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TURKISH STUDENTS' MATHEMATICS PERFORMANCE IN PISA 2012 IN SCOPE OF SOME VARIABLES

BAZI DEĞİŞKENLER AÇISINDAN TÜRK ÖĞRENCİLERİNİN PİSA 2012 MATEMATİK PERFORMANSLARI

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Abstract

PISA results have a key role to offer an opportunity to analyse the level of the national success in a variety of ways such as identifying strengths and weaknesses in our educational sysytem. In this context, this paper analyses the Turkish student performance in maths proficiency PISA 2012 comparing with that of the most successful five countries (China, Singapore, Korea, Japan, Liechtenstein) and the last five (Jordan, Colombia, Qatar, Indonesia, Peru) countries in human resources (teacher salary), student-teacher ratio, learning time after school, social activities using PISA data. Data of Turkey and relevant countries were arranged and presented comperatively with tables which used means, frequency and percentage. As a result of the study, evaluated as a whole in the scope of variables discussed, it can be said that first of all Turkey should increase its mathematics performances. Therefore students can have complex problem-solving skills and highly skilled managerial, professional, and technical occupations. According to results of the study, Turkey is left behind the most successful five countries, the last five countries and the OECD mean in the scope of the most of these variables. To icrease its mathematics performances, policy makers in Turkey should make an urgent improvement attempts about discussed variables which directly effect the mathematics performances.

Keywords: PISA 2012, Mathematics, Student Performance

Öz

PISA sonuçları, eğitim sistemimizin güçlü ve zayıf yönlerini belirlemek gibi çok çeşitli yollarla ulusal başarının seviyesini analiz etmemizi sağlaması açısından anahtar rol oynar. Bu bağlamda, bu çalışma PISA 2012 verilerini kullanarak, PISA 2012 matematik sınavında Türk öğrencilerinin performanslarını en başarılı beş ülke (Çin, Singapur, Kore, Japonya ve Lihtenştayn) ve son beş ülke (Ürdün, Kolombiya, Katar, Endonezya, Peru) ile insan kaynakları (öğretmen maaşı), öğretmen-öğrenci oranı, okuldan sonra öğrenmeye ayrılan zaman ve sosyal aktiviteler açısından

karşılaştırmıştır. Türkiye ve çalışmaya dahil edilen ülkelerin verileri düzenlenmiş ve ortalama, yüzde ve frekans dağılımları karşılaştırmalı olarak tablolarda sunulmuştur.Çalışmanın sonuçlarına göre tartışılan değişkenler bir bütün olarak değerlendirildiğinde Türkiye'nin öncelikli olarak öğrencilerin matematik performanslarını arttırması gerektiği söylenebilir. Böylece öğrenciler karmaşık problem çözme becerilerine ve yüksek beceri gerektiren yönetsel, profesyonel ve teknik mesleklere sahip olabilirler. Çalışmanın sonuçlarına göre Türkiye en başarılı beş ülkeden, son beş ülkeden ve OECD ortalamasından bahsi geçen değişkenler açısından geri kalmış durumdadır. Matematik performansını arttırmak için Türkiye politika yapıcıları, matematik performansı üzerine doğrudan etkisi olan yukarıda bahsi geçen değişkenler konusunda ivedi iyileştirme adımları atmalıdır.

Anahtar Kelimeler: PISA 2012, Matematik, Öğrenci Performansı

1. INTRODUCTION

Students' academic achievement is associated with several independent factors. Therefore, the desire to understand and identify factors that may have meaningful and consistent relationships with achievement has been shared among national policy makers and educators around the world. By collaboratively supporting and participating in a large-scale international achievement studies like TIMSS and PISA, it is believed that the rich data collected in each study would include sufficient variability to permit the revelation of important relationships that would otherwise escape detection (Wagemaker, 2003). PISA results as well as TIMSS have offered an opportunity to analyse the level of the national success in a variety of ways. All this research-based information has made it possible for us to identify strengths and weaknesses in our educational sysytem with urgent political decisions to be taken.

