



## Comparison of Turkey and Countries with High TIMSS Success in terms of the Preparedness of Schools, Teachers and Students for the Covid 19 Period\*

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Article Information	ABSTRACT
Received: 14.01.2022	<p>The purpose of this research is to compare Turkey and the countries of Japan, South Korea and Russia with high success in the Trends in International Mathematics and Science Study -TIMSS-2019 exam, in terms of the preparedness of schools, teachers and students for the Covid 19 period and to make suggestions for Turkey. In the research, document analysis method, a qualitative research method, was used. The research population consists of 38 countries that are members of -OECD- the Organization for Economic Cooperation and Development. As a sample, Turkey and the OECD countries Japan, South Korea and Russia, which were successful in the 2019 TIMSS research, were selected. The countries of Japan, South Korea and Russia achieved success by scoring above the OECD average in science and mathematics at 4th and 8th grades in the TIMSS 2019 survey. Therefore, the type of sampling is criterion sampling. Research data were obtained from international reports and statistics. Thus, it is seen that there is no problem of validity and reliability of the data. As a result of the research, when evaluated in terms of the preparedness of schools for the Covid 19 period; School principals in Turkey think that insufficient internet in schools does not hinder education to a large extent. However, it is understood that school principals in Japan think that insufficient internet affects education negatively, higher than the OECD average. When examined in terms of teachers, it is seen that teachers in Turkey and Russia think that they are good in -ICT- information and communication technologies skills. In terms of teachers' openness to change, Japan and South Korea were below the OECD average, while Russia and Turkey were found to be above the OECD average. When evaluated in terms of students, it is seen that while the rate of students' computer ownership in Turkey and Japan is below the OECD average, it is above the OECD average in South Korea and Russia.</p> <p><b>Keywords:</b> Covid 19, distance education, ICT, OECD, TIMSS</p>
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### 1. INTRODUCTION

After Covid 19 outbreak and the increasingly difficult conditions, the World Health Organization has recommended measures such as the use of masks, keeping of social distance, isolation and closure of schools to countries all over the world to control the spread of the virus. Many countries have tried to implement these measures to prevent the pandemic (Cucinotta & Vanelli, 2020: 157; WHO, 2020). Schools and universities, like many institutions, were affected by these measures and had to suspend their work on March 10, 2020 (Azkeskin & Avcı, 2021: 824). Schools and universities have started to provide education and training services online after this date.

The pandemic has changed not only the way we live, but also the way we work. People have started working from home, working remotely, and learning at home (Moise et al, 2021: 63). In addition, the pandemic forced learning and teaching activities to be carried out remotely (Reine et al, 2021: 26). A lot of nations had to switch to distance education since face-to-face education was difficult during this period (Al Lily et al., 2020:2; Özdoğan & Berkant, 2020: 15). The idea of distance education as an alternative is increasing (Boyras, 2021: 7). Access to the Internet and technology has become very important for a good conduct

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of distance education. In addition to academic success through international exams, situations such as internet and technology access of students, teachers and schools, and online education applications were also investigated before the pandemic.

Studies such as the Trends in International Mathematics and Science Study (TIMSS), the Progress in International Reading Literacy Study (PIRLS) and the Program for International Student Assessment (PISA) evaluate the success of the education systems of countries in the international arena. The importance of these studies has been increasing in the last two decades. Thanks to these studies, it can be seen how the success of a national student is internationally (Coşkun, 2021:4). In addition, countries can find out how their education system is, the opportunity to compare it with other countries and improve their own education systems.

Since 1995, many countries have participated in the TIMSS research with their 4th and 8th grade students. Turkey participated in TIMSS only at the 8th grade level in 1999 and 2007, and at the 4th and 8th grade level in 2011, 2015 and 2019 (MEB, 2020: 8; TEDMEM, 2021: 3). TIMSS provides information about countries' success rankings, average scores and strengths and weaknesses of education systems. This information offers countries an opportunity to reconsider their education policies. Students who are in the 4th grade in TIMSS are also in the 8th grade in the next cycle (TEDMEM, 2021). In this way, the knowledge and skills of the same stage four years later can be measured with TIMSS cycles.

