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The Ottoman Palace School Enderun and the Man with Multiple Talents, Matrakçı Nasuh[1]

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Introduced in this paper is one of the most remarkable Ottoman institutions, the Ottoman Palace School — Enderun, with a focus on the life story of Matrakçı Nasuh, one of its most noted graduates and teachers. Matrakçı Nasuh's life and work as a prominent mathematician and a teacher of mathematics are investigated as a case study. It shows how young boys and girls were selected because of their academic potential, brought to Istanbul, and educated in Enderun to serve the Empire. This research articulates the mathematics education on the first institutionalized gifted education system of the world and discusses its implications for today.

Keywords: Enderun, Ottoman Educational System, Matrakçı Nasuh, Gifted Education
MESC Classification: A30
MSC2000 Classification: 01A30

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INTRODUCTION

The growth of the Ottoman Empire and the expansion of its civilization over three continents, starting from 1299, are attributed to the rule of committed and effective sultans. However, the able statesmen helped the Empire prolong its existence more than four centuries after the conquest of Constantinople in 1453.

The selection and education of statesmen became critical to the Empire in the 15th century because Ottoman state affairs had evolved from those of a small nation into that of an empire covering more than 2,000,000 square miles. This expansion rapidly diversified the empire creating a highly multicultural nation with the assimilation of new cultures that blended into Ottoman life. In addition, Mehmet II (1451–1481) who claimed to be the successor of Caesar was determined to set rules that would be the basis for his eternal Empire.

A vital component of this goal was the establishment of a special school to select the most able youngsters within the Empire and to educate them to become the members of the ruling class. Thus, Mehmet II improved the existing palace school founded by his father, Murat II (1421–1451), and established the Enderun Academy (Enderun) within his private residence at Topkapı Palace in Istanbul (Akkutay, 1984).

Matrakçı Nasuh was educated in the Palace School during the reign of Bayezid II (1481–1512) and studied with Sai Çelebi, one of Sultan Bayezıd II's teachers (Ayduz, 2009). He served Sultan Selim I (1512–1520) and Süleyman the Magnificent (1520–1556) as a mathematician, historian, geographer, cartographer and a miniaturist. Matrakçı Nasuh, one of the finest products of the Enderun system, was a man with multiple talents and an l'uomo Universale (And, 2006), the universal man or a Hazerfen, which later became one of his official titles.

Thus, it is speculated that the Enderun School was an institution that contributed to the rise of the Ottoman Empire, and a factor in the staying power of the Empire, which survived for more than four centuries after the conquest of Constantinople in 1453. Investigation of the Enderun's gifted education program helps today's educators understand the organization and practices of the world's first institutionalized education for the gifted (Senel, 1998; Cakin, 2005; Melekoglu, Cakiroglu & Malmgren, 2009). Within this context, studying Matrakçı Nasuh helps to illustrate the abstract notions surrounding Enderun.

In this paper, an analysis of his infamous book *Umdet-ul Hisab* (treatise of arithmetic) is presented for the first time.

PERSPECTIVES

Sultan Mehmet II as the founder of Enderun

Angiolello described Mehmet II as a man with a "splendid mind and many gifts" (as cited in Miller, 1973, p. 25). He was educated according to the highest standards of the time and he possessed multiple abilities. Mehmet II was not only a great military leader and a statesman but also an able and influential poet and a talented gardener. He enjoyed participating in scholarly discussions on science, religion and the arts (Gibbon, 1903) and was fluent in seven languages (Runciman, 1965). In sports, Guillet wrote that he was excellent in the use of the "masse d'armes" (the mace), in horsemanship, and in archery (as cited in Miller, 1973, p. 27).

One has to understand Mehmet II in order to understand how Ottoman statesmen were trained and how, in the absence of capable sultans, they could hold the empire together for four centuries.

Drafting for Enderun School

The primary objective of the Palace School was to train the ablest children for leadership positions, either as military leaders or as high administrators to serve the Empire (Basgoz & Wilson, 1989). Although there are many resemblances between Enderun and other palace schools of the previous civilizations, such as those of the Abbasids, and Seljuks (Van Duinkerken, 1998) or the contemporary European palace schools, Enderun was unique with respect to the background of the student body and its meritocratic system. Ethnicity or race was irrelevant in the strict draft phase (devshirmeh), as students were selected from the multicultural population of the Empire.

