Analysis of PISA 2009 Exam according to some variables

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Within this research, maths, reading and science skills of the students at the age group 15 were aimed to be examined according to some variables in the scope of the Programme for International Student Assessment (PISA) 2009. Research was carried out with 4,996 students at the age group 15 and is patterned in screening model. One-way analysis of variance was used in data analysis. According to the research findings, a significant difference was obtained in students' maths, reading and science skills with regard to their having quality time at home with their parents. In the comparison made by taking into account Parents' education level and socio-economic status, a significant difference in the students' maths, reading and science skills was found as well.

Introduction

Individuals ensure their personal developments and keep up with the world via education. With respect to this, international exams are important indicators in the evaluation of an education system of a country. Programme for International Student Assessment (PISA), is one of the widest and biggest educational researches organized by Organization for Economic Co-Operation and Development (OECD). Within this research carried out once in three years since 2000, students' (age group 15) acquisition level of skills which are necessary for taking place in the modern society have been assessed in OECD member states and the other participant states (nearly 90% of world economics). Additionally, the basic skills such as motivation and problem solving are accepted as criteria that establish the ground for self-guided learning and individual and independent study (EARGED, 2010).

In the PISA project, the students who are at age group 15 and arrive in the end of their compulsory education have been subjects of PISA projects, not only their learning levels but also their

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competences in applying their learning outcomes in school life and out of school life, understanding the future conditions they will face, solving the problems, making estimations in unknown issues and benefitting from their knowledge and skills so as to make a judgement aimed to be determined (EARGED, 2010).

PISA results is used for comparing students' knowledge and skills with other countries including Turkey participating to this educational research, establishing standards for increasing educational level by means of average scores gained by countries and educational outputs, determining capacities to provide the highest level of equality of educational opportunities and the strengths and weaknesses of educational systems.

Theoretical Framework

When the literacy about PISA is examined, Berberoğlu ve Kalender (2005); have demonstrated that there are differences in regard school types rather than regional differences. Students need to be helped for using basic skills in their daily life. Anıl (2009); within PISA 2006, considering 15 age group students in Turkey; their success in science education stated that the most predictive variable was the fathers' education. About being successful in PISA, Eraslan (2009) stated that we should focus on some factors such as teacher development program, traditional school life, cultural perspective to teaching as a profession, in-service teacher training. Sarıer (2010) showed that there are differences in regards to gender and regions according to PISA results. Examining equality of cross-cultural structure of survey questions for the field of science in PISA 2006, Çetin (2010) determined that parameters between cultures or countries have been changed. Turmo (2004) showed that there is a relationship between socio-economic status of families and students' science literacy in his research. Ceylan (2009) revealed that high performing students have higher socio economic status when compared to high performing schools with low performing schools in PISA 2006. Ho (2010) showed that in his study differences in success arising from socioeconomic levels of students is being less in Hong Kong. Güzel and Berberoğlu (2010) used mathematic literacy to show the importance of effective parameters explaining students' academic performance. When compared to the students in other countries, it has been determined that Turkish students have positive attitudes towards mathematics but the relation between these positive attitudes and better academic performance in education system has not been established.

Akyüz and Pala (2010) have revealed that mathematics literacy has positive effects on problem solving skills. It has been found a positive relation between students' attitudes towards mathematics and mathematics literacy. Among teachers representing Turkey and Greece, it has been found a negative significant relationship between teachers' interests about students and mathematics literacy. In addition, it was determined that class discipline has positive effects on mathematics literacy in Turkey and Greece. Anagün (2011) regarding PISA 2006; has found that students' self-perception for science learning and attitudes during teaching-learning process has no effect on science literacy. On the other hand, Aşkar and Olkun (2005) using PISA 2003 data, it was shown that access to computers in Turkey is below normal comparing OECD countries. Students who can access to computer in school have higher scores of solving mathematics and problems when compared to the students who have no access. Also students having computer in their house have higher scores of solving mathematics and problems when compared to the students who have no computer.

