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Education Effect Based on Gardner Multiple Intelligence Hypotheses in Students Mathematics' Education Progress of High School Second Grade in Garmsar City

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Abstract: *The aim of this study includes investigation into the impact of education based on Gardner's Theory of Multiple Intelligences (MI) on educational achievement of high school students (Grade II) in mathematics from Garmsar City. The current study is of applied type in terms of nature since research is seeking for testing of some theoretical concepts in real and live situations. Whereas the present research deals with controlling and monitoring over some factors so it is of basic and final test administration in terms of semi- empirical method. According to the possibility for presence and administration of education done by researcher, statistical population of the present research includes 57 participants of high school students (Grade II) from Garmsar City, Semnan Province, Iran. Since it does not require using expensive tools for execution training based on Multiple Intelligence Theory so it is benefited from high capacity in terms of execution in the most underprivileged areas but to execute this type of training, we need to skillful and efficient teachers and principals since design of lessons for each subject requires teaching creativity, study and art; therefore, the sufficient time and cost should be spent to training such teachers. With the least facilities, any school may execute many activities that have been designed based on Gardner's theory but since conditions of schools vary in different areas so teachers should plan and execute their activities with respect to conditions of classroom and school.*

Keywords: *Education, high school, intelligence, achievement, Lack of coordination.*

Introduction

All students may learn and to be high achiever but this does not occur by the same techniques. It necessitates adapting different methods for learning in students. If educational process has been effectively designed and they are adapted to students' requirements, they may be successfully fulfilled. Students' academic successes should be evaluated by multiple intelligences and talents in order to be approximated accurately (Teele, S. 2005).
Today, in general educational system traditionally emphasize on verbal and mathematical intelligence. Exams, homework and teaching methods and all of them support verbal and mathematical intelligence and often unique talents and abilities of students are downplayed in other fields (Kornhaber, M. and Krechersky, M. 1990; Walter, J. and Gardner H. 1989 quoted from Plucker J.A. 2001).

According to Garner's view, multiple intelligences may play essential role in learning and training of students. Being aware of Theory of Multiple Intelligences may motivate teachers to find different methods to help all students in their classroom. Based on Gardner's belief, Theory of Multiple Intelligences is based on attaching respect for individuals' differences, a great variety of learning methods, evaluation techniques in these methods and several impacts that have been followed by such differences (Armstrong, T, 2009). Given that application of Theory of Multiple Intelligences has been greatly spread in education and a great number of studies are carried out throughout the farthest parts of the world in this field so researcher intended to examine Multiple Intelligences based education in educational achievement of students in mathematics at several levels of logical- mathematical intelligence when exploring the reasons of failure of learning mathematics lesson among some students and the solutions to amend these problems.

Interpretation of Subject

Following to 20 years teaching experience in training mathematics lesson, researcher has been faced by some diligent students, who have not achieved considerable results despite of their noticeable efforts in this regard. This

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fact not only created spiritual disorders in student and sometimes in their parents but also it caused to create this concern and to raise this question that if student was only the reason for such failure and elimination of this problem was also solely subjected to his/ her double efforts or not. Doesn't a student essentially has the needed ability in this sense and hasn't he/ she been led by educational guidance? Does teacher also have any share in this defect? Isn't there any missing link among teacher and student's effort that might hinder fulfillment of these bilateral effort perfectly?

We are living at an age in which all of sciences are dramatically changed and developed very soon. Theories are born, grow and then will die. Education and training trends vary but traditional training methods are sustained not only in Iran but also in many countries in the world. Teacher is deemed as source of information and knowledge in traditional classrooms. Children expect that teacher to stand before them and convey all points with accurate and perfect details and then they memorize all information given by teacher. In such classrooms, students usually do not any certain activity until teacher asks them some questions. In traditional classrooms, textbook is educational pivot where teacher exactly determines what part of textbook to be trained at any session. These classrooms are boring, formal and free of any move and motivation. Atmosphere of this classroom is based on competition. In traditional educational system, teacher predetermines to fill this capacity to the extent it may bear it. Of other characteristics of traditional classes is that student has no relationship and contact with outside world and almost with practical life. In other words, student does not know how to utilize what he/ she had learned in practice. In traditional curricula, all learners are considered as whole and training is presented identically without taking individual differences into consideration. Evaluation tools are constructed and limited to teacher's tests and homework (assignment) is identical and uniform (Baleghizadeh, 2002-1381). Based on comment by contemporary psychologist, Howard Gardner (1990), in traditional approach a simple, integrated and single- factor nature is attached for human's intelligence and this is stemmed in those efforts observe to identify the main factor of students' educational achievement at early time of twentieth century. These efforts were led to design of a tool called evaluation of Intelligence Quotient (IQ) that has been adopted widely in educational systems. With respect to the conducted studies, it was characterized that some of prodigy youth are crossed out from list of genius ones by traditional applications of IQ evaluation and they may not receive the needed educational services to grow their unique abilities and talents (Eisner, E. 2004, Diaz, R. 2004, Marker, C.J. et al 1994, and Sarouphim, K 2002).

