

DEVELOPMENTS IN THE FIELD OF MATHEMATICS AND MATHEMATICS EDUCATION IN TURKEY BETWEEN THE YEARS 2000-2020

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In this study, it has discussed that the developments in the field of mathematics and mathematics education in Turkey between the years 2000-2020. In this direction, the products of scientists working in the field of mathematics and mathematics education as a department in the process, current developments in primary, secondary and higher education institutions in terms of mathematics and mathematics education, prominent approaches in mathematics teaching and changes in mathematics teaching programs were examined.

The Effect of Computer Technology in Mathematics and Mathematics Education Studies

It can be said that the 2000s marked a breaking point in the tendency of technology to do mathematics and take place in mathematics classes (Heid, 2002; Lavicza, 2010; Raines & Clark, 2011). Since the 2000s, along with technological developments, Dynamic Geometry Software (DGS) and Computer Algebra Systems (CAS) have been widely used in the fields of mathematics and mathematics education. DGS and CAS software, specially developed for analysis, algebra and geometry, have been used with research-oriented and instructional functions such as organizing, visualizing and discovering data (Tokpah, 2008). Programming languages such as Matlab, Maple and Mathematica have been used extensively in undergraduate and graduate mathematics research. Technology has started to be used more for graphic and geometric drawings.

In the report prepared by the State Planning Organization for the years 2006-2010, the FATİH (Movement to Increase Opportunities and Improve Technology) project was initiated by the Ministry of National Education to realize the goal of "Information and communication technologies will be one of the main tools of the education process and students and teachers will be able to use these technologies effectively". With this project, it is aimed that the teaching-learning process in Turkey should be computer-aided, as in the South Korean model, following the information society strategy (Ekici & Yılmaz, 2013). Within the scope of this project, smart boards were installed in the classrooms (Figure 1).



Figure 1. A smart board installed in schools within the scope of Fatih Project

In order to complete the online content that will be needed in the context of the FATİH project, information and instructional technology experts are invited to support the Education Information Network (EBA) project.

Developments in Mathematics Curriculum in the Primary, Secondary and High School

When the process between 2000-2020 is examined, it is seen that revisions were made in the primary, secondary and high school mathematics curriculum in 2005, 2006, 2009, 2013, 2015, 2017 and 2018. In 2005, the Mathematics Curriculum for primary and secondary education (Grades 1-5, Grades 6-8 and Grades 9-12) was revised by the Ministry of National Education, Head Council of Education and Morality. With these programs, a paradigm shift has been made in mathematics teaching. Traditional mathematics teaching has left its place in the constructivist approach. Along with these programs, new alternative measurement and evaluation methods and techniques required for process evaluation were included (MEB, 2005, 2013). In accordance with the

philosophical approach adopted in the program, the expression of achievement was used instead of purpose (Sezgin Memnun, 2013). After 2005, there were significant changes in the mathematics curriculum (TTKB, 2005), which underwent a serious revision in 2005, when the principle of "every child can learn mathematics" was based. Necessary arrangements have been made in the learning areas whose objectives have been renewed in line with the needs of the age, and the competencies and skills that are thought to be gained have been increased. In addition, the acquisitions in the curriculum have been made simpler by editing, combining or updating. In addition, the fact that the lesson duration has been increased by a quarter is a great point and shows the importance given to mathematics. Anymore to doing advanced mathematics in Turkey, it is seen that studies have started to be carried out intensively in the context of students, prospective teachers and teachers samples and study groups in the context of cognitive, affective dimensions and different teaching methods within the framework of mathematics education (Ulutaş & Ubuz, 2008). In this program, for the first time, the duties of teachers and students and the characteristics of the teaching-learning environment were specified. Accordingly, students in learning environments are students who do research, are active participants, think and question, can work in groups, love mathematics and are self-confident in mathematics. Teachers, on the other hand, are individuals who prepare environments that will enable students to think independently and critically, plan and direct the learning process, guide students in their learning, produce activities necessary for learning, and evaluate their students in various dimensions with different measurement tools (MEB, 2005). As a result of this transformation, primary and secondary school mathematics curriculums published in the period from 2005 to 2018 have undergone radical changes in terms of their aims, content, achievements, skills and application steps of the program. The main reason for this radical change is that the new curricula developed have been revised in terms of both content and philosophy, namely constructivism and student-centered education philosophy (İlhan & Aslaner, 2019).

