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Multiple Intelligences Patterns of Students at King Saud University and Its Relationship with Mathematics' Achievement

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Abstract

The purpose of this study was to determine the multiple intelligences patterns of students at King Saud University and its relationship with academic achievement for the courses of Mathematics. The study sample consisted of 917 students were selected a stratified random manner, the descriptive analysis method and Pearson correlation were used, the researcher prepared multiple intelligence scale for this study.

The results showed an overall appearance of all multiple intelligences patterns of the sample students in the following order: self, social, bodily, logical, verbal, visual, musical and natural intelligence. It was also observed that progress medical track students in most of the multiple intelligences patterns compared with other tracks (Engineering, Humanities), as well as students of math 140 compared with students of other courses (Math130, Math150, Stat140). There is impact of visual intelligence, bodily, logical, and sometimes social, musical and natural on the Mathematics' achievement.

Keywords: multiple intelligences, mathematics achievement

1. Introduction and Theoretical Framework

1.1 Introduce the Problem

Massive information revolution has been sweeping the world which is characterized by the development of science, technology and superior speed to increase information and complexity. This confirms that tomorrow's communities will live in a very complex world that needs creative mentalities. Success will not be achieved in these days without achieving balance between contemporary globalization and the ability of thinking, creativity and use all energies of the human mind and multiple intelligences which the researchers think that is a general ability which made up of two types of capacity: the verbal and logical ability. This belief prevailed until the theory of multiple intelligences appeared in the hands of Howard Gardner's (1983).

Gardner's theory of multiple intelligences suggests that each individual has a unique combination of eight types of intelligences (profile intelligence) all interfere with daily life that is amenable to development in order to achieve justice among people in giving them different ways to learn.

Gardner reached to his theory through his observations of individuals who have some extraordinary abilities in mental capacity and he did not get a high score on the IQ test, so he founded his theory on: Intelligence consists of a lot of capacity; people have unique patterns of strengths and weaknesses in mental ability; people differ in capacity and concerns, so they do not learn in the same way; learner can't learn everything, so this theory helps to Guide each learner to kind of study that suit them and match their abilities; we cannot activate any intelligence separate from the other because these intelligences affect each other in varying degrees; you can activate the logical intelligence in dealing with a weakness of verbal intelligence; and you can activate the musical and bodily intelligence in dealing a weakness of verbal or logical intelligence (Gardner, 1997; Gardner, 2003; Thomas, 2006).

Normal people have at least eight types of intelligences relatively independent: verbal, logical intelligence, visual, bodily, musical, self, social and natural intelligence (Gardner, 1997; Armstrong, 2001; Armstrong, 2003).

The theory of multiple intelligences gives us scientific justifications that all materials and activities have the ability to develop a student's knowledge, skills and emotions, because it offers a wider and deeper knowledge of

concepts, also allow to each individual to reach to the level commensurate with his ability, and it may rise to the level of creativity in a specific field or other fields that chime with the manifestations of power in one of the intelligences and activities mental of students (Obaid, 2001).

Learning mathematics according to the theory of multiple intelligences achieves deeper understanding of mathematical concepts, and allows to use of multiple entrances to content of mathematics that commensurate with the nature of learners, the characteristics of teachers and scientific and technological innovations, its focus on the Strengths possessed by students and supports creative experimentation of mathematical ideas (Afaneh & Khazendar, 2004).

The multiple intelligences theory confirms that there isn't one set of teaching methods can suit all students at all times; therefore, we should deal with all multiple intelligences inside classrooms with various ways and methods that help its development, this increases the participation of students and increase their motivation to learn (Armstrong, 2000).

The integration between the theory of multiple intelligences and curriculum does not require changing the content and linking the types of intelligences with specific approaches such as linking verbal intelligence with curriculum of languages or linking logical intelligence with a curriculum of mathematics, but the curriculums should allow opportunities for learners to benefit from their multiple intelligences when dealing with the various issues in order to understanding, learning and the acquisition of the information (Campbell et al., 1999.)

The multiple intelligences theory provides a description of how the person uses his multiple intelligences to solve a problem, a framework that enables each teacher to deal with educational content and present it in several ways, and a model of learning that does not have specific rules except the requirements imposed by the cognitive components for each intelligence, it enables teachers to use a large number of teaching strategies and fair tools of assessment that suit every individual, design new approaches of teaching to reach the largest number of students, and helps them to understand the capabilities, potential and interests of students, it provides freedom for learners to choose a teaching method that suits them and enable every person to learn what she/he wants because every human being has all kinds of intelligences in varying proportions, it stresses that each person has the ability to develop all types of intelligences when she/he gets encouragement and appropriate education, and it confirms that the teacher is a guide and a mentor (Afanah & Khazendar, 2004; Elbaz, 2006).

