# THE MEAN OF SIX PRINCIPLES OF MATHEMATICS EDUCATION IN TURKEY

Tuğba Özcan[1]

Bilkent University

M. Sencer Corlu

Bilkent University

**Abstract**

This article was based on the six principles of high quality mathematics education which were equity, curriculum, teaching, learning, assessment and technology. I considered these principles given in the NCTM, in terms of Turkish mathematics education. I argued the possible complications in implementation these principles in Turkish mathematics education. Finally, I listed possible solutions in the light of studies done in this area.

*Key Words:* Six principles, mathematics education, problems with solutions

[1]Correspondence concerning this article should be addressed to my name and email address tugba.ozcan@bilkent.edu.tr

## Introduction

The purpose of this article was to explain the six principles of mathematics education. I expressed each principle for Turkish mathematics education. I also discussed how each principle could be implemented in Turkish mathematics classroom. Moreover, I tried to bring solution to the implementation difficulties in the Turkish mathematics education.

## The Means of Principles of Mathematics Education in Turkey

There are six principles of mathematics education. They are equity, curriculum, teaching, learning, assessment and technology. They are features of high quality of mathematics education(NCTM, p.11).

### Equity

One of the six principles of mathematics education is equity. Equity means that every student has the right to access all areas of the curriculum and high quality instructional materials and teaching. In Turkish mathematics education, equity mean cannot be met in full. It is one of the deficiencies of the education system in Turkey. Due to the fact that there is a big gap between wealthy and poor classes in society, every child cannot have the same opportunities in education. While children of wealthy families are able to reach a qualified mathematics education, the others are unable to do it. For example, some private schools use technology such as TI calculator, projections; but most of the public schools do not have them. Additionally, from my own experiences, I can say that there is a positive discrimination in education. In a word, the more qualified teachers are oriented to teach the higher level classes. Hence, unsuccessful students in mathematics are lack of better education. Moreover, I pass this, some people cannot even go to school. Which should not be ignored that some of the children, especially girls in certain areas of Turkey, are not permitted to be educated. Nevertheless, these problems can be solved by teachers operating under the assumption that all students can learn mathematics in

appropriate conditions(Brahier,2010, p.29). Also, I think that the government policy so important to overcome this issue. That is, all students are equal to be supported in mathematics education.

**Curriculum**

The second of the principles of mathematics education is curriculum. Mathematics curriculum is not only the textbooks and subjects studied but also it must include a wide mathematical knowledge and a well articulated across the grades(Brahier,2010, p.28). In most of the schools in Turkey, mathematics curriculum is only formed of a collection of books. It is not important how the mathematics is taught. Most of the teachers concern only what they teach, and sometimes this occurs because of the ministration. Moreover, although several topics build the basic knowledge in mathematics, MoNE curriculum does not include them. In respect of MoNE, for example, differential equations is not studied in schools as a subject of mathematics. In addition, students learn only abstract mathematics, they cannot see or imagine what a parabola, or a triangle look like, for instance. In order to visualize them, calculators or manipulative can be used in this manner. Another important point in the mathematics curriculum is that the subjects should be the correct order. To illustrate, a student not knowing the quadratic equations cannot sketch the parabola(p.30). Hence, curriculum is a kind of attitude that a student has throughout an educational career.

**Teaching**

Teaching is the third principles of mathematics education. i.e. Skills of a teacher is one of the most crucial factor in the mathematics education. Therefore, a teacher must be sufficient in the curriculum. And at the same time, teacher must have an extensive knowledge in teaching techniques, strategies, motivating and managing students. For Turkish mathematics education, some of the students are aware of this fact but some of them are not. Because of the full capacity of schools in Turkey, the teachers usually teach as all the students are in the same level of

mathematic knowledge or background. Unfortunately, several of them do not care about this. For changing the situation to the inverse, the beginning should be to decrease the number of students in each class. Then, teachers should choose appropriate methods or activities for students in each level in a positive classroom environment(Brahier,2010, p.32). As Brahier says "An effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well." (2010, p. 28). Hence, teachers should be so responsible for developing the skills required to motivate and engage the students that all students can access the significant mathematics education(p.32). But, initially, the teachers should be taught accurately and sufficiently. So, conscious teachers can bring up conscious generations.