In this context one of the most important factors related to success is the problem of equity. The lack of availability of equal educational opportunities for individuals by reason of race, color, religion, or national origin in publiceducational institutions at all levels is clearly a subject to be discussed. Equality of Educational Opportunity Report (Campbell, Coleman, Hobson, McPartland, Mood, Weinfeld & York, 1966) suggested the primary contribution of several factors in students' success. The report further suggested that students from poverty, lacking the prime conditions or values to support education, could not learn. Similarly, fairness in resource allocation is not only important for equity in education, but it is also related to the performance of the school system as a whole.

Socio-economic disadvantage is closely interconnected with many of the student and school characteristics that are associated with performance. Although poor performance in school does not automatically stem from disadvantage, the socio-economic status of students and schools does appear to exert a powerful influence on learning outcomes. However, differences across countries in the extent to which student-level factors (such as family structure, parents' job status and immigrant background) and school-level factors (such as how resources are allocated across schools) are associated with performance show that policies and practices have an impact on both equity and performance (OECD, 2013).

According to OECD reports disadvantaged schools still report greater difficulties in attracting qualified teachers. In other words, in disadvantaged schools, more resources do not necessarily translate into better-quality resources. This suggests that many of their students face the double drawback of coming from a disadvantaged background and attending a school with lower-quality resources. Evidence from PISA shows that school systems that segregate students according to their performance tend to be those where students are also segregated by socio-economic status and by the frequency of their exposure to formal mathematics (OECD, 2013).

The OECD Programme for International Student Assessment (PISA) answers the questions of whether students are well prepared for future challenges, if they can analyse, reason and communicate effectively and whether they have the capacity to continue learning throughout life. The major challenge for education policy is to foster high overall levels of student achievement (quality), while limiting theinfluence of socio-economic contexts on learning outcomes (equity), which can be considered an indicator of inefficiencies in education systems to fully capitalise on the cognitive potential of students. PISA allows the twin goals of quality and equity in education to be monitored by considering not only differences in results by country, but also performance differences between students and schools from varying socio-economic contexts. PISA results show that beyond a certain level of expenditure per student, excellence in education require smore than money: how resour-

ces are allocated is just as important as the amount of resources available (OECD, 2012).

Comparing education systems via various reference points enables countries to assess themselves in light of other countries' educational performance by providing a rich and internationally comparable set of data. This comparison not only support countries' understanding of their education systems by placing them in a global context but also provide valuable information on where they stand different areas. In addition to this, the reference point provides information on financial and human resources invested in education, organisation of schools, the impact of learning on economic and social outcomes. In this context, it is possible to state that PISA assesment system promote education policy development by highligting successful education outcomes and strategies (OECD, 2014). It also create a cooperation atmosphere by enabling countries to learn from each others' experiences.

Various groups of people who have legal or social responsibilities toward to the quality of the education system of the country may have knowlegde through PISA. It provides comperative global statistics on education for researchers, examples of successful educational practices across the world for educators, information to understand and improve the performance of the national education system for policy makers. Evaluating PISA is important in terms of developing policies for future and it enables not only understand the current situations of countries but also make comparisions between countries. In this context Turkey Ministry of National Education (MEB) declares the aim of participation of PISA as "In globalized world in addition to the national assessments of education it is a necessity to determine our education systems's performance at international level via educational indicators. Thus, our country participates PISA as a OECD member to evaluate our education systems' performance level, overcome the deficiencies, determine the precautions and to enhance the performance level of our education system according to some reference points" (MEB, 2009).

Indeed, some countries, such as Denmark and Germany, responded to PISA 2000 results by introducing major school and curricular reforms that included someof these changes. Some countries have introduced system-wide reforms that are aimed at moving towards more comprehensive schooling (Poland) or less tracking (Germany). These reforms simultaneously address various sources of inequity, such as socio-economic disadvantage, an immigrant background, or achallenging family structure. Brazil, Colombia, Estonia, Israel, Japan and Poland, all of which have improved their performance in PISA, have established policiesto improve the quality of their teaching staff by adding to the requirements to earn a teaching license, offering incentives for high-achieving students to enter the profession, increasing salaries to make the profession more attractive, or providing incentives for teachers to engage in in-service teacher-training programmes (OECD, 2013).

