

International Journal of Educational Studies and Policy (IJESP)

Volume: 4, Issue: 1, May 2023

Comparative Analysis of Mathematics Teacher Training Processes in Turkey, Singapore and the Netherlands

İpek Gündüz Çetin

ABSTRACT

The aim of this study is to compare the mathematics teacher training processes of Turkey, Singapore and the Netherlands in the context of prospective student selection, training programs, employment conditions and in-service training. Countries have been selected due to their success in PISA exams, and the processes of achieving success in teacher education of different approaches in training field teachers have been examined and compared with our country. The study is a comparative education research and horizontal comparison approach was used. In addition, the study was designed with an intertwined multiple-case pattern, one of the qualitative research methods. The data of the study were obtained by examining the teacher training programs of the countries compared, the curricula reflecting their systems, and the comparative education studies covering these countries. In the findings of the study, it was seen that the planning and criteria for the selection of pre-service mathematics teachers contributed to the qualified teacher training process in Singapore. In addition, making a postgraduate selection in the Netherlands also contributes to the selection of students with high field knowledge. While mathematics teacher training programs in Singapore and Turkey focus on similar fields, they differ in the Netherlands as they are at postgraduate level. While the employment problem progresses centrally and smoothly, since teacher prospective students are selected according to needs in Singapore, the elimination process in Turkey at the end of the undergraduate education brings employment problems with it. In the Netherlands, there is a local recruitment system. The importance given by countries to in-service training is high and similar. In this context, various suggestions have been made, taking into account cultural elements.

Keywords: Mathematics teacher training, Turkey, Holland, Singapore

DOI: <https://doi.org/10.5281/zenodo.7656730>


Article Info:

Received: 07.10.2022

Accepted: 11.02.2023

Article Type: Research Article

Cite as: Gündüz-Çetin, İ. (2023). Comparative analysis of mathematics teacher training processes in Turkey, Singapore and the Netherlands, *International Journal of Educational Studies and Policy*, 4(1), 1-14.

Corresponding Author: İpek Gündüz Çetin, Ministry of Education, ipek.gunduz.35@gmail.com,  ORCID: 0000-0003-2919-1827



This work is licensed under a [Creative Commons Attribution 4.0 License](https://creativecommons.org/licenses/by/4.0/).

Introduction

Since the existence of mankind, the concept of education has been mentioned in every society, regardless of the level of civilization. In order for education to be beneficial for the period and society it is in, it had to undergo many developments and changes. Education can reach its goals in today's conditions and in the future only through development and change. (Koçer & Koçoğlu, 2020). The development of a country and its ability to stay in a strategic position in the world are based on the power of the education system. The education system, on the other hand, draws its power from the teacher, student, school, environment, family and their communication with each other. In this system, the teacher plays an important role with his key position (Kahyaoğlu & Yang, 2007).

Examining different education systems in the world and integrating them into their own systems will be useful for increasing the quality of the education system. Studies that comparatively examine many elements of countries such as education systems, education policies, and education programs for this purpose are called comparative education studies. Türkoğlu (1988) also defined comparative education as a discipline that shows the similarities and differences of two or more education systems from different countries and different cultures, and brings useful suggestions to improve the system. States can complete the missing points by blending them with the cultural context by examining the education systems of the states that have better conditions than the ones they are in. This also helps to monitor global progress.

The importance of mathematics education has been going on for many years. Because the purpose of mathematics teaching is to provide the person with the mathematical knowledge and skills required by daily life, to teach him how to solve problems, and to gain a way of thinking that deals with the problem-solving approach (Altun & Alkan, 1998). In mathematics teaching, it is aimed to provide individuals with methods and skills that will help them in solving the problems they encounter, rather than burdening them with various information. For this reason, a mathematics education that is based on the ability of individuals to comprehend mathematical concepts and principles, to think critically and creatively, and to communicate is a desired and expected education (Orbeyi, 2007). For this reason, mathematics teachers should be competent to provide students with these skills instead of taking on a role that conveys mathematical knowledge. These competencies are shaped by pre-service and in-service programs, as well as prospective student selection and employment conditions.

