Review Article

Multiple Intelligence Theory for Gifted Education: Criticisms and Implications

ABSTRACT: This paper scrutinizes giftedness and gifted learners under the implications of multiple intelligence theory with regard to coaching young scientists. It is one of the pluralistic theories toward intelligence while supporting to view individuals as active participants during teaching and learning processes which correspond with the applications of gifted education. The history and general characteristics of the theory is explained to figure out why using multiple intelligence theory is beneficial for gifted learners, candidate of young scientists of the future under the reflection of some sample activities. Although benefits of the theory for the aforementioned era have been talked comprehensively, there are some criticisms toward theoretical perspectives and its applications, especially in Turkey. Generally, the paper tries to contribute the literature on the issue of gifted education by pointing out the use of multiple intelligence theory in several domains.

Key words: Multiple intelligence theory, gifted learners, young scientists, criticisms

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INTRODUCTION

Multiple Intelligence Theory is one of the most debated issues of 21st century (Aborn, 2006; Fasko, 2001; Han, 2007; Temiz, 2010; Ziegler, 2009). The reason is to be accepted considerably high by society because of the considered assumption that people cannot be intelligent in a specific area and so they can be intelligent and skilful in different areas. There can be some drawbacks for considering this theory, which has been entering quickly in curriculum and instruction research, as a mere truth. However, it should be stressed that Multiple Intelligences (MI) theory is one of the theories that can explain giftedness. In the light of these issues, in this study MI theory, its emergence, conceptual framework, importance & benefits, criticism attributed and how to adapt for gifted learners mathematics education are tried to be examined. The literature framed the minds about these issues while creating some questions at the same time. Especially, how these two concepts can be merged to raise prospective scientists might be confusing due to the fact they are considered as two separate entities. The aim of the paper stems from this notion and tries to bring some solutions of how multiple intelligence theory can be utilized on gifted education by providing concrete instructional suggestions especially in mathematics education. Additionally, it is being undertaken within a framework of intersection between giftedness and the approach provided by MI to describe and shed light on the problems through giftedness phenomena and the attitude toward the issue. The methodology is aimed at providing thoughtful insight about reason of rise of MI, effects of MI on giftedness. Also it is themed under the components of educational challenges in the gifted learner's education and how to respond as consistent with MI under the criticism umbrella of MI.

The Rise of MI Theory

Among the conflicting views toward intelligence like to be an innate trait or the role of environmental factors on formulation of intelligence, a new theory appeared to combine both of them. Namely, the intelligence is viewed as having some inheritable characteristics whereas it can be changed via life experiences (Gardner, 1983). Besides, people might have all types of intelligences to different degree rather than having a singular form of it as a distinction from the previous views of intelligence.

Howard Gardner is one of the proponents who suggest pluralistic theories toward the intelligence concept like Thorndike, Thurstone, Guilford and Sternberg (Guilford, 1967; Thorndike, 1920; Thurstone, 1938; Sternberg, 1985). Gardner proposed The "Theory of Multiple Intelligences" in his book *Frames of Mind: The Theory of Multiple Intelligences* in 1983 as a model of intelligence that differentiates it into specific (primarily sensory) "modalities", rather than seeing it as dominated by a single general ability.

Gardner argues that there is a wide range of cognitive abilities, and that there are only very weak correlations among them. For example, the theory assumes that a child who learns to multiply easily is not necessarily more intelligent than a child who has more difficulty on this task. The child who takes more time to master multiplication may best learn to multiply through a different approach, may excel in a field outside mathematics, or may be looking at and understanding the multiplication process at a fundamentally deeper level. Such a fundamental understanding can result in slowness and can hide a mathematical intelligence potentially higher than that of a child who quickly memorizes the multiplication table despite possessing a less deep understanding of the process of multiplication.

Theory of multiple intelligences is concerned with studies not only of normal children and adults but also on studies of gifted individuals, of persons who have suffered brain damage, of experts and virtuosos, and of individuals from diverse cultures. Moreover, his focus on this issue is based on evolutionary biology, neuroscience, anthropology, psychometric and psychological studies of prodigies and savants to create some criteria to identify the intelligence (Davis, Christodoulou, Seider & Gardner, 2011).