Since 2003, questions on mathematical literacy have begun to be asked in the PISA exams, which have been held every three years. In line with the content of such exams, since 2018, mathematical literacy questions have started to be asked in the Basic Proficiency Test and Field Proficiency Exams held within the framework of both the high school entrance exam and the higher education entrance exam. In this context, it is seen that the content of mathematics teaching in primary and secondary education and the content of mathematics problems solved in lessons have also been changed.

Overview of National Education Councils in the Outline of Mathematics Education

The National Education Council, which meets periodically under the supervision of the Turkey Ministry of National Education, is the highest advisory body where the current situation of the national education system in Turkey, the problems experienced and suggestions for their solution are discussed and evaluated. The decisions published as a result of the meetings of the National Education Councils, on the other hand, can be

decisive in shaping Turkish education policies, although they can not go beyond the quality of advice. For this reason, it is considered significant to examine the decisions taken in the said Councils in terms of mathematics and mathematics education.

In the period between 2000-2020, the National Education Council meetings were held 3 times. In the 17th National Education Council, which was held on 13-17 November 2006, the first of these, the structural situation, transitions between levels, orientation, and examination system in the context of the Turkish education system in the globalization and EU process were taken into consideration. In this meeting; There is no decision that directly concerns the field of mathematics and mathematics education (TTK (Talim ve Terbiye Kurulu Başkanlığı), 2006). However, it can be said that the decision was taken for "Primary school teaching to be up to the 1st, 2nd and 3rd grades, and that the lessons are given by the branch teachers in the 4th and 5th grades" is significant for the teaching of mathematics in the primary school. Furthermore, when the decisions are taken to increase the personal, academic and professional knowledge, skills and equipment of teachers in pre-service and in-service training programs are considered in the context of mathematics teaching, it can be seen that there is a positive effort to improve the current situation.

At the 18th National Education Council held on 1-5 November 2010, decisions were taken that the terms used in lessons such as science, technology and mathematics should be rearranged in cooperation with the Turkish Language Society (TTK, 2010). Additionally, to the teacher of each lesson; It can be said that the decisions are taken to contribute to the effective use of classrooms by assigning the duties and responsibilities of organizing their own classroom, keeping and protecting the tools and equipment to be used continuously, also partially manifest themselves in the implementation dimension in the next process. In this process, with the effort to spread the "branch classrooms application", mathematics classrooms were started to be created in some schools. Branch classrooms, which are a system in which students learn in classrooms equipped and arranged according to the lesson content, are associated with branch teachers and teachers can have the opportunity to organize their own classrooms. In addition, some studies have shown that the branch classroom system increases the motivation of the teachers, the boards and visual materials in the classrooms motivate the students and create a desire for research (Özyürek et al., 2017) and thus increase the success of the teachers and students who are inspired by the branch classroom system (Özyürek et al., 2016) shows. Lastly, the main agenda items of the 19th National Education Council, which was held between 2-6 December 2014, consist of subjects such as curriculum and weekly lesson schedules, increasing the quality of teachers, improving the quality of education administrators and school safety. It can be said that in these meetings, which are generally related to the process of restructuring the education system, regulations regarding mathematics education were indirectly taken (TTK, 2014).

Postgraduate Studies in Mathematics and Mathematics Education

Between the years 2000-2020, there has been a significant activity in mathematics education research in Turkey. Anymore, the belief that "every mathematician is also a mathematics educator" is changing and the field of mathematics education emerges as an important research area. In recent years, there has been a significant increase in postgraduate studies in the field of mathematics education in Turkey, and there has been a dynamism. In order to reach the postgraduate studies in the field of mathematics education in Turkey between the years 2000-2020 on the web automation of the National Thesis Center, a search was made with the keywords "mathematics education" and "mathematics teaching".

