INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) USAGE AND ACHIVEMENT OF TURKISH STUDENTS IN PISA 2006

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ABSTRACT
The purpose of this study is to examine the ICT usage and academic achievement of Turkish students in PISA 2006 data. The sample of the study included 4942 students from 160 schools. Frequencies, independent samples t-tests, ANOVAs, pearson correlation coefficients, exploratory factor analysis, and regression analysis were used. A high percentage of students reported that they had access to computers. From the exploratory factor analysis, two factors were emerged: Computer usage for software purposes and computer usage for entertainment and internet purposes. The factors found to be reliable. There was no significant relationship was found between students ICT skills and academic achievement. The Turkish students were found to be similar in the general PISA findings. SES and gender differences were found.
Keywords: Computers, ICT, software usage, entertainment, SES and gender differences, Turkish students.

The purpose of this study is to investigate the relationship of Internet and Communication Technologies (ICT) usage and academic achievement of Turkish students in PISA 2006. Studies on educational efficiency have been on the rise in the past decade. Since, investments in education pays back in the long run, this leads countries to evaluate educational systems with their functions based on student achievement.

ICT is crucial for all governments in the world towards promoting equity. ICT has been considered a low cost opportunity towards equalizing educational systems. There are four pillars of education through ICT: hardware and software, access to internet, competencies and skills, and content of the material (Magyar, 2004).

The general purpose of Programme for International Student Assessment (PISA) is to assess, by focusing on basic skills in mathematics and science, to what extent students possess the knowledge and skills they are supposed to develop at the end of their compulsory schooling. PISA is organized by Organization for Economic Cooperation and Development (OECD). PISA Project is also aims at measuring to what extent students are able to use their knowledge to make decisions and apply them both in school and in-real life situations.

PISA aims at evaluating how 15 year-old students might respond to real-life conditions, their knowledge and skills with a combination of various types of questions in a three-year period. It helps to determine to track how student achievement changes over time. Additionally, it helps evaluating students, teachers, schools, and educational systems.

PISA focuses on how young people overcome the difficulties they may face in their daily life. Concurrent studies that have been conducted in the respective countries confirm the results of PISA and this indicates the value and convenience of knowledge and skills PISA measures. In addition to student achievement, PISA 2006 investigated student attitudes toward ICT, math and science courses as well as their interests and tendencies to these subjects. An additional survey focusing on how students approach toward learning and how they perceive the learning environment has been also administered.

PISA ICT literacy assessment measures students' ICT literacy by measuring possessed skills and different activities. Students complete an introductory questionnaire and required to complete the basic ICT technical literacy. Student performance on their ability level and how they complete the internet applications, graphic utilization and 21st century skills were included in PISA (OECD, 2005).

ICT connects information, products, people, ideas, individuals as well as communities globally at a low cost. All countries, including OECD members, stress the importance of preparation of young generations with ICT skills in their education policy documents. ICT brings new structures in learning. Moreover, ICT skills are required in today's world. In PISA 2003 survey, students were asked about their familiarity with ICT, mainly with computers. In 2003, almost all 15-year old students reported that they were familiar with using computers, although the length of computer usage differs across the countries surveyed. Students usually had access to computers in schools. However, access to computers at home varied greatly among students. Students use computers for various purposes in addition to playing games. A small group of students reported that they often

used specific educational software. Half of the students reported that they frequently used internet and word processors. A great majority reported that they were confident with basic ICT skills (opening, deleting, saving files and accessing to internet) without getting help (OECD, 2005).

Raising the level of low achievers is critical for all countries if they aim at raising all students' educational achievement since the potential gains are greater for these students in any educational system (Sweet & Meates, 2004). The widespread access to ICT in the past decade increased hopes for improving student learning (OECD, 2001).

Previous studies that examine the relationship between ICT usage and mathematics problem-solving (Aşkar and Olkun, 2005) found that the Turkish students' Access to computers in schools was quite low when compared to OECD countries. Moreover, when students have access to computers at home, they had better achievement scores. Similarly, students who had been using computers longer had higher scores while students who had medium level access to computers and internet in school had higher scores than the others. Aşkar and Olkun (2005) suggested that on the one hand computer ownership and access to computers in school should be increased while usage should be more functional and computers should be integrated into courses.