According to Ernest (1989), there are two dimensions of mathematics teaching knowledge that a qualified teacher should have:

1. Pedagogical knowledge of mathematics: problem solving, concepts, difficulties, common mistakes, activities, etc.

2. Mathematics program knowledge

Ernest (1989) mentions the following types of knowledge apart from these two general types of knowledge:

- Mathematics knowledge
- Subject information
- Mathematics teaching knowledge

- Mathematics pedagogy knowledge
- Knowledge of classroom organization and management for teaching mathematics
- Mathematics education knowledge

When the studies conducted in this context are examined, although there are studies in terms of teacher characteristics on mathematics teacher training, few studies have been found in terms of comparative education. In a study comparing the Mathematics teacher training programs of Turkey, Finland, Japan and Singapore, it was concluded that the key factor in entry to teaching is starting a job in Turkey, while entering pre-service education in other countries. It has been concluded that the course distribution and graduation requirements are similar (Erbilgin & Boz, 2013). Similarly, when the studies in the field of teacher training are examined, there are significant differences between countries, especially in terms of prospective student teacher selection, internship, graduation, employment, and in-service training (Cirit Gül, 2016; Çelik & Bozgeyikli, 2019; Ergun & Ersoy, 2016; Uçar et al. Ucar, 2004). In addition, many studies & reports on teacher qualifications emphasize the importance of selection, training and employment of teacher prospective students (Barber & Mourshed, 2007; Darling - Hammond & Rothman, 2011).

Singapore and the Netherlands are among the countries that have achieved significant scores in terms of Mathematics success in international exams (OECD, 2019). In this study, it is aimed to investigate the similarities and differences of the processes of becoming a secondary school mathematics teacher in Turkey, Singapore and the Netherlands. In this context, the problem sentence of this study is “What are the similarities and differences of the processes of becoming a secondary school mathematics teacher in Turkey, Singapore and the Netherlands?” is in the form.

In addition, in the light of the problem statement, the sub-problems of the study are as follows:

1. How are the pre-service mathematics teachers in Turkey, Singapore and the Netherlands admitted to teacher training institutions?
2. What are the mathematics teacher training programs in Turkey, Singapore and the Netherlands?
3. What are the employment conditions of mathematics teachers in Turkey, Singapore and the Netherlands?
4. What is the in-service training of mathematics teachers in Turkey, Singapore and the Netherlands?

Method

Research Model

In this study, case study, one of the qualitative research methods, was used. Case study is a research method that helps understanding one or more current situations in their context (Yin, 1984). In this study, the selection of pre-service mathematics teachers, educational programs, employment conditions, in-service training status and desired teacher qualifications are considered as separate situations, while Turkey, Singapore and the Netherlands are considered as units of analysis. Working with this perspective is a nested multi-state pattern. In this study,

document analysis was used as a data collection method. Document analysis is the analysis of written sources of information about the case or cases to be investigated (Yıldırım & Şimşek, 2005).

Comparative education research has been affected by the paradigm shifts of social sciences because it is structured on the basis of social sciences. Therefore, the effect of the positivist paradigm in the 1980s left its place to the post-positivist paradigm (Crossley, 2000). In the context of comparative education, the positivist paradigm seeks generalizable explanations and universal principles applicable to educational phenomena across societies and cultures (Khakpour, 2012). However, they share a strong belief that the interpretative perspective in which empirical research methods are used in comparative education is important for cultural, political and social contexts and that education cannot be detached from its local culture (Bray et al., 2006). In this research, while comparing the processes of becoming a mathematics teacher in Turkey, Singapore and the Netherlands, it was interpreted by blending it with the local culture without aiming to draw a universal conclusion. Therefore, this study was carried out in the light of the interpretative paradigm.

Data Collection

Official institutions of the countries , especially the programs implemented by institutions that train mathematics teachers in Turkey, Singapore & the Netherlands, & also from previous academic studies in this field (Aksoy, 2013; Aşçı, Topal & Yıldırım, 2021; Eurydice , 2022; Gülşen, 2021; Khoh & Teo , 2002; Ministry of National Education [MEB], 2013; MEB, 2015; MEB, 2022; National Institute of Education [NIE], 2021; Orakçı, 2015; Student Selection and Relocation Placement Center [ÖSYM], 2022; Universityit Leiden, 2022; Council of Higher Education [YÖK], 2022)

Data Analyses

In this study, descriptive analysis, one of the qualitative data analysis methods, was used. Descriptive analysis is a type of qualitative data analysis that enables the data to be analyzed and interpreted in line with predetermined themes (Yıldırım & Şimşek, 2005). The data obtained were classified with reference to the sub-problems of the research and analyzed comparatively.

Results

The results of the document analyzes made in this section were separated according to the sub-problems according to the situations and each analysis unit was analyzed within the situations.