The 2012 PISA study and its after math led to a public outcry in Turkey. Turkish students were placed well below the OECD average in all three test subjects. In an intense political debate that followed the first shock in Turkey, priorities have beeen discussed. This paper analyses the Turkish student performance in maths proficiency PISA 2012 comparing with that of the most successful five countries (China, Singapore, Korea, Japan, Liechtenstein) and the last five (Jordan, Colombia, Qatar, Indonesia, Peru) in human resources (teacher salary), student-teacher ratio, learning time after school, social activities using PISA data.

2. METHOD

This paper is modelled as a secondary survey and secondary data were obtained from PISA 2012 report. Secondary data analysis is reanalysing of data which were collected by governements, international or private fondations. This analysis enables researchers to compare international datas and examine the changes in time. In secondary data analysis process, after researchers sort out data which are usable for their research, they select variables from this datas (Neuman, 2006).

This paper analyzes the difference in students' mathematics performance in PISA 2012 of the most successful five countries (China, Singapore, Korea, Japan, Liechtenstein) with the last five countries (Jordan, Colombia, Quatar, Indonesia, Peru) and Turkey with the scope of human resources (teacher salary), student-teacher ratio, learning time after school and social activities using PISA 2012 data. Among the countries incorporated in the

study, China is an exeptional one. China participated PISA 2012 with four seperated regions such as Shanghai, Hong Kong, Chinese Taipei and Macao (PISA 2012 Results). Assessing the results of regions of China seperately may tend to be unfair to other countries and may not give us a panoramic and objective perspective about the country. Therefore the results of regions of China were averaged and presented under "China" topic as a whole. Since the theme of PISA 2012 was mathematics performance (PISA 2012 Results), data were gathered from PISA 2012 reports based on mathematics performances.

While data were being analyzed, data of Turkey and relevant countries were arranged and presented comperatively with tables which used means, frequency and percentage. In tables, firstly mathematics performances of relevant countries were presented, then these performances examined with the variables of human resources (teacher salary), student-teacher ratio, learning time after school and social activities comperatively.

3. RESULTS

3.1. Comparisons of Student-Teacher Ratio

Student-teacher ratios of top five and last five countries, Turkey and OECD mean and their Mathematics performances in PISA 2012 are presented in Table 1.

Table 1.Comparisons Of Student-Teacher Ratio

Country	Mathematics performance	Student-teacher ratio in school	Student-math teacher ratio in school
China	568	15,15	123,67
Singapore	573	14,60	85,80
Korea	554	16,10	132,60
Japan	536	11,60	96,50
Liechtenstein	535	8,00	40,70
OECD	**494**	**13,30**	**106,10**
Turkey	**448**	**17,40**	**181,90**
Jordan	386	17,0	157,1
Colombia	376	27,0	246,8
Qatar	376	13,9	108,5
Indonesia	375	16,9	166,6
Peru	368	18,5	131,8

When compared with top ten countries and OECD mean, it is seen that student-teacher ratio in Turkey is higher according to Mathematics performancein PISA 2012. When compared to last five countries, Turkey gets behind the countries except Colombia especially in terms of student-math teacher ratio.

3.2. Comparisons of Student-Teachers Ratio According to Schools' Socio-Economic Profiles and Mathematics Performance

Student-teacher ratio according to schools' socio-economic profiles and Mathematics performances of top five countries, last five countries, Turkey and OECD mean in PISA 2012 is presented in Table 2.