Gardner divides intelligence into different components. In the first edition of his book "Frames of Mind" (1983), he described seven distinct types of intelligence -logical-mathematical, verbal-linguistic, visual-spatial, musical, bodily-kinaesthetic, interpersonal, and intrapersonal. In a second edition of this book, he added two more types of intelligence - naturalistic and existential intelligences.

First eight of the multiple intelligences have usually been being studied especially in educational fields whereas the existential intelligence has not attracted much attention. A concise list of the basic characteristics of those eight intelligences was presented in Table 1 below.

Table 1. Characteristics of multiple intelligences

Verbal-Linguistic	Logical-Mathematical	Visual-Spatial	Bodily-kinaesthetic
Speaking, declaring choral speaking storytelling presenting, retelling debating reading aloud dramatizing, brainstorming book making nonfiction reading researching listening process writing writing journals	problem solving measuring, experimenting collecting data, coding sequencing, classifying critical thinking predicting playing logic games solving puzzles using manipulative learning the scientific model using money using geometry	graphing photographing making visual metaphors mapping stories making 3D projects painting illustrating using charts and organizers visualizing sketching patterning visual puzzles	hands on experiments physical activities changing room arrangement creative movement going on field trips physical education activities crafts dramatizing using cooperative groups dancing

Musical	Interpersonal	Intrapersonal	Naturalistic
Listening, singing humming rapping rhyming tapping out poetic rhythms musical patterns playing instruments playing background music	cooperative learning sharing, group work peer editing, peer teaching discussing, brainstorming cross age tutoring classroom parties forming clubs social awareness conflict mediation	personal response individual study personal goal setting individual projects journal log keeping personal choice in projects independent reading	reading outside identifying insects, plants building habitats, gardens using a microscope going on a nature walk studying the stars bird watching, cloud watching collecting rocks natural experiments going to the zoo

On the other hand, there are also some other intelligences which are suggested by Posner (2004) as "attention intelligence" and by Luhrmann (2006) as "absorption intelligence" but don't address a specific content so that they don't meet the criteria to be included in the general list. Generally, opponents of candidate intelligences view them as combination of existing intelligences that's why to create a new intelligence seem not meaningful for them (Davis, Christodolou, Seider & Gardner, 2011).

The Reason of Rise of MI Theory

The general goal of the theory is stated as identification of multiple intelligence profiles of students and contribution to development of them. Importantly, the theory addresses different intelligences, so to use it in educational arena might be fruitful especially for gifted children and this part will look at the relations with teaching gifted individuals and the requirements of the theory.

According to assumptions the intelligence can be changed and the same situation is valid for giftedness. Instead of guiding students to self-contained systems, there might be open systems in which content and instruction are organized according to students' needs and interests. There are some examples contrary to the general belief which use this theory as extension or stimulation for gifted learners like Radford House, a small private primary school in Johannesburg South Africa. It addresses to gifted children and insists both intelligence types (Gouws & Dicker, 2011). Nevertheless, programs and strategies to teach gifted students are based on the assumption related to traditional view of intelligence which states it as a single quality and inherent trait (Stepanek, 1999).

At that point, multiple intelligence theory might be effective to break the cycle of traditional view. Modification in content, providing flexibility for student preferences, changing pace of instruction and providing a flexible classroom environment or use of specific instructional strategies are given examples for differentiation (Johnsen & Ryser, 1996). Actually, making use of specific instructional strategies correspond with the multiple intelligence applications in classrooms such as projects, problem based learning, independent and group works, discussions and so on. They might be effective for teaching and learning processes of gifted children as well.

The Effects of MI Theory on Gifted Learners' Education
Educational Challenges and How to Respond

When gifted students are mixed with regular students they think that huge part of their school is time wasted because they are gifted students and they have previously mastered many of subjects taught in class. Even if they know all the content of the lesson, sometimes they cannot express themselves and can become introverted. If questions asked by teacher are the same type and are easy for the level of gifted children, they do not solve and raise hand. When they solve the problems in the class, in that case his friends become disappointed. It can trigger chaos. What a student wants to do if he does not reflect himself anymore and inadaptable with his environment? Either he will not attend the class or he will attend but he feels alone and isolates from class. All these challenges are taken into consideration, the teacher's role is so important for the exceptional students.