Comparison of the selection of mathematics teacher training institutions and prospective student teachers between countries

To become a teacher in Turkey; In terms of education, it is necessary to graduate from the relevant departments of education faculties. However, graduates of higher education institutions other than education faculties who are suitable for teaching the field to which they will be assigned can also become teachers. The prerequisite for this is to successfully complete the pedagogical formation training program approved by the ministry (MEB, 2015). For this reason, secondary school mathematics teacher prospective students can complete their undergraduate education in their own departments, as well as receive formation by graduating from mathematics engineering, computer and mathematics departments. It is necessary to graduate from secondary education institutions and take the Higher Education Institutions Exam

(YKS). YKS consists of three sessions. All prospective students applying to YKS take the Basic Proficiency Test (TYT) first. This score is sufficient to study in the associate degree departments of vocational schools, but to enter the education faculties, it is necessary to take the Field Proficiency Test (TYT), in which the numerical score type will be calculated (ÖSYM, 2022). In the undergraduate education of all universities, it is seen that students with success rankings between 35,000 and 120,000 were placed in mathematics teaching departments in 2021 (ÖSYM, 2021).

In order to become a teacher in Singapore, it is necessary to be 18 years old and to be a graduate of secondary education institutions. Students must pass the A-Level exam, which is the National exam, which is accepted as the first qualifying exam, and the O- level (Ordinary) English exam. Level) exam (Khoh & Teo, 2002). Prospective students who pass the exam are interviewed by a committee consisting of faculty members and school principals in order to evaluate their cognitive and emotional characteristics. In these interviews, matters such as individuals' communication skills, their interest in teaching, their goals and ideals, their desire to learn and whether they have a strong desire to be a teacher are evaluated (Aksoy, 2013). The interview consists of a written exam, an oral exam and additional assessments at the initiative of the Ministry of Education. Thus, the process is based on the selection of the successful 3/1 cut.

Since Singapore does not have a separate teaching unit such as Secondary Education / High School, 5-year schools are continued after 6 years of primary education. Within the scope of this study, the process of teacher training for secondary schools with students of the same age group as Turkey will be examined. There are 2 programs to train mathematics teachers in Singapore: undergraduate program (4 years), pedagogical formation certificate program (1 year). In Singapore, branch teachers are trained in two specialties. Unlike basic education teaching, there is a program called "Post-Bachelor's Qualification in Education" for secondary education teachers. Prospective students wishing to apply for this program must be a university graduate (NIE, 2021).

In order to teach at the secondary level of secondary education in the Netherlands, high school graduates are required to take 1-year postgraduate education after their undergraduate education. Secondary education teachers are trained in teaching programs affiliated to vocational higher education institutions with four-year combined programs in order to provide education between the ages of 12-16. While primary school teachers take courses related to all fields, those who will teach from the second half of primary education specialize in one field. However, undergraduate specialization is not sufficient for secondary education teaching.

Secondary education teachers are those who are trained to teach HAVO (Higher general secondary education) and VWO (General secondary education preparatory to scientific education) students after the completion of the basic secondary education program. These teachers have to do a master's degree in one year on top of their 4-year teaching education. Secondary school teachers can teach all the lessons taught by primary school second cycle teachers (Eurodice, 2022).

When it is analyzed specifically in mathematics, it is necessary to have a master's degree in mathematics teaching in order to be a mathematics teacher in secondary education. The prerequisite for participation in this master's education is as follows, "Basic degree in a Mathematics-related program from a research university in the Netherlands, having accumulated a mathematical background at least equivalent to a Bachelor's degree in Mathematics". In

addition, the admissions committee examines the accuracy of the statements and evaluates whether the prospective students are sufficiently related to mathematics. Leiden, 2022).

A comparative analysis of the selection process of countries to become a Mathematics teacher is given in Table 1.

Table 1. Comparative analysis of prospective students' mathematics teacher selection

Countries	The Path to Become a Mathematics Teacher	Prospective student Teacher Selection Method	Prospective student Teacher Selection Criteria
Turkey	1. Undergraduate Education (Faculty of Education) 2. Undergraduate Education + Pedagogical Formation	National Examination	TYT+ AYT (numerical) score is sufficient for the relevant department
Singapore	Undergraduate Education in Education + Post-Bachelor's Qualification in Education	National Exam+Interview+Additional Criteria	A Level+ from the National Exam + Sufficient score in the English Exam + Appropriate communication skills and motivation during the interview process
Holland	Undergraduate Education in Mathematics + Master in Mathematics Teaching	Having completed a department that will have a command of the field of mathematics	Mastering the field of mathematics

Comparison of mathematics teacher pre-service education programs between countries

Pre-service teachers who enroll in the Mathematics Teaching Program in Turkey receive a four-year undergraduate education. The general framework of the courses that teacher prospective students have to take has been determined by the Council of Higher Education (YÖK) with a centralist approach. Although education faculties make minor changes and additions to their programs depending on the Bologna process, they generally comply with the framework program of YÖK (YÖK, 2022). The framework program of YÖK is given in Table 2. In Table 2, it is abbreviated as Field Education AE, General Culture GK, Vocational Knowledge MB.

