THE ABILITY OF (LINGUISTIC AND MATHEMATICAL) MULTIPLE INTELLIGENCE IN PREDICTING THE ACHIEVEMENT OF HIGHER PRIMARY STAGE STUDENTS IN JORDAN IN THE COURSES OF ARABIC AND MATH

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Abstract: The study aimed to detect the ability of (linguistic and mathematical) multiple intelligence in predicting the achievement of higher primary stage students in Jordan. A random sample of 120 students has been selected. In order to achieve the study's objectives, the researcher adopted the (linguistic and mathematical) multiple intelligence measure, which was developed by (Al Massarwah, 2015). The measure was applied to the main sample, after verifying its validity and reliability. The results showed that (linguistic and mathematical) multiple intelligence of the higher primary stage students was high. Finally, the study concluded some predictive regression equations of student achievement in the courses of Arabic and Mathematics. According to the study's results, some recommendations have been made.

Keywords: Multiple Intelligence, Achievement, Higher Primary Stage

Introduction

Intelligence is considered as one of the most popular terms in the field of psychology. It is also one of the most related terms to achievement and success. The term "intelligence" has attracted the attention of many scientists and ancient philosophers. It is noticed through their writings about the nature of individual's knowledge and education.

Psychologists have shown interest in studying intelligence because it is vitally linked to all various aspects of life. There is a wide agreement among psychologists on the vitality and significance of this subject, but there is a great controversy among them about the nature of intelligence and its definition.

Psychologists have differed in their perceptions of intelligence. Thus, there are multiple definitions and theories of it. It may be attributed to the ambiguity of the concept of "intelligence" and to the difficulty of accurately identifying it, since it is a characteristic and not a state of being. Intelligence theories, developed by Gardner, are the most important theories that attempted to provide scientific, logical and systematic interpretations of mental activity, concerning its constituents, limitations, and elements (Afanah & Al Khazendar, 2007).

As for Spearman's theory, it is one of the early classical theories that deal with the concept of intelligence. It suggests that mental activity consists of two factors (general and private). Then, the Multi-Factor theory emerged, as developed by Thorndike. It has explained the process of analyzing general factors into primary factors, such as: Mechanical intelligence, abstract intelligence, and social intelligence.

In 1983, Thurston concluded, through factor analysis, that there are seven primary mental capacities. Then, in 1940, Cattal came up with the idea that there are two factors of intelligence: Fluid and Crystallized Intelligence (Cohen & Swerdlik, 1999).

There is variation in defining and measuring intelligence, due to the multiple theories that aimed to interpret the concept of intelligence. The American Psychological Association (APA) issued a comprehensive definition of the concept of intelligence. It has been defined as a concept that clarifies and organizes the variation in people capacities in understanding complicated thoughts, learning through experience, coping with environment effectively and solving problems. In addition, the capacity of the same individual differs from one situation to another.

The American Psychological Association (APA) defined intelligence as, "Individuals differ from one another in their ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought. Although these individual differences can be substantial, they are never entirely consistent: a given person's intellectual performance will vary on different occasions, in different domains, as judged by different criteria" (Neisser et al., 1996).

In 1983, Gardner developed the theory of multiple intelligence in his well-known book, *Frames of Mind*. He identified seven factors of intelligence: Linguistic, mathematical, spatial, kinesthetic, musical, social and personal intelligence. In 1995, Gardner added a new factor which is natural intelligence.

The theory of multiple intelligence has a great significance in the field of education. It has explored matters and aspects that have been overlooked by other theories. For instance, while these theories depend on individual assessment and intelligence tests, the theory of multiple intelligence helps identify individual capacities and differences and guide individuals towards the jobs that suit their capacities. The educational significance of this theory is that it helps provide contributions and suggestions that are great for the field of education. It is also useful for teachers who need to improve their knowledge about teaching strategies and tools that exceed their linguistic and logical capacities. These linguistic and logical capacities can be effectively exploited and utilized in classrooms (Jaber, 2003).

The educational impact of applying the theory of multiple intelligence in classrooms can be seen in many advantages, such as improving the capabilities of taking responsibility, self-directedness, independence, acquiring new skills, improving self-learning skills, and significantly solving the problems of the school system.