### 1.1. Statement of the Problem

Technological developments and changes expand the usage areas of computer technologies and increase the need for computer literate people (Oğuz, 2021: 5). Education and training practices are also affected by technological developments and undergo radical changes (Yeşiltaş & Evci, 2021: 225). Effective integration of information and communication technologies (ICT), which is one of the areas most impacted by technological developments, into schools and classrooms can transform pedagogy and provide students with useful qualifications. Therefore, teachers are expected to include ICT in their professional practices and have the necessary competencies (UNESCO, 2018: 1). ICT has been used more effectively in educational environments in recent years. ICT can change students' learning experiences in school, provide new opportunities for learning outside of school, and also change teachers' pedagogical approaches. Countries aiming to advance in education are trying to include more digital competencies in their education systems in their curricula (OECD, 2019: 3). As countries invest in ICT projects or programs, the number of researches in this field also increases (Aydın, 2019: 177). With the digitalization of education in the 21st century of our age, there is a greater need for ICT in education and training practices and the interest in this field is increasing. Due to the closure of schools during the pandemic, the benefits and importance of digitalization in education were felt quite a lot.

After schools were closed for a long time during the pandemic, countries have made an effort to gradually reopen the schools. To assist and encourage this effort, Covid 19 country notes on the educational status of countries have been prepared by the OECD (OECD, 2021b). OECD prepared these notes by taking advantage of international education researches such as PISA and TALIS conducted before the pandemic. When the literature is reviewed, there are some studies on TIMSS and ICT applications in education. However, no research has been found that compares the results of TIMSS 2019 and the preparedness of the education systems of the countries for the Covid 19.

### 1.2. Purpose of the Study

This study aims to compare Turkey and the countries of Japan, South Korea and Russia with high TIMSS 2019 success, in terms of the preparedness of schools, teachers and students for the Covid 19 period, and to make suggestions for Turkey. Examining the preparedness of them for the pandemic period of selected countries and determining the differences are important in terms of shedding light on the policies and strategies applied in the Turkish education system. It is thought that this research will contribute to the literature in comparing the education systems of different countries.

### 1.3. Problem of the Study

How is the preparedness of schools, teachers and students in Turkey and the countries with high TIMSS 2019 success in Japan, South Korea and Russia for the Covid 19 period?

#### 1.3.1. Sub-problems of the study

1) How is the 2019 TIMSS achievement score in Turkey, Japan, South Korea and Russia?

- What is the 2019 TIMSS 4th grade Mathematics achievement score and ranking in Turkey, Japan, South Korea and Russia?
- What is the 2019 TIMSS 8th grade Mathematics achievement score and ranking in Turkey, Japan, South Korea and Russia?
- What is the 2019 TIMSS 4th grade Science achievement score and ranking in Turkey, Japan, South Korea and Russia?
- What is the 2019 TIMSS 8th grade Science achievement score and ranking in Turkey, Japan, South Korea and Russia?

2) How is the preparedness of schools, teachers and students to the Covid 19 process in Turkey, Japan, South Korea and Russia?

- How is the preparation of teachers for ICT-based teaching in Turkey and the countries of Japan, South Korea and Russia prior to the Covid 19?

- b) How is the school and student preparation for ICT-based learning in Turkey and the countries of Japan, South Korea and Russia prior to the Covid 19?
- c) What is schools' leadership, collaboration and resources prior to the Covid 19 in Turkey and Japan, South Korea and Russia?
- d) How are the students' home settings for online learning prior to the Covid 19 in Turkey and the countries of Japan, South Korea and Russia?