**Learning**

The fourth principle of mathematics education is learning. Learning is a lifelong process. But mathematics learning requires analyzing the experiences with understanding knowledge, and constructing new information on them. "The measurement learning area consists of the measurement units, which the students shall face and need during their lives."( Bulut,2007, p.205). In Turkish mathematics education, students are unable to comprehend what the mathematics means and for what reason it is used. They are learned to approve the knowledge without query. Moreover, lea in Turkish education system, mathematics learning has depended on merely doing many exercises or just memorizing information, not on solving problems or understanding the knowledge. However, like Brahier says, problem solving is a song of mathematics (2010, p.33). The solution to this case should be that students are taught for understanding. Furthermore, the students should focus on not only practicing basic skills but also conceptual ideas. Thus, they can make connections among mathematical subjects. To conclude,

as NCTM states that learning process should involve factual knowledge, procedural proficiency, and conceptual ideas(2000, p.21).

**Assessment**

The next principle is assessment. In respect of Brahier, assessment is an evaluation process of the students' learning and knowledge of mathematics. Also, assessment is for students to be increase their instructional progression by accumulating information about students(p. 28). However, for Turkish mathematics education, assessment is done just by giving grades at the end of the semester. And, in the end of the high school education, students are tested by student selection exam to be able to study in a university. In spite of these difficulties, students should be assessed by their performances in class. For example, with their writing, group works, their presentations, or attempting to solve problems. Furthermore, it is so necessary that teachers should provide students timely and give feedback for an effective assessment. In short, assessment is a feedback given on time by using sanctions and praise.

**Technology**

The last principle of mathematics education is technology. Technology is a tool for the students to fix and construct their mathematical knowledge. TIMMS' studies shows that "Successful schools are likely to have better working conditions and facilities as well as more instructional materials, such as books, computers, technological support and supplies."(2011, Chp. 5). In Turkey, the government has started a project, which name is FATIH. The aim of it is to help students in their education by giving tablet computers. On the other hand, there is a big misperception that the students who are unable to access outfits or the other materials to be able to go to the school, do not care about tablets. Technology should be used even it must be used in mathematics education but after meeting and completing the other needs of the students. That is, the other conditions must be improved first and then technology must be used in geometry,

for instance. Hence, students can benefit from to make sense of what happens when lines are intersected by a transversal. To sum up, technology is a helpful instrument for students to be engaged in mathematics.

## Conclusion

The purpose of this article was to describe the six principles of mathematics education in which the NCTM Standards list. These are equity, curriculum, teaching, learning, assessment and technology which are features of mathematics program. I considered them in terms of Turkish mathematics education. I learned that each principle affected the others. Also, all of the principles is significant for quality of mathematics education.

## References

Bulut, M. (2007). Curriculum Reform in Turkey: A Case of Primary School Mathematics Curriculum *Eurasia Journal of Mathematics, Science & Technology Education, 3(3),* 203-212. Retrieved October 4, 2013, from http:ejmste.com/v3n3/EJMSTE_v3n3_Bulut.pdf

Brahier, D. J. (2010). Mathematics as a process. In J.W. Johnston (Eds.), *Teaching secondary and middle school mathematics* (4th ed.). (p.28-40) NJ: Pearson

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics.* Reston, VA: National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics. (2011). Illuminations. Retrieved October 4, 2013, from the World Wide Web: http://illuminations.nctm.org

"A Bilkent student does not lie, cheat, or steal or tolerate those who do. On my honor, as a Bilkent student, I have neither given nor received unauthorized aid on this academic work."

_____

Tuğba Özcan