Previous studies found in international comparative studies such as TIMSS that a number of factors that might have been influencing Turkish students' performance in these comparative examinations. These factors were: Very little use of computers, calculators and other instructional technology less, use lecturing and not-taking in classrooms, loading students too much information in the curriculum, and problems associated with measurement and evaluations (Ozgun-koca & Şen, 2002). Although, some of these problems might have been overcome by the 2005 curriculum reform, the integration of computers and other instructional technologies in classrooms might have been continuing.

METHODOLOGY

The sample includes 4942 students from 160 schools in PISA 2006 data. The sample consisted of 46,3 % female and 53,7 % male students. Frequencies, independent samples t-tests, ANOVAs, pearson correlation coefficients, exploratory factor analysis, and regression analysis were used in the study.

Exploratory factor analysis indicated there were two factors. The KMO result indicated that the sampling was quite adequate. The KMO was .92. Bartlett's test was significant. The Varimax rotation was used. The scree plot and eigenvalues revealed that there were two factors over 1. The two factors explained 58 % of the total variance. Cronbach Alpha reliabilities for both factors were over .80. The factor 1 included the following skills:

This factor named as educational software usage and this factor includes the following items:
Use spreadsheets (IC4e)
Graphics programs (IC4g)
Write documents (IC4c)
Educational software (IC4h)
Write programs (IC4g)

The second factor was named as internet usage and this factor included the following items:
E-mail and chat rooms (IC4j)
Download music (IC4i)
Downoad software (IC4f)
Browse internet (IC4a)
Collaborate on the internet (IC4d)
Play games (IC4b)

FINDINGS AND INTERPRETATIONS

Descriptive statistics. In this section of the paper, descriptive statistics for some of the variables were presented.

Table 1. Descriptive statistics for gender.

	Mean ($\bar{X}$)	Standard Deviation	Median	Mod
Used computer IC 1	1,54	0,499	2	2
Use Computer at home IC3a	1,07	0,248	1	1
Use Computer at School IC3b	3,18	1,49	2	2
Use Computer Other Places IC3c	2,69	1,301	2	2

The descriptive statistics for the Turkish students who took part in PISA was as follows. While 93 % of the students had access to computers, only 7 % of them did not have an access to computers. This ratio was 96 % for male students and 91 % for female students. A quite high percentage of students indicated that they had access to computers.

60 % of the students indicated that they did not have personal computers. 60 % of the males did not have computers at home while 36 % of them had one, 3 % had two, and less than 1 % had three or more computers at home. 60 % of the female students did not have computers at home, 37 % had one, 2,7 % had two, and only 0,2 % had more than three computers at home. Thus, the results indicated that there was not much difference in terms of percentages between male and female students on the computer possession.

Student responses to how long they have been using computers were as follows: Almost 17 % of males used computers for one year or less, 25 % of them one to three years, and 25 % were three to five years, and 34 % of the males used computers for more than five years. 27 % of the female students were used computers for one year or less while 31 % of them were using one to three years, and 22 % were using computers three to five years, and 20 % of them were using computers more than five years. The results pointed out that female students' computer usage in this sample had increased.

When the question "how often students use computers at home" item was analyzed, the following results were found: 39 % of students in the sample use computers at home almost every day while 41 % never use a computer at home. 37 % of female students use computers at home almost every day while 17 % of them use computers once or twice a week and 6 % use computers a few times in a month or less and 29 % do not use computers at home at all. The percentages for computer use for male students 41 % every day, 13 % once or twice a week, 4 % o few times or less, and 41 % do not use computers at home at all. While every day usage was almost the same for both male and female students, the ratio of female students on the computer usage was higher than that of male students on once a week, once a month and never use computers at home options.

Almost 8 % of students were able to use computers in school almost every day, 36 % never had an opportunity to use computers in school almost every day. Only 8 % of the students were able to use computers in school almost every day while 36 % were never be able to use computers in school. For female students, this ratio was 9 % every day, 45 % once or twice a week, 11 % used a couple times or less in a month. 36 % of female students never used computers in school. 8 % of male students use computers almost every day, 42 % once or twice a week, 15 % were able to use computers a couple times or less in a month. The ratio of male students who were never able to use computers was 36 %. The use of computers in school did not differ much between male and female students. Sweet and Meates (2004) based on PISA 2000 data found that, although computers were available to students at home, their access to computers might have been more limited than high achieving students in PISA sample.

