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THEORETICAL ANALYSIS OF IRANS SYSTEM OF MATHEMATICAL EDUCATION

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Abstract. The general interest of Iranian students in mathematics, both in terms of specialized career paths and general skills, has always been subject to changes. This phenomenon is not merely related to personal dedication. It has deep roots in the components of mathematics education in the country. What we have done has a reflection in the mirror of what we have achieved. The transformation in Iran's math education has been ongoing. These changes have sometimes been to adapt to external phenomena and global issues and sometimes to overcome internal challenges and upcoming events. Even now, our society is subject to transformation in mathematics education, and finding the right direction for these transformations requires knowledge. We cannot reduce the plan to analyzing the technical mathematics teaching methods. Instead, it greatly depends on Iranian thought and its view of mathematics and the world. This article deals with the difficulties of mathematics education in Iran and some of its roots. For this purpose, we discuss the theories of education and mathematics education. Then, with their help, we look at the structure of mathematics education in Iran. This article can help all those who want to gain a knowledge-based understanding of mathematics education and its difficulties in Iran. In addition, it offers a plausible view for those who can try out different approaches to find some indications of the results of possible actions. In addition, it can encourage interested parties and researchers to address this crucial topic.

Keywords: Mathematical Education, Intelligence growth, Cognitive growth, Segregation, Inclusive Education.

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1. Introduction

Mathematics forms the foundation of a nation's progression as one of the most powerful scientific-historical activities of the nation-state. There is a significant relationship between the advanced and developed status of a country and the current general level of mathematics in society. The strength of mathematics is associated with the sustainable and effective development of technology in a country. It is sometimes thought that all mathematics education activities in the country can be seen in the form of mathematics teaching techniques. The subject matter teaching method and the science of mathematics teaching are two related but different categories. Reducing mathematics education to a set of techniques narrows the view. As a result, it prevents society from thinking about the real progress in generalizing mathematical skills. The science of mathematics education is born from the intersection of developmental psychology, educational sociology, and philosophy. While mathematics as a social tool can be learned collectively, its internalization is individual. Evaluating the social and personal aspects of mathematics education in the context of mathematics learning, as part of collective wisdom, is a social need (the first need); on the other hand, the existence of specialized mathematicians for the development and growth of technology in Iranian society is also a social need (the second need). In the meantime, it is often concluded that to respond to this latter need, a special path must be found for potentially gifted students in learning mathematics. To address the first need, a different path must be taken. This crossroads is largely responsible for the social wandering of Iranian students in learning mathematical skills and the cessation of their creativity. This is an important point because, for the majority of Iranian students, the responsibility for the lack of creativity lies behind such theoretical deficiencies. The existence of this crossroads is caused by a theoretical perspective that leads to obscured paths. In the meantime, it is often concluded that to respond to this latter need, a special path must be found for potentially gifted students in learning mathematics. To address the first need, a different path must be taken. Studying the structure of mathematics education in other countries and comparing it with the structure of mathematics education in Iran can confront the challenges of the present situation, though not capable of solving the structural problems and removing those challenges. Many of these applied studies have only affected the content of the curriculum or have activated some educational mechanisms but have not created a structural change in the Iranian mathematics education system. Modeling modern teaching methods is also a way to develop and improve the structure of education as a whole. The ideal case is based on knowledge and creativity to teach the discovery of techniques. See [31], [41], [16], [48], [49], [60], [19], [37], [63].

2. Theoretical Understanding of Mathematics Education

The fact that any education, including mathematics education, must be based on theory underpins the need to connect mathematics education with theories. As a result, mathematics education requires a plan that includes theory, design, implementation, and process evaluation. Apart from this plan,

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there is no pre-emption regarding the implementation in the practice position. In other words, the implementation of the above four-stage method is by no means static. It is not determined once for all, but that is completely dynamic and depends on the individual, time, and many other parameters. See [57], [14], [17], [35], [44], [21], [12], [47], [50].

2.1. **Society and Mathematics.** To understand the sociological concepts of mathematics education, we focus on psychologists who have bound up the cognition of the individual to the society. From a sociological perspective, Dorrani (1401) calls the school an educational institution with an ecological structure, then from theoretical perspective views this institution as a social capital. Finally, Dorrani discusses development, the role of capital in development. Dorrani groups the capital in form of material, and human, and points out that "Most economists believe that what ultimately determines the characteristics and process of a country's economic, social, and cultural development are its human resources, not its material capital." See [57], [10], [13], [29], [39], [43], [51], [11].

