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Prevailing Patterns of Thinking among Students of Tafila Technical University, Jordan

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Abstract

The aim of this study is to investigate thinking patterns among Tafila Technical university students, and its relationship with faculty, gender, general point average, and academic level.

The sample of study consists of (210) male and female students who have been enrolled in Tafila Technical university during 2007/ 2008 from the five faculties To achieve the purposes of this study , the study used thinking pattern questionnaire which was developed by (Hamodeh,2000) then the validity and reliability were obtained .

Also means, standard deviations, and 4-way ANOVA were used. The results showed that:-

1. Scientific thinking was the most common pattern of thinking.
2. There is no statistically significant differences due to faculty, gender, general point average, and academic level on the thinking pattern.

The researchers suggested teaching different thinking pattern skills on studying courses such as creativity and critical thinking.

Keywords: critical thinking, creative, strategies, learning, patterns

1. Introduction

Nowadays, the attention tends to be drown toward universities more than ever before, because of their vital and decisive role in communities and people's life . They are considered as sources of knowledge and experience which form the effective instrument to deal and cope with rapid and spectacular changes taking place in the world. From this view, universities are required to respond and interact with the conditions and requirements of their communities through effective university teaching, which depends on discussion , intellectual dialogue , understanding, analysis , criticism and inferring away from memorizing , indoctrination and passive reception. This clearly indicates to the importance of the university in preparing generations that able to think and investigate well (Ghaleb, 2001)

Perhaps it is suitable that we begin to recognize the nature of thinking as there are various definitions of thinking. The definition of (Costa, 2001) is one of the most common and acceptable definitions to educators. According to Costa , thinking is defined as « applying mental processes for the sensory input and making cognitive reviews for these inputs to reach a certain end through the use of: reasoning, and inference, and giving value to these ideas».

Thinking also is defined as: «a series of invisible mental activities carried out by the brain, when it is exposed to a stimulus received by senses in search of the meaning of the situation or experience, and it is a meaningful and evolutionary behavior». (Jarwan, 2002, A). Thinking levels can be divided into two major levels.

(Meta cognitive Thinking) and (Cognitive Thinking): The first level includes higher-order thinking that is used when solving the problem or making the decision. This kind of thinking requires processing of information by talking with oneself when planning for performance and monitoring the implementation of the plan. It includes planning, monitoring and implementation.

The capacity of metacognition enables the learner to observe his/her performances and employs a variety of ways in order to change the strategies when they prove that they are not effective, planning, expecting results, formatting of links, using memorial supports , and organizing information.

These strategies can be taught to students directly. The process of learning is a process in which the learner reacts with the experience he/she faces, and this interaction grows as much as the effort of the cognitive processes increases . Cognitive processes include organization, entering, integration and storage of experience by the student in order to be retrieved in the suitable time

The other level is the Cognitive Thinking which includes various processes and strategies of thinking. The processes include: critical thinking, reasoning, and creative thinking. While strategies include: problem solving, decision-making, and concepts formation. (Jarwan, 2002, A). Thinking Patterns can be defined as: a set of performances that distinguish the individual, and is considered a sign of the way he/she receives the experience from previous stored knowledge and use it to adapt with the surrounding environment (Gregorc, 1979)

2. Patterns of thinking. The patterns of thinking are as follows:

1 - Intuitive thinking (natural).
2 – Emotional thinking (or affective).
3 - Logical thinking.
4 - Mathematical Thinking.
5 - Critical thinking.
6 - Scientific thinking.
7 – Innovative thinking. http://Majdah.Maktoob .com/vb/Majdah 14694

We will give a brief description about each of these patterns. First we begin with intuitive thinking (natural) and is sometimes called the initial, or primary, or raw thinking, where no methods could be applied to interfere in patterns of thinking

2.1 Intuitive thinking. The properties of intuitive thinking are as follows:

A - Repetition.
B - Generalization and bias.
C - Thinking in generalities without partials or specifics.
D - Innate imagination and dreams.
E – exposed to wrongs and mistakes.
F - Happens in association with free thoughts.
http://majdah.maktoob.com/vb/majdah14694

