THE INTER-REGIONAL INEQUALITY OF ACCESS TO INFORMATION AND COMMUNICATION TECHNOLOGY IN TURKEY BASED ON PISA 2009 DATA

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ABSTRACT
The purpose of this study was to investigate the extent to which students from Turkey have access to a computer and the internet at school and at home, and differences in ICT accessibility by geographic region based on the data obtained from the PISA 2009. Data collected through the ICT questionnaire were analyzed by descriptive statistical indexes such as percentage technique. Important findings from the study indicated (i) access to a computer and the internet at school and at home in Turkey is still very low; (ii) Western Marmara is the best region. The region is above the average of country in the accessibility of ICT; (iii) South Eastern Anatolia is the worst region. The region is below the average of country in the accessibility of ICT. These findings confirm that developing countries in general tend to have limited computer and the internet access at school and at home.
Keywords: Information and communication technology, inter-regional differences, NUTS, PISA 2009, Turkey.

INTRODUCTION
Information and Communication Technology (ICT) has provided enormous opportunities for developments all around the world (Kari, 2007). Rapid growth and development in ICT has conduced to the diffusion of technology in education (Corbett & Willms, 2002); therefore, ICT is nowadays indispensable for educational studies, such as surveys, presentations, project work or research, online and distant learning. Not only is ICT the basis of learning environment, but also it provides individuals to have lifelong learning, to improve educational outcomes, to learn new occupational skills and to decrease inequities between groups (Çavaş, Kışla, & Twining, 2004). Having access to and using ICT at home and at school is played a crucial role in developing technical skills, processing information, getting source material and new information (Sinko & Lehtinen, 1999; Symons, 1997) Similarly, equitable and high-level access to ICT at home and at school play an important role of child development (Corbett & Willms, 2002).

People from Turkey continue to have a slow uptake of new technology. For example, the percentage of computer access in home was 67.9 and the percentage of internet access in home was 41.6 based on Turkish Statical Institute 2010 data. According to PISA 2003 data, computer access in Turkish schools were much lower compared to OECD average (Aşkar & Olkun, 2005) and students in developing countries such as Mexico, Turkey and Tunisia had the highest proportion of students who had never used a computer with 13 per cent, 14 per cent and 39 per cent of students respectively in this category and the largest gender differences was found in Turkey where 21 per cent of females and 9 per cent of males reported never having used a computer. The results showed that approximately 50 per cent of students from Turkey had access to a computer at school and fewer than 40 per cent of students from Turkey had access to a computer at home (Thomson & De Bortoli, 2007). From these data, it was found that only 14 per cent of students from Turkey had a link to the internet at home (Ainley & Searle, 2005).

Arnas-Aktaş (2005) performed a study in order to investigate the access to a computer and the internet at home in a sample of 933 Turkish children and students from ages 3-18. The results indicated that 35.7 per cent of these children and students had access a computer at home and 21.7 per cent of them also had an internet connection in their home. Another study of similar type was conducted by Orhan and Akkoyunlu in 2004 who found that 12.5 per cent of Turkish students had a link to the internet at home and also 15 per cent of Turkish students had a link to the internet at school.

In Turkey, there is about 15 million students enrolling in grades K-12, we would anticipate that a considerable number of K-12 students do not have access to a computer and the internet from their school and home. The under use of ICT in education may be arisen from illiteracy, inequality, low levels of living, low productivity, poverty (Kessy, Kaemba, & Gachoka, 2006) and inter-regional differences. Students of inequality of access to ICT are called the "digital divide" (Becker, 2000; Wolff & MacKinnon, 2002). Several researches (Ainley &

Searle, 2005; Aşkar & Olkun, 2005; Aypay, 2010; Corbett & Willms, 2002; Gündüz, 2010; Mallon, Monseur, Quittre, & Wastiau, 2010; Rodrigo, 2004; Thomson & De Bortoli, 2007) related to digital divide were examined to access and use of ICT in participant countries by gender, by socioeconomic background, by geographic location and by state using data from international benchmarking studies. For example, Gündüz (2010) carried out a research to assess the digital divide conditions in Turkey. This study provided findings that in Turkey, there was a digital divide between primary school students. It was believed that, this situation showed parallelism with the socio-economic background of the families. According to PISA 2006 data, from the Turkey showed that there were no longer inequalities in the number of females and males accessing the computer at home, and thus a decrease in the digital divide between groups (Aypay, 2010). Berberoğlu (2010) performed a research so as to examine the roles of lifelong learning and ICT in the path of creating a knowledge society and building a knowledge economy and she analysed the common efforts and achievement of 25 European Community Members and Turkey in this path. Results indicated that Sweeden, Finland and Denmark were more successful, but Turkey was positioned in the lowest cluster with some EU Members such as Romania and Bulgaria without creating any difference. Rodrigo (2004) conducted a study in order to quantify the digital divide that existed between schools in Metro Manila, Philippines and schools in countries surveyed by the International Association for the Evaluation of Educational Achievement (IEA-surveyed). The results implied that unlike students in other countries, students in Metro Manila schools are among the digital poor, with fewer opportunities to access, and process.

