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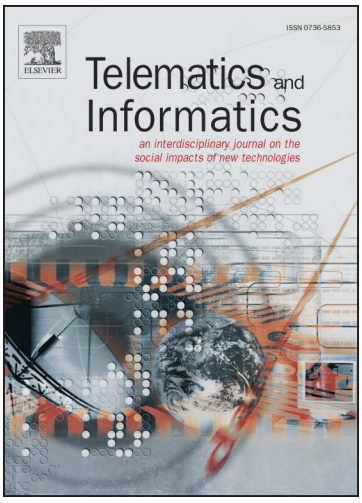

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Mustafa Aydin

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Does the digital divide matter? Factors and conditions that promote ICT Literacy

Mustafa Aydin[a]*

[a] *Department of Education, Necmettin Erbakan University, Konya, Turkey; maydin@erbakan.edu.tr*

ORCID ID: 0000-0001-8414-0008

Mustafa Aydin is an assistant professor at Necmettin Erbakan University. He completed the PhD requirements of the curriculum and instruction program His areas of interest include large-scale assessments, literacy, curriculum and instruction.

Abstract

Individuals' computer skills have long been noteworthy for both education and the labor market. Although the support provided through curricula in schools develops these skills to a certain extent, digital divide still exists for individuals with different socio-demographic characteristics. The concept of digital divide, used to define individuals who do not have equal access to digital technologies, has started to be seen as a determining factor for digital competencies with its expanding scope. The current study aims to take a perspective to investigate the effect of socio-demographic variables, which may cause digital divide, on students' ICT literacy. With this study, it is sought to explain the effect of current inequalities regarding digital access on students' ICT skills. To this end, the socio-demographic characteristics of the students in the sample of Korea and Chile from the participating countries of the International Computer and Information Literacy Study (ICILS) were examined in the context of ICT literacy. The characteristics of the models created were compared for both countries. While parents' level of education variable stands out for the Chilean model, the internet connection variable is remarkable for the Korean model. It is anticipated that the findings of the research will contribute to understanding the dynamics of the digital divide and its possible consequences, and can be a source for preventive policy steps to be developed.

Keywords: Chile, Korea, digital divide, computer and information literacy, ICILS

1. Introduction

Rapid changes in information and communication technologies have increased the availability and usability of technology and thereby made its spread inevitable. This change has also manifested itself in the living spaces of individuals. With the change in the mobility of individuals due to the COVID-19 outbreak (Engle et al., 2020; Zhang et al., 2020), opportunities to work from home have been supported by legal regulations in many countries. This situation has highlighted individuals' own competencies as well as their infrastructure needs that allow for working from home.

The new period, for which people were not prepared with regard to education, resulted in the transformation of homes into classrooms in a few weeks. The adaptation of students to this distance education process is extremely important for the quality of learning service to be carried out. However, it is also known that there are differences among individuals in terms of both their access to technology and their capacity to benefit from technology use (Hargittai, 2010; Robinson, 2015). Accordingly, characteristics which are already important for students' learning such as parental involvement (Boonk et al., 2018), the use of ICT in learning activities (Zhu & Mok, 2020), and educational opportunities at home (Pullen, 2015; Dimosthenous et al., 2020) have become increasingly more important. The extant literature reveals that socio-demographic characteristics create differences in students' digital competencies (OECD, 2013; Van Deursen et al., 2011). More importantly, emerging research reveal that

especially disadvantaged individuals are affected greatly in this new period (Bayrakdar & Guveli, 2020; Pensiero et al., 2020) and that comprehensive educational results may arise for these individuals in the long term (Bol, 2020).

Today, digital skills are at the forefront in individuals' intense relationships with technological tools (Ertl et al., 2020). Digital literacy, which is considered as a skill, is associated with 21st century skills including cooperation, communication, citizenship, problem solving, critical thinking, creativity and productivity (Voogt & Roblin, 2012). In addition to these skills that are extant in curricula, integration of ICT into curricula has become a necessity to ensure active participation to the information society. In addition, with the ever-increasing information, access to information, and evaluation and sharing of information have come to the fore as an important competence for individuals. In the framework definitions of digital skills, it is observed that these skills are dealt with in a wide perspective that covers high-level skills rather than expressing a technical aspect of these skills (Claro et al., 2012; Fraillon et al., 2019a).

