DEVELOPMENTS IN THE FIELD OF MATHEMATICS AND MATHEMATICS EDUCATION IN TURKEY DURING THE PERIOD OF 1938-1980

Prof. Dr. Ali BOZKURT
Gaziantep University

Assist. Prof. Dr. Emrah Berkant PATOGLU**
Gaziantep University

Introduction

When the Republic of Turkey was founded there was a drive to keep up with contemporary civilization and an ambition even to go beyond. Mustafa Kemal Ataturk tried to pave the way for the modernization based on reason and wisdom by pointing out the fact that a civilization without science cannot be modern. As in all areas, these efforts are seen in the areas of science and technology. In the newly founded Republic, basic principles relating to science and technology are more often taught in educational institutions. Hence, developing education in scientific areas in an institutional manner and educating scientists have become a necessity. As in other scientific areas, it has been aimed to achieve advancements in the field of mathematics. In fact in the later times of Ottoman Empire era, the modernization of education began with opening institutions that were mainly using mathematics. In order to see the whole picture regarding the advancements in the field of mathematics, it is necessary to focus on the produced works of mathematicians along with the developments of the mathematics teacher education as well as changes introduced into mathematics curricula documents. In this study, therefore, we consider the developments in each of these topics during the years of 1938-1980.

Developments in Mathematics regarding Undergraduate and Graduate degrees and Academic Studies

Some institutions, subjected to radical reforms, have become scientific research centers with their new names and functions. One of the schools subjected to this transformation was Dar ul-Funun. The foundation of this institution dates back to 1846 with attempts to establish a university in compliance with Western models, it has not been fully functionalized until 1900 in Istanbul (Unat, 1964, p. 59; Ihsanoglu, 1993).

Figure 1. Dar ul-Funun Madrasa which was Opened in Istanbul in 1900 (Hurriyet, 2019)

Attached to Dar ul-Funun, the department of Mathematics and Natural Sciences was opened. In this department, instructions were shaped with mathematics curriculum borrowed from the Western universities. However, there were not important contributions to the field of mathematics with an impact on the international arena (Altintas, 2001). Also, mathematics education in Dar ul-Funun aimed to prepare mathematics teachers rather than educating mathematicians. Generally, in this period, we can see the production of textbooks that introduced the basics of contemporary mathematics. These books were more concerned with the transmission of mathematical knowledge already accumulated in Europe than the production of novel and original mathematics. With the University Reform Act introduced in 1933, the name of Dar ul-Funun changed as Istanbul University (Ergun, 1996).