International benchmarking studies such as the Programme for International Student Assessment (PISA), the Progress in International Reading Literacy Study (PIRLS) and the Trends in International Mathematics and Science Study (TIMSS), which determine the achievement levels of students, shed light on the current situation with regard to the education systems in the participant countries. Students' performances in these exams help them to assess their education systems and to be able to look at the current education systems in the participant countries with a critical eye.

The PISA, which was conducted with the support of Organization for Economic Cooperation and Development (OECD), is the largest international benchmarking study focusing on curriculum based learning outcomes. The survey has been conducted every three years since 2000 and the PISA was carried out with the participation of 43 countries in 2000, 41 countries in 2003, 56 countries in 2006 and lastly, 65 countries in 2009. Each cycle evaluates the three domains concurrently, with the importance to the one particular domain each time: reading literacy in 2000, mathematical literacy in 2003, and scientific literacy in 2006 and again reading literacy in 2009. With its student and ICT questionnaire, the PISA also collects data concerning students' socio-demographic status, school environments, learning styles, parents, views about themselves, motivation to perform well in related domains, and computer familiarity.

Aim of the Study
The purpose of this study was to examine the extent to which students from Turkey have access to a computer and the internet at school and at home, and differences in ICT accessibility by geographic location based on the data obtained from the PISA 2009.

METHOD
The study adopted the descriptived survey research method with the student ICT questionnaire in PISA 2009 as the instrument. The data used in this study were provided by the international PISA web site. Data of the study were analysed with SPSS 13.0 program. The percentage technique is used to present and analyse data with appropriate tables.

Participants
The tests and surveys of PISA 2009 project were conducted in April 2009 among 4996 students from Turkey. The students were randomly selected from 170 schools, from 12 NUTS (Nomenclature of Territorial Units for Statistics) regions in Turkey. According to the NUTS regions in Turkey which take part in PISA 2009 study the percentages and numbers of the students were as follows; Istanbul Region 800 (16.0%), Western Marmara Region 244 (4.9%), Aegean Region 620 (12.4%), Eastern Marmara Region 525 (10.5%), Western Anatolia Region 481 (9.6%), Mediterranean Region 637 (14.8%), Central Anatolia Region 296 (5.9), Western Black Sea Region 375 (7.5%), Eastern Black Sea Region 216 (4.3%), North Eastern Anatolia Region 142 (3.8%), Central Eastern Anatolia Region 218 (4.4%), South Eastern Anatolia Region 442 (8.8%), [total 4996, 100%].

RESULTS
Access to ICT Resources at School and at Home
Access to a Computer at School
In many countries school plays a crucial role in providing equitable access to ICTs (Thomson & De Bortoli, 2007). Table 1 presents the regional disparities in access to a computer at school for the twelve NUTS regions in Turkey. As can be seen in Table 1, access to a computer at school in Turkey (49.1%) is still very low. Overall, 49.1 per cent of students from Turkey have access to a computer at school; this range from 38.0 per cent in Mediterranean Region to 72.5 per cent in North Eastern Anatolia Region. Students from North Eastern Anatolia Region, Western Marmara Region, Central Eastern Anatolia Region reported the highest proportion of students accessing to a computer at school, quite above Turkey's average and students from Eastern Marmara Region, Western Black Sea Region, Central Anatolia Region and Aegean Region reported reasonable accessing to a computer at school, slightly above Turkey's average. In Istanbul Region, Eastern Black Sea Region and Western Anatolia Region less than 50 per cent of the students indicated accessing to a computer at school, slightly below Turkey's average. However, results showed that the lowest access with approximately 40 per cent of the students from Mediterranean Region and South Eastern Anatolia Region had access to a computer at school, quite below Turkey's average.