Linguistic intelligence is one of the essential constituents of Gardner's theory of multiple intelligence. According to Gardner, linguistic intelligence can be identified among individuals through clear indicators. These indicators include the ability to memorize quickly, desire to speak, desire to listen to CDs, having interest in linguistic games, showing a growing linguistic balance, and having interest in reading stories. In addition, logical intelligence is perceived as the model father of intelligence. It can be identified among individuals through the abilities of classifying, collecting, designing, noticing the relationship between things, doing mathematical operations, and using abstract concepts.

Literature Review

There are many studies that have tackled the subject of the current study. (Snyder, 2000) aimed at identifying the relationship between multiple intelligence and academic achievement. The sample of his study consisted of (128) female and male students in senior grade levels in Britain. The list of multiple intelligence was applied to the participants. It concluded a positive correlation that has a statistical significance between multiple intelligence and academic achievement.

(Chan, 2001) aimed at identifying the predictive abilities of natural intelligence in divergent thinking and achievement. The study's instruments were applied to a sample consisted of (192) female and male students. The study concluded that it is impossible to predict academic achievement in the courses of English language

and math through multiple intelligence. The study also concluded that it is possible to predict the academic achievement in the course of Chinese language through multiple intelligence.

Fotini (2001) aimed at using the learning strategies that are based on the theory of multiple intelligence to reduce students' anxiety towards the math course. The sample of the study consisted of (17) female and male students. The study's results showed that there was an improvement in the performance of the sample in the math course. It also concluded that there was an increase in the sample's motivation and enthusiasm to learn.

Pajkos & Klein (2001) aimed at increasing the mathematical achievement of students through adopting an integral and cultural curriculum. The study's results showed an increase in the students' academic achievement, motivation level and attitudes towards math. (McMahon & Rose, 2004) aimed at investigating the relationship between multiple intelligence and achievement in reading. The sample of the study consisted of (288) fourth grade students. The list of (Teele Inventory of Multiple Intelligence) was applied to the participants. The study concluded that it is possible to predict the academic achievement in writing through linguistic intelligence.

Mohammad (2006) conducted a study, under the title, "Effectiveness of a suggested program in the light of multiple intelligence theory in developing the ability of self-expressive writing among 12th grade students". The sample of the study consisted of (25) students who suffered from writing difficulties. The study concluded that the suggested program is effective in improving the skill of writing among the participants.

Adawi (2008) aimed at identifying the impact of applying an educational portfolio list based on multiple intelligence on the achievement of fifth grade students in Arabic course. The study's sample consisted of (120) female and male students. The study's results showed that there are statistically significant differences between the study's two groups in students' academic achievements.

Statement of the problem

The study problem arises from tracking the educational reality of Jordan, and from the decline in the learning outcomes, especially in Arabic and math. There are individual differences among students' mental capacities due to differences in their psychological, mental, social, emotional, and kinetics characteristics. These individual differences are attributed to the variation in the levels of (linguistic and mathematical) multiple intelligence of higher primary stage students in the educational directorate of Al-Shobak district. In addition, most studies, theories, and opinions concerned with intelligence have pointed out the strong relationship between intelligence and academic achievement. Thus, the current study aimed at identifying the relationship between (linguistic and mathematical) multiple intelligence and academic achievement in the courses of Arabic and math.

The current study aimed at identifying the relationship between (linguistic and mathematical) multiple intelligence and academic achievement, especially the kinds of multiple intelligence that are more capable of predicting the academic achievement in the courses of math and Arabic. It is conducted due to the scarcity of Arabic studies in this field. The study problem can be seen through the following questions:

1. What is the extent of higher primary stage students' possession of (linguistic and mathematical) multiple intelligence in the schools of Al-Shobak district?
2. What are the abilities of (linguistic and mathematical) multiple intelligence in predicting the academic achievement of students in the Arabic course?
3. What are the abilities of (linguistic and mathematical) multiple intelligence in predicting the academic achievement of students in the math course?

Objectives

The study aimed at identifying the following:

- 1.The degree of (linguistic and mathematical) multiple intelligence among higher primary stage students in the schools of Al-Shobak district.
- 2.The abilities of (linguistic and mathematical) multiple intelligence in predicting the academic achievement of students in the Arabic course.
- 3.The abilities of (linguistic and mathematical) multiple intelligence in predicting the academic achievement of students in the math course.