They should be referred to academic competitions such as Math Olympiads. Thanks to competition, they can reach new subject areas in archives or in school library. They do not have to stick only with opportunities available in regular classroom. It is confirmed that when highly gifted and talented students are given appropriately stimulating educational experiences and practices, they begin to learn to determine higher educational goals for themselves (Ozturk & Debelak, 2008).

Several studies on gifted education mention the reality of underachievement too as if special groups of learners aren't identified on time or they aren't provided appropriate learning environments which they need more than anything. Shortly, identification process of gifted individuals is an important issue in order to provide support with regard to their abilities, so elementary school teachers' viewpoints toward giftedness serve a high demand in favour of learners (Akar & Sengil-Akar, 2012). First of all, the instructor should know what gifted children already know about the subject. She can give pre-assessments. If he knows the basic subjects, he must not force to repeat it. In addition, the instructor should extend the curriculum (Van Tassel-Baska & Brown, 2007; Villa, Thousand, Nevin & Liston, 2005) that includes interesting activities, challenging problems, games or puzzles. The child may want to do these activities independently. However the teacher should orient him to interact with other students for more beneficial lessons. On the other side, discovery learning approach can be used for exceptional children. They think more abstractly than others. The instructor guides to find answers of open-ended problems by asking "why" "what if" to exceptional students.

Darga (2010) also stresses the fact that appropriate education atmosphere is provided by

premature diagnosis is considered as the educational challenges of gifted students education. However, diagnosis tools are generally applicable to 6 years old children in order to diagnose their intelligent and cognitive structures. It is proposed that how and to which development characteristics of them should be analysed is considerably difficult for the students' early diagnosis. To overwhelm this challenge, it is offered in the study that Brigance K-1 Screen II inventory which was found in 1982 should be adapted to Turkish and top 30% of the gifted students who are successful in the inventory are applied to Teele's inventory. All in all, Darga (2010) draws attention to lack of true diagnosis and finally suggests some solutions to reach the support of the gifted students' development and their roles in education as how to respond this problem.

Benefits of MI Theory for Gifted Students

As it is known, gifted and talented students have a strong ability in one area or more than one. One of the branches is mathematics and these children can be called as mathematically talented, mathematical genius, young mathematicians or number sense gurus. In fact they prefer mostly modular curriculum (compact curriculum) instead of traditional or spiral one (Rotigel & Fello, 2004). They need to be challenged further in to the topic during instruction. Rather than drill and practice and yearly repetition of narrow topics, they should be provided greater depth with open ended opportunities during solving complex problems due to the fact that they have an intuitive understanding of mathematical processes and while skipping some steps of mathematical solution they cannot explain clearly how they reach the right answer. Additional resources and careful planning of small group interaction can be applied to strengthen the gifted math students'

skills. Moreover, especially acceleration, including advance concepts and real world applicability of topics, seems to be the key element of differentiated instruction after meeting mathematically talented students' affective needs (Rotigel & Fello, 2004; Yenilmez & Bozkurt, 2006).

There are some studies that try to investigate the benefit of multiple intelligence theory on regular class students (Birgili & Calik, 2013; Gurbuzoglu-Yalmancı & Gozum, 2013; Koroglu & Yesildere, 2004; Osciak & Milheim, 2001; Tucker, 1995; Yenilmez & Bozkurt, 2006). According to Osciak & Milheim (2001), multiple intelligences theory is suggested as a helpful approach during instructional delivery for gifted students. MI theory can be also applied through course content, usage of instructional activity, general communication and discourse and, enhanced participant interaction. In this case, innovation of instructional design for gifted children is indispensable. For instance, due to the fact that mathematical intelligences are good at logical, mathematical and scientific ability, it is required that comparing, contrasting and creating rational explanations for an idea should be taken into consideration.

To meet and go beyond the expectations of gifted students, one of the helpful tools for instructional designer is application of MI to online learning such as web-based instruction because this system can lead opportunities for activities that address eight intelligences regardless of physical location of them. In the learning process, the teaching and learning materials such as WebQuest (see Figure 1&2), as a web-based tool, requires activities integrated with instruction so that internet includes collaborative writing projects, small group activities and communication among children from different separated locations.