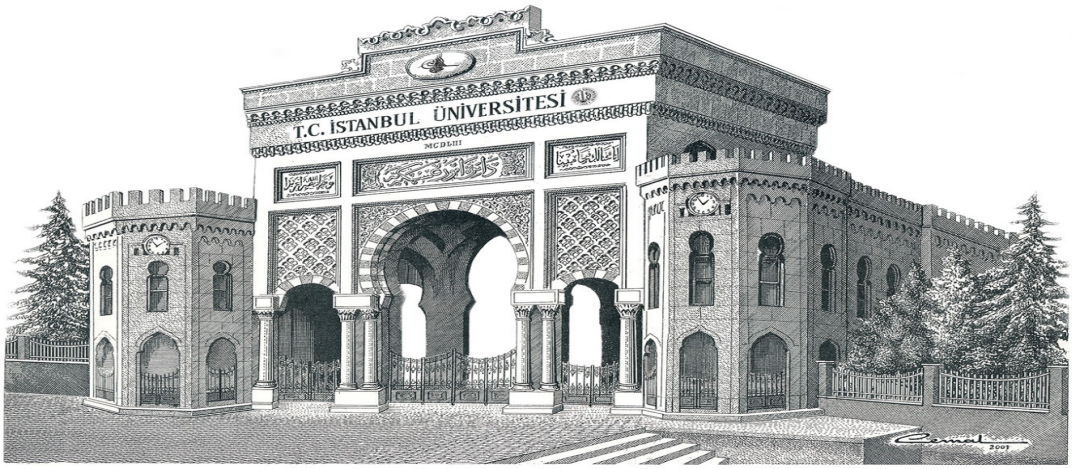

Figure 2. The Gate of Istanbul University Founded in 1933

In this new era, Mathematics Institution within the Faculty of Science, mathematics education gained acceleration with the specialists coming from abroad, especially from Germany. In these years, by bringing some scientists that were unhappy with the regime shift in Germany, such as Richard Edler von Mises and William Prager, they were given the opportunity to deliver mathematics lectures. In fact, Richard Edler von Mises was assigned as the head of Mathematics Institution. In this institution, lectures started on analysis, number theory, general mathematics, advanced algebra, and analytic geometry. There were eminent mathematicians among the members of staff in the institutions including Ali Yar delivering the algebra lectures taught at Dar ul-Funun and Kerim Erim owning the title of the first Turk with a PhD degree in Mathematics. Later, some other important figures joined the team such as Cahit Arf, Ratip Berker and Ferruh Semin who completed their graduate studies at mathematics in the abroad.

Kerim Erim and especially with his algebra studies, Cahit Arf's contributions cannot be ignored in the education of young researcher mathematicians in Turkey since 1930s

and in the occurrence of a new mathematician generation since 1940s. Studies that were carried out in this period began to be published in the Journal of Science Faculty (Duru, 2019).

During these years, in other words in the 1930s, when analyzing the studies in Turkey regarding mathematics, it is also possible to chance upon Ataturk's studies in this context. Between 1936 and 1937, at the Dolmabahce Palace, Ataturk wrote a book of geometrical terms which was published by the Ministry of Culture as a guidance for those who taught geometry and write books on this subject. In the 48 paged book, Ataturk suggested using terms such as geometry instead of "hendese", angle instead of "zaviye", plus instead of "zait", diameter instead of "kutur" and explained 142 geometric terms and definitions with figures and examples (Topçu, 2016). From 1938, on Ataturk's command, when new textbooks which included new terms were being published the new mathematical terms began to appear in textbooks.

During the 1940s, together with faculty members who study for doctorates at Istanbul University at the department of mathematics, Turkish mathematicians have carried out important studies in algebra, geometry, functions theory and topology areas. In 1941, Patrich Du Val, who was from the British Algebraic Geometry School, came to Istanbul University Faculty of Science and studied with Cahit Arf in the area of algebraic geometry. Patrich Du Val stayed in Turkey for 8 years (Ishakoglu, 1993). Under Du Val's consultancy, in 1947, between the years of 1947 and 1948, Macit Bukey has published two important studies (Topcu, 1998). The Mathematics Institution, ongoing until the 1950s, later on divided into more branches such as analysis, algebra and number theory, geometry and applied mathematics. In 1981, after the foundation of The Council of Higher Education, these branches were transformed into departments. These are the departments of Analysis and Functions Theory, Algebra and Number Theory, Geometry, Topology, Applied Mathematics, Fundamentals of Mathematics and Mathematical Logic. Each day new departments were added. This was due to the fact that the dynamics of mathematics shows rapid improvement when interacting with other sciences. As a result of this improvement, in the world of mathematics according to the classification of the Mathematical Review, mathematics is divided into over 60 subbranches and with dissociation of these subbranches, it has been divided into 544 different branches (Altintas, 2001, p. 225).

In 1944, Istanbul Technical University was founded. Foundations of this university were laid in Hendese-i Mulkiye School (Technical School of Engineering). This school adopted the name of Muhendis Mekteb-i Alisi (Certified Engineering School) in 1909 by engaging with the Ministry of Public Works. This civil school was turned into a Certified Engineering School in 1928. Adopting the name of Istanbul Technical University (ITU) in 1944, mathematics lectures were delivered via certified mathematics sections in faculties

of mechanics and architecture. In the faculty of civil engineering, they were carried out in the geometry section. Here, studies were generally geared towards applied mathematics. As well as Turkish professors, well-known foreign professors like Rudolf Weyrich, Heinz Horninger, Revuz and Deheuvels gave lectures (Senkon, 2004). However, since the purpose of this university was education, there were not enough mathematicians to improve mathematical science in Turkey. Mathematicians working here had not had enough students and their limited number of students could not carry out research in mathematics in the harsh conditions of that time. Bringing together all the mathematics sections at Istanbul Technical University, a new department called the Department of Mathematics Engineering was established in 1971. This department, which was a first in the world, was perhaps regarded as strange in the beginning. However, since it was thought of as a way of getting into Faculties of Science for students who had a strong slant towards mathematics in 1970s, the Department of Mathematics Engineering achieved its purpose to some extent.