By purposing this point that intelligence has several types, forms and signs and by focusing on this fact that all of people have different intelligent profiles, Gardner became an origin for intellectual (theoretical) and practical wide movements in some of educational and training systems in the world that they have taken step by reliance on concept of Multiple Intelligences (MI) toward creation of variation and differences in their curricula (Mehrmohammadi, 2006- 1385). For the first time in 1983, by publishing a book under title of "*Mind Frames: Multiple Intelligences*" and through a definition from intelligence based on which intelligence is the ability for creation of an effective valuable product or service in a culture, Gardner categorized different eight abilities of intelligence by challenging traditional assumption of intelligence. These categories included: Verbal- Linguistic Intelligence, Logical- Mathematical Intelligence, and Visual- Spatial Intelligence, Bodily- kinesthetic Intelligence, Musical Intelligence, Interpersonal Intelligence, Intrapersonal Intelligence, and Naturalistic Intelligence (Azarfar, 2007-1386).

Gardner's Theory is not necessarily limited to eight intelligences or abilities. He argues that there are probably more than eight intelligences and one of his works (1999), he purposed Spiritual Intelligence and Existential Intelligence as well. By interpreting these intelligence, he intends to acknowledge to the existing abilities of thinking about great questions concerning to meaning of life (Woolfolk, 2007). Of some reason that Gardner has purposed for the presence of different and separate types of intelligence is his documentation to the evidences came from brain traumas where often as their results, activity of one part of brain areas is interrupted like language area while activity is normal and intact in other regions (Seif, 2010- 1389). From Gardner's point of view, each of us possesses a unique composition of these intelligences; therefore, trainers should employ educational various techniques with respect to multiple intelligences of learners. Thus, multiple intelligences should utilize throughout the all curricula (Gardner 2011; Gardener 1999).

Importance and Necessity of Conducting Research

Mathematic is forerunner among sciences so any one who like think properly and better should inevitably became acquainted with this science. According to this great idea, cultural belief of our mentors will be crucially important in this course in order to be able to prepare the needed ground for deepening of this item. In such conditions, education and training system may be act as manifestation and declaration for revival of mathematics science as infrastructure and main assumption in all of basic science disciplines at educational degrees. In today world,

mathematics serves as blood in huge body of the sciences. Training of mathematics is not only a science itself but also a model for training of other sciences properly. Initiative, innovative and bold minds are doubtlessly outcomes from organizing system in order to be accountable for its surrounding questions where mathematics will be substantially able to revive it. Thus, it could be implied that mathematics proper training means the proper training of other sciences (Derogar, 2003- 1381).

The weak performance of some educational systems in TIMSS International Exam caused several studies to be conducted in order to identify the reasons for lack educational achievement of students in this field (Biramipour, 2009-1388). For this purpose, quality of teaching is one of the important subjects that have been considered in researches of educational and training field (Givvin et al 2005, Good and Brophy 2001 & 2007, and Clark 2004). Many results came from these studies in this field have shown that improvement of teaching quality may play important role in increasing rate of educational achievement among students (Allahyari 2001-1380; Sammons et al 1995, Cotton 1995; Kadkhoda 2009- 1388; Karamati 1991- 1371; Creemers 1994; Kalami 1996-1375; Wallberg and Haertel 1992).
On the other hand, with growth and explosion of information at this age that is followed by changes and developments in communities, this question may be raised for many individuals that whether logical- mathematical intelligence is more essential and necessary than other types of intelligence. In fact, most of people believe in that there is only one logic and that is mathematical logic (As a result, one may resolve any question by such logic). Gardner (2004) states: "I do not agree with this idea that logical- mathematical intelligence is more important than other kinds of intelligence. It is not a proper imagination that logical- mathematical skill may solve other problems." In traditional method, for training mathematics teacher only suffices to activation of logical-mathematical and verbal- linguistic intelligences in students. By this method only those students are able to learn that possess high level of logical- mathematical intelligence. While there are only 25% of students who are benefitted from intelligence at high level but by designing the activities which may encompass other intelligences in students we are able to contribute the students to make progress in mathematics as well (Martin 1998). Therefore, the present research may improve hope, motivation and happiness in realization of this trend by creation of successful experience in teaching- learning process and lead to the future achievements; as Cohn (2010) believes that "*Nothing succeeds like success*".

Research Objectives

I- General Goal

It includes investigation into the impact of education based on Gardner's Theory of Multiple Intelligences (MI) on educational achievement of high school students (Grade II) in mathematics from Garmsar City.