In the definitions of skills regarding ICT, the concepts of “ICT literacy” and “Computer and Information literacy (CIL)” are prominent in the literature. CIL was defined as “an individual’s ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in society” (Fraillon et al. 2014, p. 17).This definition refers to using computer technologies to collect/manage and produce/exchange information. The concept of CIL includes knowledge about hardware and software applications and an understanding of the concepts of technology rather than referring to a literacy perspective involving only the use of technology (Kuhlemeier & Hemker, 2007). ICT literacy, on the other hand, considers ICT as a basic learning tool (Fraillon et al., 2013).

Because digital skills provide flexibility to individuals in both learning and participation in the workforce, there are attempts to identify these skills and help individuals acquire them in many countries (ACARA, 2015; Claro et al., 2018; Fraillon et al., 2019b; Lorenceau et al., 2019). On the other hand, research on digital tools reveals that not every student has similar conditions and there are inequalities between students (Hatlevik & Gudmundsdottir, 2013; Lebens et al., 2009; Scherer & Siddiq, 2019; Vigdor et al .; 2014; Yeo & Lee, 2020). It is stated that conditions partially improve as the development level of countries increases; however, these inequalities continue to affect individuals even for countries with good conditions, (Van Deursen & Van Dijk, 2019) and they also create a difference in individuals' activities and skills (Hargittai & Hinnant, 2008). Although some schools overcome this situation with the policies they implement (Drossel et al., 2020), how this situation affects the digital literacy levels of students will also be a guide for the policies to be implemented.

With the current research study, the effects of the variables, which are stated to create a digital divide in the literature, on the digital literacy levels of the students are examined. This study was carried out with the International Computer and Information Literacy Study (ICILS) data, and it puts forth the contributions of the socio-demographic characteristics of students in successful and unsuccessful countries to their computer and information literacy (CIL) achievements.

2. Theoretical framework

2.1. Digital Divide

The concept of digital divide, in the most general sense, is used to describe the difference between those who use the computer and the Internet and those who do not. Broadly, it is also defined as a concept expressing inequalities in the use of these tools,

especially ICT tools and the Internet (Castells, 2002). In her two-level definition of this divide, Hargittai (2002) defines the inequality on the access side due to cost and infrastructure as level-1, and the inequality in user expertise (digital literacy) as level-2. The added third level is the inequality in outcomes (eg. learning and productivity) as a result of exploiting IT resulting from the second-level digital divide and other contextual factors (Wei et al., 2011). These three divide types are listed as digital access divide, digital capability divide, digital outcome divide.

Van Dijk (2006), addressing different aspects of the scope of the type of access, points out to components of *material access*, related to computer and internet access, *motivational access*, as a desire to have a computer and internet access, *skills access*, consisting of skills required to use a computer and the internet, and *usage access*, expressing duration of use, diversity and effectiveness. In fact, this typology shows that this concept of digital divide tends to describe the divide in skills that encompasses usage processes beyond physical access. On the other hand, it is also stated that the digital divide has become a multidimensional phenomenon expressing a series of complex divisions caused by various factors (Bruno et al., 2010). Of course, these versatile definitions are also expected to contribute to the elimination of inequalities.

Although it has been observed that the context of the digital divide is not consistently revealed in the studies in the literature (Scheerder et al., 2017), it is known that socio-demographic and socio-economic determinants are prominent variables in both the second and third level digital divide (Scheerder et al., 2019). These characteristics are also defined as prominent variables in technology adoption (Niehaves & Plattfaut, 2013). Research has also revealed that gender and education level are closely related to differences in digital skills (Gui, 2007; Gui & Argentin, 2011; van Deursen & van Dijk, 2009). These studies revealed that students' digital skills are related to background

characteristics that cause digital divide.

2.2. Computer and Information Literacy

With the widespread digitalization, computer and information literacy is considered as a basic criterion for employment as well as being a necessary skill in almost every field (Martin, 2006). Fraillon et al. (2013, p.17) defined this concept as “an individual’s ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in society”. In addition to the concept of computer and information literacy, which defines the individuals to perform a task with digital tools, it is seen that ability to use and benefit from digital technologies stand out in each concept of "digital competence" (Calvani et al., 2012), "digital skills" (Zhong, 2011) and "ICT literacy" (Martin & Grudziecki, 2006).