2 .2 Emotional thinking
sometimes called emotional thinking and means to understand or explain things or make decisions according to the preferences and desires of the individual or what he/she likes or is familiar with.
Emotional thinking properties are as follows:
A - Shallowness
B - Haste.
C - Simplification.
D - Optional absorption.
E- Making decision according to black and white or true – false method

2.3 Logical thinking
Represents the improvement occurred in the natural way of thinking through serious attempt to control the excesses of the natural or innate thinking. logical thinking mainly depends on the reasoning to understand and absorbed things. Reasoning is considered a step on the path of "measurement". It is noted that the availability of a cause or a reason does not necessarily mean that this reason is valid or acceptable

http://naja7.org/tag

2.4 Mathematical Thinking

It includes the usage of previous equations, preparation, relying on the structures and rules, symbols, theories and evidence, as they represent an intellectual framework governing relationships between things. (Abd and Asha,2009,P73)

In contrast with the natural and logical thinking, the starting point lies in the equation or symbol even before data are available, that these previous channels (equations, symbols) will facilitate the passage of information in accordance with a selected mathematical form or system. http://Naja.org/tag

2.5 Critical Thinking

Critical thinking is the individual ability to express an opinion whether supporting or contrasting in different positions, with providing justification and good reasons for each opinion. (Gerlid,2003,P.1)
Critical thinking and reflective thinking aims to make a judgment or expressing an opinion.

It is important here for the individual to have his own opinion in the issues discussed, and demonstrates his /her opinion with persuasive and convincing evidence in order to be of those who think in a critical way.(ALzubbi,etall,2010,P.170). Information and data are subjected to mental and logical tests in order to find out the evidence or proofs and to identify the clues. The processing of these information and data is performed through mental and logical tests in order to establish the proofs or /and to identify the clues.

2.6 Scientific thinking

Scientific thinking is a mental process by which problem-solving or decision-making is performed in a scientific way through organized systematic thinking.

2.6.1 Steps of scientific thinking in decision making are :

A - Identify the problem and the goals of decision-making.

B - Collecting data and its related facts, predicting possible impact.

C - Develop alternative solutions to the problem

D - Evaluation of each of the alternatives

E - Making the most appropriate decision which represents the best way to achieve the objective in the light of the potential and resources available.

2.6.2 Steps of scientific method of knowledge:

A - Observation.

B - Desire for knowledge "question".

C - Develop hypotheses.

D - Determine the best ways to answer the question.

E - Test hypotheses.

E - Inference and conclusion.

G -The cautious generalization. http://uaecc.net/vb/shothread.php?t=15939

2.7 Creative Thinking

Creativity is defined as viewing familiar things from an unfamiliar point of view. It includes developing this view to turn into an idea, then into a design, then into creativity which is applicable and easy to use.(Himg,2001,P. 43) (Olson.1990,P.383)

2.7.1 Characteristics of creative thinking

A - Avoid logical sequence.

B - Provide several alternatives to solve the problem.

C - Avoid the process of differentiation and choice.

D - Avoid the traditional style of thinking.

E - Modify the attention to a new intellectual direction. http://Naja7.org/tag

3. Problem Statement

Opinions and views in education agree on the necessity to emphasize the educational goals (outcomes), whether in planning, formulation, or achieving them by students. It is well known that high levels of the knowledge goals require higher cognitive capacities of thinking. Hence, there must be an identification of thinking patterns among university students. Identifying the prevailing patterns of thinking among students would contribute to achieve the desired objectives.