## 2. METHODOLOGY

### 2.1. Study Design

Document analysis is that of written materials including information about the cases aimed to be investigated (Yıldırım & Şimşek, 2016: 189). Since this research aims to make a comparative analysis of Turkey and the countries with high TIMSS 2019 achievement, document analysis technique which is one of the qualitative research methods was used.

### 2.2. Population

The research population consists of 38 OECD member countries. As a sample, Japan, South Korea and Russia were selected from the OECD countries that were successful and had data in the 2019 TIMSS research with Turkey. Therefore, the type of sampling is criterion sampling.

### 2.3. Data Analysis

Data created by international organizations such as the OECD and the World Bank can be used for document analysis (Özkan, 2021: 23). The data of this research were obtained from TIMSS 2019 results and OECD reports. The OECD created these reports by taking advantage of the TALIS 2018 and PISA 2018 research, which include the opinions of teachers, students and school administrators prior to the Covid 19.

## 3. FINDINGS

Fourth and eighth grade Science and Mathematics achievement scores and rankings of Turkey and Japan, South Korea and Russia countries in 2019 TIMSS are presented in this section.

### 3.1. Findings on 2019 TIMSS Achievement in Turkey, Japan, South Korea and Russia

The 2019 TIMSS 4th and 8th grade mathematics and science achievement status in Turkey and Japan, South Korea and Russia are shown in Table 1, 2, 3, 4.

#### 3.1.1. Findings Related to 2019 TIMSS 4th Grade Mathematics Achievement Score and Ranking in Turkey, Japan, South Korea and Russia

The 2019 TIMSS 4th grade mathematics achievement scores and rankings of Turkey, Japan, South Korea and Russia are shown in Table 1.

Table 1.

*2019 TIMSS Grade 4 Mathematics Achievement Scores and Rankings in Turkey, Japan, South Korea and Russia*

<b>Country (58)</b>	<b>Score (297-625)</b>	<b>Ranking (1-58)</b>
South Korea	600	3
Japon	593	5
Russia	567	6
Turkey	523	23
TIMSS Avarage	500	37.5

Source: (MEB. 2020: 35; Mullis et al. 2020: 1).

The scores and rankings of selected OECD countries (South Korea, Japan, Russia, Turkey) in the mathematics 4th grade assessment in the TIMSS 2019 cycle are shown. Within 58 countries joining in the 4th grade assessment of mathematics, South Korea ranks 3rd with 600 points, Japan ranks 5th with 593 points, Russia ranks 6th with 567 points, and Turkey ranks 23rd with 523 points. The TIMSS average is 500 points.

### 3.1.2. Findings Related to 2019 TIMSS 8th Grade Mathematics Achievement Score and Ranking in Turkey, Japan, South Korea and Russia

The achievement scores and rankings of selected OECD countries (South Korea, Japan, Russia, Turkey) in the mathematics 8th grade assessment in the TIMSS 2019 cycle are shown in Table 2.

Table 2.

*2019 TIMSS Grade 8 Mathematics Achievement Scores and Rankings in Turkey, Japan, South Korea and Russia*

Country (39)	Score (388-616)	Ranking (1-39)
South Korea	607	3
Japon	594	4
Russia	543	6
Turkey	496	20
TIMSS Avarage	500	18.5

Source: (MEB, 2020:45; Mullis et al. 2020: 2).

Thirty-nine countries joined at the 8th grade level of Mathematics in TIMSS 2019. Among the participating countries, South Korea ranks 3rd with 607 points, Japan 4th with 594 points, Russia 6th with 543 points, and Turkey 20th with 496 points. South Korea, Japan and Russia scored higher than the TIMSS average, but Turkey scored less than the TIMSS average.

### 3.1.3. Findings Related to 2019 TIMSS 4th Grade Science Achievement Score and Ranking in Turkey, Japan, South Korea and Russia

The 2019 TIMSS 4th grade science achievement scores and rankings of Turkey, Japan, South Korea and Russia are shown in Table 3.