In 1948, research into mathematics began to be carried out within the Faculty of Science of Ankara University. Cengiz Ulucay (functions theory) and Saffet Suray (1914-1983) (differential geometry and mechanics), who were educated at Lille University in France, were among the first mathematicians in the department. A group of seven mathematicians from Turkey participated in VII. International Mathematics Congress, which took place in Paris in 1948 and their studies won general approval in this congress. Ord. Prof. Dr. Kerim Erim was selected to the management committee of Congress. The eighth of the aforementioned congress (VIII. International Mathematics Congress) took place in Istanbul. During this period, textbooks in different areas of mathematics continued to be written (Picture 3,4).

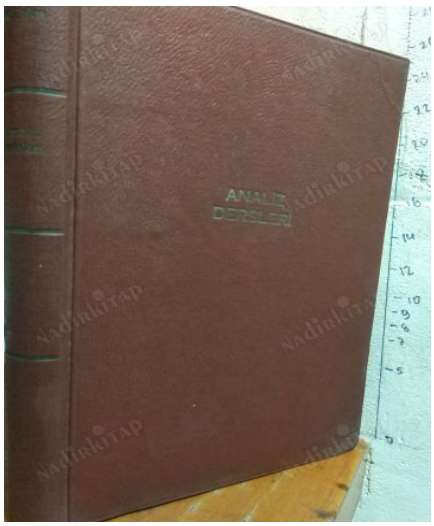

Figure 3. Kerim Erim, Analiz Dersleri, Diferensiyel ve İntegral Hesap, kısım I, 459 sayfa. 17x24 cm, 1948, 2. Basım, İÜ yayımları

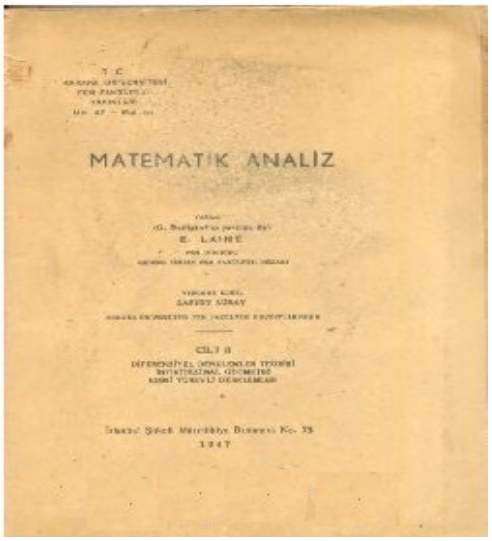

Figure 4. Saffet Süray, Ankara Üniversitesi Fen Fakültesi, 1947, Yayın Yeri: İstanbul

The scientific studies movement, starting with reform in 1933, was interrupted because of the economic difficulties between the years of 1955-1960 (Inonu, 1973). Until 1960, Istanbul University, Istanbul Technical University and Ankara University were the mathematical study centers after which new centers were added. From 1960, Ege University and from 1964, Middle East Technical University's department of mathematics started to provide education. Subsequently, together with the foundation of respectively Ataturk University, Hacettepe University and Bogazici University, the number of lecturers in mathematics and in parallel to this, the number of papers increased (Altintas, 2011, p. 224-225; Binbasioglu, 2014, p. 522-523). Between the years of 1923 and 1963, Turkey published 477 related articles with mathematical content. 336 of these articles were implemented in several universities in Turkey and 141 of these articles were implemented in several universities abroad (Inonu, 1975).