It is known that different policies are carried out in many countries in order for individuals to acquire these skills, which are deemed necessary with regard to ICT for societies. The European Commission, too, states that knowledge and data literacy, digital content creation, communication and collaboration skills are among the basic digital competencies that are thought to be necessary to be acquired by 21st century students (Carretero et al., 2017). Developing these competencies will both support the students to cope with possible problems in education or professional fields in the future, and will contribute to the elimination of social inequality by closing the development differences in this area. The proliferation of national / international large-scale evaluations of ICT literacy [ICILS (International), PISA (International), ACARA (Australia) TILT (Germany)] conducted in many different countries and within different frameworks can be seen as evidence of increased interest (ACARA, 2015, Fraillon et al., 2013; Lorenceau et al., 2019, Senkbeil, et al., 2013).

International Computer and Information Literacy Study (IEA-ICILS 2018), which is carried out with the participation of eight graders, consists of two overarching conceptual categories (i.e., strands), which are divided into seven aspects or content categories within each strand (Fraillon et al., 2013). The first strand, which is 'collecting and managing information' consisting of basic definitions of ICT literacy, includes a more practical understanding of how to use a computer, and skills of accessing, evaluating and managing information. The second strand, which is 'producing and exchanging information', includes transforming, creating, sharing information and using it securely. ICILS study, which also offered a data source for the current study, is distinguished among large scale ICT-based assessments. In the study, there are data regarding ICT antecedents and processes in the contexts of both home and school, which contributes greatly to the understanding of the context. It was chosen as a data source in the current study due to this characteristic of ICILS study. 14 countries participated to the second strand of the assessment which is practiced every five years, and students' computational thinking was also assessed as well as their levels of CIL (Fraillon, 2019a). ICILS 2018 results revealed that less than 25% of students achieved only two out of five achievement levels, which shows that students still have serious deficiencies in basic computer skills in order to participate in society.

2.3. CIL (Computer and Information Literacy) Achievement and Student Background

Students' characteristics with regard to home environment play an important role in their academic and social development (Bradley et al., 1988; Davis-Kean, 2005; Bywater et al., 2015). This also manifests itself in research studies on students' CIL achievement, as well. Gui (2007) found that when age variable is controlled, education level and parental education have a relevant effect on the ability to solve complex tasks

related to ICT. In the ICILS 2013 results, students' socioeconomic backgrounds had a moderate, positive relationship with the students' CIL in all participating countries. Therefore, socioeconomic status seems to be the most important predictor of students' computer and information literacy in all countries (Claro et al., 2012, Hatlevik et al., 2015). In addition, it has been revealed that the socio-economic level is the determinant of the level-2 divide rather than the level-1 divide (Hatlevik et al., 2018).

It has been identified that students' parents, from whom they can receive support at home, also contribute to CIL achievements (Fraillon et al., 2014, Goldhammer et al., 2013). The education level or level of providing support to children of some parents also determines the students' ICT experience. This seems understandable, considering that disadvantaged students are less likely to have digitally literate parents (Becker, 2000).

The assessments show that there is a gender effect on students' CIL achievement (Fraillon et al., 2013, 2019b). It is stated that this difference seen in the research results in favor of girls is not very significant (Siddiq & Scherer, 2019). Punter et al. (2017) argued that the tasks related to ICT are determinant in this difference regarding gender.

3. The present study

An examination of the literature suggests that the socio-demographic characteristics of the students (socioeconomic background, computer experience, internet access at home) are a determining factor in digital divide. On the other hand, these features also contribute to students' CIL achievements and ICT interactions. With the current research, it is aimed to reveal to what extent the difference that students experience in the elements of digital divide is reflected in their digital literacy skills. It is thought that understanding this will contribute to the policies regarding CIL literacy. Within the

scope of the research, the characteristics of the countries with the highest and lowest CIL achievements in ICILS 2018 assessment were examined. For this purpose, answers to the following research questions were sought.