Table 3.

*2019 TIMSS Grade 4 Science Achievement Scores and Rankings in Turkey, Japan, South Korea and Russia*

Country (58)	Score (249-595)	Ranking (1-58)
South Korea	588	2
Japon	567	3
Russia	562	4
Turkey	526	19
TIMSS Avarage	500	35.5

Source: (MEB, 2020:57; Mullis et al. 2020: 3)

Within 58 countries joining in the 4th grade assessment of science, South Korea ranks 2nd with 588 points, Russia ranks 3rd with 567 points, Japan 4th with 562 points, and Turkey 19th with 526 points. The TIMSS average is 500 points. South Korea, Japan, Russia and Turkey achieved scores above the TIMSS average in the Science 4th grade assessment in the TIMSS 2019 cycle.

### 3.1.4. Findings Related to 2019 TIMSS 8th Grade Science Achievement Score and Ranking in Turkey, Japan, South Korea and Russia

The achievement scores and rankings of selected OECD countries (South Korea, Japan, Russia, Turkey) in the science 8th grade assessment in the TIMSS 2019 cycle are shown in Table 4.

Table 4.

*2019 TIMSS Grade 8 Science Achievement Scores and Rankings in Turkey, Japan, South Korea and Russia*

Country (39)	Score (370-608)	Ranking (1-39)
Japon	570	3
South Korea	561	4
Russia	543	5
Turkey	515	15
TIMSS Avarage	500	18.5

Source: (MEB, 2020:67; Mullis et al. 2020: 3).

Among 39 countries participating in the 8th grade evaluation of science, Japan ranks 3rd with 570 points, South Korea 4th with 561 points, Russia 5th with 543 points, and Turkey 15th with 515 points. The TIMSS average is 500 points. In the 8th grade science TIMSS 2019, South Korea, Japan, Russia and Turkey scored above the TIMSS average.

### 3.2. Findings Regarding the Preparedness of Schools, Teachers and Students for the Covid 19 Process in Turkey, Japan, South Korea and Russia

The findings regarding the preparedness of Turkey, Japan, South Korea and Russia are shown in Table 5, 6, 7, 8.

#### 3.2.1. Findings on Teachers' Preparation for ICT Based Teaching Prior to the Pandemic in Turkey, Japan, South Korea and Russia

Findings on teachers' preparation for ICT based teaching in selected OECD countries (Japan, South Korea, Russia, Turkey) prior to the pandemic is shown in Table 5.

Table 5.

*Preparation of Teachers for ICT Based Teaching in Turkey and the Countries of Japan, South Korea and Russia Prior to the Covid 19 (%)*

Countries	a	b	c	d	e
Japon	18	60	35	53	39
South Korea	30	59	71	61	21
Russia	69	69	-	75	15
Turkey	67	74	76	61	7
OECD Average	53	56	67	60	18

a) Teachers who report that they largely allow students to use ICT in their projects and classroom work (%)

b) Teachers who use of ICT in formal education and training (%)

c) Teachers who can support student learning by using digital technology (computer, tablet, smart board) a lot (%)

d) Teachers who include ICT in their professional development activities (%)

e) Teacher who report that they need for high level of ICT skills in their professional development (%)

Source: (OECD, 2021a)

According to the teachers' opinions; the rate at which teachers largely allow students to use ICT in their projects and classroom work; Japan 18%, South Korea 30%, Turkey 67%, Russia 69%, OECD average 53%. In Russia and Turkey, teachers allow students to use ICT in projects and classroom work above the average of OECD, while in South Korea and Japan teachers allow below the average of OECD. Interestingly, South Korean and Japanese teachers allowed their students to use ICT less than the OECD average and performed well in the TIMSS.

When the rate of teachers' use of ICT in formal education and training is compared, it is seen that South Korea is 59%, Japan is 60%, Russia is 69%, Turkey is 74%, and the OECD average is 56%. In South Korea, Russia and Turkey, teachers' use of ICT in formal education is better than the average of OECD.