PISA 2009 is the first application for reading skills as main area for Turkey. At the same time, student surveys of social, cultural, economic and educational issues have been applied in PISA 2009. In this study it is aimed to find out student's mathematics, reading and science literacy according to these situations: case of having time together with mother, case of having time together with father, status of mother's mandatory education and secondary education, status of

father's mandatory education and secondary education, status of mother's graduation, status of father's graduation, status of mother's employment, status of father's employment.

Methodology

Researches aiming to describe the facts in the past or present as it is, are organized researches regarding descriptive model (Karasar, 2003). In this study it is revealed social, cultural, economic and educational student existing performance issues. Accordingly, this research is a study patterned descriptive model.

Working Group

The information used in this research is obtained from Turkish Ministry of National Education. The selection of the working group is determined by random selection from 170 schools via stratification of 12 statistical territorial unit grouped by 56 province and school types. The working group of the research is constituted by 4996 students currently studying in Primary, General High School, science school, Anatolian Teacher High School, Anatolian Fine Arts High School, Vocational High School, Anatolian Vocational High School, Technical High School, Anatolian Technical High School and Multi-Program High School. 2445 of the students in the working group (48,9%, average of age =20,58, SD=1,57) are girls and the rest 2551 (%51.1, average of age=21.53, SD=1.62) are boys.

Data Collection Instruments

In this study students' answers to PISA 2009 questionnaire are used. PISA 2009 student questionnaire contains a lot of information about students' general properties (class, age, gender, etc…), students' family infrastructure (case of spending time with mother/ father, status of parent's mandatory education and secondary education, status of mother's/ father's graduation, status of having computer for school lessons, having educational computer program, number of books). Furthermore this questionnaire contains questions about student's mathematics, reading and science literacy.

Data Analysis

In the statistical analysis of the data one-way analysis of variance techniques are used. In the case of the value of F was found significant, Scheffe test was used so as to determine the cause of the difference.

Findings

Below, students' maths, reading skills and science average scores, and results are given in the circumstances of such as having time with mother at home, having time with father at home, mothers' compulsory education and secondary education level, mother's graduation from a university, father's graduation from a university, mother's employment situation and father's employment situation.

Tablo 1. Standard Deviation Distributions and Averages of Maths, Reading and Science skill points of the students.

Graduation	N	Mean	Sd.
Maths	4996	446.91	91.98
Reading	4996	466.42	80.19
Science	4996	455.45	79.12

After examining the Table 1, it is found that the highest average score is for Reading skills whilst

the lowest average score is for Maths skills (446,91).

Scores of students' skills in relation to having time together with parents at home.

Table 2. The averages, standard deviations and "f" values of the students' skill scores in relation to the students' having time together with their mothers at home.

	Having time with mother n=4130		Not having time with mother n=708			
	X	**S**	**X**	**S**	**F**	**p**
Mathematics	460.61	89.46	382.34	71.47	488.40	.00**
Reading	483.41	87.41	401.26	88.99	519.52	.00**
Science	466.83	75.90	400.90	69.81	466.56	.00**

*p<.05, **p<.01

After examining Table 2, a significant difference was determined between the averages of maths, reading and science scores of the students depending upon their having time together with their mothers.

Table 2. The averages, standard deviations and "f" values of the students' skill scores in relation to the students' having time together with their fathers at home.

	Having time with father n=3865		Not having time with father n=876			
	X	**S**	**X**	**S**	F	**p**
Mathematics	460.88	89.43	396.63	79.74	383.10	.00**
Reading	484.18	86.86	414.98	92.53	406.27	.00**
Science	466.85	75.83	414.46	73.95	344.05	.00**

*p<.05, **p<.01

After examining Table 3, a significant difference was determined between the averages of maths, reading and science scores of the students depending upon their having time together with their fathers.

Scores of students' skills in relation to parents' education level

Table 4. The averages, standard deviations and "f" values of the students' skill scores in relation to the students' mothers' education levels.