Those entrusted to find these children were scouts who were specially trained people throughout the Empire's European lands. Scouts were recruiting youngsters according to their talent and ability with school subjects, in addition to their personality, character, and physical perfection. The Enderun candidates were not supposed to be orphans, or the only child in their family (to ensure the candidates had strong family values); they must not have already learned to speak Turkish or a craft/trade. The ideal age of a recruit was between 10 and 20 years of age (Taskin, 2008). Mehmed Refiq Bey mentioned that youth with a bodily defect, no matter how slight, was never admitted into palace service (as cited in Miller), because Turks believed that a strong soul and a good mind could be found only in a perfect body (Ipsirli, 1995).

The brightest youths who fit into the general guidelines and had a strong primary education were then given to selected Muslim families across Anatolia to complete the

enculturation process (Horniker, 1944; Miller, 1973; Ipsirli, 1995). They would later attend schools across Anatolia to complete their training for six to seven years in order to qualify as ordinary military officers (Ilgurel, 1988). They would get the highest salaries amongst the administrators of the empire, and very well respected in public (Akarsu, n. d.). Armagan, (2006) defined the system as a pyramid which was designed to select the elite of the elite, the ablest and most physically perfect. Only a very few would reach the Palace school. More than three hundred years later, in 1789, Thomas Jefferson, the future president of the United States, proposed a similar system of identifying the most capable and educating them to their highest potential in his "A Bill for the More General Diffusion of Knowledge" (Jefferson, 1779).

Curriculum and the General Principles of Enderun School

The Enderun system consisted of three preparatory schools located outside of the palace in addition to the one within the palace walls itself. According to Miller (1973), there were 1,000–2,000 students in three Enderun Colleges, and about 300 students in the top school in the Palace. The curriculum was divided into five main divisions.

1. Islamic sciences; including Arabic, Turkish and Persian language education,
2. Positive sciences; mathematics, geography,
3. History, law, and administration: the customs of the Palace and government issues,
4. Vocational studies, including art and music education, and
5. Physical training, including weaponry (Ipsirli, 1995; Akkutay, 1984; Miller, 1973; Basgoz & Wilson, 1989).

The successful graduates were assigned according to their abilities into two mainstream positions: governmental or science (Armagan, 2006), and those who failed to advance were assigned to military. One of the most distinctive properties of the school was its merit system consisting of carefully graded rewards and corresponding punishments (Akkutay,1984; Ipsirli, 1995; Miller, 1973).

Ipsirli (1995) described the main objective of the school as not only to educate but to help students discover their abilities. At the end of the Enderun school system, the graduates were able to speak, read and write at least 3 languages, able to understand the latest developments in science, have at least a craft or art, and excel in army command as well as in close combat skills.

The school system never aimed to educate its students to become only a scientist, an artist or a soldier; but aimed at versatility which turned out to be the education of the perfect human who has good knowledge of everything so that they could become leaders of the Empire.

The Buildings of Enderun School

Topkapi Palace's third court consisted of the Imperial Treasury, the Pavilion of the Holy Mantle, and the buildings of the Palace School. Thus, the school is located next to the most valuable possessions of the Ottoman Sultans—the treasury and the legacy of the Prophet of Islam. There were seven halls or grades within the Palace School and within each hall there were 12 teachers responsible for the students' mental and academic development. Students wore special uniforms designated by their achievement level (Deri, 2009) and Miller (1973) indicated that additional buildings included the library, mosque, music conservatories, dormitories, and baths. See a hall of Enderun in Figure 1.