Considering the rate of teachers' use of digital technology (computer, tablet, smart board); Japan is 35%, South Korea is 71%, Turkey is 76%, OECD average is 67%. While the rate of teachers' use of digital technology in South Korea and Turkey is better than the average of OECD, it is lower in Japan.

Considering the rate of including ICT in the professional development of teachers; Japan is 53%, South Korea is 61%, Turkey is 61%, Russia is 75%, OECD average is 60%. While the rates of including ICT in teachers' professional development in South Korea, Russia and Turkey are above the OECD average, this rate is below the OECD average in Japan. Considering the rate of teachers' need for high level ICT skills; Turkey 7%, Russia 15%, South Korea 21%, Japan 39%, OECD average 18%.

#### 3.2.2. Findings on the Preparation of Schools and Students for ICT Based Education Prior to the Pandemic in Turkey and Japan, South Korea and Russia

Findings on the preparation of schools and students for ICT based education in selected OECD countries (Japan, South Korea, Russia, Turkey) prior to the pandemic is shown in Table 6.

Table 6.

*Preparation of Schools and Students for ICT Based Education Prior to the Pandemic of Turkey and Japan, South Korea and Russia (%)*

Countries	a	b	c	d	e
Japon	34	27	24	19	12
South Korea	24	15	54	52	53
Russia	32	22	43	78	78
Turkey	22	20	66	76	85
OECD Average	25	19	54	65	61

- a) Principals who report that the lack or inadequacy of digital technology greatly hinders the school's capacity to provide quality education (%)
- b) Principals who report that inadequate internet access greatly hinders the school's capacity to provide quality education (%)
- c) Principals who agree that students enrolled in a school where an effective online learning support platform is highly available (%)
- d) Principals who agree that students attending a school where there is a great deal of effective professional resources designed to help teachers learn how to use digital devices (%)
- e) Principals who agree that students attending a school where teachers have sufficient time to prepare lessons that integrate digital devices into learning (%)

Source: (OECD, 2021a)

According to the opinions of school principals; When the rate of principals who state that the lack or inadequacy of digital technology greatly hinders the school's capacity to provide quality education is examined, it is seen that Turkey is 22%, South Korea is 24%, Russia is 32%, Japan is 34%, and the OECD average is 25%. While the rate of principals who thought that the lack of technology in schools prevented education in Turkey and South Korea prior to the pandemic was below the OECD average, it was above the OECD average in Russia and Japan. Although the rate of principals who think that the lack of technology negatively affects education in Turkey is lower, Turkey's TIMSS 2019 success is lower than the countries in the research such as Japan, South Korea and Russia.

According to the opinions of school principals; The rate of principals reporting that inadequate internet access greatly hinders the school's capacity to provide quality education is 15% in South Korea, 20% in Turkey, 22% in Russia, 27% in Japan, and the OECD average of 19%. Insufficient internet access was reported by the principals as 15% in South Korea, 20% in Turkey, and 22% in Russia. Since this rate is close to the average of OECD countries, it was not seen as a statistically significant difference. However, school principals in Japan stated that insufficient internet access hinders quality education at a higher rate than the OECD average (OECD, 2021a). School principals in Turkey think that insufficient internet does not hinder education to a large extent, but they were not as successful as South Korea and Russia in the TIMSS 2019 research.

According to the opinions of school principals; The rate of students enrolled in a school where an effective online learning support platform is largely available is seen as 24% in Japan, 43% in Russia, 54% in South Korea, 76% in Turkey, and the OECD average of 54%. Students in Turkey consider schools with online learning opportunities in choosing schools more than the OECD average and students from other countries participating in the research.