Table 2. Turkish mathematics teacher training program

Period	Course title	CTS	Period	Course title	ECTS
1	Introduction to Education	3	2	Education psychology	3
1	Educational Philosophy	3	2	Educational Sociology	3
1	Ataturk's Principles and History of Revolution 1	3	2	Ataturk's Principles and History of Revolution 2	3
1	Foreign Language 1	3	2	Foreign language	3
1	Turkish language	5	2	Turkish Language 2	5
1	information technologies	5	2	Analysis 2	5
1	Analysis 1	4	2	Abstract Mathematics 2	5
1	Abstract Mathematics	4	2	Euclidean Geometry	3
3	Instructional Technologies	3	4	Turkish Education History	3
3	Teaching Principles and Methods	3	4	Research Methods in Education	3
3	MB Elective 1	4	4	MB Elective 2	4
3	GK Elective 1	3	4	GK Elective	3
3	AE Elective 1	4	4	AE Elective	4
3	Approaches to Learning and Teaching Mathematics 2	3	4	High School Mathematics Curriculum 2	3
3	Linear Algebra 1	3	4	Linear Algebra 2	3
3	Analytical Geometry 1	3	4	Analytical Geometry2	3
3	Analysis 3	4	4	Algorithm and Programming	4
5	Classroom Management	3	6	Measurement and Evaluation in Education	3
5	Ethics and Ethics in Education	3	6	Turkish Education System and School Management	3
5	MB Elective 3	4	6	MB Elective 4	4
5	GK Elective	3	6	GK Elective 4	3
5	AE Elective 3	4	6	AE Elective 4	4
5	Teaching Mathematics 1	4	6	Teaching Mathematics 2	4
5	Possibility	3	6	Statistics	3
5	Problem Solving in Mathematics	3	6	Mathematical Modeling	3
5	Differential equations	3	6	Introduction to Algebra	3
7	Teaching Practice 1	10	8	Teaching Practice 2	13
7	Special Education and Inclusion	3	8	Guidance in Schools	3
7	MB Elective 5	4	8	MB Elective 6	4
7	Community Service Practices 1	3	8	AE Elective 6	4
7	AE Elective 5	4	8	Geometry Teaching	3
7	History of Mathematics	3	8	Philosophy of Mathematics	3
7	Algebra Teaching 2	3			

(YÖK, 2022)

There are 2 programs for education of mathematics teachers in Singapore: the undergraduate program and the pedagogical formation certificate program. In Singapore, branch teachers are educated in two specialties. This application is expected to introduce prospective teachers to the basic concepts and principles in education necessary for effective teaching and reflective practice in primary and secondary schools. Nine core courses are required for Educational Studies, the undergraduate program to become a teacher in Singapore, and deals with key educational concepts such as student development, the learning and thinking process, the social context in which the school operates, the application of psychology in teaching and learning, and the use of instructional technologies.

Table 3. Singapore mathematics teacher training program

Lessons	Credit
1 year	
Professional Practice and Inquiry I	2
Educational Psychology I: Learning and Teaching Theories and Practices	2
Group Studies in Service Learning	1
Social Context of Education in Singapore	2
Character and Citizenship Education in the Context of Singapore	2
2 years	
Teaching and Managing Students at the Intermediate Level (Part 1)	2
Meaningful Learning Technologies	2
Evaluating Learning and Performance	1
Digital Literacy for the Net Generation (elective)	3
Digital Media Literacy (elective)	3
Computer Literacy Through Coding and Practices (elective)	3
3 years	
Pedagogical Practices	1
Teaching and Managing Students at the Intermediate Level (Part 2)	1
educational research	3
Research Project	3
4 years	
Professional Practice and Inquiry II	

(NIE,2022)

Educational Studies BA (Ed)/ BSc (Ed) prospective teachers will specialize in teaching methodology at primary or secondary school level. These are designed to provide trainees with pedagogical skills while teaching specific subjects in Singaporean schools.

Program Studies is the field in which (CS) specialization topics are selected. The choice of specialization topics in this field also depends on the path and options chosen by the pre-service teacher.

Pre-service teachers can choose 2 courses that are compatible with the choice of Academic Subjects (AS). CS1 and CS2 are the programs to be chosen for secondary school mathematics teaching (NIE, 2022).

Table 4. CS1 and CS2 Mathematics Structure for BA/ BSc (Ed)

Lessons	Credit
Teaching and Learning Mathematics I	3
Teaching and Learning Mathematics II	3
Teaching and Learning Mathematics III	3
Specialization Areas in Mathematics Teaching and Learning	3

(NIE, 2022)

The graduate courses taken to become a Mathematics teacher in the Netherlands are based on the education program of the Leiden Mathematics Institute. The courses of the two-semester program are given below.