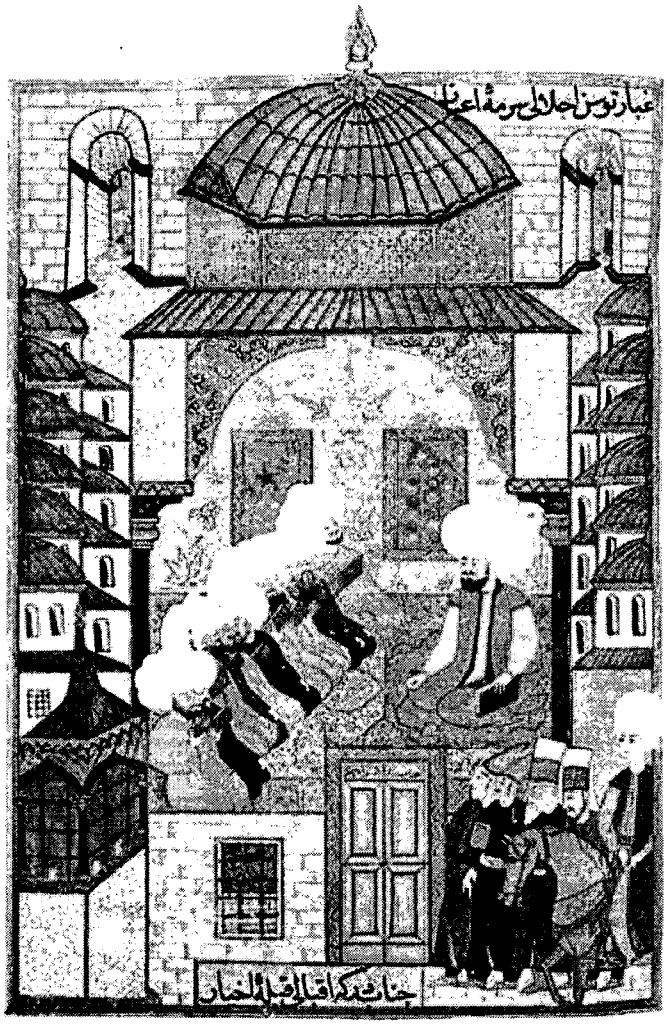

Figure 1. A miniature illustrating a specific teacher and a large number of students of the Enderun in Topkapi Palace, İstanbul (Osmanli kultur ve uygarligi, 2010)

Matrakçı Nasuh

Nasûh bin Abdullah al-Silahî al-Matrakî (Matrakçı Nasuh or in short, Matraki) came from a Bosnian family from the European lands of the Empire and became the student of Sai at Enderun during the reign of Bayezıd II (1481–1512). During his years at the Enderun system he exhibited his talents and developed his skills and ability in a variety of subjects. He became renowned in the 16th century as a mathematician, historian, geographer, cartographer, topographer and a musketeer. Moreover, he was an outstanding knight, calligrapher and engineer. Because he was a musketeer, he was also called al-Silahî (Yurdaydin, 1995) and known as Matrakçı because of the name of the game he developed to train soldiers[2].

In 1530, Matraki (n. d.) translated the influential Islamic history book of et-Teberi from Arabic, and published his first original book, Tuhfetu'l-guzat on military tactics, war games and weaponry. In the same year, he presented his construction, made from paper, of two moving fortresses, during the circumcision ceremonies of the sons of Süleyman I (1520–1556) (Yurdaydin, 1995). See Figure 2.

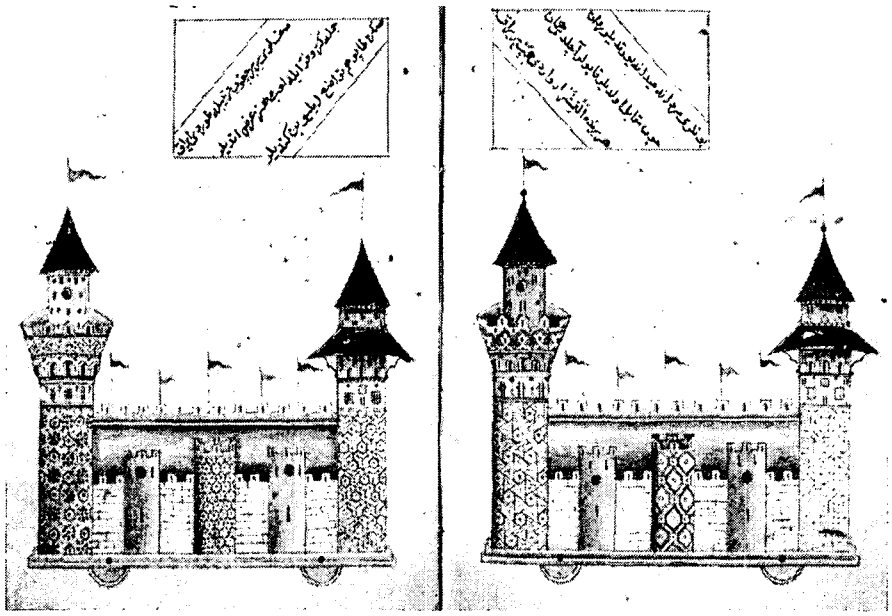

Figure 2. Matraki's illustration of his moving fortresses in his book *Tuhfetu'l-guzat* (Ayduz, 2009)

[2] See an example of this game at: http://www.cenksanati.com/index.php?module=CMpro&func=viewpage&pageid=100

Four years later (1534), he joined the Ottoman army for Süleyman's Iranian campaign and depicted several miniatures and maps of the cities he visited, thus proving his artistic ability to the Sultan as an illustrator and painter, as well. Johnston (1971) described his work as artistically esthetic and perfectly accurate; detailed enough to provide information on architectural history. Figure 3 is Matraki's illustration of the city of Diyarbakir (located in the southeastern Anatolian region of modern Turkey).