FIFA decided to choose the winners of World Cup Tournament throughout the history by randomly asking some people all over the world. Assume that you have received an e- mail from FIFA indicating that you have been chosen one of these lucky people and you should reveal your winner for the World Cup Tournament with a strong rationale based on the results of previous years and some evidences. How would you start the process to choose and reward your winner?

In 2015 a new Extended Alice Book will be prepared and published. There will be new chapters which includes mathematics concepts such as ratio and proportion. Editors sent the teacher an e-mail and ask her to assist you in order to write new chapters about *Extended Alice* including ratio and proportion units blended with your imagination. Your mission is to recommend your own chapter, full of true mathematical constructs, to the editors.

Figure 1. Your winners for the world cup tournament **Figure 2.** Alice in wonderland extended book 2015

Criticisms to MI Theory

The effects and applications of multiple intelligence theory on education have been talked about throughout the paper especially making connections in Turkish educational system because it is considered that the theory was approved by educators without any questions although serious criticisms were made by psychologists and many scientists. The reason is attributed to the current condition of the education system which doesn't meet the expectations of people beside knowledge deficiencies in this era (Akpinar & Dogan, 2011). Does the theory would be approved unless it offers tragic news for the education? However, there are some other criticisms with regard to different perspectives. Especially, people should be knowledgeable about each aspect of the theory before giving suggestions to use it as a strategy for gifted students' education.

According to Waterhouse (2006) the validated data about the theory is lacking. Namely, it is not based on empirical findings and supported by neuroscience phenomenon although proponents of the theory refer the importance of accumulated knowledge through years for the validation process. On the other side, it is mentioned that negative findings outweigh the positive ones about this issue. The deficiency at testability of subcomponents for each intelligence type due to Gardner's assumptions toward psychometrics resulting general descriptions of intelligences is criticized as well.

There is a confusion to make distinction between intelligences and skills (White & Bren, 1998). Actually, skills can be defined as performances resulting as operations of intelligences (Gardner & Moran, 2006). They are shaped by the environment. For instance, swimming is a skill and providing support or put some constraints to individuals to actualize this action might influence their use of bodily-kinaesthetic intelligence. Namely, skills might be gained through several ways whereas people possess intelligences due to the fact that they are born as human beings (Davis, Christodolou, Seider & Gardner, 2011).

Although the borders between skills and intelligences have been mentioned, there is still another discussion which raises a question on people's minds about the sufficiency of these intelligences because many scholars believe that these specific intelligences have subparts. Actually, this situation is confirmed by Howard Gardner. For instance, according to Gardner, there are several dimensions like rhythm, harmony, melody and timbre in musical intelligences (Gardner, 1983, 1993).

Moreover, there are some harsh criticisms about the nature of the theory by taking special groups of people into account. Unless intelligences work in cooperation and information with each other, the independence of them shouldn't be questioned. This brings out the notion of single intelligence with specific abilities. The theory might be considered by looking at geniuses. Genuine people might excel more than one domain so that if intelligences are independent, it is questionable whilst if the assumption is the integration of intelligence, people who perform relatively well on just one domain will again make people suspicious toward the theory (Klein, 1997).

Beside geniuses, savants who are generally autistic people perform excellently in some specific areas such as making complex calculations on mind or playing a piece on the piano after hearing the song. Even though they show highly better performances on aforementioned eras, they don't thoroughly perform well in the respective domains so that talking about their logical- mathematical or musical- rhythmic intelligences bring the considered problem which is mentioned as "triviality" again (Klein, 1997)

The criticisms related to the nature of the theory and its implications with regard to people who have special abilities reflect just one part of the issue. Nevertheless, the use of the theory and the confronting problems during its use in Turkey should be concerned with student, teacher and parent perspectives. One of the starting points of the theory is to object the reality that educational systems around the world give high attention to mainly two intelligence areas, logical- mathematical and verbal- linguistics respectively. This case is valid for the Turkish education system as well. Actually, the existed standard examinations confirm this situation because questions come from related subject areas. Student who demonstrate high performances on the abovementioned eras are seen as intelligent whereas any other individual who perform highly at musical or natural modules as examples isn't included in this category. Thus, they don't have so many opportunities to show their performances and face with resentment which result underachievement as an important

heading in the literature and it should be examined in detailed with related to this topic. Shortly, students have insufficient knowledge about multiple intelligence theory (Bas, 2010) due to existence of examinations.