II- Special Goals

1. To compare the impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **mathematics educational achievement** among high school students (Grade II) with logical-mathematical intelligence at high and low levels;
2. To contrast the impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **knowledge field of mathematical concepts** among high school students (Grade II) with logical-mathematical intelligence at high and low levels;
3. To compare the impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **practice field of mathematical concepts** among high school students (Grade II) with logical- mathematical intelligence at high and low levels;
4. To contrast the impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **field of mathematical argumentation (reasoning)** among high school students (Grade II) with logical-mathematical intelligence at high and low levels;

Questions of Research

1. Does it vary the rate of impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **mathematics educational achievement** among high school students (Grade II) with logical-mathematical intelligence at high and low levels?
2. Does it vary the rate of impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **knowledge field of mathematical concepts** among high school students (Grade II) with logical-mathematical intelligence at high and low levels?

3. Does it vary the rate of impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **practice field of mathematical concepts** among high school students (Grade II) with logical- mathematical intelligence at high and low levels?
4. Does it vary the amount of impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **field of mathematical argumentation (reasoning)** among high school students (Grade II) with logical- mathematical intelligence at high and low levels?

Research Hypotheses

1- The rate of impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **mathematics educational achievement** varies among high school students (Grade II) with logical- mathematical intelligence at high and low levels.
2- The rate of impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **knowledge field of mathematical concepts** varies among high school students (Grade II) with logical- mathematical intelligence at high and low levels.
3- The amount of impact of training based on Gardner's Theory of Multiple Intelligences (MI) on **field of mathematical argumentation (reasoning)** varies among high school students (Grade II) with logical- mathematical intelligence at high and low levels.

Definition of technical and specialized terminology

✓ **Education**:
Education denotes those activities that are intended to facilitate learning designed by teacher and are passed among teacher and one or more learners as mutual action (Seif, 2003- 1982).

✓ **Educational Achievement**:
Educational Achievement is the rate of change in behavior in the field of competence for acquiring information in relation to content of textbooks and giving answers to them on time via administration of exams evaluated by teachers (Mesbahi, 1997).

✓ **Effectiveness:**
Effectiveness indicates the extent by which objectives have been realized and or in other words, it is the rate of success in realization of goals or doing tasks (missions) (Zaeri, 2004).

✓ **Intelligence from Gardner's View**:
What is intended to be implied in this intelligence from Gardner's view is bio- psychological competence in order to process information that may be activated within a cultural context to solve the problem or to create alternative products that are valuable in a certain culture (Gardner, 1999, p.33) and Gardner considers eight categories for them. These categories include: Verbal- Linguistic Intelligence, Logical- Mathematical Intelligence, and Visual- Spatial Intelligence, Bodily- kinesthetic Intelligence, Musical Intelligence, Interpersonal Intelligence, Intrapersonal Intelligence and Naturalistic Intelligence (Azarfar, 2007-1386).

1- Verbal- linguistic intelligence denotes ability to use words and language.
2- Logical- mathematical intelligence means ability to adapt reasoning, logic and figures.
3- Visual- spatial intelligence denotes ability to understand the world properly in spatial- visual form and creation of change in this insight.
4- Bodily- kinesthetic intelligence comprises of having skill in using body to express thoughts and feelings and ease in application of hands to create or change in objects.
5- Musical intelligence means capability to compose and comprehend music.
6- Interpersonal intelligence denotes ability to comprehend, contact, understand and distinguish spiritual states, intentions, motives and emotions of others.
7- Intrapersonal intelligence means ability to perceive oneself and being aware of one's own internal modes and ability to practice appropriately based on them.
8- Naturalistic intelligence denotes having skill in recognition of different varieties of plants and animals and individual environment including natural phenomena and or non- living forms (Armstrong, 2009).

Methodology

The current study is of applied type in terms of nature since research is seeking for testing of some theoretical concepts in real and live situations. Whereas the present research deals with controlling and monitoring over some factors so it is of basic and final test administration in terms of semi- empirical method. This plan will be very useful and valuable when it is not possible to implement real empirical plans and its findings are more scientific and accurate than findings from basic empirical plans to great extent (Naderi and Seif Naraghi, 2009- 1388).

Research Variables

In this study, education based on Gardner's Multiple Intelligences (MI) has been considered as independent variable and students' logical- mathematical intelligence as moderating variable or second independent variable while students' mathematics educational achievement as whole as well as each of fields namely knowledge of concepts, application and reasoning of concepts serve as dependent variable.