Classroom position is the result of a dynamic interaction between the mind and thought of the students and their teachers. Understanding the students patterns of thinking helps the university professor to construct teaching plans and learning procedures, and raises the level of interaction between teacher and students in order to increase the effectiveness of the interaction between students patterns of thinking, and patterns of thinking for their teachers at the university. This will contribute in student achievement and their university adaptation especially that the majority of students at the university would prefer test questions that don't exceed the lowest patterns of thinking . This indicates that they have traditional patterns of thinking not exceeding the first and second levels of Bloom taxonomy of epistemic goals (knowledge and comprehension). The problem in this study includes a question about the reality of thinking patterns prevailing among students of Tafila Technical University, and if these patterns vary by difference of faculty, gender, grade point average and academic level of the students. So the current study is seeking to answer the following questions:

1- What is the most common pattern of thinking among students of Tafila Technical University?

2- Does thinking pattern change according to student gender or cumulative GPA, faculty or academic level?

4. Aim of the study

The aim of this study is to reveal the prevailing thinking patterns among students of Tafila Technical University and to explore whether these patterns vary by faculty, gender, average, and academic level

5. Importance of the study

The importance of this study arises out of the importance of the subject matter it treats which is patterns of thinking among university students. As the subject of thinking is a fundamental goal in various educational stages , it's patterns have to be explored in order to guide students to the necessity of following methods of higher-order thinking if the study results show that there are mythical or superstition and lower patterns of thinking(AL-Momani,2006). The aim is to prepare individuals to be thinkers, able to ask questions and queries, and have mind flexibility, so that they can face all the challenges posed by the technology of modern era of information and knowledge revolution related to communications and Internet. It's clear that any study providing researchers with basic experimental level will enable to use it for various purposes, both in the evaluation of the training programs impact or in conduction other studies. This study could be useful for such things regarding patterns of thinking of university students and its results may be considered by decision makers in the field of education both in the development of courses study plans or following teaching methods based on thinking as well as in tests preparation and evaluation.

6. Previous studies

The aim of Farouk Othman study (1987) is to identify self-concept and its relationship with inflexibility among university students in different majors . The study sample consists of (270) students from the first and fourth years in Faculty of Education at Mansoura University . The study results have shown a negative relationship between self-concept and inflexibility and in the first and fourth-year students while the fourth-year students showed more flexibility than first-year students. Also the results have shown that students of scientific specialization had more flexibility than vocational specialization.

(Wright,1988) study aims to reveal the impact of age , gender, cumulative average on students ability of critical thinking . The study sample was (163) male and female students from Nebraska University, U.S.A ,studying computer course. The results showed that their was an impact of variables of age , gender, cumulative average on critical thinking improvement.

(Bitner, 1990) study aimed at identifying the growth of scientific thinking from the sixth grade to twelfth grade . The sample consisted of (111) students divided into two groups. The first is experimental and the second is control the teachers of experimental group was asked to encourage their students and train them to give causative explanations and to find the relationships in the course curriculum throughout the academic year. Results have showed that experimental group members were superior than the control group members in scientific thinking capacities. This indicates that scientific thinking has a positive relationship with age and academic level.

(Frederick, 1993) study aimed to identify the impact of studying both philosophy and literature courses on the critical thinking. The study sample consisted of (80) students from fourth and fifth primary grades. Courses' teaching duration lasts (12) weeks and then the researcher measured critical thinking skills for students. results of students who have studied philosophy course were higher than their peers who studied literature course in critical thinking and logical thinking skills. The interpretation of this result was that the philosophy course allows discussion between students on one hand, and between students and teachers on the other hand, which leads to hiding traditional conflict between the two parties and provides higher freedom of thinking.. There is no doubt that the study result indicates that the university teaching based on intellectual interaction between students and professors at the university can promote and develop critical thinking ability of students.

The aim of (Al Qubati,1993) study is to find out the growth and mathematical ability and its relationship with logical thinking and achievement in mathematics in secondary and university stage . The study sample consists of 744 male and female students in which 536 students were from first secondary scientific stream, 106 college students were from second year, while 105 students were from AL-Yarmouk University, third and fourth year. Mathematical ability standard has been used. Results showed the mathematical ability is related with students growth. Also it was found that coefficient was significant between mathematical ability, logical thinking and mathematical achievement.