Table 1. Students' from Turkey access to a computer at school and at home

The NUTS regions in Turkey	School (%)	Home (%)
Istanbul Region	46.6	73.4
Western Marmara Region	65.6	63.1
Aegean Region	50.5	63.4
Eastern Marmara Region	54.7	63.8
Western Anatolia Region	44.9	65.9
Mediterranean Region	38.0	40.2
Central Anatolia Region	51.0	47.6
Western Black Sea Region	54.7	49.6
Eastern Black Sea Region	45.4	44.9
North Eastern Anatolia Region	72.5	35.9
Central Eastern Anatolia Region	61.5	31.7
South Eastern Anatolia Region	38.5	28.7
Turkey's average	49.1	54.3

Access to a Computer at Home
Almost all of the Turkish PISA 2009 students showed they had less access to a computer at home. Overall, 54.3 per cent of students from Turkey had access to a computer at home; this ranged from 28.7 per cent in South Eastern Anatolia Region to 73.4 per cent in Istanbul Region (Table 1). Students from Istanbul Region, Western Anatolia Region, Eastern Marmara Region, Aegean Region and Western Marmara Region reported the highest proportion of students accessing to a computer at home, quite above Turkey's average. However, in Western Black Sea Region, Central Anatolia Region and Mediterranean Region less than 50 per cent of the students indicated accessing to a computer at home, slightly below Turkey's average and results indicated that the lowest access with approximately 30 per cent of the students from South Eastern Anatolia Region, Central Eastern Anatolia Region and North Eastern Anatolia Region had access to a computer at home, quite below Turkey's average.

These percentages implied that students from Istanbul Region, Aegean Region, Eastern Marmara Region, Western Anatolia Region and Mediterranean Region had less access to a computer at school than at home, and students from Western Marmara Region, Central Anatolia Region, Western Black Sea Region, Eastern Black Sea Region, North Eastern Anatolia Region, Central Eastern Anatolia Region and South Eastern Anatolia Region had more access to a computer at school than at home. All in all, students from Turkey had less access to a computer at school than at home.

Access to the Internet at School
Table 2 indicated that similar regional disparities were evident for access to the internet at school for the twelve NUTS regions in Turkey. Link to the internet at school in Turkey (44.4%) is still low-level. Overall, 44.4 per cent of students from Turkey also had access to the internet at school; North Eastern Anatolia Region had the highest percentage of students with access: over 70% of students in North Eastern Anatolia Region reported accessing to the internet in their school. In contrast, only about 30% of students in South Eastern Anatolia and Mediterranean Regions had access to the internet at school. Students from Central Eastern Anatolia Region, Western Marmara Region, and Western Black Sea Region had an internet connection at home, quite above

Turkey's average, and in Aegean Region, Eastern Marmara Region and Central Anatolia Region, less than 50 per cent of the students indicated accessing to internet at school, slightly above Turkey's average. But, in Istanbul Region and Western Anatolia Region less than 40 per cent of the students indicated a link to the internet at school. This was lower than the Turkey's average.

Table 2. Students' from Turkey access to the internet at school and at home

The NUTS regions in Turkey	School (%)	Home (%)
Istanbul Region	39.4	74.0
Western Marmara Region	57.0	61.5
Aegean Region	49.8	60.3
Eastern Marmara Region	49.1	60.6
Western Anatolia Region	39.7	60.3
Mediterranean Region	33.3	40.0
Central Anatolia Region	47.0	43.2
Western Black Sea Region	53.9	48.5
Eastern Black Sea Region	44.0	44.9
North Eastern Anatolia Region	72.5	31.0
Central Eastern Anatolia Region	58.3	27.1
South Eastern Anatolia Region	29.4	26.9
Turkey's average	44.4	52.2

Access to the Internet at Home
Table 2 showed that there were regional disparities in link to the internet at home. Overall, 52.2 per cent of students from Turkey also had a link to the internet at home; in Istanbul region nearly 75% of students had a link to internet at home, whereas the average was lower amongst the South Eastern Anatolia Region, and lower still – about 30% – in Central Eastern Anatolia Region and North Eastern Anatolia Region. About this percentage is still half that of Western Anatolia Region, Aegean Region, Eastern Marmara Region and Western Marmara Region. Students from Istanbul Region, Western Anatolia Region, Eastern Marmara Region, Aegean Region and Western Marmara Region reported the highest proportion of students accessing to the internet at home, quite above Turkey's average. But, in Western Black Sea Region, Eastern Black Sea Region, Central Anatolia Region and Mediterranean Region less than 50 per cent of the students indicated a link to the internet at school. This was lower than the Turkey's average.

These findings showed that students from Istanbul Region, Western Marmara Region, Aegean Region, Eastern Marmara Region, Western Anatolia Region, Mediterranean Region and Eastern Black Sea Region had less access to the internet at school than at home, and students from Central Anatolia Region, Western Black Sea Region, Eastern Black Sea Region, North Eastern Anatolia Region, Central Eastern Anatolia Region and South Eastern Anatolia Region had more link to the internet at school than at home. All in all, students from Turkey had less link to the internet at school than at home.