- Mathematics component (60 EC)
 - Research Project (30 EC)
 - Courses suitable for the research topic (30 EC)
- Education component (60 EC, Dutch)
 - Training Courses (30 EC, Dutch)
 - Teaching and Practice (30 EC, Dutch)
- World Education Program (60 EC, Dutch and English)
 - Training Courses (30 EC, partly in Dutch)
 - International Teaching and Practice (30 EC, English)

The Mathematics component of the specialization includes a 40 EC research project, including a master's thesis and an oral presentation in one of the research groups of the Leiden Mathematics Institute, and 20 EC courses to be selected in accordance with the research topic. Some of these courses can be taken from the national Mastermath program (Universiteit Leiden, 2022).

The percentages of countries' mathematics teacher training programs by area are given in Table 5.

Table 5. Percentages of countries' mathematics teacher training programs

Countries	Profession Information	General Culture	Field Training
Turkey	34%	18%	48%
Singapore	43%	9%	48%
Holland	50%	-	50%

Comparison of mathematics teacher employment conditions between countries

Pre-service teachers who have graduated from the department of mathematics teaching can work as a mathematics teacher in high schools and equivalent schools, private schools and private teaching institutions affiliated to the Ministry of National Education. In addition, prospective students who want to do academic research can have academic job opportunities at universities by completing their master's and doctoral education in their fields. In order to be able to work in public schools in Turkey, all teacher prospective students must take the Public Personnel Selection Examination (KPSS) at the end of their undergraduate education and obtain a required score. In recent years, in addition to the KPSS score, the interview exam has also been among the appointment criteria (Aşçı, Topal, & Yıldırım, 2021).

In Singapore, the National Institute of Education and the Ministry of Education work very effectively and collaboratively. The Ministry of Education provides salaries and scholarships to prospective teachers throughout their undergraduate education in order to encourage multi-faceted development as well as their professional development. Pre-service training (orientation) for teacher prospective students who have completed their undergraduate education is provided by the National Education Institute. After the orientation training, prospective students are impartially assigned to schools in different regions of the country by the Ministry of Education. It can be said that teacher prospective students in Singapore do not have job anxiety (Orakçı, 2015). In short, teacher training and appointments in Singapore are carried out without any disruption due to effective communication and coordination between the National Institute of Education and the Ministry of Education. This situation contributes to the positive attitudes of teachers and the public towards the education system.

In the Netherlands, the open recruitment method is preferred. The terms of service and legal status of education personnel, including teachers, in both public and private institutions are determined at a decentralized level in sectoral collective agreements. These agreements are set out in negotiations between employers and unions. The Minister of Education, Culture and Science is not involved in the negotiation of collective bargaining agreements. Where possible and desired, these agreements allow for further refinement at the school board level. At the institutional level, negotiations are held between each competent authority and the federations of civil service and education associations representing the staff of the institutions for which that authority is responsible (Eurydice, 2022).

For these appointments, preservice teachers applying for jobs in a particular education sector must be eligible for a teaching appointment. This means that mathematics teachers have a certificate that qualifies them to teach at the secondary level. In addition to teaching qualifications, teachers must have a certificate of conduct (VOG). Teachers who are not yet fully qualified may also be appointed on a temporary basis. These teachers are also usually side entrance teachers (Eurydice, 2022).

Table 6. Comparison of mathematics teacher employment conditions

Countries	Assignment Type	Assignment Conditions
Turkey	Central	KPSS Exam Interview
Singapore	Central	Graduation from the relevant department
Holland	Local	Open recruitment method

Comparison of in-service training of mathematics teachers between countries

In our country, activities related to the professional development of the personnel working in official education institutions at all levels are carried out by the "Education Board" formed by the Ministry of National Education and the "In-Service Training Department" operating under the Ministry. In this context, all kinds of professional development programs are carried out within the scope of the "Ministry of National Education In -Service Training Regulation" published in the Official Gazette dated 4.1.1995 and numbered 22161. When the change plans and practices of the Ministry of National Education are examined and the studies to develop teachers in these plans are on the agenda, the in-service training plans of the Ministry come to the fore and the effectiveness levels of the in -service training plans are discussed. In-service training activities carried out through the In-Service Training Institutes established within the body of the Ministry of National Education "Teacher Training and Development General

Directorate” are regularly planned and implemented periodically every year as trainings to develop teachers (Gülşen, 2021).

For teachers who want to receive postgraduate education in Turkey, it is stated in the relevant law that “necessary convenience is provided in terms of giving permission provided that they do not disrupt their duties”. Curriculums of teachers are arranged in a way that allows them to continue their postgraduate education (MEB, 2013). In addition, with the Regulation on Promotion in the Teaching Career Levels published in 2022, teachers who have received postgraduate education are exempted from the exams that must be taken in order to receive a title (MEB, 2022).