While Goodnough (2001) confirming that the theory of multiple intelligences opens the door to a variety of teaching strategies that can be implemented within the classroom and suggests that there is no one set of teaching strategies suit all students at all times, because they have different intelligences; therefor, any particular strategy may succeed with a group of students and not succeed with another group (Goodnough, 2001).

There are many educational studies emphasize the importance of multiple intelligences to develop mathematical thinking (Aldeeb, 2011; Aldahash, 2010; Abdulsamee & Lachin, 2006), critical and creative thinking (Abuhashim, 2004), attitude towards mathematics (Albalawneh & Hamza, 2012; Aldahash, 2010; Farghali, 2009; Abdulsamee & Lachin, 2006), the ability to solve problems (Aljarah & Rababah, 2011; Zayton, 2010), the reduction of math anxiety (Alsayed, 2009), mathematical communicate (Albarakati, 2008; Hakim & Lotfi, 2006), mathematical concepts (Abuhashim, 2004), and the survival of the impact of learning (Aldeeb, 2011; Ayad, 2009; Isik & Tarim, 2009).

In the area of the relationship between use of multiple intelligences and the development of academic achievement, Pajkos and Klein (2001) aimed to improve the mathematics achievement for sixth and seventh grades of students by using the strategies of multiple intelligences. This study found that students prefer to learn math using the verbal and logical intelligence strategies and recommended to use strategies of multiple intelligences in mathematics education.

The Bendar and Coughlin (2002) sought to improve the motivation of kindergarten and grades from third to fifth students who have low motivation and mathematical achievement by using multiple intelligences strategies. The study found emergence of a significant improvement in motivation and achievement among students.

Dillihunt (2003) indicated an improvement in the academic growth and mathematics achievement among students who were dealing with the multiple intelligences compared to students who were treated by the traditional way of teaching.

Afaneh and Khazendar (2004) tried to identify the multiple intelligence levels among students from first to tenth in Gaza and its relationship to mathematics achievement and tendencies of students towards it. The study found a positive relationship between only logical intelligence and mathematics achievement and the tendency towards it. Also the results indicated no difference between male and female in the musical, personal and social intelligence.

The results, also, showed the male supremacy in the logical and bodily intelligence and the female supremacy in verbal and visual intelligence.

Also Abdulsamee and Lachin (2006) tried to identify the effectiveness of the use of multiple intelligences in developing academic achievement, mathematical thinking and tendency towards mathematics at the first grade preparatory pupils. The study found improvement in academic achievement, mathematical thinking and tendency towards mathematics at the sample pupils.

Albarakati (2008) found that Superiority of the female students in ninth-grade in Mecca who studied using multiple intelligences in achievement and mathematical communication compare with the students who studied using the six hats strategy.

Cooper (2008) found that a statistically significant effect of using multiple intelligences theory and metacognition skills to improve mathematics achievement among students.

The Cooperative learning based on the theory of multiple intelligences has a statistically significant effect on the academic achievement of fourth-grade students in Turkey compared to the traditional way, as the study found the lack of impact of cooperative learning based on the theory of multiple intelligences on the survival of the impact of learning (Isik & Tarim, 2009).

Tabuk and Ozdemir (2009) Found a lack of statistically significant differences for the use of strategies of multiple intelligences in learning based on project in mathematics achievement for the sixth grade students in Istanbul compared to the traditional way, also the results indicated that the use of project that fits with the best types of intelligence had the greatest impact on student achievement.

Saidi and others (2011) tried to determine the multiple intelligences patterns of twelfth grade in Oman and its relationship to chemistry achievement for students. The study found a positive correlation between intelligences prevailing among students and their achievement in chemistry, it also indicated that the order of intelligences prevailing among students as follows: verbal, logical, bodily and visual.

Ghazi and others (2001) were aimed to investigate the relationship between multiple intelligences and academic achievement for the Pakistani government college students, the results revealed the existence of a significant relationship between multiple intelligences combined and academic achievement, while this relationship is too weak for bodily intelligence and non-existent for the musical intelligence and high for the rest of intelligences individually.

Alsalameh (2012) examined the multiple intelligences of the basic education students and its relationship to academic achievement and sex. This study found a strong relationship between multiple intelligences and academic achievement, while there are no statistically significant differences between students according to gender.

There are a number of studies that have sought to explore and arrange multiple intelligences patterns among students in general in order to use them to guide the teaching and learning process, such as (Abualhadid, 2006) who reached in the following order: bodily, visual, logical, Verbal, social, self, natural, musical Intelligence depending on the prevalence of these intelligences ratios. The study also confirmed the existence of a high relationship between the use of the theory of multiple intelligences and academic achievement.

Nofal (2008) found the progress of verbal intelligence pattern among students, then social, bodily, existential, Visual, logical, natural and musical intelligence. The study also found that male progress in musical intelligence and female progress in logical, visual, self and existential intelligence, while there are no differences in verbal, bodily and social intelligence. The study pointed to link all types of intelligences with achievement except of bodily, visual and natural intelligence.