1. How do Korean students' gender, internet connections at home, parents' level of education and computer experience affect their CIL achievement?

2. How do Chilean students' gender, internet connections at home, parents' level of education and computer experience affect their CIL achievement?

4. Methods

4.1. Participants

This research was conducted with the ICILS 2018 Korea and Chile sample. These selected countries are those with significant differences in achievements in terms of their CIL performance in the ICILS study. A total of 2875 students, 1497 boys (52%) and 1378 girls (48%), participated in the study in the Korean sample. There were a total of 3092 students, 1519 (49%) boys and 1573 (51%) girls in the Chilean sample. While it was planned to include Danish data in the study, the Korean sample, which was in the second place in ICILS 2018, was preferred because Danish data included deficiencies in some variables (access to internet, etc.) in the dataset in terms of socio-demographic characteristics. Data collection, coding and reporting processes were carried out according to the quality standards predefined by the International Association for the Evaluation of Educational Achievement (IEA) (Fraillon et al., 2014). In this study, the procedures specified in the guidelines were followed in data analysis.

4.2. Measures and Procedures

Within the scope of the research, the items related to the socio-demographic

characteristics of the students, the scales used and the achievement test scores were accessed from the ICILS database. The statistical techniques (confirmatory factor analysis, item response theory, and Cronbach alpha coefficients, etc.) used for these tools developed within the scope of the study are included in the manuals (Fraillon et al., 2020). There are 5 different plausible values (PV1-PV5) based on statistical estimation in order to reduce the margin of error regarding student achievements in large-scale evaluations. These values are the values that allow predicting students' performance by assuming that each student has answered all the questions in the test in cases where it is not possible for all students to answer all questions of a test (House, 2002). In this research, analyzes were carried out with the PV1 value as the CIL achievement score of each student.

Variables

Achievement Test

In this study, which is based on logistic regression analysis, the score of 500,00, which is determined as an average by the IEA regarding the CIL success of the students, was considered as the ICILS standard. Students who reach a score of 500, determined as the cut-off point, and above were defined as "successful" while those below the cut-off point were defined as "low achieving" profile.

Predictor Variables

Variables of students' gender (S_SEX), internet connection (S_INTNET), parents' level of education (ISCED) and computer experience (COMPEX) were placed in the model as predictor variables. For the gender (male, female) and internet connection (no, yes) variables, the categories in the data set were used as they were. Parents' levels of education and computer experience variables were re-categorized as in Table 1. For this

analysis type where it is important to know the reference categories in understanding the findings, the categories for all variables are presented in Table 1.

Table 1. Analysis categories regarding variables

4.3. Data Analysis

Before the analysis procedures, the predictive variables were examined in terms of the number of individuals in the categories, multicollinearity and outliers. In this study, in which the dependent variable is categorical (successful-low achieving), binominal logistic regression analysis was used to test the differences between the students' CIL scores with the variables related to their home characteristics. The purpose of using logistic regression analysis is to create a consistent model that accurately describes the relationship between the dependent variable and the independent variable, using the least number of variables. Since it is aimed in logistic regression analysis to predict the value of the categorically dependent variable, prediction for group membership to two or more groups is made here (Tabachnick & Fidell, 2013). In this analysis, the maximum likelihood estimation procedure is used to find the best linear combination of predictors as it is aimed to maximize the possibility of obtaining the observed result frequencies (Hox, 2002).

Since the dependent variable is binary (dichotomous) in this study, the equation for logistic regression is as follows.

$$E(y) = \frac{exp\,(x'\beta)}{1 + exp\,(x'\beta)}$$

Here $x_i' = [1,x_{i1},x_{i2},...,x_{ip}]$ i. is data vector of observations and $\beta' = [\beta_0,\beta_1,\beta_2,...,\beta_p]$ is parameter vector of p variables. Logistic response function can be easily linearized. Linear response function is found as:

$$\eta = x'\beta$$

Here, it is defined with this transformation:

$$\eta = ln\frac{\pi}{1-\pi}$$

This transformation is called logit transformation of π odds. π odd is defined as $P(y = 1) = \pi$, namely it indicates the probability that response variable is 1. Odds ratios were examined to determine the relative estimation effect of the predictors. Odds ratios provide information about the change in probabilities produced by a unit change in the predictor variable when all other predictors are controlled for (Peng et al., 2002). The odds ratios for the variables are presented in the research findings.