The aim of (Ahmed Saleh, 1994) study is to discuss the progress of the educational level and its impact on the growth of critical thinking abilities among students in secondary school and university stages . The study sample consists of (759) students of which (393) are females and (366) are males. It is shown that there are statistically significant differences between males and females in the first secondary grade education in critical thinking in favor of males. Results also showed no statistically significant differences between males and females in critical thinking at the university, and there were statistically significant differences between high school students and undergraduate students in favor of university students.

The aim of (Murad,1994) study is to explore the role of critical thinking and teaching experience in the behavior at different educational positions on educational process in primary grades teachers. The study sample consists of 83 male and female teachers in Qahira and Jeeza governorates while critical thinking test was applied . the results showed no statistically significant differences between males and females in critical thinking.

The aim of study conducted by (Al Kilani,1995) is to identify the reality of critical thinking among a sample of secondary school principals enrolled in master's program in educational administration. The study sample consisted of (54) male and female headmasters. The study results indicated that there are statistically significant differences attributed to major of study or specialization and in favor of scientific specializations.

The aim of the study carried out by (Maryiam Saman, 1996) is to identify the relationship between different learning levels and the spread of Superstitious Thinking. The study sample consisted from (800) population from the city of Damascus. The results showed that Superstitious Thinking decreases with the progress of the individual educational

level , and that Superstitious Thinking is less spread among male than among females. In addition , the results indicated that Superstitious Thinking decreases when the economic level of individuals increases.

(Abd Almottaleb,1998) study aimed at identifying prevailing thinking patterns among university students and the impact of cooperative education on thinking patterns. The results showed that prevailing patterns of thinking according to their commonness are as follows:

Logical thinking, deductive, metaphysical, scientific, creative, superstitious. Also, there were statistically significant differences between the means of students from faculty of education and faculty of sciences. It was found that authoritarian thinking was in favor of faculty of sciences students while logical thinking was in favor of Faculty of Education students. There were also differences in prevailing thinking patterns in theoretical and practical faculties.

The aim of Hammouri and Alwehr study (1998) is to explore the ability of the Hashemite University students of critical thinking, and it's relationship with each of the student's academic stream at the secondary school, and the student's achievement in the general secondary education .The study sample consisted of (121) male and female students from the first year. The results showed that there was no statistically significant effect of any of the academic streams and student's achievement at the general secondary stage on critical thinking.

Hamouda (2000) study aimed to identify the thinking patterns at the University of Jordan students and its relationship with gender and academic specialization an dthe educational level. the sample consisted of (352) male and female students from faculties of Arts, Pharmacy and Social Science and thinking patterns instrument was applied on the sample. Results showed that the compromise thinking is the dominant pattern among university students regardless of their academic specialization, academic level and gender. While statistically significant differences were found in the creative thinking pattern due to the variable of academic level and in favor of second year and less than second year .

A study conducted by (Al-Gharaibeh,2001) identified the logical thinking level in elementary grades (sixth, eighth, tenth) and the impact of academic level, gender on the level of logical thinking. TOIT test was used to explore logical thinking level . The study sample consisted of 417 male students and 575 female students. The results revealed low level of logical thinking among elementary grades (sixth, eighth, tenth) in the total marks and showed statistically significant differences at (α= 0.05) attributed to gender and in favor of females

The aim of (Al-Fokaha,2001) study is to explore the creative thinking level at Philadelphia university using Holms scale. The results indicated that many students who have high levels of creative thinking do not receive enough care and interest for their creativity. Additionally, there were statistically significant effect for the following variables: college, education style and parents treatment style on creative thinking .

Barakat study (2005) aimed to reveal the relationship between reflective thinking and academic achievement. The study sample consisted of (400) male and female students from secondary and university stages in Tulkarem. Results showed that students have medium average of reflective thinking. Also the study showed no statistically significant differences between students' scores on the reflective thinking scale due to the gender and academic achievement variables.