	Non Graduate n=655		Graduate of Primary n=2369		Graduate of Secondary n=849		Graduate of High School (3B) n=31		Graduate of High School (3A) n=867		F	p
	X	S	X	S	X	S	X	S	X	S		
Maths	404.25	80.60	438.47	82.86	448.58	88.86	396.09	64.01	515.10	91.00	188.23	00**
Reading	425.62	91.64	468.45	84.44	467.05	91.30	415.84	90.10	525.61	82.42	146.83	00**
Science	426.80	75.22	449.20	72.59	450.69	75.96	427.73	68.75	510.74	75.24	150.81	00**

*p<.05, **p<.01

After examining the Table 4, a significant difference is found between the students' average scores in the case of the students' mothers' education level (compulsory and secondary education). According to the Scheffe test results which was done by taking into account the students' mothers' education level (compulsory and secondary education) in order to determine in which groups the difference between the maths scores exists, it is determined that the average of the mothers who are not graduate (x=404,25) from any of the schools; higher than the average of primary school graduates (x=438,47), secondary school graduates (x=448.58), high school graduates (3B) (x=396.09) and high school graduates (3A) (x=515.10).

According to the results of Scheffe test results which was done in order to determine in which

groups the difference between the reading skills scores exists, it is determined that the average of mothers who are primary school graduates (x=468,45), secondary school graduates (x=467.05), high school graduates (3B) (x=415.84) and high school graduates (3A) (x=525.61) are higher than mothers who are not graduate (x=425,62) from any of the schools.

According to the results of Scheffe test results which was done in order to determine in which groups the difference between the science skills scores exists, it is determined that the average of mothers who are not graduates of any schools (x=426.80) is higher than primary school graduates (x=449.20), secondary school graduates (x=450.69), high school graduates (3B) (x=427.73) and high school graduates (3A) (x=510.74)

Table 5. The averages, standard deviations and "f" values of the students' skill scores in relation to the students' mothers' education levels.

	Non Graduate n=202		Graduate of Primary n=1667		Graduate of Secondary n=1178		Graduate of High School (3B) n=89		Graduate of High School (3A) n=1610		F	p
	X	S	X	S	X	S	X	S	X	S		
Maths	389.43	75.19	426.34	81.39	425.69	81.85	435.76	91.12	496.96	90.16	207.56	00**
Reading	400.34	101.14	451.46	84.20	454.19	88.50	468.10	98.17	515.18	82.16	179.24	00**
Science	406.02	72.64	439.91	72.08	439.28	72.63	443.05	75.75	495.06	75.10	173.43	00**

*p<.05, **p<.01

After examining the Table 5, a significant difference is found between the students' average scores in mathematics, reading and science skills in the case of the students' fathers' education level (compulsory and secondary education). According to the Scheffe test results which was done by taking into account the students' fathers' education level (compulsory and secondary education) in order to determine in which groups the difference between the maths scores exists, it is determined that the average of the fathers graduates of primary school (x=426.34), secondary school (x=425.69), high school (3B) (x=435.76) and high school (3A) (x=496.96) higher than the average of who are not graduate from any of the schools (x=389.43).

According to the results of Scheffe test results which was done in order to determine in which groups the difference between the reading skills scores exists, it is determined that the average of the fathers who are graduates of primary school (x=451.46), secondary school (x=454.19), high school (3B) (x=468.10) and high school (3A) (x=515.18) higher than the average of who are not graduate from any of the schools (x=400.34)

As for science scores, it is determined that the average of the fathers who are graduates of primary school (x=439.91), secondary school (x=439.28), high school (3B) (x=443.05) and high school (3A) (x=495.06) higher than the average of who are not graduate from any of the schools (x=406.02)

Scores of students' skills in relation to parents' graduation situations from a University

Table 6. The averages, standard deviations and "f" values of the students' skill scores in relation to the students' mothers' graduation situation from a University.

	Mother is a Graduate of a University n=238		Mother is not a Graduate of a University n=3975			
	X	S	X	S	F	p
Mathematics	550.11	91.82	443.91	88.65	320.98	.00**
Reading	550.49	90.02	468.27	91.00	199.13	.00**
Science	534.91	79.65	453.02	76.81	254.23	.00**

*p<.05, **p<.01

After examining Table 6, a significant difference can be seen between the averages of maths, reading and science scores of the students depending upon their mothers' graduation situation from a University.

Tablo 7. The averages, standard deviations and "f" values of the students' skill scores in relation to the students' fathers' graduation situation from a University.