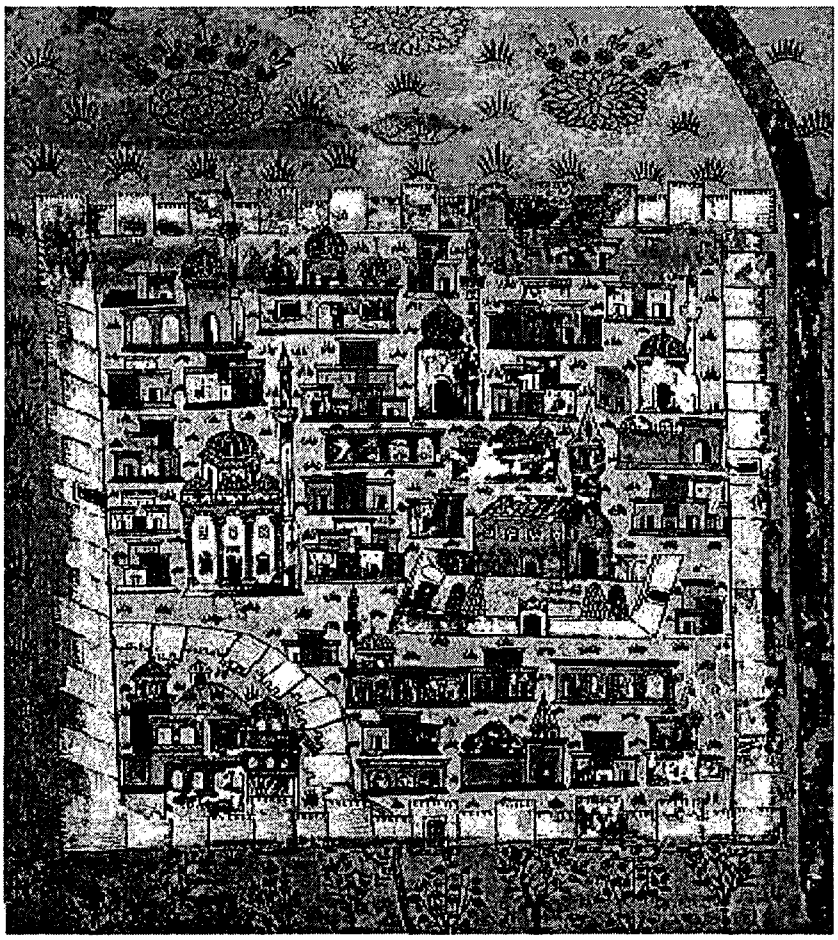

Figure 3. Matraki's illumination of the city of Diyarbakir (Ayduz, 2009)

Umdet-ul Hisab and Matraki's Approach to Mathematics Education

Matraki is arguably one of the finest outcomes of the Enderun system, and each chapter of his life and each of his works are worth investigating. Matraki wrote two books on mathematics. *Umdet-ul Hisab* was the last edition that contained both previous books. Additionally, he published several others on history, geography, and military tactics.

However, the authors only focused on his mathematical ability in this paper and how he made mathematics easy to for his students and readers to understand.

Matraki's interest in mathematics as he explained was based on a saying of the Prophet of Islam, who had said: "Count your acts in this life, before your acts are counted in the hereafter" (Yurdaydin, 1963, p.17). According to Matraki, mathematics is a noble and beautiful science that was a means to know more about God (Yurdaydin, 1963). Matraki's approach to mathematics learning was explanatory to make it easier for the public to understand it in order to apply it in their lives. From this respect, he was a pioneer in mathematics education and his book is an excellent example of a successful blend of mathematical pedagogy and rigorous content knowledge.