The aim of (Miller ,2005) study is to explore the differences between high achievement level and low achievement level students in terms of thinking patterns in addition to other variables. The study sample consisted of 633 male and female students from faculty of psychology at the University of California using the experimental style . The results were in favor of students of low achievement level in the first, second and third variables which have studied the relationship between thinking patterns used by high achievement level and low achievement level students. The results have also showed a difference in mathematical thinking and applied thinking and in favor of high achievement level students .

From the mentioned review of previous studies, it is clear that all studies are interested in thinking patterns. However, they varied in their objectives and results, some of them have focused on identifying the impact of some demographic variables on thinking patterns among students or managers, such as (Wright, Hammouri and Alwehr) studies. On the other hand, it was found that some other studies have focused on the impact of personal and cognitive variables on different thinking patterns such as the study of (Barakat) and (Kilani).

7. The method and procedures

7.1 The study population and sample:

The study population consists of all students of Tafila Technical University five faculties: - Educational Sciences, Arts, Sciences, Administrative Sciences, and Engineering from the first, second, third and fourth years of the academic year 2007/2008, including (3250) students. The sample of the study consists of (210) male and female students

The sample was formed by selecting one section randomly from each academic year in each of the five faculties. Thus, the number of selected sections = 20 sections. The sample was classified according to the cumulative average of the members into two categories: the first: Students who have rating good and up that good level (the cumulative average ≥ 68), the second: students whose rating is less than good (the cumulative average <68). Table number (1) shows the distribution of sample according to gender, faculty, academic level and cumulative average

Table (1). Distribution of the sample according to variables of gender, grade point average, faculty and academic level.

Variable	categories	number	Percentage
Gender	Male	107	%50.95
	Female	103	%49.04
Rating	good and more	36	17.14%
	Less than good	174	82.85%
Faculty	Education	52	24.76%
	Sciences	61	29.04%
	Engineering	52	24.76%
	Arts	24	11.42%
	Administration	21	10.00%
Academic level	First and second years	155	73.80%
	Third and fourth years	55	26.20%

7.2 instrument of the study:

This study used the right instrument to explore the thinking patterns at university students, that instrument has been prepared and developed by Nuha Hammouda and she used it in her study (Hammouda, 2000).

This instrument has been prepared and developed to reveal six patterns of thinking after a conceptual analysis of each pattern by reviewing available studies, researches and literature about thinking patterns . A number of cognitive processes that reflect the pattern of thinking were concluded. Table No. (2) presents mental cognitive processes that reflect scientific thinking patterns.

Table (2). The mental cognitive processes that reflect scientific thinking patterns

Number	mental cognitive process
1	Try to find out various causes of phenomena
2	Adopt the experiment as a mean of knowledge to reach the best answer for questions
3	Carefulness in making decisions of the study
4	Provide the evidence to support or deny an idea , and rejection of all ideas that are not supported by strong evidence
5	Preference of scientific trips to other types of trips.
6	Acceptance of scientific facts that are supported by scientific evidence
7	rely on information collection as a necessity to solve problems

8	Considering knowledge as a cumulative process benefits from the previous knowledge
9	Refuse to consider any result as final and absolute
10	stick to the facts without exaggeration with concern to accuracy in terms
11	gather common facts related to each other to make generalizations
12	Find out the results of actions or activities or expect them
13	Have a methodology and a strategy of clear methods and instruments

(Samaan,1996), (westbrook, 1994), (Hammouda ,2000)

Table (3). The mental cognitive process related to critical thinking pattern.

No.	Mental cognitive process
1	Take decisions based on mental processes in a short time.
2	Make final judgments on a topic.
3	adapt to complex and embarrassing situations
4	accept others opinions comfortably.
5	think independently.
6	the ability of challenge and self assurance.
7	learn unknown things to strengthen the self.
8	discover mistakes and errors in order to correct them.
9	Tendency to challenge topics.
10	tolerance of stress and psychological pressures in a large degree.
11	Using previous experiences to face problems .

Lipman (1988), Hammouda (2000)

Table (4) The mental cognitive processes that reflect the creative thinking pattern

No.	Mental cognitive process
1	Interest in modern and novel ideas
2	Have a large scale of flexibility in dealing with the idea
3	High self-confidence and self-sufficiency
4	Refuse to comply with the regulations and routine .
5	Realize what others can not see in a subject or an issue.
6	Create new novel relationships between things and issues.
7	Sense of beauty.