In addition to this, the theory requires actions like making researches, independent or group working, discussions, questioning; but teachers' instructional strategies from the early years of schooling have a tremendous effect on students' adaptations to these applications. Assume that a child is educated with traditional methods, lectures and so on throughout his/ her elementary years. If applications corresponding with multiple intelligence theory is tried to be applied to a classroom including to this child, is it possible to develop the child's various intelligence areas or to meet the needs of them? This probability might be in trouble. Essentially, this example implies teachers' roles on transferring the theory to the practice.

Generally, several studies are done to reflect the viewpoints of teachers toward the implications of multiple intelligence theory to education in Turkey (Acat, 2005; Demirel, Akınoglu, Acat, Avanoglu, Bagcioglu, Ozkan, Sayan, Sivaci, Sahinel & Talu, 1998; Usun, 2010; Yenilmez & Bozkurt, 2006). Results show that students' logical, critical and creative thinking as higher order thinking skills develop thanks to use of Multiple Intelligence Theory in classrooms (Demirel et. al., 1998) whereas some problematic aspects are waiting to be solved immediately.

Does pre-service education system in Turkey ensure people or meet the needs of teacher candidates in a way that the curriculum includes related courses with this theory, its philosophy or instructional and evaluation elements in this era? To look from a different side, do teachers bridge the gap with the help of in-service training if they couldn't grasp the important elements in the university? These questions are given because teachers' misconceptions and insufficient knowledge might create problems on applications which cause failures in education rather than success contrary to general beliefs. Due to teachers' knowledge deficits, to reflect the theory onto the educational practices in terms of teaching and learning processes might be difficult (Bas, 2010).

Furthermore, the elementary and secondary curricula are comprehensive although given time to complete them is limited. Hence, teachers may find difficult to apply different strategies

appropriate to multiple intelligence theory. On the other hand, teachers' curriculum and instruction organizations regarding to gifted students in regular classrooms in terms of multiple intelligence theory should be thought too. How will they adapt strategies or methods of instruction to these special groups under such constraints? Apart from the comprehensive curriculum and time limits, material preparation and technology use are other problematic factors. Since multiple intelligence theory contributes to creativity of teachers in material preparation and strategy development, teachers should use various sources and technologies to reveal intelligence profiles of students and to strengthen them besides appropriate evaluation criteria (Bas, 2010); however, there are so many school which lack important materials and technological devices as a barrier for the implementation of the theory (Bas, 2010).In addition to this Inal (2013) mentions the impossibility for the theory implementations of the theory in Turkey due to required excessive use of materials to be able to differentiate students' intelligence profiles. Actually, this situation is criticized under the consumption concept such that the need to use excessive material consumption according to dominant intelligence type exerts the term "consumption" under consideration (Inal, 2013) which directs the discussion to different dimensions which is not the main focus of this paper.

Even material and technological equipment deficiencies are solved to some degree, the time is a big issue for teachers and students because the required time to complete subjects or create appropriate learning environments for each discipline under its applications might not suffice to teachers especially in crowded classrooms (Yenilmez & Bozkurt, 2006) beside the advantages of the theory on students' attitudes and achievement (Coskungonullu, 1998; Kaptan & Korkmaz, 2001; Ozyilmaz-Akamca & Hamurcu, 2005; Sengul & Oz, 2008). How they would address each child's intelligence area or how gifted students will get benefit from this situation? Surely, gifted learners will benefit from taking courses with their peers in addition to their contribution to them. However, multiple intelligence use as a strategy might not reveal opportunities for this group unless stated problems are handled well as it is mentioned.

On the other side, it is also contended that the theory prevents children to develop

themselves in various areas while inducing them to be experts just one area while supporting the individualism rather than socialism because of the fact that the uniqueness of each child is highlighted and children are encouraged to learn their differences from others and use them as opportunities (Inal, 2013). They are the general aspects of the new curriculum which are considered with a different eye.

Last but not least, the theory is supported by many people especially educators on the side of equality as opposed to the elitist approach (Sak, 2011). The reflections of the theory are seen on Turkey such that the theory is utilized on elementary education programs. Nevertheless, serious criticisms are made toward its implications. Actually, Sak's viewpoints reflect the most appropriate position toward the theory because it is contended that approving the theory as it is an absolute truth isn't suitable approach because there are many studies which falsify it as well as researches providing confirmation.