Matraki was a humble man who believed all his mistakes were his fault and all the useful parts in his book were a reflection of God's eternal knowledge. Thus, he started his book by apologizing for any mistakes he had made and then explained how he organized his book. The first chapters of his book were devoted to a special Ottoman accountancy method – *siyakat* or the stairs method and written for the Enderun students who were going to be the high officials of the Empire. Matraki explained the stairs method which dictated different calculation rules beyond the usual laws of mathematics. The reason for such difference was because of the secrecy of the accountancy documents for the state. Thus, stairs method which was difficult to read was developed. The second reason was due to the need for writing many things in a limited space. In the stairs method, numbers were replaced by words or figures. Valuable information was encrypted reducing the risk of forgery (Elitas, Guvemli, Aydemir, Erkan, Ozcan & Oguz, 2008).

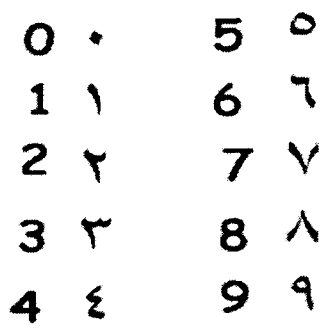

Figure 4. Indian Numerals

In other sections of his book, Matraki first introduced the Indian number system. According to Ottoman ethics, respect for owners of the knowledge, the system we today know as the Arabic numerals were actually invented by the mathematicians of India as reported by Matraki. Matraki also introduced four operations with fractions and other

algorithms for arithmetic. In Figures 5 and 6, we present two of the six methods of multiplication that he explained in his book. In both of these examples, it was shown that 155 × 525 = 81375. The first method in Figure 5 is known to the world as Napier's bones although Napier published this method approximately 50 years after Matraki published *Umdet-ul Hisab*. In order to help the readers, a translation of his number system is provided in Figure 4.

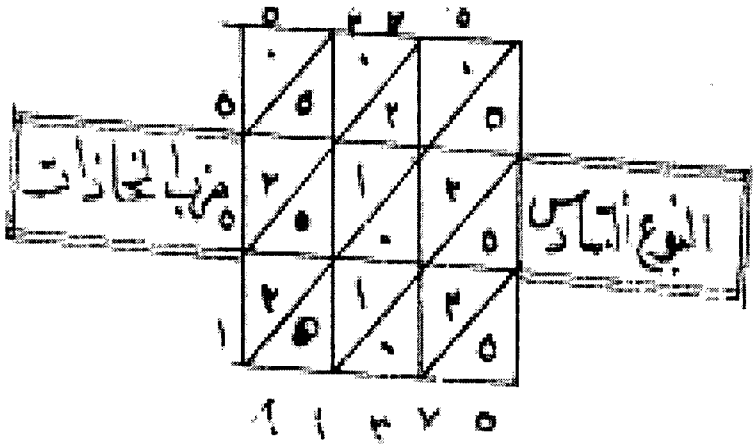

Figure 5. Matraki's lattice method for multiplication (Matraki, n. d., p.164)

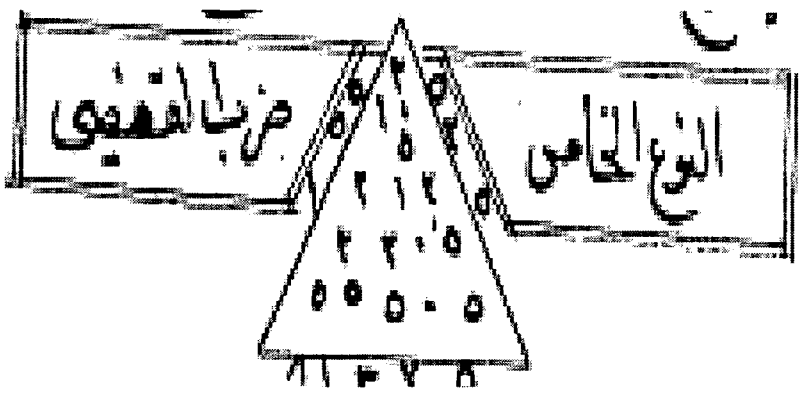

Figure 6. Matraki's triangle method for multiplication (Matraki, n. d., p.164)

Later in his book, Matraki presented real-life mathematical problems to explain the rules of algebraic thinking. He chose his examples from daily life in which he aimed to relate complex problems to his students' lives. He first asked the problem, left some space

for the readers to solve it, and then in engaging narrative form started to explain his solution. For example:

> If you would like to know how much 200 kantars (a kantar = a weight of 100 ludre) would weigh if one kantar includes 12 ludre per box, then you listen to me:
>
> You should subtract the tare which is 12 ludres and treat the result as the multiplicand whereas the 200 kantars should be the multiplier. Then, deduct the two digits from the result of the multiplication. 100–12 = 88, then 88 x 200 = 17600, which means 176 kantar. (Matraki, n.d.)