According to the opinions of school principals; The rate of students attending a school where effective professional resources designed to help teachers learn how to use digital devices largely exist is seen as 19% in Japan, 52% in South Korea, 76% in Turkey, 78% in Russia, and 65% on the OECD average. While South Korea and Japan are below the OECD average, Turkey and Russia are above the OECD average.

According to the opinions of school principals; The rate of students attending a school where teachers have sufficient time to prepare lessons that integrate digital devices into learning is seen as 12% in Japan, 53% in South Korea, 78% in Russia, 85% in Turkey, and 61% in OECD average. In this category, while Japan and South Korea are below the OECD average, they are above Turkey and Russia.

### 3.2.3. Findings on Schools' Leadership, Cooperation and Resources in Turkey and Japan, South Korea and Russia Prior to the Pandemic

The findings of selected OECD countries (Japan, South Korea, Russia, Turkey) on schools' leadership, cooperation and resources prior to the pandemic is shown in Table 7.

Table 7.

*Schools' Leadership, Cooperation and Resources in Turkey and Japan, South Korea and Russia Prior to the Pandemic (%)*

Countries	a	b	c	d
Japan	70	6	9	20
South Korea	70	13	91	58
Russia	85	18	69	50
Turkey	79	29	46	57
OECD Average	74	21	36	37

- a) Teachers who agree that most teacher at school are open to change (%)
- b) Teachers who report to participate in collaborative professional learning activities at least once a month (%)
- c) Teachers attending online courses / seminars (%)
- d) Principals often cooperating in challenging work tasks (%)

Source: (OECD, 2021a)

According to the teachers' opinions; Considering the rate of teachers being open to change to a large extent, it is seen that Japan is 70%, South Korea is 70%, Turkey is 79%, Russia is 85%, and the OECD average is 74%. It is understood that while teachers in Japan and South Korea are open to change below the OECD average, Russia and Turkey are open to change above the OECD average.

According to the teachers' opinions; considering the rate of participation of teachers in collaborative professional learning at least once a month in their schools, it is seen that Japan is 6%, South Korea is 13%, Russia is 18%, Turkey is 29%, and the OECD average is 21%. It has been determined that while teachers' participation in collaborative professional learning in Japan, South Korea and Russia is below the OECD average, it is higher than in Turkey. Considering the rate of teachers attending online courses and seminars, it is 9% in Japan, 46% in Turkey, 69% in Russia, 91% in South Korea, and the OECD average of 36%. Except for Japan, other countries participating in this study are above the OECD average.

From the school principals' point of view, 20% of principals in Japan, 50% in Russia, 57% in Turkey, and 58% in South Korea report that they cooperate to a great extent with the principals of other schools in challenging work tasks. The OECD average is 37%. Except for Japan, the countries Russia, Turkey and South Korea are above the OECD average.

### **3.2.4. Findings on Students' Home Settings for Online Learning Prior to the Pandemic in Turkey and Japan, South Korea and Russia**

The findings of selected OECD countries (Japan, South Korea, Russia, Turkey) of Students' Home Settings is shown in Table 8.

Table 8.

*Students' Home Settings for Online Learning Prior to the Pandemic in Turkey and Japan, South Korea and Russia (%)*

<b>Country</b>	<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>
Japan	61	40	87	81
South Korea	90	83	85	77
Russia	94	85	89	84
Turkey	67	36	87	77
OECD Average	89	78	91	85

a) Students reporting to have a computer to carry out their schoolwork- all students- (%)

b) Students reporting to have a computer to carry out their schoolwork- bottom quartile income group - (%)

c) Students reporting to have suitable physical space for learning at home - all students- (%)

d) Students reporting to have suitable physical space for learning at home- bottom quartile income group- (%)

Source: (OECD, 2021a)

From the students' point of view; According to the PISA 2018 prior the pandemic, the rate of having a computer for all students to carry out their school work is 61% in Japan, 67% in Turkey, 90% in South Korea, 94% in Russia and 89% in the OECD average. While the rate of student having a computer in Japan and Turkey is below the OECD average, it is above the average in South Korea and Russia.