2.2. **Intelligence and Mathematics.** Directing instruction toward the achievement of behavioral goals that are primarily test-type outcomes can only lead to the achievement of those goals and does not necessarily lead to meaningful learning and lasting competence. Overemphasis on the use of intelligence tests, especially IQ, can be misleading. IQ is the ratio of functional age to chronological age at the time of the test. Therefore, IQ is a time-varying quantity that is related to education and learning. While timely education serves learning, untimely education delays learning. Premature education is one of the signs of untimely education. Since IQ is a function of an individual's average performance over time, it is impossible to predict the future of IQ without considering the corresponding training that led to the learning. Although IQ at a particular time is effective in determining its value at later times, its continued high level is highly dependent on average future educational success. In other words, the individual's learning plan should be considered in the light of past experience; however, one should not overemphasize the past experience as a sole criterion for future learning. Of course, it remains true that past learning experiences are effective in maintaining the rhythm of development. What is emphasized is that the criteria for maintaining or improving learning in the future depend on teaching that is appropriate to the needs of the learner, which fosters a sense of knowledge and discovery, and is not just a set of instructions to achieve some behavioral goals. In fact, the measurement of IQ should be based on a specific goal, such as helping the learner, and not for the purpose of unnecessarily improving the academic base of students. Another common belief in Iranian society is the association of high IQ with the possibility of future success in mathematics. This difficulty can be criticized from two perspectives. First, success in learning mathematics is related to appropriate training. Second, intelligence has different aspects. The IQ only shows the average abilities of an individual and not necessarily one aspect in particular. See [57], [56].

2.3. **Cognition and Mathematics.** From Vygotsky's perspective on cognitive development, the organization of mathematics education is not determined by "what the learner knows" or "what the learner should know." Instead, it is based on "what the learner can know with the help of others." According to this theory's second parameter, progress within the zone of proximal development requires the construction of a scaffold that guides the learner step by step, much like how a scaffold allows access to all floors of a tall building. Vygotsky's learning theory also suggests that movement within the zone of potential development is achievable by building such a scaffold. More capable classmates play a significant role in this process. When a student quickly grasps certain concepts, they can assist their classmates in understanding those concepts as well. In doing so, the student who offers help not only provides a scaffold for their peers but also advances their own zone of potential development. See [3], [57], [7], [54], [56].

2.4. **Environment and Mathematics.** Considering Bronfenbrenner's layers, we find that society as a macro-organization can guarantee this unity. Any form of education outside of school policies will damage the unity of the micro-organization. Regarding the active parallel educational institutions in mathematics education to support specific subjects, it should be noted that only a small group of students need separate instruction. See [1], [57], [7], [8], [17], [30], [39].

2.5. **Self-Actualization and Mathematics.** Humans have five stages of needs: physiological, security, belongingness (or membership), self-esteem, and self-actualization. When the need for self-esteem is met, an individual can reach the highest level of human need, which is self-actualization. According to this theory, a person will not progress to a higher level of need until each of the previous needs is at least partially fulfilled. See [3], [18], [27], [28], [30], [56], [58], [59], [62].

2.6. **Theories of Traditional Spectrums.** Focusing on spectrum theory, all parts of the Iranian mathematical education system are distanced from each other as much as possible. Even students with relatively close situations are receiving education in different ways with different titles. To clarify this last point, it is necessary to note that in the current Iranian education system, students are educated in several categories. To observe the confusing tangle of "paths" resulting from the crossroads of "special path" and "other path", it is necessary to shed light on the structure of this education. We must remember that, according to the theory of cognitive development, students develop their symbolic apparatus and cognitive tools in interaction with each other. In contrast, to the wide spectrum of segregated students, the theory of inclusive education proposes that each student has specific needs rather than specific abilities. According to this theory, it is one of the tasks of the educational structure to meet these needs. The requirements of a loose structure do not help meet cognitive needs. See [2], [3], [4], [5], [9], [17], [22], [23], [25], [28], [32], [33], [35], [40], [46], [52], [55], [61].

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3. Obstacles in Iran Mathematics Education

Mathematics education in Iran faces several groups of difficulties that affect each other. Therefore, they should be examined about each other. Among them, we can mention the difficulties of content, test-oriented, elitism, and behaviorism in mathematics education. The relationship between them can be summarized in a general characteristic, namely, segregation. Predicting the future of mathematics learning based on the past without considering instruction tailored to the student's future needs will have no result other than non-meaningful learning. This is a fundamental question as to why the results of mathematical Olympiads are so popular among the public, while formal and scientific programs to popularize mathematics are not taken very seriously. In contrast, advanced societies insist on the generalization of mathematical knowledge and skills by motivating them and also by enabling educational goals for all students in a comprehensive or more inclusive structure than the spread of Olympiads. To better understand these aspects, in the remainder of this article, we will analyze in more detail the segregated structure of mathematics education in Iran. See [57], [15], [20], [56].

4. Segregation in the Structure of Iran's Mathematics Education

Segregation is the opposite of inclusion, and its signs include the existence of various types of private schools and education, non-profit, and public schools with different educational levels. Phenomena such as brilliant talents and numerous educational olympiads can be seen. One of the requirements for the segregation of the organization is the process of disintegration. A significant part of the survival of this organization is due to the "mathematical orientation" that requires its special treatment. This process pre-evaluates students and judges the student's potential for progress based on the evaluation of his or her mathematical experiences. This part of the disintegration process is against the results of developmental theories. Based on Piaget's intelligence theory, Vygotsky's theory of cognitive development, Maslow's theory of hierarchy of needs, Goodchild's micro-classification of mathematics learners, and Bronfenbrenner's layer theory, the mathematics classrooms are subject to critical analysis. See [24], [26], [36], [45], [53], [56].