DISCUSSION
In this study, inter-regional inequalities examined in terms of ICT accessibility at school and at home in Turkey based on the data obtained from the PISA 2009. According to the results of the study it was found that: i) 49.1 per cent of students from Turkey overall reported having access to a computer at school, and 38.0 per cent in Mediterranean Region to 72.5 per cent in North Eastern Anatolia Region; ii) 44.4 per cent of students from Turkey overall reported having link to the internet at school, and 29.4 per cent in South Eastern Anatolia Region to 72.5 per cent in North Eastern Anatolia Region; iii) 54.3 per cent of students from Turkey overall reported having access to a computer at home, and this ranged from 28.7 per cent in South Eastern Anatolia Region to 73.4 per cent in Istanbul Region; iv) 52.2 per cent of students from Turkey overall reported having link to the internet at home, and this ranged from 26.9 per cent in South Eastern Anatolia Region to 74 per cent in Istanbul Region; v) The access to a computer and the internet at school was highest in the North Eastern Anatolia Region and lowest in Mediterranean and South Eastern Anatolia Regions; vi) The access to a computer and the internet at home was highest in the Istanbul region and lowest in South Eastern Anatolia Region; vii) All in all, students from Turkey had less access to a computer at school than at home. Similarly, students from Turkey had less access to the internet at school than at home; viii) Western Marmara is the best region. The region is above the average of country in the ICT resources; ix) South Eastern Anatolia is the worst region. The region is below the average of country in the ICT resources.

These findings supported the findings of previous studies (e.g., Gök, 2004; Koçberber & Kazancık, 2010; Sarıer, 2010) which revealed that the South Eastern Anatolia region was below the average of country in the educational

opportunities, in particular, in terms of educational investments. Student selection examination (ÖSS), high school entrance exams (OKS-SBS) and PISA results showed that, students performance in Turkey had significant differences between genders and regions, and the students from South Eastern Anatolia Region performed below the Turkey average scores in measures of mathematics literacy, scientific literacy, reading literacy and problem solving (Berberoğlu & Kalender, 2005; Sarıer, 2010). These results were consistent with Koçberber and Kazancık's (2010) study, which indicated that Western Marmara was above the average of country in the educational opportunities and investments. Similarly, Berberoğlu and Kalender(2005), and Sarıer's (2010) studies which showed that students from Marmara Region performed above the Turkey average scores in measures of mathematics literacy, scientific literacy, reading literacy and problem solving.

In PISA 2003, countries with academically higher performing students had five or fewer student per computer, whereas Turkey had ten or more students per computer (Aypay, 2010) . According to the results of the PISA 2009 it was found that access to a computer and the internet at school and at home in Turkey was still very low. At this point students from Turkey are still among the world's digital poor. Students in developing countries such as Tunisia, Turkey, Philippines and Mexico had the highest proportion of students who had not access to a computer and the internet at school and at home (Rodrigo, 2005; Thomson & De Bortoli, 2007). The results indicated that students from Turkey can not access and link to ICT resources to the same extent as their international counterparts and Turkey has inter-regional differences in terms of ICT resources. These findings confirm that medium human development countries in general tend to have limited computer and the internet access at school and at home, and students from developing countries can not participate fully in the digital world (Rodrigo, 2005; Thomson & De Bortoli, 2007).

CONCLUSION
Nowadays, although information and communication technology is used a lot in every field, the results of PISA 2009 show that in Turkey, access to a computer and link to the internet at school and at home is still too low. These findings imply that information and communication technology (ICT) in Turkey is not completely integrated into learning environment and students' life. Aypay (2010) gave out that Turkey 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. Results from the current study supported the finding that students from Turkey students had access to computers but their access was limited (Aypay, 2010). Delen and Bulut (2011) also stated that ICT is an important factor that should be taken into consideration when designing classroom environments. The results of this research and studies (e.g., Aypay, 2010; Berberoğlu, 2005; Delen & Bulut, 2011) on this topic indicated that there is stil a great achievement and accessibility of ICT gap between regions and schools in Turkey. The under use of ICT in education and in home may be arisen from illiteracy, inequality, low levels of living, low productivity, poverty (Kessy, Kaemba, & Gachoka, 2006) and inter-regional differences. In order to improve the quality of learning environment for students who have not access to computers and the internet at home and at school; obstacles to the access to computers and internet at home and at school should be removed as soon as possible, while investments should be encouraged. These results also provide potential insights for the conduct of the future research and they can be used for international benchmarking.

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