Did students use computers in other places than school and home? Student use of computers in some other places other than school and home was as follows: 19 % were able to use computers in some other places while 15 % were not able to use computers in other places. This ratio for female students was 10 % and 26 % were not able to use computers in other places. 26 % of female students used computers once or twice in a week, 22 % a couple times in a month, and 16 % use only once in a month in other places than at home and in school. One-fourth of male students were able to use computers almost every day, 42% once or twice in a week, 28 % used a couple of times or less in a month in other places. 6 % of female students did not use computers at all. The results indicated that male students had higher opportunities to access computers in other places except school and home than the female students in the sample. Sweet and Meates (2004) found a strong relationship between student achievement levels and their access to computers at home.

Table 2 presents information on students' access to internet alone or with some help. Based on the Table 2 results, 73 % of students indicated that they were confident that they could search the internet while only 17 % could do with some help, 68 % of the students were able to chat with others while 16 % could perform the same task with some help, 65 % of the students responded that they were able to download music from the internet while only 23 % could download with some help, and 60 % of the students were able to download files from the internet when only 17 %, 53 % of the students indicated that they were able to write and send e-mails while 23 % could perform this task with some help. Only 43 % of the students said that they were able to send a file via e-mail when 34 % of the students need some help to do the same task. The majority of students indicated that they were confident with searching the internet, downloading music and files, using chat, and write and send e-mails.

Only sending a file via e-mail was less than 50 %. Sweet and Meates (2004) found a strong relationship between internet access at home and student achievement levels.

Table 2. Student Confidence Levels on the Internet Usage.

	I can do myself	I can do with some help
Search internet	% 72,9	% 16,5
Write and send e-mail	% 52,9	% 28,2
Download file from the internet	% 60,1	%25,4
send a file via e-mail	%43,8	% 33,8
Download music	% 65	% 22,9
Chat	% 68,1	% 16,7

According to the Table 2 and Table 3, it is clear that the Turkish students who attended PISA 2006 study had high self-confidence levels on the computer use in the internet. In PISA 2000, there was no difference in terms of confidence levels on using internet between high and low achieving students (Sweet & Meates, 2004).

Table 3. Presents Information on Student Confidence Levels on the Use of Computers.

	I can do by myself		I can do with some help	
	Males (%)	Females (%)	Males (%)	Females (%)
Being able to use software to find and erase viruses	35,7	16,2	34,6	42,2
Creating presentations in a multi-media environment (sound, video, graphics)	52	35,7	30,5	41
Creating Web pages	33,7	25	40,4	45,9
Being able to use a spreadsheet	39,5	31,9	36,4	72,5
Being able to use a database	30,8	23,3	36	37,2
Re-organizing pictures (making changes on them)	48,5	35,3	29,3	35,7
Being able to copy and move files	74,5	68,8	15,3	19,6
Being able to write data into a CD	66,5	54,5	20,5	27,8
Being able to use a word-processor	57,0	54,9	26,3	27,1

SES differences. Taking the influence of socio-economic status as a background variable is important for educational research. This section deals with the SES differences in the sample. Whether parental educational level (fathers and mother) makes any difference regarding ICT skills is investigated in this section.
Table 4. Presents ANOVA results on students' ICT usage for software purposes based on mothers educational level (ISCED classification).

Table 4. ANOVA results on students ICT usage for software purposes based on mother educational level (ISCED Classification).

Source	**SS**	**df**	**MS**	**F**	**p**
Between	86.066	6	14,344	13.853	.000
Within	4384.031	4234	1.035		
Total	4470.097	4240			

The results indicated that there were significant differences among students on ICT usage for software purposes (being able to use word-processor, creating web pages, spreadsheets) [$F_{(6\text{-}4234)}$=13.853, $p<0.05$). A Sheffee post-hoc comparison test was conducted to see which groups differ. Thus, the mean of computer usage for software of students whose mothers did not have an ISCED1 level was ($\overline{X}$ =3,2) higher than students whose mothers educational level as ISCED2 ($\overline{X}$ =2,7), students whose mothers' educational level was ISCED3A and ISCED4 ($\overline{X}$ =2,9) computer usage for software purposes were higher than that of students whose mothers had an educational level of ISCED5B ($\overline{X}$ =2,7),

Moreover, students whose mother's educational level is ISCED1 ($\overline{X}$ =3,05), ICT usage for software is higher than those students whose mother's educational level ISCED2 ($\overline{X}$ =2,8), ISCED 3A and ISCED4 ($\overline{X}$ =2,9). Thus, as students mothers' educational level goes down, their interest towards computer might be increasing.