Significance

The significance of this study arises from its consistency with the modern expectations in educational environments which aim at increasing attention to the outcomes of education. It aims at identifying the degree of (linguistic and mathematical) multiple intelligence among higher primary stage students in the courses of Arabic and math. Thus, it helps investigate the difficulties that face students in their academic life. It represents a contribution to the literature of multiple intelligence. It helps identify the relationship between multiple intelligence and academic achievement in the course of Arabic and math. Educators, educational advisors, parents, and others may benefit from the results of the current study. It helps them give attention to the variables that have the strongest relationship with students' academic achievement.

Terminology

Multiple intelligence: Gardner (1983) has defined multiple intelligence as a group of skills that help the individual solve essential problems in life, capacity to create effective results or create a service that has value in a certain culture. These skills include the capacity to differentiate or create problems which require new knowledge. He also believes that multiple intelligence is a complicated structure consisting of a great number of separate capacities that are relatively independent. Each capacity represents a kind of intelligence, and each one is peculiar to a certain area in the brain.

Gardner has defined multiple intelligence as "the capacity to solve problems or to fashion products that are valued in one or more cultural settings and detailed a set of criteria for what counts as a human intelligence" (Gardner & Hatch, 1989). Capacities such as writing a symphony, execute a painting, stage a play, build up and manage an organization, carry out an experiment are perceived as human intelligence. People exhibit various types of intelligence which differ from one person to another based on heredity and environment factors. Gardner has developed a list that includes seven different types of intelligence: logical-mathematical, linguistic, musical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal.

Linguistic (verbal) intelligence: It is the capacity to use words efficiently and the ability to process the linguistic structure. It also includes the capacity to arrange words and understand their meanings (Gardner, 1983).

Mathematical (logical) intelligence: It is the capacity to use numbers efficiently. It also includes the ability to solve problems and think logically. It also includes sensitivity to models and to logical and virtual relationships (Gardner, 1983).

Achievement: It is the score students get in schools exams written in the marks record in the course of Arabic and math.

Higher primary stage: It is the stage that includes the following grades: (seventh, eighth, ninth, and tenth).

Methodology

This study has adopted the descriptive analysis approach in order to fulfill its objectives. The study was conducted through using the (linguistic and mathematical) multiple intelligence measurement to collect the required data. The data was collected through applying this measurement on a random sample that represents the study's original population.

Population and sampling

The population of the study consisted of higher primary stage students in the schools of Al-Shobak district. The population consisted of 944 male and female students. The study's instrument was applied to a random sample. The sample consisted of 120 male and female nine-grade students.

Instrument

After reviewing previous theoretical literature related to the subject of the study, the (linguistic and mathematical) multiple intelligence measurement improved by Massarwah (2015) is utilized. It consisted of: 15 items about linguistic intelligence and 14 items about mathematical intelligence.

Applying the instrument of the study

10 educational Psychology specialists verified the validity of the study's instrument. It was also checked through measuring and evaluation. In addition, the reliability of the study's instrument was checked through applying it twice to an exploratory sample with a time interval of two weeks. The repeated reliability coefficient of (linguistic and mathematical) multiple intelligence respectively was (0.83 & 0.88). After that, the instrument was applied to the original sample of the study during the first academic semester of 2015 /2016.

Results and discussion

The first question: What is the extent of higher primary stage students' possession of (linguistic and mathematical) multiple intelligence in the schools of Al-Shobak district?

Table 1 Arithmetic mean and standard deviation for the students' responses to linguistic and mathematical) multiple intelligence measure

<i>Intelligence</i>	<i>Arithmetic mean</i>	<i>Standard deviation</i>	<i>Level of Intelligence</i>
Linguistic	3.98	1.01	High
Mathematical	3.70	1.14	High

The results in Table 1 indicate that there are virtual differences in students' possession of (linguistic and mathematical) multiple intelligence. For instance, students' possession of linguistic intelligence obtained an arithmetic mean of 3.98 with a high level of intelligence. However, students' possession of mathematical intelligence got an arithmetic mean of 3.70 with a high level of intelligence.