Aljarah and Rababah (2011) reached in the following order of multiple intelligences: self, social, logical, visual, natural, verbal and musical Intelligence and the study pointed to the existence of a positive correlation between multiple intelligences and the ability to solve problems and no differences between male and female students in multiple intelligences patterns.

Alabdulkarim and Alhelew (2014) found the pattern of social intelligence is more common among students followed by natural intelligence, bodily, verbal, visual, logical, musical Intelligence and self-intelligence, the study results also indicated to male students' progress in self and bodily intelligence and female students' progress in verbal intelligence.

The teaching and learning of mathematics in the light of the theory of multiple intelligences take us away from the familiar stereotypes, automatic repetition and routine which may cause the fatigue of students and their

reluctance to study in general and the study of mathematics in particular. It contributes to providing a learning environment consistent with possibilities and capabilities of learners and helps them on achievement for all courses in general and the courses of mathematics in particular.

1.2 The Problem of the Study

A researcher noticed through his work low achievement levels of students in math accompanied by lack of learning mathematics and that was confirmed through personal interviews with colleagues in the field of teaching mathematics, direct observation of the performance of students, and the results of the mid and final tests.

The intelligences theory is considered a considerable addition in the field of education, where teaching according to this theory enable students who have difficulties to overcome these difficulties through the use of alternative methods of investing or focus on their strong intelligences (Jaber, 2003).

The effective education should focus on the strengths of learners rather than focusing on the treatment of weaknesses only, as the focus on the strengths of learners gives them the motivation to learn with their favorite way.

Multiple intelligences and differentiated among students is considered an appropriate way to teach individuals, this requires from teachers to use the variety of learning strategies commensurate with the multiple intelligences of students in order to achieve the highest communication in the classroom and taking into account all the learners and their levels and potential educational available in educational situations.

1.3 Study Questions

This study attempts to answer the following questions:

1) What are patterns of multiple intelligences among King Saud University students?

2) What is the relationship between patterns of multiple intelligences and achievement of mathematics' courses?

1.4 Importance of the Study

The importance of the current study was identifying multiple intelligences patterns among students at King Saud University in order to focus upon them when teaching for these students and prepare teaching practices, the study helps teachers to focus on strategies that are commensurate with the types of multiple intelligences of students and provides some indicators that help to guide students.

1.5 Objectives of the Study

The purpose of this study was identifying multiple intelligences patterns among students at King Saud University and the relationship between the patterns of multiple intelligences and mathematics' courses achievement.

1.6 Limitations of This Study

• The study was limited to the first year students (PY) at King Saud University in the first semester 1435-1436h /2014-2015m.

• The current study was limited to the following eight intelligences patterns: verbal, logical, visual, bodily, self, social, musical, and natural intelligence.

• The instrument which was developed by the researcher, so the interpretation of the results depends on the instrument's validity and reliability.

1.7 Study Terms

1) Multiple Intelligences are intelligences group that make up the general intelligence of the student which estimated by the students' responses on scale of multiple intelligences that includes: verbal, logical, visual, bodily, self, social, musical, and natural intelligence.

2) Verbal intelligence is the ability to use native language or other languages.

3) Logical intelligence is the ability to use numbers, reasoning, logic and relations.

4) Visual intelligence is the ability to accurately visual perception, sensitivity to colors, fonts, shapes, the place, and the relationships between them.

5) Bodily intelligence is the ability to use the body skillfully to express their thoughts and feelings, and use their hands in the formation of things.

6) Self-intelligence is the ability to know yourself, strengths and weaknesses, awareness of your emotions and motivations, and the ability to control, understanding and respect yourself.

7) Social intelligence is the ability to perceive others' feelings, motives and mood and to distinguish them.

8) Musical intelligence is the ability to recognize and analyze the music, and includes sensitivity to rhythm, melody and tone.

9) Natural intelligence is the ability to classify types of things, such as plants and animals, and includes sensitivity to natural phenomena, and the ability to distinguish between objects.

10) Mathematics' achievement is a set of experiences, knowledge and skills of mathematics which first year students at King Saud University learned, and which can be determined through the students' achievement tests.

2. Method and Procedures

Descriptive approach and survey has been used to get the data and facts about multiple intelligences patterns among students at King Saud University and the relationship between the patterns of multiple intelligences and mathematics courses achievement.