Table (5). The mental processes contained in superstitious thinking pattern .

No.	Mental cognitive process
1	Naivety and lack of knowledge and education
2	Thinking superficially in the posed subjects
3	Believing in superstitions without criticism.
4	believe all what is said as it is

5	Keeping away from scientific method in dealing with different issues
6	Basing on invisible ,metaphysical and supernatural things
7	Lack of recognition of causal relationships
8	Considering all matters as final and absolute even if they are wrong.

Table (6). The cognitive mental processes that reflect the authoritarian style of thinking

No.	cognitive process reflecting authoritarian style
1	Stick in one's opinions as a sign of magnanimity.
2	Avoid consulting others about a subject considering this as a kind of weakness
3	Appearing always as the strongest person in front of others
4	Raising up the voice during discussions as a way to prove his point of view
5	Creating a problem if the person is unable to justify his opinions.
6	desire to make others show full obedience and submission.
7	Refuse to confess that others opinions are right
8	Preferring to leave friends than to leave the own ideas and views.

The mental cognitive processes of compromise thinking pattern are illustrated in Table (7)

Table (7) The mental cognitive processes included compromise thinking pattern

No.	mental cognitive process
1	Using compromise solutions for different issues.
2	Combination of own personal opinion and others opinions in any case.
3	Thinking that points of agreement are more than disagreement in any subject.
4	Considering that reconcile between odds and quarreling parties as the noblest and greatest work
5	Refusing excessiveness and immoderation either positively or negatively.
6	Concern for keeping meeting with others.
7	Waiver of personal opinion, if the other has stuck to his opinion.

7.3 Instrument of extracting scores and degrees

The study instrument consisted of (78) items with five options for each item (strongly agree 5, agree 4, not sure 3 , disagree 2 , strongly disagree 1)

After checking students' answers to the questionnaire, items and degrees are gathered for each of the six study subjects representing the patterns of thinking.

The pattern is considered prevailing if the total score is the highest possible degree (5=strongly agree).

Thinking pattern is considered less prevailing if the paragraphs' total score is less than the lowest possible degree (1= strongly disagree), which means students rejection of the of the items.

A table which shows the number of items for each pattern was prepared. It also shows the highest degree that could be achieved in order to evaluate this pattern of thinking , and the lowest degree to exclude the pattern of thinking.

Table (8) The number of thinking patterns items on the study instrument and grades achieved for each of them.

Pattern of thinking	Number of items	Range of highest degree to decide if the person has the thinking pattern	Range of lowest degree to decide if the person has the thinking pattern	No specific pattern of thinking
Scientific	23	92 – 115	23 – 46	47- 91
Critical	13	52- 65	13-26	27-51
Creative	11	44-55	11-22	23-43
Superstitious	11	44-55	11-22	23-43
Authoritarian	10	40-50	10-20	21-39
Compromise	10	44-55	11-22	23-43
Total	78			

The validity and reliability have been obtained . External validity and arbitrators validity were verified through presenting the items and conceptual analysis for each style to the Master's students of Educational Psychology and they were asked to judge whether the items cover and reflect the cognitive processes patterns.

The instrument was applied on a sample of (352) male and female students at the University of Jordan, and Pearson correlation coefficients between these 6 patterns was calculated. It was found that the assumptions of the relationship between these patterns are true and valid.

It was assumed that there is a high positive correlation between the scientific and critical thinking , after analysis it was found that the correlation coefficient is (0.579). Also it was assumed that the relationship between the scientific thinking and superstitious thinking is low and it was found that the correlation coefficient is (0.008)

Similarly, other correlation coefficient reflects logical relationships corresponding with the similarity or difference between different patterns of thinking according to the conceptual analysis.

To calculate the reliability, Cronbach Alpha coefficient of reliability between the items of each dimension of the six thinking patterns was calculated. Stability coefficients ranged between (0.74) and (0.49) and is considered acceptable for the purposes of study.