Teachers assigned to post-adaptation schools in Singapore have versatile professional development opportunities. Teachers are encouraged to attend courses that cover different methods and techniques, tailored to the educational needs of the 21st century, planned by the National Institute of Education. The institution is responsible for the coordination and planning of these courses, workshops and conferences. One of the in-service activities offered to teachers is postgraduate education, and teachers who want to work in this field are provided with facilities (education permit, financial aid, etc.). Online professional development studies are also planned, taking into account the intensity of teachers and their participation opportunities (NIE, 2021).

To enable teachers in the Netherlands to keep their professional skills up to date, every teacher in the Netherlands, including those in higher vocational education, is provided with a grant from the teacher development fund once in their teaching career. They can use it to pursue a second undergraduate or graduate education. From 2015, all teachers are given sufficient time, funding and opportunity to pursue their professional skills. This situation is guaranteed by collective bargaining agreements (Eurydice, 2022).

Discussion, Conclusion and Suggestions

In this study, mathematics teacher training systems of Turkey, Netherlands and Singapore were analyzed comparatively. Requirements for participation in pre-service mathematics teacher training differ in all three countries. In Singapore, pre-service teachers decide that they want to take this education before their undergraduate degree, but in the Netherlands, those who have a sufficient level of mathematics can receive training to become a mathematics teacher with postgraduate education. In Turkey, on the other hand, there is an alternative way to become a mathematics teacher with the pedagogical formation certificate obtained after the undergraduate education from the departments related to mathematics as well as the undergraduate departments of mathematics teaching.

People's choice of profession is related to the harmony between the requirements of the profession they will choose and the characteristics of the person (Ginzberg, Gingsburg, Axelrad & Herma, 1951). From this point of view, as in all professions, teacher prospective students are expected to prefer education faculties, considering that they have the qualifications related to the teaching profession. In addition, as Erdem, Gezer and Çokadar (2005) stated, teachers' perspectives on their profession play a major role in their successful fulfillment of this profession, since subjects such as the psychology of the teacher, his thoughts, lifestyle and habits affect the students. For this reason, the better the teacher can educate himself, the more he gets ready for change and open to innovations, the more qualified and competent individuals he will train and contribute to the progress of the society with each individual he trains. However,

testing of communication skills, including motivation to become a teacher, is carried out only in Singapore.

Shulman (1986), who is one of the prominent names among researchers working on what types of knowledge teachers should have in mathematics education, examined the content knowledge that a branch teacher should have under three headings: content knowledge, pedagogical content knowledge and curriculum knowledge. Curriculum knowledge has been evaluated in the category of vocational knowledge in all three countries, and all three topics are included in the mathematics teacher training programs of the countries. When the education programs of the countries are examined, it is seen that the field education is given similar importance in all three countries. While education is given in the field of general culture as well as vocational knowledge and field education in Turkey and Singapore, this is ignored in the Netherlands. The reason for this may be that the education is given at the postgraduate level.

When the employment conditions of mathematics teachers in the countries are examined, a central recruitment method is applied in Turkey and Singapore, while local governments in the Netherlands make open recruitment. Although Turkey and Singapore seem similar in terms of recruitment methods, in fact, there is no unemployment problem in Singapore because the number of prospective student teachers is determined key to the needs, while teacher prospective students in Turkey go through a tough race to start the job by going through KPSS and interview processes. However, due to the post-licensing of this screening system, human resources trained in Turkey may be wasted (Kalkan, 2021). With reference to 2021 data of ÖSYM, the number of mathematics teachers waiting to be appointed is around 14000 (ÖSYM, 2021).

In-service training is as important as pre-service training in order to increase teacher quality (Saracaloğlu & Ceylan, 2016). When the in-service training status of teachers is examined, it can be said that all three countries create in-service training opportunities for teachers. In addition, in Turkey and Singapore, opportunities are provided for postgraduate education as well as for all teachers.

The cultural, sociological, ethnic and economic structure of each country differs from each other in many ways. That's why every country has its own education system. Every education system has positive and negative aspects. Also, no system can be regarded as an ideal model. Countries may have problems in education arising from the specific structure of that country. Copying the education system of a country and taking it as a model should not mean a solution (Arslan & Cashier 2021). When the processes of the three countries are examined in detail, criteria other than higher education entrance exam should be determined for student entry to mathematics teacher training programs. It should be ensured that teacher prospective students are selected from people who love to research, have a special interest in mathematics and have high communication skills. While determining the quota of teacher training programs, the need for teachers that may arise as a result of the planning should be taken into consideration. Taking advantage of the positive aspects of the process of being a mathematics teacher in Singapore and the Netherlands is thought to be a solution for improving the mathematics teacher training process in Turkey. In addition, it is recommended for researchers to compare the details of the mathematics teacher training process and education programs of different countries.