In 1963, The Scientific and Technological Research Council of Turkey (TUBITAK) was established to support scientific research. As in many branches, this institution has also supported young talented students in mathematics with scholarship opportunities and contributed to the development of mathematics in the period. of the Republic. Thus, students who were sent abroad for graduate education in mathematics lead the way in different universities when they came back home. Nowadays, in each year four different awards are given to the citizens of Republic of Turkey by the Scientific and Technological Research Council of Turkey (TUBITAK). These awards are; Science, Service, Encouragement and Technology Encouragement Award. Also TUBITAK participated in a science award program initiated by TWAS (Third World Academy of Sciences) in 1992. Each year this award is given in the areas of mathematics, physics, chemistry and biology alternately. Also in 1968, as a result of Cahit Arf's demands and persistence, who was the Chair of Scientific Institution in those times, the Applied Mathematics Unit was established within the scope of ITU Faculty of Civil Engineering by TUBITAK. TUBITAK established research institutions or units within the scope of some universities and gathered there scientists who did not want to take on overwhelming routine work such as an excessive teaching load or consultancy. The unit which was affiliated with the Marmara Research Center (MAM) in 1972, affiliated with the Fundamental Sciences Research Institute which was established in 1983 with the efforts of Erdal Inonu and was named "Department of Applied Mathematics." This institute's other name was "Department of Pure Mathematics." At this unit's core were names such as Erdogan Suhubi, Mithat Idemen and Emin Erdogan and the name and the place of this unit changed from time to time. The unit carried out its studies under the chairmanship of Suhubi until 1985 and by the end of 1996 it was under the chairmanship of Idemen (Kalaycioglu, 2009).

In 1971, with the Rector of Istanbul University Prof. Dr. Nazim Terzioglu (1912-

1976)'s efforts, the "Mathematics Research Institute", linked with Faculty of Science, was established for the purpose of providing the mathematicians a way to share their knowledge and ideas. He established a mathematics library, consisting of about 2000 books which were bought and donated from abroad. He himself also published many books and articles on mathematics (e.g, See Picture 5).

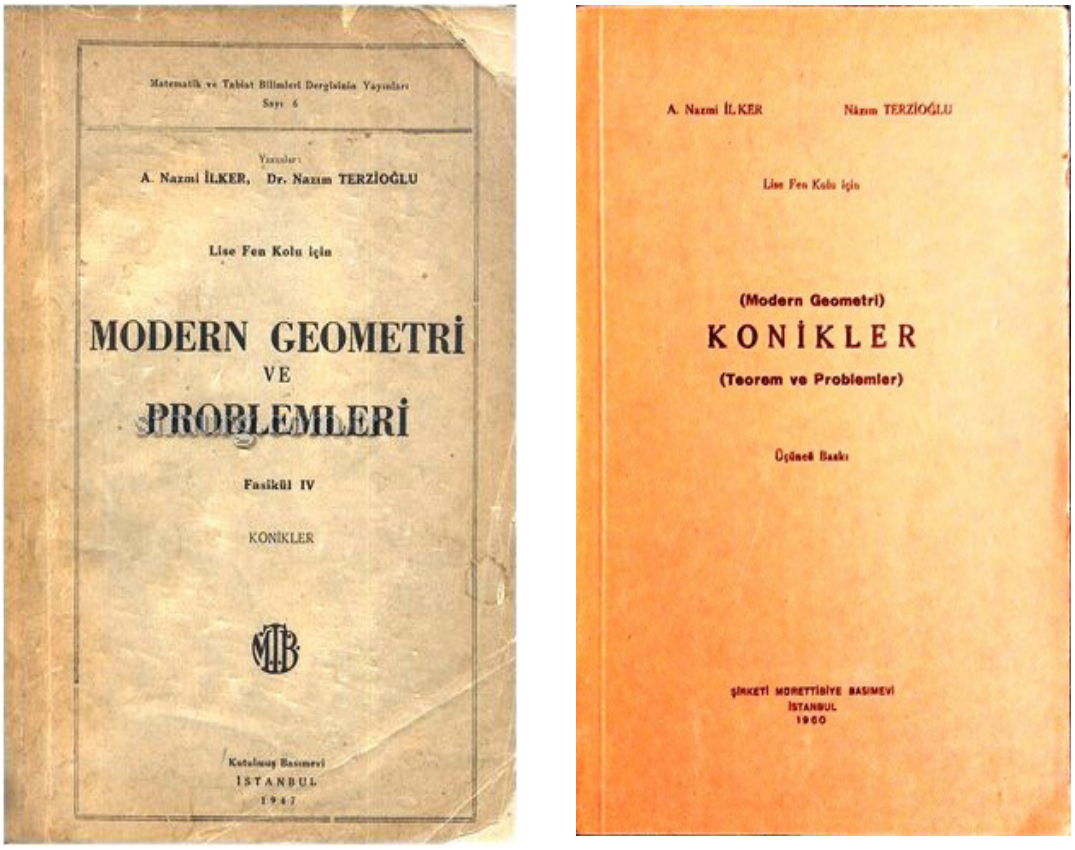

Figure 4. Examples of Books Written by Nazim Terzioglu (Biography)