For the purposes of this study, the researchers calculated the reliability in the same way using the exploratory sample amounted to (60) male and female students. Stability coefficients ranged between (0.78) and (0.57) and they are acceptable for the purposes of this study.

Regarding the distribution of instrument items of thinking patterns , Table (9) shows the following:

Table (9). Distribution of instrument items on patterns of thinking

Pattern of thinking	Number of instrument items	Number of items
Scientific	1,6, 11, 16,17, 20, 23, 28, 29,30, 31, 37,43, 44,50, 54, 58,62, 67, 71,72, 75, 78	23
Critical	7,13, 19, 26,35, 42, 46,51, 61, 65,69, 74, 77	13
Creative	5,12, 21, 27, 33, 41, 48, 53,57, 66, 70	11
Superstitious	4,9, 15, 24, 32, 38, 40, 49,56, 64, 73	11
Authoritarian	3,10, 14, 25,34, 39, 45,52, 60, 68	10
Compromise	2,8, 18, 22,36, 47, 55,59, 63, 76	10

7.4 Procedures

The researcher has provided the questionnaire to the students . After answering they were entered into the computer to be statistically analyzed and to extract the results.

Means and multiple variance analysis were used to identify the relationship between gender, cumulative average, faculty and academic level as independent variables and the prevailing thinking pattern among students in order to analyze the relationships between them_.

8. Results

To answer the first question of the study"What is the most common pattern of thinking among the students of Tafila Technical University"? Arithmetic means and standard deviations were used as presented in Table(10)

Table (10). means and standard deviations

Thinking pattern	authoritarian		superstitious		Critical		Scientific		Creative		Compromise		total	
Variable	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male	2.44	0.51	2.41	0.70	0.62	0.44	3.53	0.86	3.24	0.94	2.59	0.56	2.81	0.67
Female	2.33	0.54	2.28	0.62	2.51	0.53	3.32	0.60	3.41	2.24	2.45	0.55	2.71	0.76
Total	2.39	0.52	2.35	0.66	2.56	0.49	3.43	0.75	3.32	0.71	2.52	0.56	2.76	0.71

Table (10) reveals that the performance average on the scientific is the first pattern with an average of 3.53 and standard deviation 0.86 . The second pattern is creative thinking with an average of 3.24 and standard deviation 0.94 .While critical thinking comes in the third step with an average of 2.60 and standard deviation 0.44.

Compromise thinking is the fourth with an average of 2.59 and a standard deviation of 0.56.

The authoritarian pattern of thinking is in fifth place with an average of 2.44 and standard deviation of 0.51 ,the last and sixth pattern is superstitious thinking with an average of 2.41 and standard deviation 0.70. This indicates that the scientific thinking pattern is the most common style of thinking in the study.

To answer the second question "Do you think that thinking pattern differs according to gender , cumulative GPA, faculty or academic level?" averages and standard deviations for the responses were used as shown in Table (11)

Table (11). Averages and standard deviations for the sample responses to the six patterns items

Variable	Categories	Average	Standard deviation
Gender	Male	2.81	0.67
	Female	2.71	0.76
cumulative grade point average	>= 68	2.84	0.61
	< 68	2.74	0.80
Faculty	Educational Sciences	2.77	0.74
	Sciences	2.80	0.51
	Engineering	2.77	0.67
	Arts	2.81	0.66
	Administration	2.66	0.49
Academic level	1+2	2.80	0.85
	3+4	2.66	0.49

Results indicate to external differences in the performance averages due to the difference of students gender , cumulative GPA, faculty or academic level.