References

- Aksoy, E., & Gözütok, D. (2014). Amerika Birleşik Devletleri, Finlandiya, Singapur ve Türkiye’de öğretmen eğitimindeki dönüşümler. *Journal of Educational Sciences and Practices*,13(25)
<https://www.idealonline.com.tr/IdealOnline/lookAtPublications/paperDetail.xhtml?uId=5937&>
- Altun, M. (2005). *İlköğretim ikinci kademe (6, 7 ve 8. sınıflarda) matematik öğretimi*. İstanbul: Alfa Basım Yayım Dağıtım.
- Arslan, Ü. G. & Vezne, R. (2021). Almanya ve türkiye mesleki eğitim öğretmeni yetiştirme sistemlerinin karşılaştırılması. *Öğretim Teknolojisi ve Hayat Boyu Öğrenme Dergisi*, 2 (1) , 111-134. <https://doi.org/10.52911/itall.910388>
- Aşçı, M., Topal, T. & Yıldırım, R. (2021). Türkiye’de 2050 yılına yönelik öğretmen yetiştirme programlarına ilişkin senaryolar. *OPUS International Journal of Society Researches, Eğitim Bilimleri Özel Sayısı* , 5099-5115. <https://doi.org/10.26466/opus.865457>
- Barber, M. & Mourshed, M. (2007). *How the world’s best-performing school systems come out on top*. London: McKinsey and Company.
- Çelik, Z & Bozgeyikli, H. (2019). *Dünyada ve Türkiye’de öğretmen yetiştirme, istihdam ve mesleki gelişim politikaları*. Ankara: EBSAM.
- Council of Higher Education [YÖK] (2022). Yeni Öğretmen Yetiştirme Lisans Programları. Retrieved from:<https://www.yok.gov.tr/kurumsal/idari-birimler/egitim-ogretim-dairesi/yeni-ogretmen-yetistirme-lisans-programlari>
- Darling-Hammond, L. & Rothman, R. (2011). Lessons learned from Finland, Ontario, and Singapore. L. Darling-Hammond and R. Rothman (Eds.), *Teacher and leader effectiveness in high performing education systems*. Washington, DC: Alliance for Excellent Education and Stanford, CA: Stanford Center for Opportunity Policy in Education. <http://www.all4ed.org/files/TeacherLeaderEffectivenessReport.pdf>
- Erbilgin, E. & Boz, B. (2013). Matematik öğretmeni yetiştirme programlarımızın Finlandiya, Japonya ve Singapur programları ile karşılaştırması. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, Özel sayı* (1), 156-170. <http://efdergi.hacettepe.edu.tr/yonetim/icerik/makaleler/286-published.pdf>
- Erdem, A. R., Gezer, K. & Çokadar, H. (2005, September). Ortaöğretim fen-matematik ve sosyal alanlar öğretmenliği tezsiz yüksek lisans öğrencilerinin öğretmenlik mesleğine ilişkin tutumları [Conference presentation abstract]. 14. Proceedings of the National Educational Sciences Congress, 471-477.
- Ergun, M. & Ersoy, Ö. (2016). Hollanda, Romanya ve Türkiye’deki sınıf öğretmeni yetiştirme sistemlerinin karşılaştırılması. *Kastamonu Eğitim Dergisi* , 22(2) , 673-700. <https://dergipark.org.tr/tr/pub/kefdergi/issue/22602/241499>
- Eurydice (2022). Netherlands Overview. Retrieved from: https://eacea.ec.europa.eu/national-policies/eurydice/content/netherlands_en
- Ginzberg, E., Ginsburg, S., Axelrad, S. & Herma, J. L. (1951). *Occupational choice: An approach to a general theory*. New york: Columbia University Pres.