From the students' point of view; Considering the rate of having a computer for students in the bottom quartile socioeconomic group to carry out their school work, it is seen that Turkey is 36%, Japan is 40%, South Korea is 83%, Russia is 85%, and the OECD average is 78%. While the ratio of students in the bottom quartile socioeconomic group in Japan and Turkey to own a computer is below the OECD average, it is above South Korea and Russia.

From the students' point of view; The rate of all students who have a suitable physical space for online learning is 85% in South Korea, 87% in Japan, 87% in Turkey, 89% in Russia, and 91% in OECD average. All selected countries participating in this study are below the OECD average.

From the students' point of view; The rate of students in the bottom quartile socioeconomic group having a suitable physical space for online learning is 77% in South Korea, 77% in Turkey, 81% in Japan, 84% in Russia, and the OECD average of 85%. In the lower socioeconomic group, all selected countries participating in this study are below the OECD average.

## **4. RESULTS, DISCUSSION**

Fifty-eight countries at the 4th grade and thirty-nine countries at the 8th grade participated in the TIMSS 2019 in the fields of Mathematics and Science. South Korea ranked 3rd, Japan 5th, Russia 6th, and Turkey 23rd in Mathematics assessment for 4th grades from selected OECD countries. In the evaluation of 8th grades in mathematics, South Korea ranks 3rd, Japan 4th, Russia 6th and Turkey 20th. In the 4th grade science evaluation, South Korea ranked 2nd, Russia 3rd, Japan 4th, and Turkey 19th. At the level of 8th grade science, Japan ranks 3rd, South Korea 4th, Russia 5th, and Turkey 15th. In other words, the countries of South Korea, Japan and Russia achieved scores above the OECD average in the TIMSS 2019 survey in all categories. Turkey scored above the OECD average in the 4th grade science and mathematics, and 8th grade Science assessments, but it scored below the OECD average in the 8th grade Mathematics assessment.

According to the data collected by the OECD prior to the pandemic; Teachers working in Turkey stated that they use ICT more than South Korea, Japan and Russia countries and the OECD average. However, Turkey's TIMSS 2019 success was found to be lower than in selected countries. Therefore, it has emerged that the use of ICT in higher education and training practices in Turkey does not significantly affect success in international education exams. However, according to related studies (Acar et al, 2021; Chakravarty et al, 2021; Eskicioğlu, 2021; Güney, 2021; Zolochevskaya et al, 2020), it is expected that the use of ICT positively affects academic achievement. Although teachers in Turkey state that they use ICT mostly, the reasons for their low

academic achievement should be investigated. In addition, teachers working in Japan and South Korea stated that they need ICT skills at a higher rate than the OECD average. However, teachers working in Turkey and Russia stated that they need less ICT skills. Thus, it can be said that the teachers working in Russia and Turkey feel good in their ICT skills and in this context, they are prepared for the pandemic process.

Although school directors in Turkey think that deficient internet in schools does not anticipate education to a huge degree, school directors in Japan think that deficient internet negatively influences education higher than the OECD average. Technological leadership and digital skills, which are already important all over the world, have gained even more importance with digital transformation during the pandemic process (Acosta, 2020:261; Beytekin & Çiğdem, 2020:219; Çelebi, 2021:103). Compared to the OECD average, Japan, Russia and South Korea, students in Turkey prefer schools with teachers who offer online learning and give importance to digital devices.