4.1. **The Perspective of Intelligence Development.** Piaget's theory of cognitive development only refers to the potential for learning to occur and in no way guarantees the occurrence of learning. The only factor that guarantees learning is functional education. Since not every type of education leads to "meaningful learning." See [57], [56].

4.2. **The Perspective of Rationales.** The intensity of preparation courses for entrance exams depends on the social importance of the institution conducting them and usually involves solving numerous similar problems. According to Goodchild's studies, this phenomenon will lead to blind mathematical

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activities instead of meaningful learning. In addition, this method of teaching mathematics encourages non-functional rationales in mathematics and its learning, which ultimately leads to instrumental knowledge and also eliminates the opportunity for meaningful learning. See [18].

4.3. **The Perspective of Cognitive Development.** From Vygotsky's perspective of cognitive development, learning drives growth. In this way, it is not possible to assess growth in the absence of a learning process. Success in mathematical skills is related to a mathematics learning framework, that is appropriate to the student's learning needs, rather than to the results of standardized tests. Cognitive development theory insists that a student can learn mathematics, not necessarily through instruction but through individual discovery. Two core factors in Vygotsky's theory of cognitive development are the zone of proximal development and Vygotsky's scaffolding. However, in the currently developing parts of Iran's educational structure, the basis of mathematical activity for students is temporary behavioral goals, not cognition.

4.4. **The Perspective of Hierarchy of Needs.** The segregation that is developing in the structure of our mathematics education leads to the conditional membership of students in different parts of this broken apparatus. In this way, the achievement of these students in reaching the stage of self-actualization is faced with many doubts. This crisis causes an irreparable loss of the type of fixed mindset to a significant part of our students. See [28].

4.5. **The Inclusive Education.** The alternative to integrated educational systems is the modern approach of inclusive education. In inclusive education, students are not taught differently based on their backgrounds or abilities as opposed to a segregated structure. The modern theories of inclusive education do not prioritize the visual similarities among students; instead, they focus on the specific educational needs of each individual. Every student requires time and resources appropriate to their unique needs. Unlike segregated education systems, the success of inclusion and learning is entirely operational, emphasizing practical outcomes. See [4], [57], [6].

5. Modernism and old stuff

Public education in Iran before the 20th century was mostly outdated leaving Iranian children unequipped with the necessary skills for life and adulthood required in the subsequent century. Over time, several educational systems were proposed in Iran contributing in various ways, sometimes with progress and sometimes with setbacks, in improving public education. Under the shadow of the current situation in Iran, we need a new plan. This article attempts to shed light on the need for innovation. We have examined the functioning of the Iranian education system and its behavior towards mathematics from theoretical perspectives. We emphasized that the method of segregation contradicts the main goal of mathematics education in fostering students' creativity in the modern world. It is important to note that we do not propose any sudden change. Instead, we call for a step from the current situation to

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experience effectiveness. The key issue is to recognize the mathematics education structure aligned with the theories and not oppose them. Ultimately, a new plan is essential to reorganize the Iranian system of mathematics education to ensure the opportunity to thrive. See [34], [40], [42], [38].

6. Discussions and Conclusion

This article examines the specifics of mathematics education in Iran through the lens of grounded theories. According to Piaget's stages of cognitive development, a child reaches a stage of cognitive growth when they receive instruction tailored to their needs, providing them with meaningful experiences of mathematical concepts. Any attempt to accelerate this process can lead to undesirable effects. From the perspective of the hierarchy of needs, fulfilling each need serves as a bridge; therefore, improperly ordering the partitioning of students can create significant deficiencies in that bridge and ultimately hinder the achievement of self-actualization. Vygotsky's theories emphasize learning development, asserting that meaningful learning can only occur through discovery. For this to happen, Vygotsky's factors must be actively engaged and not hindered by segregation. According to Bronfenbrenner's layers theory, effective mathematics learning requires a cohesive cognitive and communicative system, where all elements function in harmony. This system should not be disrupted by two forms of segregation: the disintegrated micro-system and the test-oriented behaviorism approach. Only a small percentage of students have special educational needs in mathematics that necessitate outside schooling. However, schools should remain the primary focus rather than a secondary option. There is no scientific or practical justification for the segregation of the social and future aspects of mathematics specialization within K12 education systems. The theory of learning supports the viewpoint presented in this article regarding mathematics education. Segregation and inclusion cannot develop simultaneously. A critical condition for achieving inclusion in education is securing integration, where disconnected parts are connected. To advance society and enhance mathematics education, we need human resources equipped with modern knowledge, collective will, and investment aligned with our needs.

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