2.1 Population and the Study Sample

The community of this study represented in the first year students (Preparatory year) at King Saud University, the sample was a stratified random manner, and it had 917 male and female students. The following table shows this sample:

Table 1. The study sample

Type	Track	Courses				Sum
		Math140	Math150	Math130	Stat140	
Male	Medical	109	-	-	-	109
	Engineering	108	39	-	-	147
	Humanities	-	-	93	84	177
Female	Medical	111	-	-	-	111
	Engineering	121	16	-	-	137
	Humanities	-	-	90	146	236
Sum		449	55	183	230	917

2.2 The Study Tools

2.2.1 Multiple Intelligences Scale

After tracing the literature of multiple intelligences and looking at the previous relevant studies, the scale has been developed by taking advantage from Mackenzie (1999), and Chislett and Chapman (2005-2006) scales, then drafted 48 items to measure the eight intelligences: verbal, logical, visual, bodily, social, self, musical and natural intelligence, so that were allocated for each item ladder five responses: always apply, apply, apply sometimes, do not apply, and never apply, These responses were given scores of 5-1. The researcher has confirmed the validity of scale through a group of arbitrators with experience and competence to know their opinion about the validity of items and clarity, the researcher conducted the proposed amendments. Researcher confirmed the validity of the construction of the scale by applying it on an exploratory sample of 45 students, and calculation Pearson correlation between each item and a dimension that belongs to it, the correlation coefficients was between (0.37, 0.86), the reliability coefficient was calculated to ensure the stability of the scale and its dimensions by using Cronbach Alpha, the reliability values ranged between 0.511, 0.749 and 0.822 for whole scale (Appendix A).

2.2.2 Achievement Tests

student achievement has been to rely on the results of the students in the final examinations for the first semester 35-36, which was prepared by the committees private based on clear scientific criteria, Cronbach alpha equation was used to ensure the stability of these tests, the reliability values reached to (0.752, 0.854, 674, and 0.768) for Math140, Math150, Math130, and Stat140.

3. Discussing the Results and Its Interpretation

3.1 The First Question

What are patterns of multiple intelligences among King Saud University students?

To answer this question, the mean and standard deviation were calculated and arrange all patterns of multiple intelligences in general and according to the type and the track, as illustrated in the following tables:

Table 2. Averages, standard deviation and arrange for patterns of multiple intelligences for all students

Pattern	Number	Average	S.D.	Ranking
Verbal	917	20.55	3.46	5
Logical	917	20.70	3.76	4
Visual	917	19.99	3.97	6
Bodily	917	21.10	3.50	3
Social	917	21.50	3.61	2
Self	917	21.99	3.56	1
Musical	917	19.08	4.48	8
Natural	917	19.19	3.51	7

The results in Table 2 show that the highest intelligence is self-IQ with an average (21.99/30), this is probably due to the nature of the academic stage which need to the self-reliance and privacy, especially among female students, then the social intelligence came in the second arrangement with an average (21.97/30). This is probably due to the environment and the culture that encourage to enroll in a private social activities, especially among male students, and the proliferation of social media, which may lead to increased social communication process, not within the same community' but between the different communities, in addition, the conservative culture which make the responses appear Contrasted showing what they want, not the reality. The bodily intelligence came in the third place with an average (21.09/30), then logical, verbal and visual intelligence, finally, musical intelligence came with an average (17.98/30), and natural intelligence with an average (18.89/30). Researcher attributed the delay of musical and natural intelligence to the desert life where they live; the lack of natural views that attract male and female students; in addition to the religious norms, customs and traditions. These results come in a partial agreement with the study of (Afaneh & Khazendar, 2003), (Oboualhadid, 2006; Nofal, 2008; Aljarah & Rababah, 2011) and (Alabdulkarim & Alhelew, 2014) in some intelligences that came in early arrangement, as well as, patterns of late intelligences, but the study differed with these studies in the order of intelligences patterns in general.

Table 3. Averages, standard deviation and arrange of multiple intelligences for male and female

Pattern	Male				Female			
	Number	Average	S.D.	Ranking	Number	Average	S.D.	Ranking
Verbal	433	20.25	3.17	5	484	20.81	3.68	4
Logical	433	20.60	3.73	4	484	20.78	3.79	5
Visual	433	19.87	3.76	6	484	20.10	4.16	6

Bodily	433	21.09	3.34	3	484	21.12	3.64	2
Social	433	21.98	3.57	1	484	21.06	3.58	3
Self	433	21.97	3.52	2	484	22.02	3.60	1
Musical	433	17.98	4.72	8	484	20.06	4.01	7
Natural	433	18.89	3.90	7	484	19.46	3.08	8

Table 3 illustrates that the highest intelligence among male students is the social intelligence with an average (21.98/30), then self-intelligence which an average (21.97/30), and the bodily intelligence with an average (21.09/30), then the logical intelligence, verbal and visual intelligence, finally, musical intelligence came with an average (17.98/30), and the natural intelligence with an average (18.89/30). The highest intelligence among female students is self-IQ with an average (23.02/30), then the bodily intelligence which an averaged (21.12/30), and the social intelligence with an average (21.06/30). These three patterns among female students are the same in the ranking of the male students with a different arrangement and probably due to the same reasons. The verbal-IQ came in fourth place for the female students, then logical and visual-IQ, these three intelligences (verbal, logical and visual) are located in the same range compared to male students with a different arrangement, also, they need to interest and development. Researcher attributed the delay to these three patterns of intelligences among male and female students to the lack of interest from teachers in the different stages, and ignored these patterns of intelligences from the students, finally, the natural intelligence came with an average (19.46/30) and musical-IQ with an average (20.06/30). These intelligences came at this ranking among male students with a different arrangement and probably due to the same reasons.