	Father is a university graduate n=611		Father is not a university graduate n=3586			
	X	S	X	S	F	p
Mathematics	519.24	91.70	438.84	87.05	438.34	.00**
Reading	530.65	83.38	463.29	90.81	360.32	.00**
Science	513.44	75.33	448.76	76.03	378.75	.00**

*p<.05, **p<.01

After examining Table 7, a significant difference can be seen between the averages of maths, reading and science scores of the students depending upon their having time together with their mothers.

Scores of students' skills in relation to parents' employment situation

Table 8. The averages, standard deviations and "f" values of the students' skill scores in relation to the students' mothers' employement situations.

	Unemployed n=3934		Looking for a job n=174		Part-time Job n=102		Full-time Job n=502			
	X	S	X	S	X	S	X	S	F	p
Mathematics	448.69	88.50	429.47	87.29	456.32	101.42	482.01	100.70	24.30	.00**
Reading	473.22	88.45	447.69	92.29	473.46	84.25	501.29	93.98	22.92	.00**
Science	457.32	76.11	429.07	82.39	461.71	83.37	485.13	83.95	22.68	.00**

*p<.05, **p<.01

A significant difference can be seen between the averages of mathematics, reading and science skills scores of the students according to their mothers' employment status (unemployed, looking for a job, part-time and full time)

Table 8. The averages, standard deviations and "f" values of the students' skill scores in relation to the students' fathers' employment situations.

	Unemployed n=1125		Looking for a job n=400		Part-time Job n=427		Full time Job n=2716			
	X	S	X	S	X	S	X	S		
Mathematics	445.59	87.63	404.38	79.71	438.36	80.82	461.28	93.93	51.54	.00**
Reading	469.04	89.22	435.75	90.93	454.21	84.40	486.15	88.94	53.65	.00**
Science	457.88	75.70	425.21	74.23	442.82	72.41	466.36	79.47	39.75	.00**

*p<.05, **p<.01

A significant difference is determined between the averages of mathematics, reading and science skills points of the students according to their fathers' employment status (unemployed, looking for a job, part-time and full time)

Discussion

One of the findings from this research is skill score of mathematics, reading and science in PISA 2009 regarding time spending with mother/father shows significant difference. For a child, most important people within first social environment are his/her parents. As the child grows up and understands human relationships, s/he experiences sense of recognizing him/herself (Crow and Graham, 1973). In this way, s/he becomes more independent from him/her parent. Since increasing

emotionally independency from parents is related more academic conformity, this was in accordance with the finding of this research. (Hoffman, 1984).

According to parental educational status, parents not graduated from any school comparing parents graduated elementary, secondary, high school 3A-3B showed significant differences for skill score of mathematics, reading and science in PISA 2009. At the same time, according to parents' graduating status from university, significant differences are found for skill score of mathematics, reading and science in PISA 2009. In general view as the level of education raises, skill score of mathematics, reading and science increases. Papanastasiou (2008) has determined that situation of parents' education level is directly related with school performance. On the other hand, Anıl (2009) has revealed that father's education rather than mother's education is more predictive for the PISA result. This result of the study can be repeated with another study designed with qualitative research methods.

On the other hand, according to parents' employment situation, significant differences are determined for skill score of mathematics, reading and science. Also it is found that there is a significant relationship between student's socio-economical status and test results. (Ceylan, 2009; Ho, 2010; Turmo, 2004; White, 1982; White, Reynolds, Thomas ve Gitzlaff, 1993). It is convenient to think that as parents' socio-economical status get better their children gets higher marks form exams.

PISA 2009 is the first application for reading skills as main area for Turkey. Therefore there isn't any detailed comparison with past PISA applications. At the same time, showing little improvement for PISA 2009 is related effect of gradually changing between 2005-2009 years for Turkey.
In the light of the results of this research some suggestions are given below:

- In order to compensate the disadvantages deriving from the weak socio-economic working conditions of students' parents, the educational possibilities and facilities of the students whose parents have better socio-economic conditions have to be clearly determined.
- Psychological Counselling and Guidance Services have to inform the students and raise their awareness about having more time with their parents.
- In the scope of Psychological Counselling and Guidance Services, organizing family meetings which explain parents' contribution and support to the students' development of maths, reading and science skills.

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