thinking stage and transitional thinking stage in favor of participants in the transitional thinking stage. There were also significant differences ($\alpha=0.05$) between participants academic cumulative averages in both concrete thinking stage and abstract thinking stage in favor of participants in the abstract thinking stage. However, there were no significant differences between participants' cumulative averages in both transitional thinking and abstract thinking stages. These findings corroborate the results concluded by Shabib (2012) and Al Sayyed (2018) and might be explained in light of these issues. First, cognitive processes are used to a limited extent in cumulative thinking skills such as knowledge acquisition and retention, observation, comparison, concrete and practical thinking, and some lower order thinking skills like comprehension and application. Mastery of these skills is essential for moving towards higher order thinking levels. Moreover, cumulative thinking skills require extensive and complex use of cognitive processes that occur when an individual interprets, analyzes and interprets information to answer a question or solve a problem that cannot be solved using lower order thinking skills, such as judging, expressing an opinion, or using criteria and mechanisms to conclude results like abstract, critical and creative thinking, metacognition, inferential and reflective thinking. Third, cumulative abstract thinking is one of the types of compound thinking derived from Piaget's theory. It is the fourth and final stage of growth, which aims at eliciting results, extracting abstract meanings of things and relationships through virtual thinking through symbols, generalizations, and the ability to make assumptions and validate them. Fourth, the fact that there were no significant difference between students' cumulative averages in both transitional and abstract thinking stages might be referred to a set of reasons. These reasons include the acquisition of the ability to solve concrete problems logically, development of classification concept, ability to practice thinking in various ways, transition from self-centered language to a language of social nature, ability to visualize the expected results, ability to make implicit comparisons that provide concrete information, and the ability to transit using transformational rules.

3.3 Results Related to the Third Question

To answer the third question "In light of Piaget's theory, to what degree is the difference between students' academic discipline significant according to the different thinking stage among Practicum female students at Najran University? Kruskal-Wallis test was used. the Z calculated value was (11.564) and the significance level (0.003). In other words,

results of Kruskal-Wallis test revealed that there were statistically significant differences ($\alpha=0.05$) between Practicum female students' cumulative averages due to their stage academic disciplines. To determine the directions of these differences, Mann-Whitney test was used. results are shown in Table 3.

Table 3. Mann-Witney for the Directions of Differences in Participants' Cumulative Averages According to Their Academic Disciplines

Academic discipline	Concrete	Transitional	Abstract
mathematics	---	18.714**	8.870
Physics	18.714	---	9.844

Results in Table 3 show that there were a statistically significant differences level ($\alpha=0.01$) between mathematics discipline students and peers of physics discipline in favor of mathematics discipline students. Such a result might be due to the nature of mathematics discipline that differs from other disciplines and so students' thinking was of a high level of flexibility, balance and effectiveness. Besides, the presence of inferential hypothetical thinking in relations is a key criterion to show. Furthermore, the developed ability of mathematics students to think of probabilities involved in a context before the provision of practical solutions was better than the ability of students of other disciplines. Another interpretation can be related to the fact that both abstract and creative thinking share the required mental processes like application, analysis, synthesis, evaluation, and inference.

In addition, analysis of abstract thinking processes revealed that it includes both kinds of creative thinking. The first one is the convergent thinking where the individual tries to infer and perceive the relationships to reach new outcomes based on information available about the situation. The second one is the divergent thinking through which the individual generates new and original pictures that were not in existence. Moreover, results showed that there were no statistically significant differences between Practicum students of mathematics' discipline and their peers in the chemistry discipline. No significant differences were between practicum students in chemistry discipline and peers in the physics discipline. The fact that there were no differences between the kind of thinking of students in the three disciplines can be explained in light of the ability of all students to think scientifically, reflect their ideas in a balanced way, the ability to formulate, test hypotheses, conclude the results and interpret them logically. Therefore, they consequently transferred from self-centeredness to think of mutual social relations. Learning is based on observation, thinking, intelligence, ability to notice important relation between skills and experiences, ability to make generalizations and distinctions, and ability to use abstract symbols, plan and conclude. Moreover, learner's achievement increases if he spends more time learning thinking. Students understand the importance of thinking if they devote enough time for it whether inside or outside classroom. In short, understanding thinking occurs when a student learns to change the content of the learning material into a means for transferring thinking to other fields. In short, these results can be seen in congruence with the results of Shabib (2012), Al Ajmi (2012) and Al Sarhani (2014).