To explore whether these differences are statistically significant, the researcher used variance multiple analysis to determine the relationship between each of the faculty, gender, academic level and the six thinking patterns as shown in Table 12

Table (12). the variance multiple analysis of the relationship between each of the faculty, gender, academic level and the six thinking patterns

Source of variation	sum of squares	degrees of Freedom	Squares mean	F value	significance level
Faculty	.511	4	.128	.654	.625
Average	.002	1	.002	.009	.927
Gender	.067	1	.067	.341	.560
Academic level	.684	1	.684	3.501	.063
Faculty *level	.256	4	.064	.327	.859
Faculty *gender	.577	4	.144	.738	.567
Average *gender	.161	1	.161	.824	.365
Faculty*Average *gender	.036	2	.018	.092	.913
Faculty *level	.885	3	.295	1.509	.214
Average *level	.109	1	.109	.556	.457
Faculty*Average *level	.211	1	.211	1.078	.301
Gender *level	.001	1	.001	.003	.955
Faculty *Gender *level	.271	2	.135	.693	.502
Average *gender *level	.095	1	.095	.484	.487
Faculty* Average *gender *level	.000	0			
Error	35.180	180	.195		
Total	1558.295	209			

Table (12) has shown that there was no statistically significant differences in the performance on the six thinking patterns attributed to the average, faculty, gender and academic level, suggesting that these differences were apparent differences.

9. Results discussion and interpretation

The present study results indicated that the pattern of scientific thinking is the most common in this study with an average of 3.53 and standard deviation of 0.86. The second pattern is creative thinking with an average of 3.24 and standard deviation of 0.94.

This result concerning the first question could be explained by considering educational and cognitive experiences, concepts, attitudes and ideas acquired by students in different stages whether in school or at university have encouraged the spread of the scientific pattern more than other thinking patterns. It is clear that those students are being taught in a method that focuses on scientific and creative thinking patterns and their skills such as: scientific thinking, using styles that promote creative thinking like accepting criticism and not to fear failure, independency, wide imagination (Priest,2002). This result corresponds with educational calls for teaching and educational programs built on scientific and creative thinking in different stages at school or university in order to make students ready to complete high studies which is based on scientific and creative thinking in academic researches and scientific theses.

The results of the current study consistent partly with (Al-Gharaibeh,2001) and (Bitner,1990)and (Saman,1996). (Al-Gharaibeh,2001) study indicated to decrease of logical thinking while(Bitner,1990) study indicated that scientific thinking is related positively to age. (Saman,1996) study revealed that superstitious thinking has negative relationship with educational level.

The result concerning the second question could be explained as thinking is a human process regardless of gender whether male or female since both males and females have raised in the same environment and enrolled in the university at the same time after receiving their schooling at similar circumstances in terms of teaching methods ,educational activities and in the relationship between teacher and students. Therefore, there is no justification to any statistically significant differences in the studied variables on common thinking patterns for students.

So it could be said that the points of agreement between the 2genders are greater than difference in personal and cognitive aspects.

The study results has partly agreed with (Murad,1994) and (Barakat,2005) and (Alhammori & Alweher,1998) study. (Murad,1994) study showed no statistically significant differences in critical thinking due to gender. (Barakat,2005) study showed no statistically significant differences in reflective thinking due to variables of gender and educational achievement. (Alhammori & Alweher,1998) study showed no statistically significant differences in critical thinking regarding study stream and student achievement level.

The difference between the results of the current study and Kilani study (1995) could be attributed to the sample used. This study was applied on university students while Kilani study was applied on school principals - who are older than university students - and scientific thinking could grow up with age as Bitner's study 1995 indicated

10. Recommendations

In light of the study results and discussion, the researcher provide the following recommendations- :

1- Scientific thinking is the most common pattern of thinking among the study members, so that the researchers recommend more studies to be conducted to develop other types of thinking such as creative and critical in the light of different cognitive items whether independent or within study courses of the university students.

2- The need to adopt teaching methods based on developing patterns of thinking and to focus on thinking approach more than grade points.

3- Studying the obstructions and hinders of creative and critical thinking development in order to get rid of them.

4- Increase flexibility in the university procedures and in the treatment between students and instructors as an attempt to increase students flexibility in thinking and the multiple attitudes which can help.

5- Conducting Further studies to link between thinking patterns and other variables such as mental capacity, and types of personality.

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