Table 4. Averages, standard deviation and arrange for patterns of multiple intelligences for the academic track

Pattern	Medical				Engineering				Humanities			
	N	Aver	S.D	Ran	N	Aver	S.D.	Ran	N	Aver	S.D.	Ran
Verbal	220	21.03	3.45	5	280	20.15	3.03	6	413	20.56	3.71	4
Logical	220	22.35	3.66	2	280	20.64	3.35	4	413	19.86	3.80	5
Visual	220	19.79	3.86	7	280	20.40	3.92	5	413	19.81	4.06	6
Bodily	220	21.15	3.15	4	280	20.78	3.37	3	413	21.31	3.75	3
Social	220	21.28	3.53	3	280	21.19	3.59	2	413	21.82	3.64	2
Self	220	22.52	3.37	1	280	21.56	3.60	1	413	22.01	3.59	1
Musical	220	18.02	4.63	8	280	19.22	3.89	7	413	19.54	4.68	7
Natural	220	19.88	3.43	6	280	18.84	3.33	8	413	19.06	3.62	8

Table 4 shows that the highest intelligence of medical track students is selfU-IQ with an average (22.52/30), then logical intelligence which an average (22.35/30), and Social intelligence which an average (21.28/30), bodily intelligence came in rank four, then verbal and natural intelligence, finally, visual and musical intelligence came. The track of engineering, the self-intelligence came in the first place with an average (21.56/30), then social intelligence with an average (21.19/30), and bodily intelligence with an average (20.78/30), the logical intelligence came the fourth, then visual and verbal intelligence, finally, musical and natural intelligence came. Humanities track students, the highest intelligence is self-IQ with an average (22.01/30), then social intelligence came in the second arrangement with an average (21.82/30), and bodily intelligence came in the third place with an average (21.31/30), then verbal, visual and logical intelligence, finally, musical and natural intelligence came. It is clear from the results that the three tracks (medical, engineering and Humanities) participate in the progress of the self and social intelligence, but the medical track uniqueness of logical intelligence because the students on the medical track have higher cognitive abilities that allow them to use logic and arithmetic more than others and they tend to be more accurate and discipline than others.

Table 5. Averages, standard deviation and arrange of multiple intelligences according to the courses

Pattern	Math140				Math150				Math130				Stat140			
	N	Aver	S.D.	R	N	Aver	S.D.	R	N	Aver	S.D.	R	N	Aver	S.D.	R
Verbal	449	20.53	3.34	5	55	20.60	2.48	1	183	21.38	3.53	4	230	19.90	3.73	4
Logical	449	21.61	3.61	2	55	19.55	2.12	2	183	20.31	3.57	5	230	19.50	3.95	5
Visual	449	20.34	3.96	6	55	18.45	3.25	7	183	20.22	4.11	6	230	19.48	3.99	6
Bodily	449	21.12	3.49	4	55	19.44	3.29	3	183	21.86	3.95	3	230	20.87	3.53	3
Social	449	21.57	3.58	3	55	18.44	3.99	8	183	22.52	3.48	1	230	21.27	3.67	2
Self	449	22.38	3.65	1	55	18.73	4.48	6	183	21.93	3.96	2	230	22.07	3.28	1
Musical	449	18.68	4.51	8	55	18.82	4.25	5	183	19.79	5.03	7	230	19.34	4.38	7
Natural	449	19.29	3.47	7	55	19.38	3.32	4	183	19.57	3.65	8	230	18.66	3.55	8

The results in Table 5 shows that the highest intelligence of Math140 students is self-IQ with an average (22.38/30), then logical intelligence came in the second rank with an average (21.61/30), and social intelligence with an average (21.57/30), the bodily intelligence came as the fourth, then verbal and visual intelligence, finally, the natural and musical intelligence came. While Math150 students have verbal intelligence which came in the first place with an average (20.60/30), then logical intelligence with an average (19.55/30), and bodily intelligence with an average (19.44/30), then natural, musical and self-intelligence, finally, visual and social intelligence came. For math130 students, the social intelligence came in first place with an average (22.52/30), then self-intelligence with an average (21.93/30), bodily intelligence with an average (21.86/30), verbal-IQ came the fourth, then logical and visual intelligence, finally, musical and natural intelligence came. The self-intelligence came in the first place among Stat140 students with an average (22.07/30), then social intelligence came the second with an averaged (21.27/30), and bodily intelligence came the third with an average (20.87/30), the verbal-IQ came the fourth followed by visual and logical intelligence, finally, the musical and natural intelligence came.