Table 2.Comparisons Of Student-Teachers Ratio According To Schools' Socio-Economic Profiles

Country	Mathematics performance	Student-teacher ratio according to schools' socio-economic profiles		
		Socio-economically disadvantaged schools	Socio-economically average schools	Socio-economically advantaged schools
China	568	15,9	14,7	14,7
Singapore	573	14	14,3	15,9
Korea	554	14	17	16,6
Japan	536	10	12	13
Liechtenstein	535	*c	7,7	*c
OECD	**494**	**12,5**	**13,4**	**13,8**
Turkey	**448**	**20,7**	**16,9**	**14,2**
Jordan	386	16,7	17,8	15
Colombia	376	26	28,8	25,4
Qatar	376	12,5	11,8	16
Indonesia	375	17,9	15,6	16,7
Peru	368	17	18,3	20,1

* There are too few observations or no observation to provide reliable estimates.

Student-teacher ratio in socio-economically disadvantaged schools in Turkey is higher than top five countries according to mathematics performance. Turkey has higher student-teacher ratio than both OECD mean and last five countries except Colombia. Student-teacher ratio in socio-economically average schools in Turkey is higher than top five countries except from Korea according to mathematics performance. It is obviously seen that while Turkey is left behind the OECD mean, it could pass the last five countries apart from Qatar. Student-teacher ratio in socio-economically disadvantaged schools in Turkey is higher than the last countries and China, Singapore and Korea which are one of the top five countries according to Mathematics performance. However the student-teacher ratio in Turkey couldn't reach the OECD mean.

3.3. Comparisons of Ratio of Salary at top of Scale to Starting Salary and Mathematics Performances

Ratio of salary at top of scale to starting salary and Mathematics performances of top five countries, last five countries, Turkey and OECD mean in PISA 2012 is presented in Table 3.

Table 3. Comparisons Of Ratio Of Salary At Top Of Scale To Starting Salary

Country	Mathematics performance	Ratio of salary at top of scale to starting salary	
		Lower secondary education	Upper secondary education
China	568	2.37	2.71
Singapore	573	2,69	2,69
Korea	554	2,78	2,78
Japan	536	2,21	2,27
Liechtenstein	535	1,62	1,62
OECD	**494**	**1,61**	**1,62**
Turkey	**448**	***a**	**1,15**
Jordan	386	2,75	2,75
Colombia	376	1,55	1,81
Qatar	376	1,67	1,67
Indonesia	375	1,45	1,41
Peru	368	1,05	1,05

***** The category does not apply in the country concerned. Data are therefore missing.

Ratio of teachers' salary at top of scale to starting salary in upper secondary education in Turkey is lower than top five countries according to Mathematics performance. Turkey which was left behind the OECD mean, was left behind the last five countries except Peru, too. Since the data about ratio of teachers' salary at top of scale to starting salary in lower secondary education in Turkey, any comparison couldn't be presented.

3.4. Comparisons of Percentage of Mathematics Teachers Attending Professional Development Programs According to Schools' Socio-Economic Profiles and Mathematics Performances

According to principals' report, percentage of attending professional development programs of mathematic teachers in terms of schools' socio-economic profiles and Mathematics performance of top five countries, last five countries, Turkey and OECD mean in PISA 2012 is presented in Table 4.

Table 4.Percentage Of Mathematics Teachers Attending Professional Development Programs According To Schools' Socio-Economic Profiles

Country/Region	Mathematics performance	Schools' socio-economic profiles		
		Socio-economically disadvantaged schools	Socio-economically average schools	Socio-economically advantaged schools
China	568	49.82	49.45	62.77
Singapore	573	62,2	68,7	68,4
Korea	554	32,5	30,8	31,3
Japan	536	24,2	17,3	25,1
Liechtenstein	535	*c	23	*c
OECD	**494**	**37,4**	**37,4**	**42,2**
Turkey	**448**	**8,3**	**12,2**	**41,4**
Jordan	386	31.6	30.9	38.6

Colombia	376	13.0	23.8	27.9
Qatar	376	77.1	84.2	73.8
Indonesia	375	39.4	39.9	49.6
Peru	368	23.9	31.2	44.4

* There are too few observations or no observation to provide reliable estimates.