In another example Matraki guides his readers to solve for x in the problem $x-(x/3+x/4)=3$.

> If one third and one fourth of an unknown quantity is subtracted from that unknown, and if the difference is 3, the solution is this; listen to me:
>
> In order to do the subtraction, you need to unite the fractions in a whole so that the subtraction is correct and that whole is 12. Each operation becomes 12 times. Twelve's one third becomes 4 and it's one fourth becomes 3. The sum becomes 7. When subtracted from 12, it leaves 5. When the denominator is multiplied with 3, it becomes 36. So that, the unknown equals 36 divided by 5, and that equals to 7 and 1 as the remainder. (Matraki, n.d.)

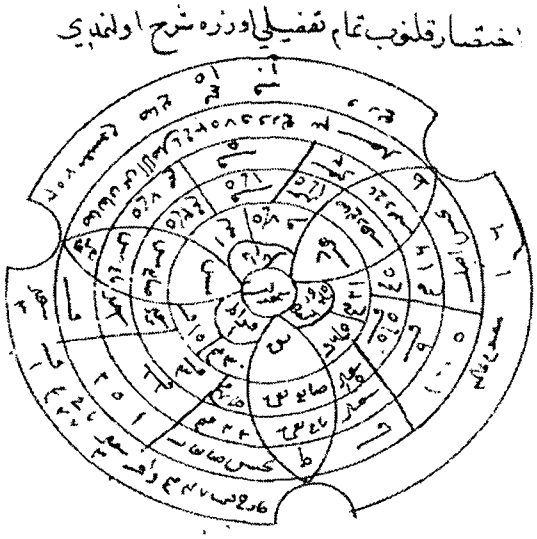

Figure 7. Matraki's unit conversion diagram (Matraki, n. d., p.26)

Finally, Matraki's also exhibited artistic talent as reflected in his conversion tables between different units used in the Ottoman Empire. See Figure 7. Matraki presented a process for finding the square root of large numbers, and brought unique approaches to many other mathematical problems that people of his time would face in their daily lives. His book was used as a reference book for more than two centuries after his death, and became a foundation for much of the European and Ottoman science.

RESULTS

The researchers suggest that Ottoman contributions to world civilization were not restricted to their magnificent mosques or their advanced military technology. The Enderun School was not merely a building or a school but a system of education that became the pioneer educational institution in gifted education and was the first of its kind.

The Enderun system was also significant as an early model of multiculturalism because students from different ethnic backgrounds were brought together and learned to live together under a common ideal. The multicultural environment of Enderun had a positive influence on the peace and harmony created in Ottoman States until the decline of the Empire. The authors also consider that the meritocratic system applied at Enderun Colleges was one of the main reasons of its success.

Matraki's *Umdet-ul Hisab* showed that several methods of arithmetic were known to the Ottomans and commonly used among the Ottoman elite and the public. Matraki set the foundations of a successful mathematics teaching method by bringing examples from real life, so his readers would apply theory to practice. In this respect, he deserves to be remembered as a great teacher in addition to all his other talents. Matraki, himself embodies how effective the Enderun education system was, and how greatly its graduates contributed to science and arts.

CONCLUSION & SIGNIFICANCE

There has been little understanding of the Ottoman educational system, both in Turkey and abroad. There is even less understanding of the gifted education system developed in the Ottoman Palace. Much of the history of the Ottoman Empire was written in Ottoman Turkish and script, which is replaced by modern Turkish and Latin alphabet after the reforms of Ataturk in 1928. Thus, only scholars specialized in studying this language are able to translate the volumes of archival material into Modern Turkish.

It is possible that special education program coordinators and policy makers may learn

from Enderun. However, a detailed analysis of each curricular subject and research conducted on instruction emerge as further research areas.

The Enderun system was also significant in the way students from different ethnic backgrounds were brought together and managed to live and learn together under a common ideal. Researchers hope Enderun school culture will also be investigated thoroughly in the future.

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