The previous results illustrate that all students in four courses take part in the progress of self, social and bodily intelligence, but Math140 students characterized by logical intelligence, because that nearly 40% of all students are medical track who progress in logical intelligence, and the rest of the students are engineering track students who tend to some extent towards the logical and mathematical operations more than other students because of the nature of their studies.

3.2 Second Question

What is the relationship between patterns of multiple intelligences and achievement of mathematics' courses?

To answer this question, a Pearson correlation between multiple intelligences patterns and mathematics achievement were calculation. These are reflected in the following table:

Table 6. Pearson correlations between the multiple intelligences patterns and mathematics achievement

Pattern	Math140	Math150	Math130	Stat140
Verbal	0.002	0.136	0.072	0.056
Logical	0.218*	0.162	0.169*	0.117
Visual	0.030	0.463*	0.045	0.060
Bodily	0.039	0.433*	0.097	0.045
Social	0.027	0.256	0.083	0.007
Self	0.101*	0.225	0.072	0.052
Musical	0.112*	0.431*	0.062	0.016
Natural	0.029	0.394*	0.105	0.088

* There is statistically significance at a level of 0.5.

Table 6 shows the existence of a statistical significant relationship between logical, self and musical intelligences and Math140 students' achievement. It also depicts a statistical significant relationship between visual, bodily, musical and natural intelligence and Math150 students' achievement. There is a statistical significant correlation between logical intelligence and Math130 students' achievement. There is no correlation between multiple intelligences patterns and Stat140 students' achievement, but the logical intelligence owner of the largest correlation coefficient and this gives an indication of the importance of logical intelligence in the area of statistics. Through the results clearly correlations between all courses of mathematics and logical intelligence pattern greater than other patterns of intelligence, especially in Precalculus (Math140). This is probably due to the nature of the students (Medical and engineering students). These results come in agreement with the studies of (Pajkos & Klen, 2001; Bednar & Coughlin, 2002; Dillihunt, 2003; Abdulsamee & Lachin, 2006; Albarakati, 2008; Cooper, 2008; Zoubi et al., 2009; Shalabi & Obuawad, 2009; Isik & Tarim, 2009; Saidi et al., 2011; Ghazi et al., 2011; Alsalameh, 2012) in the presence of a positive impact statistically significant for multiple intelligences on the academic achievement of the students, while varying with (Tabuk & Ozdemir, 2009) which concluded that no impact of multiple intelligences in project-based learning on mathematics achievement.

4. Conclusion and Recommendations

Through previous results illustrated in general, all intelligences patterns among students came in the following order: self, social, bodily, logical, verbal, visual, musical and natural intelligence. This arrangement differed among the male students; in terms of social intelligence came in first place, followed by self, bodily, logical, verbal, visual, natural and musical intelligence. Whereas self-intelligence came in first place among female students, followed by bodily, verbal, social, logical, visual, natural and musical intelligence. As can be seen from the results proved the progress of medical track students compared with other tracks students (engineering, Humanities) in most of the multiple intelligences patterns. Similarly, students of Precalculus (Math140) showed progress over students of other courses (Math130, Math150, and Stat140). The results, also, illustrated the impact of multiple intelligences patterns on mathematics achievement by showing the impact of visual, bodily, logical and social intelligence, and sometimes musical and natural intelligence on mathematics academic achievement.

In light of these results, the researcher recommends the following: measuring the multiple intelligences among students and employ it to guide students toward academic tracks that are compatible with their intelligences and encourage them to invest it actively in the learning process, teachers must use the most common patterns of intelligences in each class among students, as well as the intelligences patterns that are most closely associated with the mathematics achievement, enhancing the knowledge of staff and their skills about the theory of multiple intelligences and its applications in the field of educational practices, and urging them to use educational approaches and strategies that fit with multiple intelligences of their students, in particular self, logical and social intelligence, through training, workshops and educational meeting programs, reorganizing mathematics courses to consider multiple intelligences in balanced patterns, and do further studies about common patterns of multiple intelligences for other categories of students and measure its relationship with other variables.

References

Abdulsamee, A. M., & Lachin, S. A. (2006). The effectiveness of the proposed program based on multiple intelligences to development achievement, mathematical thinking and tendency towards mathematics at the preparatory school students. *Journal of Studies on curricula and teaching methods*, *118*, 133-167.

Abualhadid, F. A. (2006). *The impact of teaching unit in groups of primary school students in the light of the theory of multiple intelligences on achievement and the tendency towards mathematics*. The sixth Annual Engineering Conference of the Egyptian Association for Mathematics Educations, Cairo.