It can be clearly seen from Table 4 that in general, teachers work in socio-economically disadvanteged schools attend professional development programs less than teachers work in socio-economically average and advantaged schools. When taken into consideration the professional development program attendance of teachers work in socio-economically advanged and disadvantaged schools, the highest difference is seen in data of Turkey (attendance of teachers work in advantaged schools 41,4%; attendance of teachers work in disadvantaged schools 8.3 %). Teachers in Turkey attend to professional development program less than top five countries, OECD mean and last five countries according to Mathematics performance.

3.5. Comparisons of Percentages of Students Attending After School Lessons and Mathematics Performance

Percentages of students attending after school lessons and Mathematics performance of top five countries, last five countries, Turkey and OECD mean in PISA 2012 is presented in Table 5.

Table 5. Percentages Of Students Attending After School Lessons

Country	Mathematics performance	No attendance	Less than 4 a week	4 a week or more
China	568	46.25	41.55	12.2
Singapore	573	32.5	49.6	18.0
Korea	554	34.0	39.7	26.3
Japan	536	30.2	55.7	14.1
Liechtenstein	535	74.0	21.7	4.3
OECD	**494**	**62.1**	**30.0**	**7.9**
Turkey	**448**	**66.1**	**24.0**	**9.9**
Jordan	386	51.3	33.4	15.3
Colombia	376	34.5	42.9	22.6
Qatar	376	42.3	39.3	18.5
Indonesia	375	54.0	37.4	8.7
Peru	368	28.1	43.2	28.6

Percentages of students attending after school lessons are presented in three categories such as "no attendance, less than 4 a week and 4 a week or more". According to Table 5, while 66,1 % of students in Turkey didn't attend after school lesson, 62,1 % students in OECD mean students didn't attend after school lessons. Based on these data, Turkey was left behind both OECD mean and last five countries according to Mathematics performance. In consequence of these results, it is obvious that avarage points of the students attending after school lessons of Liechtenstein are left behind the other countries. With regard to this finding, it is necessary to examine the quality of the after school activities' programme of these countries.

3.6. Comparisons of Percentage of Students Attending Following

Activities and Mathematics Performances

According to principals' raports, percentages of students attending following activities and Mathematics performance of top five, last five, OECD mean and Turkey are persented in Table 6.

Table 6. Percentage Of Students Attending Following Activities

Country	Mathematics performance	Mathematics Club	Mathematics Competitions	Chess Club
China	568	65.35	76.32	61.45
Singapore	573	20.7	86.9	27.6
Korea	554	76.4	75.9	92.8
Japan	536	6.5	12.0	35.9
Liechtenstein	535	2.9	34.1	0.0
OECD	**494**	**62.1**	**30.0**	**7.9**
Turkey	**448**	**66.1**	**24.0**	**9.9**
Jordan	386	51.3	33.4	15.3
Colombia	376	34.5	42.9	22.6
Qatar	376	42.3	39.3	18.5
Indonesia	375	54.0	37.4	8.7
Peru	368	28.1	43.2	28.6

In table 6, activities which schools present for their students are categorized in three headings. According to these headings, percentage of students who attend Mathematics competitions and Mathematics club in Turkey was less than both OECD mean and the last five countries according to Mathematics performance. It is interesting to notice some extreme positions in some attitudes. The students' attendance of mathematic clup at the countries of which mathematic performance is higher, Japan and Liechtenstein, is lower than other countries. At first glance it seems somehow contradictory. In order to evaluate this finding, it is necessary to focus on these countries mathematic curriculum and after school activities. Besides from table 6 it can be clearly seen that percentage of students attending Mathematics club was higher than Japan, Liechtenstein.