Table 5. One-Way ANOVA results for students' usage of ICT for entertainment and internet purposes based on mothers' educational level (ISCED classification).

Source	SS	df	MS	F	p
Between	189.856	6	31.643	28.932	.000
Within	4724.676	4320	1.094		
Total	4914.532	4326			

There were significant differences on the ICT usage for entertainment and internet (playing games, downloading music, surfing the internet, etc.) [$F_{(6-4320)}$=28.932, p<0.05). Sheffee post hoc test was performed to find out which groups differ. When students whose mothers' did not have ISCED1 level of education, the mean of ICT usage for entertainment and internet ($\overline{X}$ =3,0) was found to be higher than the students whose mother's educational level ISCED1 ($\overline{X}$ =2,7), ISCED2 ($\overline{X}$ =2,5), ISCED3A and ISCED4 ($\overline{X}$ =2,37), ISCED5B ($\overline{X}$ =2,23), and ISCED6 ($\overline{X}$ =2,2).

Moreover, the mean of computer usage for entertainment and interned for students whose mothers' did not have ISCED1 educational level ($\overline{X}$ =2,71) was higher than that of students whose mothers' educational level ISCED2 (($\overline{X}$ =2,47), ISCED3A, ISCED 4 ($\overline{X}$ =2,37), ISCED5A, and ISCED6A ($\overline{X}$ =2,21). These results indicated that as the mothers' educational level goes down, students' interest in ICT might be increasing.

Table 6. One-Way ANOVA Results for Students' Usage of ICT for Entertainment and Internet Purposes based on Fathers' Educational Level (ISCED classification).

Source	SS	df	MS	F	p
Between	34.639	6	5.773	5.510	.000
Within	4463.406	4260	1.048		
Total	4498.044	4266			

There were significant differences among students on software usage (usage of word processor, constructing web pages, usage of tabulation programs, etc.) based on father educational levels [$F_{(6-4260)}$=5.773, p<0.05). A Sheffee test was conducted to determine which groups differ. The Sheffee test indicated that the mean of students whose fathers did not completed ISCED1 usage of computers for software purposes ($\overline{X}$ =3,11) was higher than the mean of students whose fathers' educational level was ISCED5B ($\overline{X}$ =2,73). Similarly, the mean of students whose fathers' educational level was ISCED1 ($\overline{X}$ =3,07) was higher than that of students whose fathers' educational level ISCED2 ($\overline{X}$ =2,91) and ISCED5B ($\overline{X}$ =2,73). These results might indicate that the lower the students fathers' educational level, the higher their interest and desire towards computer usage for software purposes. Fathers' educational level has been found important for student achievement in PISA 2006 data for Turkish students.

Table 7. One-Way ANOVA results for student use of ICT for entertainment and internet purposes based on fathers' educational level.

Source	SS	df	MS	F	p
Between	120.100	6	20.017	18.005	.000
Within	4830.455	4345	1.112		
Total	4950.555	4351			

Table 7 presents students usage of ICT for entertainment and internet purposes based on fathers' educational level. Significant differences were found among students use of computers for entertainment and internet purposes (playing games, downloading music, surfing the internet) based on their fathers' educational level [$F_{(6-4351)}$=20.017, p<0.05). A Scheffee test was conducted to determine which groups differ. The mean of students whose fathers did not completed ISCED1 use of computers ($\overline{X}$ =3,0) was higher than that of students whose fathers' educational level was ISCED2 ($\overline{X}$ =2,61), ISCED3A, ISCED4 ($\overline{X}$ =2,53), ISCED 5B ($\overline{X}$ =2,38) and ISCED 5A and ISCED6 ($\overline{X}$ =2,32). Along the same lines, the mean of students whose fathers' educational level was ISCED1 use of computers for entertainment and interned ($\overline{X}$ =2,78) was higher than the students use

of computers for the same purposes for students whose fathers' educational level was ISCED2 ($\overline{X}$ =2,61), ISCED3A, ISCED4 ($\overline{X}$ =2,53), ISCED 5B ($\overline{X}$ =2,38) , and ISCED 5A and ISCED6 ($\overline{X}$ =2,32). Based on these results, it might be concluded that the lower the students fathers' educational level, the higher their use of computers for entertainment and internet purposes. High achievers in PISA use internet more than the low achievers (Sweet & Meates, 2004). When all students were taken into account, PISA 2006 data revealed that students most often use computers to communicate. Students also use computers to do research in the internet. In terms of entertainment, students most often download music using internet (Shewbridge, 2007).