CONCLUSION

Besides all criticisms and blurred sides of the theory, there are various researches about its effectiveness on engagement, performance and affective aspects of learning (Cho & Ahn, 2003; Coskungonullu, 1998; Dillihunt & Tyler, 2006; Kaptan & Korkmaz, 2001; Ozyilmaz-Akamca & Hamurcu, 2005; Sengul & Oz, 2008; Temur, 2007; Ziegler & Phillipson, 2012) as a contributor factor to child development. It is also mentioned that Gardner' theory is used as a framework to plan a program in order to meet the needs of different learners and the improvement of different intelligences in educational settings as it is done in Finland (Tirri, 1997).All of the findings ignite a spark on minds as use of it for different fields such as gifted education or profiting the theory to raise the young scientists.

There is no doubt that MI theory is highly preferable approach in gifted and talented children's education. The approach is like a door that is opened for differentiating general design of course content, the use of instructional activities, communication and discourse between learner and instructor, and improving participant interaction (Osciak & Milheim, 2001). Due to the fact that MI theory focus on active learner and multiple ways for learning based on individual's preferred learning style, it can hold its own in history scene of educational sciences. Of course not every theory is like a taboo, in

everywhere people and changes exist so that both criticisms and praises are subjected to emerge. Sak (2010) also highlights that one of the believed fault is to see multiple intelligences theory as an absolute truth instead of a nominative theory. Since, there exists some researches both affirm and falsify this theory.

In addition, the theory is vital for attracting attention of the young scientists because *Gardner's Five Minds of Future* stresses disciplined, synthesizing, creating, respectful and ethical minds required for young scientists for the future both in land and abroad. Also according to Pava (2008) in addition to single brain can house several minds as Gardner supports, several brains with their own several minds can combine to create and share a single mind. Namely, this argument claims the pragmatic way of thinking. Sometimes the whole can be worthier than the parts like several minds which depict multiple intelligences. Therefore, the educators should give impact on the way they teach them. In that case, young scientists should be educated by Universal Design of Learning (UDL) which is used by architects, engineers or environmental design researchers. It combines and provides interdisciplinary curriculum, use of technology, partner learning, student collaboration and peer mediated instruction. They should also be developed as peacemakers (Villa, Thousand, Nevin & Liston 2005).

Many students love science at an early age. Unfortunately in many schools it is commonly textbook based reading and learning about science instead of truly doing science. Nevertheless, in the world of giftedness and gifted education, it is believed that the need for science should be offered to all children. Gifted learners or talented young scientists stay engaged and feel motivated to learn through their formal education if real doing of science and world secrets are provided to them (Corash & Jones, 2012).

Many gifted children see the world differently than youngsters so they need more advanced techniques during instructional design and process. Even small precious support can enhance their self-motivation and honour their skills (Subotnik, Olszewski-Kubilius & Worrell, 2012). Moreover, Smutny (2012) suggests that talented learners who will be young scientists of learners should be satisfied with the freedom by learning their own level and speed. As an illustration, analysis of historical events can be used as accelerated program in science and

mathematics. A routine math problem can be created as puzzles that rule out all known solutions before (Cho & Kim, 2003). Hence, learning environment should be arranged as curious and inspired as possible.

To conclude, approved assumptions and related aspects of the theory make it an appropriate approach for gifted education and a fruitful way to raise the young scientists. Although Gardner's theory holds many critical questions on it, the presupposed suggestions to design and organize learning environments might provide conceptual and meaningful learning for such group of learners. The paper just tries to organize the current information at hand and finding connections between two different areas as gifted education and multiple intelligence theory in favour of raising prospective scientists of the future. However, it should be noted that the literature needs sufficient empirical findings which is lacking on that issue to confirm the questionable minds. Last but not least, according to some scientific views it can be reminded that inherent high capacity of any area remarks superior-high *intelligence*; whilst with development of the capacity by advanced usage of the area defines superior *skills*. Even if these terms are used interchangeably, it should be realized that the terms must be separated due to the fact that they have dissimilar dimensions.

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