4. DISCUSSION

This paper analyzed the difference in students' mathematics performance in PISA 2012 of the most successful five countries (China, Singapore, Korea, Japan, Liechtenstein) with the last five countries (Jordan, Colombia, Quatar, Indonesia, Peru) and Turkey with the scope of teacher salary, student-teacher ratio, learning time after school and social activities using PISA 2012 data. PISA 2012 calculates the student-teacher ratio according to school principals' reports which include the total number of teachers and students in their schools. However according to PISA report student-teacher ratio is not equivalent to class size. Since schools with large special education programmes tend to have many teachers, but the size of regular classes is not reduced by the school's high teacher-student ratio (OECD, 2013). According to research result, teachers in Turkey tend to have more students than OECD mean, top five countries and last five countries except Colombia and Peru. Besides mathematics teachers in Turkey tend to have more students than OECD mean, top five countries and last five countries except Colombia. Researchers have shown that student-teacher ratio effects the academic achievement (Pangeni, 2014; Willms & Somers, 2001; Wößmann, 2003). As student per teachers is increasing, academic achievement is getting worse. Since instructional time spent on subjects, homework assignments, feedback and actively involving students in the classroom are the major factors related to educational quality (Fuller, 1987). While in terms of student-teacher ratio Turkey is close to OECD mean, in terms of student-mathematics

teachers ratio it gets behind considerably even last five countries. To overcome this challenge Turkey can employ more mathematic teachers so that students' mathematics performances can be better.

Since the difference of socio-economic status is considerable in Turkey, analyzing the student-teacher ratio in scope of socio-economic levels of schools can be more meaningful. Therefore the student-teacher ratio in schools in different socio-economic level was selected as a variable. According to research results, student-teacher ratio in socio-economically advantaged, average and disadvantaged schools in Turkey is higher than both OECD mean and top five countries. Besides, it is clearly seen from the results that while the difference between student-teacher ratio in socio-economically advantaged and disadvantaged schools in OECD mean and the top countries are low, in Turkey this difference is higher than even the last five countries. It means that disadvantaged schools tend to have more students per teacher than advantaged schools and the equal oppotunities are not provided to students from different socio-economic level for their education. In other words, the students in socio-econmically advantaged schools can get the chance of being taught maths in smaller groups while the students in socio-economically disadvantaged have to struggle for the same purpose in highly populated classrooms. It is stressed that teachers should give feedback before, during and after learning tasks, as well as after assessments; should can help students to keep learning efforts on a same high level; and create powerful learning environments (Schelfhout, Dochy, Janssens, Struyven & Gielen,2006). At this point student-teacher ratio can be a vital role for students' learning process. However the most important thing is that this opportunity should be provided for all schools in different socio-economic status. In any case there is a relationship between socio-economic statues and mathematics achievement (Okpala, 2002; Patton, 2003; Secada, 1992). After the inequality of student-ratio is added to this, the gap between schools is getting larger. As Strutchens and Silver (2000) suggested, socio-economic status is related to academic achievement and it is so entangled that it should be studied thoroughly. Turkey, who left behind top five countries, OECD mean and some last five countries in terms of student-teacher ratio in different socio-economic status, should two substantial attempts. The first one is that it should balance the student-teacher ratio in schools in different socio-economic status; the second one is that it should decrease student-teacher ratio as much as it can.

Not only student-teacher ratio, but also teachers' salary affects the students' academic performances. According to research results, teachers' salary at top of scale to starting salary in upper secondary education in Turkey is lower than top five countries according to Mathematics performance. In addition, Turkey was left behind the OECD mean. Teachers' salaries represent the largest single cost in expenditure on education. PISA shows that high-performing systems tend to prioritise the quality of teachers over aspects such as the size of classes, especially in high-income countries. It is clear that higher salaries can help school systems to attract the best candidates to the teaching profession (OECD, 2014). Researches have also shown that one of the major factors to recruit and retain qualified teachers is the teaching salary (Odden & Kelley, 1997). On the contrary, Hanushek (1989) presented a convincing statement that there exists no statistically significant effect between student achievement and teacher salaries. Conversely, in a meta-analysis that included Hanushek's data, Hedges and Greenwald (1996) found a systematic relationship between resource input (such as teacher salary) and student achievement. Similarly, a later work by Aksoy and Link (2000) found a relationship between teacher salary and student achievement. During their examination of key variables measuring time spent learning math and their effect on high school math achievement, they determined that beginning district-level teacher salary is an important indicator of student achievement across all samples used. In terms of equity, it is possible that the considerable increase in teacher salaries contributes to significant increase in students' academic achievement.