Table 1. Postgraduate Thesis in Mathematics Education

Year	Master degree	Doctoral degree
2000	7	0
2001	3	0
2002	8	0
2003	10	2
2004	9	0
2005	15	0
2006	7	3
2007	11	4
2008	9	4
2009	11	2
2010	20	3
2011	18	2
2012	23	5
2013	14	6
2014	12	5
2015	16	0
2016	18	7
2017	15	6
2018	22	2
2019	67	9
2020	20	4
Total	335	64

While a total of 90 postgraduate theses, 19 of which were doctoral and 71 master theses, were completed between 1980 and 2000 (Bozkurt, Patoğlu, Cücük, 2020), this number increased to 335 in master's and 64 in doctorate programs between 2000-2020. It is noteworthy that most theses were prepared in 2019. As a result of the data obtained,

although research has been carried out in the field of mathematics education in Turkey since the 1990s, it is striking that there has been a significant increase in the number of theses produced, especially after 2005. This shows that there has been a serious movement in the field of mathematics education after 2005 and this is reflected in the number of theses. This situation also points to the increase in the number of mathematics education researchers and the number of institutes providing graduate education in the field of mathematics education, where mathematics education has started to settle in Turkey as a research area (Baki, Güven, Karataş, Akkan & Cakıroglu, 2011).

In order to reach postgraduate studies in the field of mathematics in Turkey between the years 2000-2020, a detailed search was made by selecting the "mathematics" department option in the web automation of the National Thesis Center implemented by the T.R. Council of Higher Education. According to the results of the review, a total of 1770 postgraduate theses, 450 of which were doctoral and 1320 master, were completed between 1980-2000, while a total of 11,451 postgraduate theses, 2613 of which were doctoral and 8838 master's, were completed between the years of 2000-2020. When these postgraduate theses are considered quantitatively and evaluated according to their preparation years, it is noteworthy that the number of theses was low in the early 2000s. As a matter of fact, 158 master's and 32 doctoral theses were made in 2000, the year when thesis studies were the least. However, there has been a gradual increase in postgraduate thesis studies in the following years. It is pretty remarkable that the number of master's theses is 1000 in 2019.

Table 2. Distribution of theses in the field of mathematics between 2000-2020 by years

Year	Master degree	Year	Master degree	Year	Doctoral degree	Year	Doctoral degree
2000	158	2011	518	2000	32	2011	135
2001	185	2012	459	2001	43	2012	131
2002	199	2013	491	2002	77	2013	171
2003	223	2014	467	2003	83	2014	210
2004	262	2015	481	2004	63	2015	198
2005	318	2016	467	2005	65	2016	216
2006	366	2017	533	2006	74	2017	176
2007	406	2018	550	2007	99	2018	187
2008	360	2019	1000	2008	80	2019	199
2009	404	2020	459	2009	115	2020	134

Total: 8838

Total: 2613

When the contents of these are examined, it is possible to say that their interdisciplinary studies have started to increase.

Mathematics Village established in İzmir/Şirince in 2007 and Çakıllarası Mathematics Village established in Eskişehir in 2016 were opened, creating environments for doing and learning mathematics intertwined with nature.



Figure 2. A picture from Çakıllı Mathematics Village

In addition to the Turkish Mathematics Association established in 1948 and the Mathematicians Association in 1995, women studying in the field of mathematics established the Turkish Women Mathematicians Association in 2012 (Figure 2).

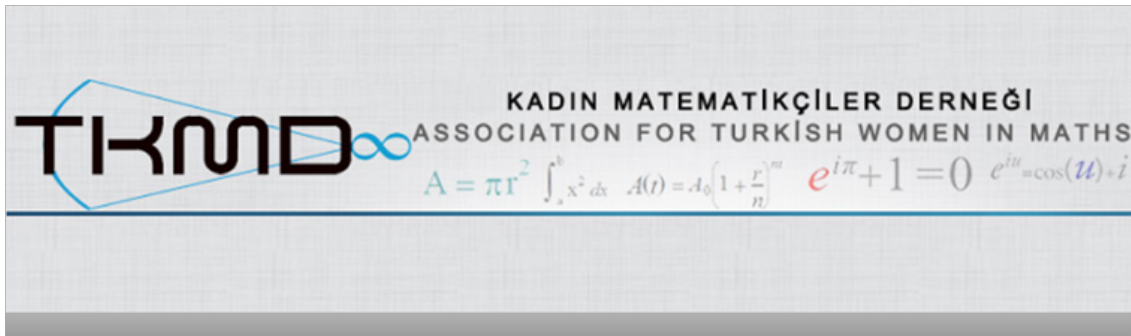


Figure 3. Turkish women mathematicians association

In 2012, in addition to these associations established by mathematicians, the Mathematics Education Association began to operate specifically for mathematics education.

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