It can be attributed to the variance in the level of intelligence among individuals. It is noticed that the arithmetic mean of linguistic intelligence is higher than that of the mathematical intelligence. It can be explained that student's relationship with family and the surrounding environment is considered as an important factor in their acquirement of language. It was confirmed by Gardner (1983), as he stated that multiple

intelligence is affected by environmental factors. In addition, practicing various forms of linguistic learning; reading, writing and listening shall lead to increasing linguistic intelligence which is increased in the light of having these effectors. In addition, the individual's language acquisition starts from the moment of birth. As for developing the logical mathematical intelligence, it comes in later stage, as one gets older.

The second question: What are the abilities of (linguistic and mathematical) multiple intelligence in predicting the academic achievement of students in the Arabic course?

Table 2 Result of multiple regression analysis for the Arabic course (Y) upon multiple intelligence (linguistic X1, Mathematical X2)

	R	R²	Unstandardized Coefficient (b)	Standardized Coefficient (β)	Constant (a)	F	Sig.	Sample Size
Linguistic (X1)	0.770	0.592	0.243	0.268	-2.383	85.011	0.006	120
Mathematical (X2)			0.166	0.542			0.000	
Y = -2.383 + 0.243 X₁								
Y = -2.383 + 0.166 X₂								

Table 2 points out to the results of multiple regression analysis of the Arabic course through multiple intelligence (linguistic X1, Mathematical X2) (the predictor). It is noticed through the results that the equation of the sample's total regression that the increase in linguistic intelligence (X1) with one unit- shall make an increase of (0.243) in the student's average in the Arabic course (Y).

It is noticed through the results that the equation of the sample's total regression indicates that the increase in mathematical intelligence (X2) with one unit- shall make an increase of (0.166) in the student's average in the Arabic course (Y).

Results also show that (linguistic and mathematical) multiple intelligence is able to explain a percentage of (59) % of the students' marks variation in the Arabic course. This percentage is statistically significant for linguistic and mathematical intelligence. Accordingly, we are able to predict the student's mark in the Arabic course through linguistic and mathematical.

It may be attributed to the nature of academic achievement that is affected by many factors and variables. In other words, intelligence in general does not have a clear effect without having motivation, self-confidence and effort. For instance, linguistic intelligence increases with the increase in reading and comprehending vocabulary. It can be attributed to the academic curricula which are filled with too much information. It is also attributed to adopting teaching strategies that are based on spoon feeding, which participates in the students' linguistic enrichment. In addition, language proficiency plays a role in the process of teaching math.

The results are inconsistent with Adawi (2008), Fotini (2001), McMahon & Rose (2004) and Snyder (2000). For instance, all of these studies indicated a positive relationship between linguistic intelligence and academic achievement. They have also indicated that it is possible to predict the academic achievement through multiple intelligence.

The Third question: What are the abilities of (linguistic and mathematical) multiple intelligence in predicting the academic achievement of students in the math course?

Table 3 Result of multiple regression analysis for the math course (Y) upon multiple intelligence (linguistic X1, Mathematical X2)

	R	R²	Unstandardize d Coefficient (b)	Standardize d Coefficient β(	Constan t (a)	F	Sig.	Sampl e Size
Linguistic (X1)	0.81 3	0.66 1	0.351-	0.410-	1.482-	113.84 1	0.00 0	120
Mathematica l (X2)			0.316	1.093			0.00 0	
Y = - 1.482 - 0.410 X₁								
Y = - 1.482 + 1.093 X₂								

Table 3 points out to the results of multiple regression analysis of the math course through multiple intelligence (linguistic X1, Mathematical X2) (the predictor). It is noticed through the results that the sample's regression equation indicates that the increase in linguistic intelligence in one unit shall lead to a decline of (0.410) in the student's average in the math course. The sample's regression equation indicates that an increase of one unit in the mathematical intelligence shall lead to an increase of (1.093) in the average of the student in the Math course.

Results also indicate that (linguistic and mathematical) multiple intelligence can explain 66 % of students' marks variation in the math course. This percentage is statistically significant for both the linguistic and mathematical intelligence. Thus, we can predict the student's mark in the math course through linguistic and mathematical intelligence.

It is noticed that mathematical intelligence help predict the academic achievement in the math course with a higher rate than that in the Arabic course. It can be attributed to the use of teaching strategies based on the theory of multiple intelligence by most math teachers which leads to increasing the possibility of predicting the student's mark in the math course through mathematical intelligence. In addition, the rise of the students' motivation and enthusiasm to answer the multiple intelligence measure led to an increase in their academic achievement on the measure. Thus, it was reflected positively on the correlation between their scores in mathematical intelligence and marks in the math course.