Gender Differences on Computer Usage. This section presents t-tests results for students' use of computer for software purposes, for entertainment and internet use, and how well students' confidence levels on using computers.

Table 8. The mean comparisons between males and females on ICT usage.

ICT Usage	Gender	N	$\overline{X}$	Standard Deviation
Software	Female	1946	3,20	1,01
	Male	2364	2,81	1,00
Entertainment	Female	1981	3,00	1,07
	Male	2413	2,31	0,95
How Well	Female	2026	1,84	0,65
	Male	2476	1,69	0,64

A t-test was conducted to see whether there were significant differences on computer usage for software purposes ($t_{(4308)}$ =12,701, p<.05) (See Table 8). The mean of male students ($\overline{X}$ =3,20) was significantly higher than that of female students ($\overline{X}$ =2,81). This result might indicate that there is a relationship between being male and computer usage for software purposes. Sweet and Meates (2004) found that high achievers use word processors more frequently than the low achievers. However, in contrast, low achievers use spreadsheets more often than the high achievers in PISA 2000. Among the OECD countries only in five countries males were found to be more often communicating on computers including Turkey and Greece. In seven OECD countries no gender differences were found. These countries were: Japan, Portugal, Germany, Czech Republic, Spain, Belgium and Sweden. Females were found to be more often using computers in Iceland, Ireland, New Zealand, Australia, and Denmark (Shewbridge, 2007).

Table 9. t-test results of ICT usage for software purposes based on gender.

Gender	**N**	$\overline{X}$	**S**	**df**	**t**	**p**
Female	1946	3,20	1,01	4308	12,714	,000
Male	2364	2,81	1,00			

A second t-test was conducted to see whether there were significant differences on computer usage for entertainment and internet purposes ($t_{(4392)}$ =22,367, p<.05) (See Table 9). The mean of male students ($\overline{X}$ =3,00) was significantly higher than the computer usage for entertainment and internet purposes of female students ($\overline{X}$ =2,31). This result might indicate that there is a relationship between being male and computer usage for entertainment and internet purposes. Males more frequently download software than females in PISA 2006 data (Shewbridge, 2007). An interesting finding was reported by Sweet and Meates (2004). Low achievers used computers more frequently for programming than high achievers.

Table 10. t-test results of ICT usage for entertainment purposes based on gender.

Gender	**N**	$\overline{X}$	**S**	**df**	**t**	**p**
Female	1981	3,00	1,07	4308400,5	22,367	,000
Male	2413	2,31	0,95			

A third t-test was conducted to see whether there were significant differences on how well students think they were confident with computers ($t_{(4500)}$ =7,766, p<.05) (See Table 11). The mean of male students ($\overline{X}$ =1,84) on how confident they were with computers was significantly higher than the computer usage for entertainment and

internet purposes of female students ($\overline{X}$ =1,69). This result might indicate that there is a relationship between student confidence levels. Males more often download music from the internet than female students in PISA 2006 data. Sweet and Meates (2004) reported that low achieving students use more often computers for playing games in PISA 2000.

Table 11. t-test results on how well students use computers based on gender.

Gender	N	$\overline{X}$	S	Df	t	p
Female	2026	1,84	0,65	4500	7,776	,000
Male	2476	1,69	0,64			

When 2006 PISA data examined, males reported that they used computers more often than females. They felt also more confident in more demanding computing tasks. In mathematics, female students were less confident learning mathematics and feel more anxious about learning mathematics. Moderate gender difference was found overall. In science, no significant gender differences were found. However, in reading females outperform males (Shewbridge, 2007).

Correlations. This section of the paper presents correlation coefficients among the study variables**.** There was a small negative correlation between how long students used computers and their usage for software purposes (r=-.27). There was a significant medium relationship between how long students used computers and their use of computers for entertainment and internet purposes (r=-.36). A medium negative correlation was found between how long students used of computers and how well they think they were able to use computers (r=-.41). A high positive correlation was found between students use of computers for entertainment and internet and their use of computers for software purposes (r=.70). There was also a medium positive correlation between how well students think they use computers and their use of computers for software purposes (r=.56) and their use of computers for entertainment and internet (r=.53). Sweet and Meates (2004) did not report any significant relationship that low achieving students were less interested in using computers. However, their confidence and ability levels were lower.