Several international scientific meetings were held via the Mathematics Research Institute. Due to his contributions to the institute, the institute was named after Nazim Terzioglu who passed away in 1976 and then the institute's name was changed to "Istanbul University, Faculty of Science, Nazim Terzioglu Mathematics Research Institute." In 1982, YOK changed the institute's name to "Istanbul University, Faculty of Science, Nazim Terzioglu Mathematics Research Center" (Senkon, 2004). The IV. Scientific Congress of the Balkan Mathematicians Association, which was gathered in Istanbul in 1971 with the backing of Nazim Terzioglu was the first international scientific meeting to be held in Turkey which was solely mathematics in content.

From time to time bibliographies were written on developments in Turkey regarding mathematics such as Erdal Inonu's A Bibliography of Turkish Mathematics Researches in the Period of 1923-1966 and Some Observations and was co-written by Safak Alpay and Alev Terzioglu's A Bibliography of Turkish Mathematics in the Period of 1967-1982. In 1973, Prof. Dr. Erdal Inonu published a bibliography of mathematics researches

and a total of 660 articles of which 148 different names were determined (Inonu, 1973).

Developments in Educating Teachers of Mathematics

Along with the foundation of the Republic, some regulations were made primarily on schools and on the content of education given by these schools. By the 1928-1929 school year, the Ankara Gazi Secondary School and the Education Institute was opened and started to serve as an institution that educates mathematics teachers to teach at the secondary school institutions (Picture 5).

Picture 5. Ankara Gazi Secondary School and Education Institute (Tamsanat)

The Secondary School and Education Institute moved from Konya to Ankara, in November 1929 with Gazi Mustafa Kemal Boys' Education Institute which was located in Ankara and these two schools were joined under a single roof as Gazi Education School and Training Institute (Aydin, 2011). However, in 1932, the Boys' Elementary School was axed and in that year it was turned into Gazi Secondary Education School and Training Institute. Instead of the axed school, Gazi High School, with English teaching, and a paid boarding school, was opened. The high school was moved to a separate building in 1936-1937 school year and English teaching was dropped. In the 1946-1947 school year, with the purpose of serving more pupils with less teachers, Turkish, History- Geography, Mathematics, Departments of Physical and Natural Sciences were reunited under the name of "Department of Block Courses." In 1948-1949 school year, this department was divided into two as "Science" and "Letters" (Akyuz, 2007, p. 387).

The second phase of the 1960s was the phase of erecting new buildings, enriching teaching staff and it was when departmental differentiation increased due to the desire of

fulfilling the country's need for teachers. The number of departments were increased by opening three new departments namely; Mathematics, Social Studies and Art Training. The names of Departments of Science and Letters were changed to Science and Biology and Turkish (Sakaoglu, 1992). English, in 1967-1968 school year, German and French, in 1968-1969 school year, Music, in 1973-1974 school year were added to the newly opened departments. By 1967-1968 school year, after the amendment of Regulation of Educational Institutes' second article, institutes education period was extended to three years. In the 1971-1972 school year, assistant staff were given to each department of Izmir Institute of Education; however, no records showing that these staff were used were found (Sahin, 2011, p. 1125).

Starting as a pilot scheme in Turkey, the Department of Elementary School was established in the 1992-1993 school year with the purpose of educating teachers for 6th, 7th and 8th grades with elementary school teachers. This started to be opened in several locations along with the end of 1980s and the current Department of Elementary School Teaching was changed to the Department of Elementary School Teaching. In this department, respectively Department of Science Teaching (1992-1993), Department of Mathematics Teaching (1998-1999), Department of Early Childhood Education (1998-1999) and Department of Social Sciences (1998-1999) were opened (Sahin, 2011, p. 1130).