The study's results are inconsistent with the results of Pajkos & Klein (2001) and Afanah & Al-Khazendar (2004) which showed that there is a positive relationship between multiple regression and academic achievement in the math course. In addition, using strategies that are based on multiple intelligence theory led to an increase in the academic achievement of students in math. The study's results are consistent with the results of Chan (2001), which showed that it is impossible to predict the academic achievement of students in the courses of math and Arabic through multiple intelligence.

Conclusion

The study concludes that there is a correlative relation that is statistically significant between multiple intelligence and the academic achievement of students. The possibility of the prediction of the marks of students

through linguistic intelligence is higher in the Arabic course than the math course. The possibility of the prediction of the marks of students through mathematical intelligence is higher in the math course than the Arabic course. Academic achievement is a multi-aspect phenomenon that is not affected by intelligence only, but by other variables, as well. An example of these variables is motivation, exerted efforts, and self-confidence.

Recommendations

1. Emphasizing the use of teaching strategies that are based on multiple intelligence while teaching.
2. Emphasizing that there shall be an increase in the attention and care of school and academic administrations to developing the multiple intelligence of students.
3. Establishing special programs that are concerned with developing the multiple intelligence of students.

References

- Adawi, Azmi. (2008). *The impact of an educational portfolio that is based on a multiple intelligence basis in the academic achievement of fifth grade students in the course of Arabic in Alruwad in Amman*. Unpublished PhD dissertation, The University of Jordan, Amman.
- Afanah, Azu & Al khazendar, Najib. (2007). *Classroom teaching through multiple intelligence*. ed. 1, Al Masira Publishing house, Amman.
- Chan, D.H. (2001). Assessing Giftedness of Chinese Secondary Students in Hong Kong: A multiple Intelligence Perspective. *High Ability Studies*, 12(2): 215-234.
- Cohen, R. J., & Swerdlik, M. E. (1999). *Psychological Testing and Assessment: An Introduction to Tests and Measurement*. 4th, CA: Mayfield Publishing: Mountain View.
- Fotini, B. (2001). What Kind of Multiple Intelligence in Formed Instruction and Assessment can be developed that Will Help Adult Learners Deal with Math Anxiety so that reach Their Stated Goals. *ERIC*, No. ed453386.
- Gardner, H. (1983). *Frames of Mind: The Theory of Multiple Intelligences*. Basic Book: New York.
- Gardner, H., & Hatch, T. (1989). Multiple intelligences go to school: Educational implications of the theory of multiple intelligences. *Educational Researcher*, 18(8), 4-9.
- Jaber, Abed Alhamid. (2003). *Multiple intelligence and understanding (developing and reinforcement)*. Al Feker Al Arabi Publishing house, Cairo.
- Massarwah, T. (2015). *Multiple Intelligences (linguistic and mathematical) and their relationship on the achievement for the students of the eight grade in the subject of Arabic and Mathematics*. Unpublished Master dissertation, Mu'tah University, Jordan.
- McMahon, S. D. & Rose, D. S. (2004). Multiple Intelligence and Reading Achievement: An Examination of the Teele Inventory of Multiple Intelligence. *The Journal of Experimental Education*, 73(1): 41-52.
- Mohammad, Ayman Eid. (2006). *The effectiveness of a suggested program in the light of multiple intelligence theory in treating the difficulties in expressing themselves in writing for 12th grade students*. Unpublished PhD dissertation, The University of Ein Shams, Egypt.

[Neisser, U.](#); Boodoo, G.; Bouchard, T. J.; Boykin, A. W.; Brody, N.; Ceci, S. J.; Halpern, D. F.; Loehlin, J. C.; Perloff, R.; [Sternberg, R. J.](#); Urbina, S. (1996). [Intelligence: Knowns and unknowns](#). *American Psychologist*. **51**: 77–101. [Doi:10.1037/0003-066x.51.2.77](#). [ISSN 0003-066X](#).

Pajkos, D. & Klien, J. (2001). *Improving Upper Grade Math Achievement via the Intelligence of A culturally Responsive Curriculum*. Action Research Project: Chicago.

Snyder, R. F. (2000). The relation between Learning Styles/Multiple Intelligence and Academic Achievement of High School Students. *The High School Journal*, 83(2): 20-31.