It is known that teacher salary is a extrinsic motivation for teachers' performance. However professional development programmes which directly affect the teachers' performance can be assumed as an intrinsic motivation for them. Not only for motivation for themselves, teacher development is vital for a school's ability to grow. It begins with teachers holding advanced degrees in the subject that they teach. The better the teacher's education, then the better the results of student achievement will be. When we examine the PISA

results teachers in Turkey attend to professional development program less than OECD mean. It is clear that many high achieving nations organizes extensive professional development regardless of school's socio-economic profiles. According to the results it is evident that the systems which support its teachers for being highly qualified, has the ability to positively affect students educational experiences. Reasearch at the literature supports this evidence. For instance Hackett (2005) states that students perform better when their teachers are engaged in several of the aspects of high quality professional development. Similarly the students who are getting education at the school disctricts which supports teachers' professional development and affords in-service opportunities demonstrates high classroom performances (Darling-Hammond &Berry, 2006; Hurwitz & Hurwitz, 2005; Rivers & Sanders, 2002).

It is clear that learning is a collaborative process especially between teachers and students who play the key roles in this process. Therefore not only teachers make an effort, but also students endeavour as much as their teachers. Student engagement and interest in learning is a key aspect of time-on-task. A growing body of research has found that students' participation in after school programs is beneficial to academic achievement (Mahoney, Lord & Carryl, 2005; Pierce, Hamm & Vandell, 1999; Posner & Vandell, 1994). After school programmes increase learning time by providing learning opportunities that are more engaging, broadening students' skills and interests. In the countries ranking the highest on the PISA, there is increasing variety in after school activities; these countries no longer emphasize practicing routine test items (Baker, 2012). Since the types and purpose of after-school programs vary widely, it could be that some students who aren't performing well in a given subject attend after-school programs to catch up with their classmates. However the PISA results on this topic suggests that it is the quality of regular after-school programs, not the quantity of learning hours, that has the most impact on students' performance. It is evident that the students in Turkey spend more time at after-school programs than students in Liechtenstein however their performance level is lower. Therefore while evaluating these data, it is necessary to keep in mind not only quantity of the after-school programs but also the quality of them.

The report PISA 2012 states that in modern societies, all of life is problem solving. Complex problem-solving skills are particularly in demand in fast-growing, highly skilled managerial, professional, and technical occupations. Mathematics play an important role for enhancing problem solving skills. Therefore while examining students' math scores at PISA, it is significant to evaluate their attendance maths clup, maths competitions and chess club which develops boundless potential of the mind. All of these activities enables focusing, critical thinking, abstract reasoning, strategic planning, analysis, creativity, evaluation and synthesis. According to the PISA results students in Turkey attends mathematics clubs and competition less than OECD average however their attendane to chess clup is nearly higher than all top ten countries. Therefore it is required to evaluate the qualitiy of the chess clups in schools.

Evaluated as a whole in the scope of variables discussed, it can be said that first of all Turkey should increase its mathematics performances. Therefore students can have complex problem-solving skills and highly skilled managerial, professional, and technical occupations. Since mathematics performances are affected by various factors such as teachers' salary, teachers development programmes, student-teacher ratio, students' participation after school lessons and after school activities, these factors should be considered and examined thoroughly. According to results of study, Turkey is left behind the most successful five countries (China, Singapore, Korea, Japan and Liechtenstein), the last five contries (Jordan, Colombia, Quatar, Indonesia and Peru) and the OECD mean in the scope of the most of these variables. To icrease its mathematics performances, policy makers in Turkey should make an urgent improvement attempts about discussed variables which directly affect the mathematics performances.

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