Control of additional variables

In this study, some of factors have not been controlled including parents' literacy, family's economic and social state, motivation and personality variables like introversion and extroversion and self (ego) concept and psychological adaptation but since students have been elected via selective technique by SHAHED School (Children of Martyrs) so it was expected to react at identical level against the above- said factors. On the other hand, technique of controlling unwanted variables was done by means of randomized arrangement since randomized arrangement technique is the only method by which all of contingent additional variables may be controlled (Kerlinger, 2008).

Statistical Population of Study

According to the possibility for presence and administration of education done by researcher, statistical population of the present research includes 57 participants of high school students (Grade II) from Garmsar City, Semnan Province, Iran.

Multiple Intelligences Measurement Questionnaire

In order to measure each of eight components of intelligence, a 80- question questionnaire foe evaluation of multiple intelligences has been excerpted from book "Measurement and application of multiple intelligences in home and school (Azarfar, 2007- 1386)" based on LIKERT Spectrum ranges from very low (1), low (2), average (3), high (4) and very high (5) within 80 questions and in eight categories each of which has 10 questions and before holding the first session of training, this questionnaire was distributed among students and then filled out.

Face and content validity of multiple intelligences measurement questionnaire was examined by 3 experts and specialists and the needed corrections were exerted for it.

To determine reliability of questionnaire, 20 questionnaires were distributed randomly among 20 students out of case study and then after completion and collection of them the necessary amendments were done. In order to calculate the rate of reliability, Cronbach Alpha Coefficient was utilized that is more accurate than half- split technique (Molavi, 2005; it has been used for different points in this questionnaire).

Data Analysis Method

In this section, the collected information and data were analyzed based on research questions. To summarize and classify information, descriptive statistics was utilized including *mean, median, frequency, frequency percentage, standard deviation* and diagrams like *histogram, bar diagram and pie chart* and *normal curve*; and to find the relationship among variables and to examine research questions the inferential statistics was adapted including *Leven's test, independent group t-test, Kolmogorov- Smirnov test* and *Pearson Correlation Coefficient* where all computations were done by SPSS software.

Conclusion

Since it does not require using expensive tools for execution training based on Multiple Intelligence Theory so it is benefited from high capacity in terms of execution in the most underprivileged areas but to execute this type of training, we need to skillful and efficient teachers and principals since design of lessons for each subject requires teaching creativity, study and art; therefore, the sufficient time and cost should be spent to training such teachers. With the least facilities, any school may execute many activities that have been designed based on Gardner's theory but since conditions of schools vary in different areas so teachers should plan and execute their activities with respect to conditions of classroom and school. Within several workshops which have been held for teacher with

subject of multiple intelligences, researcher has been faced with purposing the problem of lacking sufficient time so according to researcher's comment this problem should be examined from two aspects:

a. *Lack of teachers' acquaintance with way of classroom administration when employing active techniques*: Many teachers have been faced with some of problems including lack of information about how to organize students and way of establishing the relationship with students as well as the insufficient information concerning to students' reactions when they employ such activities since classroom administration techniques by means of traditional methods greatly differs from class administration when employing active techniques and this caused them to face with problem in regulation of time.
b. b) *Lack of coordination among textbook contents and execution of educational active methods*: The quantity of uniform and boring exams is very high in mathematics textbook and doing all of them are very time- consuming. Since our education system is textbook- oriented so students and their parents as well as educational officials in schools insist on solving all exercises from textbook (although they are iterative and uniform) and this may cause teacher to be faced with problem of lack of sufficient time to implement such activities. Thus it seems that if we intend to implement Multiple Intelligence Theory at large scale rather than training techniques, content of textbook should be coordinated with Multiple Intelligence Theory.

Therefore, increasing teachers' knowledge and awareness of different techniques of processing students' information as well as providing opportunities to design teaching methods based on multiple dimensions of students' learning may be considered as an effective step toward achievement of the aforesaid goals. Today, most of schools may not provide the needed experience for students that could be useful in their optimal performance in twenty first century. To realize this, rather than this point that the current education and training system should be supported appropriately, also teachers should be perfectly and deeply proficient in training subject matter and they should be aware of this fact that there are a lot of ways for learning of students and they should make effort for planning modern techniques to create experiences that may guarantee students' success in learning for long run.
Cooperation by students' parents in execution of curricula based on Multiple Intelligence Theory may also contribute schools teachers in implementation of this technique in such a way that many schools where students are trained according to Multiple Intelligence Theory may hold briefing sessions for parents of students and present them the needed information in this regard.

Research Limitations

✓ Period of execution of this study was limited to two weeks and nine sessions.
✓ the present study was conducted on male high school students (Grade II) in Garmsar City.
✓ Subject of syllabus has been restricted to mathematics lesson as well as two chapters of mathematics textbook from high school Grade II.
✓ Students, who were absent for more than three sessions, excluded from samples at time of information processing and they were included in failed participants (testees).
✓ Training has been carried out by researcher.

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