Teachers being open to change; While Japan and South Korea are below the OECD average, Russia and Turkey are above the OECD average. Maya (2013), in her research with primary and secondary school administrators in Çanakkale, Turkey, concluded that school administrators are open to change at a moderate level and they think that it is highly beneficial for administrators to be open to change. It has been determined that while the participation rate of teachers in collaborative professional learning is below the OECD average in Japan, South Korea and Russia, it is above the OECD average in Turkey. The pandemic and school closures have forced "thinking outside the box" and devising innovative and pragmatic solutions to enable education and training to take place remotely (OECD, 2021a). In Turkey, it can be said that teachers' reporting that they are open to change and cooperation is positive in this respect, since there are many compulsory changes and innovations during the pandemic processes. It has been determined that the rate of teachers attending online courses and seminars in South Korea is quite high compared to other countries. It can be said that South Korea is at a good level in online education applications.

It has been observed that the rate of having a computer for students to carry out their school work is quite high in Russia. While the rate of computer ownership of students in Japan and Turkey is below the OECD average, it is observed that it is above the average in South Korea and Russia. Ekici, (2021:168), in his research in the Eastern Anatolia region of Turkey; Augmented reality, an ICT application that has attracted attention recently, was found beautiful, surprising, remarkable and entertaining by pre-service teachers. However, it was emphasized that there are infrastructure deficiencies in ICT and that these problems prevent ICT applications. In addition, Ira et al. (2021), using the Ministry of National Education, Turkish Statistical Institute and PISA data, it was determined that 19.7% of secondary school students in Turkey never used a computer, and only 69.1% of the students had a computer at home, emphasizing the lack of ICT use. In addition, it is emphasized that ICT play an increasingly important role in almost every aspect of our daily lives and significantly affect many aspects of education (OECD, 2019:3). In the bottom quartile socioeconomic group, the difference in the rate of students having a computer becomes more pronounced against Turkey. It has been observed that the rate of students having a suitable physical space for online learning is below the OECD average in all countries participating in this study. This showed that the physical space in the houses were not ready for the pandemic process. Özçelik (2021), in his research conducted in Elazığ, Turkey, concluded that students' home settings are not suitable for online courses.

After the closure of schools with the pandemic, there are problems in technology and internet access in the conduct of distance education activities, and this creates an obstacle to ensuring equality of opportunity and opportunity in education (Çelik & Şahin, 2020; UNESCO, 2020; Zhang et al., 2020). It has been revealed that access to ICT is very important for the good implementation of distance education especially after pandemic.

## 5. RECOMMENDATIONS

- In the light of the above information, the academic programs implemented in schools should be reviewed, the textbooks and question types should be made suitable for international exams.
- Learning environments based on thinking skills should be created for students to ensure success in international exams.
- Students and teachers should be informed about exams like TIMSS and PISA. Awareness should be raised among education stakeholders about comparative education between countries.
- Students participating in the TIMSS research in the 4th grade also participate in the 8th grade. For this reason, students' Science and Mathematics success status should be followed through TIMSS, deficiencies should be eliminated and necessary improvements should be made.
- Incentive policies should be followed by considering regional differences in students' access to and use of ICT.
- Since the rate of computer ownership is low in the bottom quartile socioeconomic group in Turkey, special policies should be determined for this group of students. Priority should be given to students in the lower socio-economic group.
- For distance education, it is important not only to have access to technology, but also to whether there is a suitable physical space at home. Therefore, students should be provided with a physical space where they can both access technology and receive distance education. Awareness training should be given to parents of students about the importance of creating a suitable home setting where their children can receive online education at home.
- Potas et al (2021) emphasized in their research that young people spend a long time with technology, especially during the pandemic, and the risk of becoming technology addicted. Therefore, young people should be provided with technological tools and internet access, as well as training on the effective and correct use of technology.

- Teachers in Turkey stated that they use ICT at a high rate in their lessons, but the academic achievement of the students is low. Therefore, training practices should be implemented to meet the training needs of teachers regarding the effective use of ICT.

### Research and Publication Ethics Statement

This research was conducted with Research Ethics Committee approval of Çanakkale Onsekiz Mart University dated 25.02.2021 and the number 04/02. The first version of this study was presented as an oral presentation at The Fourth International Congress of Educational Research held in Çanakkale on October 27- 30, 2021.

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