Abuhashim, M. A. (2004). *Effective use of multiple intelligences strategies in the development of some Engineering concepts and complex thinking skills in science among primary school students* (PhD unpublished). Ain Shams University.

Afaneh, I., & Khazendar, N. (2003). Learning strategies of multiple intelligences and its relationship with some variables of the students' teachers' specialty Mathematics in Gaza. In *Fifteenth conference of the Egyptian Association for Curriculum and Instruction, Education curriculum and preparation of contemporary life, Ain Shams University guesthouse* (Vol. II, pp. 218-235).

Afaneh, I., & Khazendar, N. (2004). *Classroom teaching with multiple intelligences*. Dar Afaq for publication and distribution, Gaza, Palestine.

Afaneh, I., & Khazendar, N. (2004). Levels of multiple intelligences for basic education students in Gaza and its relationship with achievement in mathematics and tendencies towards it. *Journal of Human Studies*, *2*(12), 323-366.

Alabdulkarim, S. O., & Alhelew, B. S. (2014). Multiple intelligences prevalent among children in Riyadh, *Journal of Modern Education Association*, Issue 20, 71-110.

Albalawneh, F. Y., & Hamza, M. A. (2012). The impact of a program based on the multiple intelligences in the teaching of mathematics on achievement of the fifth grade math students and their attitudes towards it. *Magazine Al-Quds Open University for researches and studies*, *28*, 291-326.

Albarakati, N. H. (2008). *The impact of using multiple intelligences, the six hats and KWL strategies in achieving, communication and interdependence of maths among ninth-grade students in Makkah*. Faculty of Education, Umm alqura university.

Aldahsh, A. A. (2010). The effectiveness of a program of educational activities based on Gardner's theory of multiple intelligences in the development of mathematical thinking and the tendency towards mathematics among middle school students in schools in Riyadh Region. *Journal of the College of Education*, *34*, 225-274.

Aldeeb, M. H. (2011). Effectiveness of the proposed program of multiple intelligences in the development of achievement and mathematical thinking and the survival of the impact of learning in basic school students in Gaza province. *The magazine of Al-aqsa university*, *XV*(I), 30-63.

Aljarah, A. D., & Rababah, H. A. (2011). Multiple intelligences and its relationship with solving problems among outstanding students in Jordan, Umm Al Qura University. *Journal of Educational and Psychological Science*, *3*(1), 69-120.

Al-Salameh, E. (2012). Multiple intelligences of the high primary stage students. *International Journal of Psychological Studies*, *4*(1), 196-204. http://dx.doi.org/10.5539/ijps.v4n1p196

Alsayed, A. M. (2009). *The effectiveness of educational activities program in mathematics according to Gardner's theory of multiple intelligences in development achievement' and reduction of anxiety in basic education students in Oman*. The ninth conference of an engineering, technological innovations and development of the teaching of mathematics, Oman.

Armstrong, T. (2000). *The multiple intelligences in the classroom, 2nd*. Alexandria, Virginia USA.

Armstrong, T. (2001). *The multiple intelligence in the classroom*. Association for supervision and curriculum development, USA.

Armstrong, T. (2003). *The multiple intelligence of reading and writing: Making the words come alive* (pp. 13-14). Alexandria, Virginia USA.

Ayad, M. K. (2009). *The impact of multimedia program in the light of the theory of multiple intelligences on the acquisition of technological concepts and the survival of the impact of learning among the seventh grade students in Gaza*. The Islamic University of Gaza.

Bednar, J., & Coughlin, J. (2002). *Improving student motivation and achievement in math-matrices through teaching to the multiple intelligences*.

Chislett, V., & Chapman, A. (2005-2006). Multiple intelligences test-based on Howard Gardner's MI model. Retrived from http://www.businessballs.com/freepdfmaterials/free_multiple_intelligences_test_youn-g_people.pdf

Cooper, F. (2008). *An examination of the impact of multiple intelligences and metacognition on the achievement of mathematics students*. Capella University.

Dillihunt, M. (2003). *The effects of multiple intelligence and direct instruction on third and fifth grade student achievement*. Task engagement, Student motivation and teacher efficacy, Howard University.

Elbaz, K. (2006). The effectiveness of the primary school science program in light of the multiple intelligences theory in the development of achievement and natural intelligence and learning patterns amendment. In *Tenth engineering conference of the Egyptian society for engineering education, Engineering education present and visions of the future challenges* (No. 1, pp. 8-33).

Farghali, A. M. (2009). The effect of using multiple intelligences strategies in developing some basic thinking skills and achievement in mathematics and the tendency towards its among first-grade students with learning difficulties. *Journal of the College of Education*, *143*, 113-149.

Gardner, H. (1997). Multiple intelligences as a partner in school improvement. *Educational leadership*, *55*(1), 20-21.