To evaluate the model in this study, likelihood ratio test results are presented for overall model evaluation, and Hosmer and Lemeshow test results and R^2 of Nagelkerke and R^2 values of Cox and Snell are presented for goodness of fit. When analyzing logistic regression models, there is no statistics directly equivalent to classical R^2. Therefore, these R^2 values, which are called Pseudo R^2, are a value used in the comparison of models (Hosmer et al., 2013).

5. Findings

CIL achievement model for Korea

When the model including the independent variables created for the Korean sample was compared with the fixed model, it was seen that the test for the model was significant [$\chi 2$ (4) = 193.800, p <0.001]. It shows that the predictor variables considered as a cluster differentiate successful and unsuccessful students significantly. With the variables determined within the scope of the research, the c-statistic value for the Korean model was found as 69.4. This value, together with the variables in the model,

shows that the correct classification for the intended model is 69%. The C-statistic value varies between 0.5 and 1, with higher values indicating better predictive ability (Peng et al., 2002). Table 2 shows regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the four predictors.

Table 2. Logistic regression analysis of student achievement in the CIL based on socio-demographic variables (Korea)

Hosmer-Lemeshow (H-L), which calculates the chi-square statistics of the observed frequencies against the frequencies expected from the model, was not significant ($\chi 2$ (6) = 5.826, p> .05). That this value is not significant shows that the model-data fit for this model with four variables is at a sufficient level.

According to the Wald criterion, children's computer experience (COMPEX) [χ^2 (1) = 83.766, p <0.001], internet connection (S_INTNET) [χ^2 (1) = 4.167, p <0.001], gender (S_SEX) [χ^2 (1) = 79.852, p <0.001] and parents' levels of education (ISCED) [χ^2 (1) = 19.359, p <0.001] predict achievement level significantly. It has been understood that the variables in the model are important determinants of Korean students' CIL achievement. The coefficient for COMPEX is .783, which corresponds to the log of odds ratio between students who have computer experience for five years or more and those who do not. The odds ratio equals 2.189, which means odds that students with five or more years of computer experience are successful is 2.189 times greater than the odds of students who do not have this experience.

The coefficient for S_INTNET is .886, which corresponds to the log of odds ratio between students who have internet connection at home and those who do not. The odds ratio equals 2.425, which means odds that students who have internet connection at home are successful is 2.425 times greater than the odds of students who do not have internet connection at home.

The coefficient for S_SEX is .767, which corresponds to the log of odds ratio between the female group and male group. The odds ratio equals 2.153, which means the odds that female students are successful is 2.153 times greater than the odds of male students. The coefficient for ISCED is .399, which corresponds to the log of odds ratio between students whose parents' level of education is undergraduate or above and students whose parents' level of education is below undergraduate. The odds ratio equals 1.491, which means the odds that students whose parents' level of education is undergraduate and above are successful is 1.491 times greater than the odds of students whose parents' level of education is below undergraduate.

In this model of Korean students' CIL achievement, the high odds ratio for the internet variable is remarkable. Odds ratio of parental education level stands out as the lowest.

CIL achievement model for Chile

When the model with independent variables created for Chile sample was compared with the fixed model, it was seen that the test for the model was significant [$\chi 2$ (4) = 489.154, $p < 0.001$]. It shows that the predictor variables considered as a cluster differentiate successful and unsuccessful students significantly. With the variables determined within the scope of the study, the c-statistic value for the Chile model was found to be 68.9. This value, together with the variables in the model, shows that the correct classification for the intended model is 69%. Table 3 regarding Chile model shows regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the four predictors.

Table 3. Logistic regression analysis of student achievement in the CIL based on socio-demographic variables (Chile)

Hosmer-Lemeshow (H-L), which calculates the chi-square statistics of the observed frequencies against the frequencies expected from the model, was not significant ($\chi 2$ (7) = 5.735, p> .05). That this value is not significant shows that the model-data fit for this model with four variables is at a sufficient level.