- Gül, A. G. A. C. (2016). Türkiye ile Çin, Finlandiya, Japonya ve Hollanda'nın Öğretmen yetiştirme ve seçme sistemlerinin karşılaştırılması. *Adnan Menderes Üniversitesi Eğitim Fakültesi Eğitim Bilimleri Dergisi* , 7 (2) , 63-72.
<https://dergipark.org.tr/tr/pub/aduefebder/issue/33910/375347>
- Kahyaoğlu, M.& Yangın, S. (2007). İlköğretim öğretmen adaylarının mesleki öz-yeterliklerine ilişkin görüşleri. *Kastamonu Eğitim Dergisi*, 15(1), 73-84.
<https://dergipark.org.tr/tr/pub/kefdergi/issue/49108/626697>
- Kalkan, A. (2021). Türkiye ve bazı gelişmiş ülkelerin öğretmen yetiştirme sistemleri ve programlarının karşılaştırılması olarak incelenmesi. *Uluslararası Karamanoğlu Mehmetbey Eğitim Araştırmaları Dergisi* , 3 (1) , 1-16.
<https://doi.org/10.47770/ukmead.878302>
- Köçer, M., Koçoğlu, E & Öner, G. (2020). Eğitim Tarihi. Ankara: Pegem Akademi
- Millî Eğitim Bakanlığı [MEB]. (2013). Millî Eğitim Bakanlığı İzin Yönergesi Retrieved from: <http://mevzuat.meb.gov.tr/dosyalar/1627.pdf>
- Ministry of National Education [MEB] (2015). Millî Eğitim Bakanlığı öğretmenlerinin atama ve yer değiştirme yönetmeliği. Retrieved from: <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=20694&MevzuatTur=7&MevzuatTertip=5>
- Ministry of National Education [MEB] (2022). Öğretmenlik Kariyer Basamaklarında Yükselme Yönetmeliği Retrieved from: <https://www.mevzuat.gov.tr/anasayfa/MevzuatFihristDetayIframe?MevzuatTur=7&MevzuatNo=9304&MevzuatTertip=5>
- National Institute of Education [NIE] (2021). A Teacher Education Model for the 21 Century. Retrieved from: https://nie.edu.sg/docs/default-source/nie-files/office-of-strategic-planning-academic-quality/te21-report_a-tchr-ed-model-for-the-21st-century.pdf?sfvrsn=2
- NIE.(2021). National institute of education Retrieved from <https://nie.edu.sg/te-undergraduate/>
- OECD (2019). PISA 2018 Results: Executive Summary. Retrieved from: https://www.oecd.org/pisa/Combined_Executive_Summaries_PISA_2018.pdf
- Öğrenci Seçme ve Yerleştirme Merkezi [ÖSYM], (2021) Yükseköğretim Kurumları Sınavı Retrieved from: <https://www.osym.gov.tr/TR,21286/2021-yks-yerlestirme-sonuclarina-iliskin-sayisal-bilgiler.html>
- Öğrenci Seçme ve Yerleştirme Merkezi [ÖSYM], (2021). KPSS Lisans. Retrieved from: https://www.osym.gov.tr/TR,21301/2021_kpss-a-grubu-ve-ogretmenlik-genel-yetenek-genel-kultur-egitim-bilimleri-alan-bilgisi-ve-oabt-sinav-sonuclarina-iliskin-sayisal-bilgiler.html
- Öğrenci Seçme ve Yerleştirme Merkezi [ÖSYM], (2021). Yükseköğretim Kurumları Sınavı (Yks) Kılavuzu Retrieved from: https://dokuman.osym.gov.tr/pdfdokuman/2022/YKS/kilavuz_11022022.pdf

- Orakçı, Ş. (2015). Şangay, Hong Kong, Singapur, Japonya ve Güney Kore'nin öğretmen yetiştirme sistemlerinin incelenmesi. *Asya Öğretim Dergisi* 3(2), 26-43. <https://dergipark.org.tr/tr/pub/aji/issue/38889/454208>
- Press Release on New Teacher Capacity Building Policy. (2014). Retrieved from: <http://www.moe.gov.sg/media/press/2014/09/growing-our-teachersbuilding-our-nation> (Deleted)
- Saracaloğlu, A. S. & Ceylan, V. (2016, October). *Farklı Ülkelerde Öğretmen Yetiştirme: ABD, Güney Kore, İrlanda, Singapur ve Türkiye*. In The 4th International Congress on Curriculum and Instruction'da sunulmuş bildiri, Antalya.
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- Teo, T. W. & Khoh, R. L. (2015). Teaching Science in Culturally Relevant Ways Teaching Science in Culturally Relevant Ways: Ideas from Singapore Teachers. World Scientific
- Türkoğlu, A. (1998). *Karşılaştırmalı eğitim dünya ülkelerinden örneklerle*. Adana: Baki Kitabevi.
- Uçar, R. & Uçar, İ. H. (2004). Japon eğitim sistemi üzerine bir inceleme: Çeşitli açılardan Türk eğitim sistemi ile karşılaştırma. *Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi*, 1(1), 1-18.
- Ültanır, G. (2000). *Karşılaştırmalı eğitim bilimi kuram ve teknikler*. Ankara: Eylül Yayınları.
- Universiteit Leiden, (2022). Mathematics and Education (MSc) Retrieved from: <https://www.universiteitleiden.nl/en/education/study-programmes/master/mathematics/mathematics-and-education>
- Yıldırım, A. & Şimşek, H. (2005). *Sosyal bilimlerde nitel araştırma yöntemleri*. Ankara: Seçkin Yayıncılık.
- Yin, R. (1984). *Case study research: design and methods*. California: Sage Publications.