Table 12. Correlations among the study variables.

	How long used Computer IC2	Software	Entertainment	How well
How long used Computer IC2	1			
Software	-0,276*	1		
Entertainment	-0,358*	0,698*	1	
How Well	-0,412*	0,562*	0,553*	1

An OLS regression was conducted using students' mathematics achievement as the dependent variable in PISA 2006. However, no significant relationship was found between the dependent variable (math achievement) and the independent variables such as how well students use computers, students' use of computers for software purposes as well as use of computers for entertainment and internet. A dummy variable was constructed to assess whether gender was significantly related in this model. Gender was also turned out to be non-significant in the regression model. In another study, a negative relationship was found between computer and OHP usage and academic achievement of Turkish students in science classes (Aypay, Erdogan, & Sozer, 2007). Şahinkayası (2008) found small differences between Turkish students and students from EU member countries on overall ICT usage, confidence on performing routine computer tasks, attitudes towards computers. Moreover, Şahinkayası found that excluding self-confidence in routine tasks and internet, a small negative relationship between ICT usage and academic achievement in PISA 2003. Olkun and Altun (2003) found that students learn geometry better.

CONCLUSION

The data on the Turkish student sample regarding their use of computers on a number of variables and their academic achievement was investigated. The results indicated that there is no significant relationship between their use of ICT and academic achievement. The descriptive statistics revealed that a quite high percentage of students had access to computers. The results indicated that there was not a high difference in terms of percentages between male and female students on computer possession at home. Moreover, the results pointed out that female students' computer usage in this sample had increased. While every day usage was similar for both male and female students, the ratio of female students on the computer usage was higher than that of male students once a week, once a month and never use computers at home variables. The use of computers in school

did not differ much between male and female students. As expected, the results indicated that male students had higher opportunities to access computers in other places except school and home than the female students in the sample. Finally, the majority of students indicated that they were confident with searching the internet, downloading music and files, using chat, and write and send e-mails. Only sending a file via e-mail was less than half of the students. Very frequent use of ICT did not necessarily improve student performance in PISA nor very little use. The PISA results showed that a moderate use of computers was associated with higher student achievement.

When SES differences were examined, an interesting picture emerged. As the mothers' and fathers' educational level goes down, the use of computers for software purposes increases. A similar finding emerged when computer usage for entertainment and internet purposes. Thus, there was a negative relationship between mothers' and fathers' educational level and the computer usage. This is an interesting finding that needs to be further investigated. This finding should be interpreted with the fact that the ICT usage does not have a significant correlation with mathematics, science and reading achievement in PISA 2006.

Male students used computers for software purposes more often than female students. This finding indicates that there is a relationship between being male and computer usage for software purposes. The results of the study indicated that there were significant differences based on gender. There were significant differences on computer usage for entertainment, internet purposes, and how confident the students were with computers. Male students used ICT more than the female students. As the student confidence levels with computers increases, their use of computers for software purposes was lower while their attention was drawn towards entertainment and internet. As the longevity of student involvement with computers increased, they felt less confident with computers and they used computers for software purposes more often.

Turkey joined all the PISA studies and this has been important to track changes in student achievement and to detect the way the curriculum has been implemented. Turkey revised its curriculum and it has started using a constructivist approach as of 2004 and it would be interesting to observe how the changes in the curriculum might be reflected in student achievement in PISA results in the future. Although somewhat the performance of Turkish students has improved when compared to past PISA scores, the performance of Turkey did not improved much. One reason for that might be, the implementation of reforms takes a long time and teacher behaviors in classroom and the teaching methods might not change in a short period of time.

Implications. Turkey first needs to lower the differences among schools. Turkey also needs to improve the use of ICT in educational system by adapting the technology in the content of the courses. As the data suggested, students had access to computers but their access was limited. The number of students per computer should be improved. In PISA 2003, while countries with academically higher performing students had five or fewer student per computer, Turkey had ten or more students per computer. Especially, low SES student engagement with ICT should be increased. Moreover, the content of the courses in schools might need to be revised. An interesting finding of this study was non- significant relationship between the use of ICT and academic achievement. This might be pointing out to problems related to the integration of ICT within the content of the courses. Although the curriculum had been revised, the measurement and evaluation system did not change much. Finally, students should neither be prevented nor should be encouraged too much to use computers. They should be encouraged on a moderate level. The quality of their involvement might be making the difference.

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