3.4 Results Related to the Fourth Question

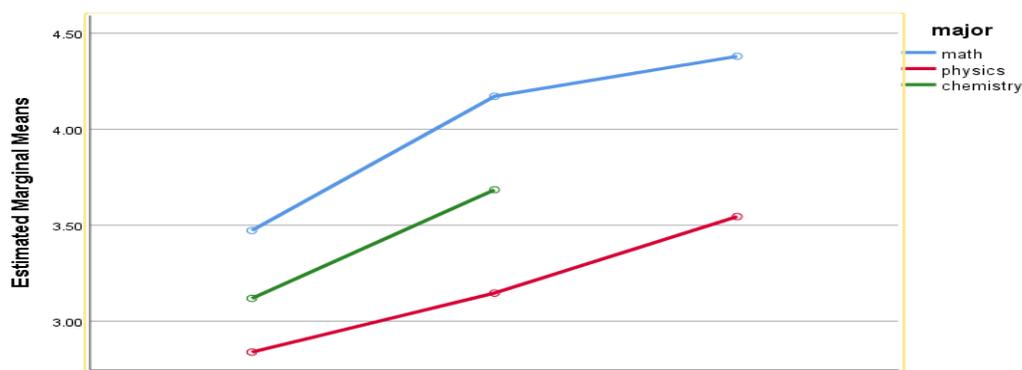


Figure 2. Means of Students' Cumulative Averages in Light of Discipline and Thinking Stage

To answer the fourth question, "In light of Piaget's theory, what is the effect of interaction between the stage of thinking and academic discipline among Practicum female students at Najran University? MANOVA was used. Results showed that the value of interaction between academic disciplines and the inferential thinking stage was ($P=0.148$) and the significance level was (0.931). In other words, there were no statistically significant differences

between the cumulative averages of Practicum female students due to interaction between stage of thinking and discipline. Figure 2 presents the means of students' cumulative averages in light of discipline and thinking stage.

Figure 2 shows no effect for the interaction between student's discipline and stage of thinking, which can be interpreted in light of a set of reasons. First, the emergence of important changes in students' thinking and behavior. Second, the shift of thinking from the concrete kinetic to symbolic thinking. Third, the focus on one element and neglecting other elements of the context. Fourth, the lack of persistence in maintaining characteristics and continuous traits. Fifth, the focus on reality fixed elements. Sixth, lack of understanding dynamic characteristics. Seventh, the inability to reflect thought. In this sense, these results can be seen in agreement with the findings of Al Ajmi (2012) and Oadeh (2016).

3.5 Results Related to the Fifth Question

To answer the fifth question, "In light of Piaget's theory, what kind of relation is between the stage of thinking and cumulative average among Practicum female students at Najran University? Gamma Coefficient was used. Distribution of students' cumulative averages as a whole in light of thinking stages is presented in Figure 3.

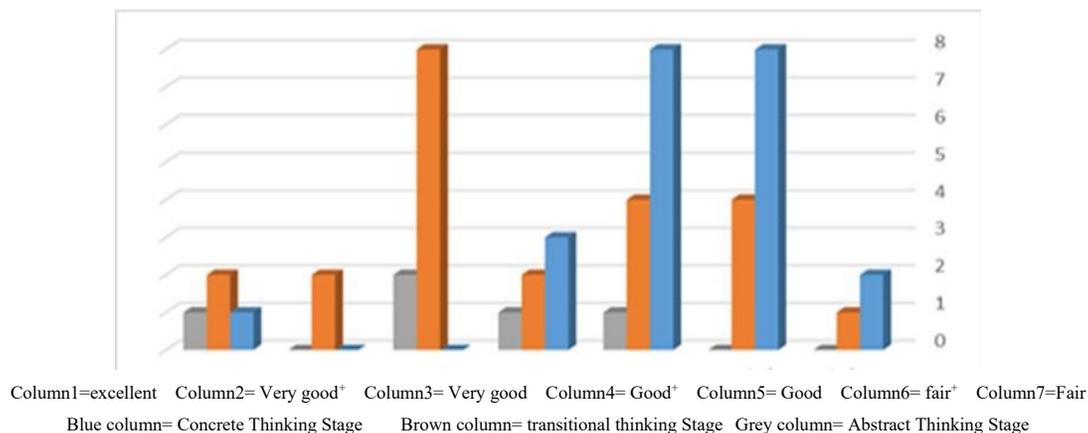


Figure 3. Estimations of Practicum Students as a Whole According to Their Cumulative Averages for Them in Light of Their Thinking Stages

Results in Figure 3 indicate that Gamma coefficient value was ($\gamma=0.559$) and is significant ($\alpha=0.01$). that is, there was a correlation between Practicum students' cumulative averages and stages of thinking in light of Piaget's theory. This result can be explained due to a set of factors among which is students' ability in abstract thinking and visualizing besides putting forward new ideas that grow along with their growth and comprehension. Other important reasons for this result are the shifting from abstract to reality, solving problems across logic and its application, and then to create an intuition about different things in thinking. Therefore, this finding can be considered in consistent with the results of Shabib (2012) and Oadeh (2016).

4. Conclusion

Findings of studies that dealt with constructivism confirm the effectiveness of using constructive learning in developing learners' academic achievement, mathematical thinking and attitudes towards mathematics. Moreover, the application of constructivism to teaching has also modified the performance of teachers and their vision of student learning. Therefore, results of the present study are hoped to participate to the enhancement of pre- service and in- service teachers' vision of their students, their thinking capabilities, and their ability to solve problems presented to them during the teaching course. They might also help professors at universities to present and focus on topics that promote students' ways of thinking. They might also represent a call for stakeholders to revise and review all study plans at universities or schools and in away or another include topics that allow learners to practice all stages of thinking with more focus on the abstract thinking stage.

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