Gardner, H. (2003). *Multiple intelligences after twenty years*. Paper presented at the American educational research, Chicago, Illinois.

Ghazi, S., Shahzada, G., Gilani, U., Shabbir, M., & Rashid, M. (2011). Relationship between students' Self perceived multiple intelligences and their academic achievement. *International Journal of Academic Research*, *3*(2), 619-623.

Goodnough, K. (2001). Exploring multiple intelligences theory in the context of science education: An action research approach. *Dissertation Abstract International*, *61*, 2146.

Isik, D., & Tarim, K. (2009). The effects of Multiple Intelligences & Cooperative Learning on Mathematics Skills Achievement for Grade 4 in Elementary School Mathematics. *Asia pacific education review*, *10*(4), 465-474. http://dx.doi.org/10.1007/s12564-009-9049-5

Jaber, A. J. (2003). *Multiple intelligences and understanding develop and deepen*. The Arab thought house, Cairo.

Nofal, M. (2008). Differences of multiple intelligences among first-year students studying in institutions of higher education in UNRWA in Jordan. *Al-Najah University Research Journal*, *22*(5), 1600-1623.

Obaid, W. (2001). *Multiplication in eight and its impact on cognitive Curriculum system*. Thirteenth conference of the Egyptian Association of curricula and teaching methods, Education curriculum, technological revolution and contemporary curricula. Cairo, guest house, Ain Shams University

Pajkos, D., & Klen, C. (2201). Improving upper grade math achievement via the integration of a culturally responsive curriculum. *ERIC Ed*.

Tabuk, M., & Ozdemir, A. (2009). The effects of multiple intelligence approach in project based learning on Mathematics achievement. *International Online Journal of Education Sciences*, *1*(1), 177-195.

Thomas, A. (2006). *Multiple intelligences in the classroom* (2nd ed.). Translation Dhahran national schools**,** Educational Book House, Kingdom of Saudi Arabia.

Zayton, E. M. (2010). The effect of teaching program based on the integration of multiple intelligences and learning patterns in the ability of female students to solve mathematical problems and their motivation to learn math (PhD unpublished). The University of Jordan, Amman, Jordan.

Appendix A

A questionnaire to measure the students' multiple intelligences patterns

Dear Student:

This questionnaire includes a series of statements regarding the multiple intelligences patterns, and in front of each of these statements five estimates:

- Always apply: If the phrase applied in all cases.
- Apply: If the phrase applied in the majority of cases.
- Sometimes applies: If the phrase applied in some cases.
- Do not apply: If the phrase applied in a few cases.
- Never apply: If the phrase did not apply.

So you should put (√) below the appropriate estimation of each phrase from your opinion.

Student's name	Track
Sex	Course

N	Item	Always apply	Apply	Sometimes applies	Do not apply	Never apply
1	I enjoy reading books, magazines and newspapers					
2	I can perform calculations mentally					
3	Engineering topics easier than algebra topics					
4	I enjoy manual work such as decoration, painting and photography					
5	I prefer to work with a team					
6	I set my goal in life and think about it regularly					
7	I I like poetry with a rhyme					
8	I am interested in environmental issues					
9	I like crosswords					
10	I believe that everything has a rational explanation					
11	I remember things organized in graphics formats					
12	I enjoy when playing sports					
13	I love to participate in clubs and, cultural and social activities					
14	I devote time to reflect on all aspects of my life					
15	I prefer musicals to others					
16	I enjoy traveling, surfing and camping					
17	I remember dates, names of people and places easily					
18	I can solve the mathematical problems easily					
19	I prefer drawing from writing					
20	I know the things by touching them					
21	I am eager to make new friends					
22	I am independent in my thinking					
23	I can perform the tone and rhythm after hearing					
24	I enjoy studying biology, plant and animal sciences					
25	I make sure to take notes help me to understand and remember things					
26	I prefer the relay logical organizer to understanding things					
27	I enjoy solving mazes and visual puzzles					
28	I have generated new ideas when I am in any activity kinesthetic					
29	I have the ability to influence others					
30	I have the ability to make my decisions					
31	I sing when I do something					
32	I love to categorize objects into similar groups					

33	People ask me all the meanings of words
34	I enjoy the practice of sports games and puzzles that require logical thinking
35	I can read drawings and maps accurately and easily
36	I prefer the practical education to theoretical education
37	Others seek to get closer to me
38	I prefer working alone to groups
39	I have the ability to recognize and know the music tracks, rhythm and consistency
40	I am interested in planting trees and breeding animals or one of them
41	I can speak in front of others
42	I prefer mathematics to other subjects
43	I enjoy drawing and design of geometric shapes
44	I use physical movements to express my thoughts
45	I love helping others
46	I have the ability to identify the strengths and weaknesses of my personality
47	I prefer to listen to music while studying
48	I like to collect samples of rocks or other objects

Dear Student: thank you and appreciation for your response