Overview of the National Education Councils Within the Framework of Mathematics Education

National Education Councils hold an important place in Turkey's education system. Seen as a consulting body, National Education Councils determine policies regarding education and take decisions within this framework. General topics mainly on education are taken into consideration in Councils, which have been held every three or four years since 1939. Within the framework of this research each council is analyzed in terms of decisions regarding the education of mathematics.

At the 1st National Education Council, held on July 17-29, 1939, it was decided that the textbooks that were to be taught in Turkey were to be a common and single book, and to be prepared and published by the Ministry of National Education. Also, it was decided that the important courses such as mathematics were to be taught before noon and free and common activities were to be undertaken after noon under the teacher's supervision (Ministry of National Education (MEB), 2017a).

At the 2nd National Education Council, held on February 15-21,1943, it was decided for vocational and technical schools' textbooks to be written separately and historical readings to be added to these textbooks (MEB, 2017b).

At the 3rd National Education Council, held on December 2-10,1946, it was suggested that there were some difficulties in educating branch teachers in quantitative terms depending on the increasing number of secondary schools. Within this framework, in the 1946-1947 school year, the Ankara Gazi Secondary Teacher Education School and Training Institute, Balikesir Necatibey Secondary Teacher Education School and Istanbul and Izmir Boys' Teacher Education Schools were turned into education institutes. At Gazi Education Institute, by means of the opening of "Department of Block Courses", courses such as Turkish, and Chemistry were started to be taught as a block course, however, after two years of trial it was not successful. In 1948-1949 school year, this department was divided into two as Science and Letters (MEB, 2017c).

At the 4th National Education Council, held between August 23-31, 1949, it was decided that educating teachers for secondary and high schools was to be regulated according to the needs of the education institutes and high school teachers organization. As of the 1967-1968 school year, the Department of Science was divided into Science and Biology and the Mathematics Department of Letters was divided into the Department of Turkish and Social Studies and as of the 1968-1969 school year all department's education period was extended to 3 years (MEB, 2017d and Batir, 2008, p. 524).

At the 9th National Education Council, held from June 24 to July 4, 1974, mathematics course content was particularly grasped for the first time. Within this framework, it was decided that the works to be continued for modern ideas were to appear in programs by reviewing elementary and secondary school's mathematics programs and a single book to be written by means of opening competition or establishing a commission (Rule-86). In addition, it was decided that the research project regarding modern science and mathematics programs was to be continued in 100 high schools and 89 elementary schools and for these programs to be applied in some high schools together with some technical and vocational high schools on trial according to potentiality and conditions (MEB,2017e).

Developments within the Framework of Mathematics Curriculum

In the history of the Republic, revision works were periodically done on curriculums to be applied at kindergarten, elementary, secondary and high school levels. Within this framework, curriculums were improved regarding mathematics education on elementary, secondary and high school levels as part of content in 1924 for the first time. It can be seen that apart from some partial revisions on elementary, secondary and high school levels, radical revisions were made in almost every decade. For example; revisions on elementary curriculums were made in 1926, 1936, 1948, 1968, 1983, 1990,1998, 2005, 2013 and 2018. Within these curriculums, mathematics curriculums were also revised. In all curriculums, weekly course hours are close to each other and these hours can vary from 4 to 6 hours.

Mathematics lessons were taught in some curriculums as a separate course such as arithmetic and geometry (e.g, the curriculum of 1948) and sometimes as a single course under the title of mathematics (e.g, the curriculum of 1968). Only recognized for its cognitive aspect until 1960s in terms of curriculums; the purpose of mathematics education was highlighted referring to the development of students' affective and psychomotor skills from that date. Also, the necessity of allowing individual differences and constructing mathematics considering students' features were started to be highlighted (Ergun and Ark., 2016).

In 1977, in revised and applied secondary school mathematics curriculum, it is seen that mathematical content was detailed, its lines were drawn and its context was specified in a similar manner. Also, teachers were instructed on how to prepare questions for behaviors and explanations were made on multiple-choice questions. Sample evaluation questions and student observation forms are included in gym class curriculum.

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