According to the Wald criterion, students' computer experience (COMPEX) [χ^2 (1)= 90.602, p <0.001], internet connection (S_INTNET) [χ^2 (1)= 46.465, p <0.001], gender (S_SEX) [χ^2 (1)= 14.491, p <0.001] and parents' levels of education (ISCED) [χ^2 (1)= 211.097, p <0.000] predict achievement level significantly. It has been understood that the variables in the model are important determinants of the CIL achievement of Chilean students.

The coefficient for COMPEX is .776, which corresponds to the log of odds ratio between students who have computer experience for five years or more and those who do not. The odds ratio equals 2.173, which means odds that students with five or more years of computer experience are successful is 2.173 times greater than the odds of students who do not have this experience.

The coefficient for S_INTNET is .870, which corresponds to the log of odds ratio between students who have internet connection at home and those who do not. The odds ratio equals 2.386, which means odds that students who have internet connection at home are successful is 2.386 times greater than the odds of students who do not have internet connection at home.

The coefficient for ISCED= 1.249, which corresponds to the log of odds ratio between students whose parents' level of education is undergraduate or above and students whose parents' level of education is below undergraduate. The odds ratio equals 3.488, which means the odds that students whose parents' level of education is undergraduate and

above are successful is 3.488 times greater than the odds of students whose parents' level of education is below undergraduate.

The coefficient for S_SEX is .306, which corresponds to the log of odds ratio between the female group and male group. The odds ratio equals 1.357, which means the odds that female students are successful is 1.357 times greater than the odds of male students.

In this model of the CIL achievement of Chilean students, the high odds ratio for the variable of parents' level of education is remarkable. The lowest odds ratio was found to belong to the gender variable.

6. Conclusion and Discussion

The main purpose of this study is to reveal how the variables that cause the digital divide play a role in students' CIL achievement. The variables of gender, parents' level of education, internet connection and computer experience, which were determined as predictors of CIL achievement in models created for Korea and Chile, were found to be significant for both countries. In this study, it is observed in the models created with the variables that are stated to cause a digital divide in the social sense that digital divide is extant although the countries have different economic structures and students have different levels of digital literacy. The results of this research on digital skills are considered important; especially in understanding the third-level effects of digital divide (Scheerder et al., 2017) on which limited research is available. With this research, it has been shown that digital divide, which is stated to be differently related to student achievements in the literature (Huang, & Russell, 2006), still exists and have also effect on CIL achievements. It is thought that these research findings, including Chile, will contribute to the recommendation of the United Nations to fill the gap in studies on ICT instruments in Latin American countries (Balboni et al., 2011).

Based on the examination of research variables, it is identified that students' computer experiences have effect on their CIL achievements. In particular, parallel findings were observed in studies on computer skills conducted with a control group (Fairlie, 2012). Jara et al., (2015) reported that students' having computers at home and their long-term computer experience contributed significantly to test scores for digital skills. Braak and Kavadias (2005) stated that this experience affects their general beliefs about computers and their perceived efficacy levels. Rohatgi et al. (2016) also identified that students' computer experience had both a direct effect on students' CIL achievement and an indirect effect through their basic self-efficacy levels. In addition, the literature highlights its contribution to students' academic achievement (Fuchs, T., & Wöβmann, 2005).

The results of this research suggest that the gender effect observed in favor of girls on students' CIL achievement is valid for both countries. In their study on digital skills in European countries, Punter et al., (2017) stated that there is a difference in favor of girls although it is not seen as an extraordinary difference, but this situation cannot be generalized. Comprehensive meta-analysis results for digital literacy also revealed the existence of a small effect ($g = 0.12$) in favor of girls (Siddiq & Scherer, 2019). The small effect of gender in favor of girls for Chile identified in the current study in is in parallel with the results of the earlier research conducted in Chile (Claro et al. 2012).

It has been found out that whether students have internet connection at home or not has a similar effect on their CIL achievement in both countries. It is stated that this variable, which has an important place in the digital divide literature, contributes to the digital competencies of students as also observed in the present study (Malamud et al., 2015; Malamud, 2019). van Deursen and van Dijk (2014) stated that with the widespread use of the internet, the social, economic and cultural relations of the usage gap seen in traditional media tools have also become valid for internet usage. They emphasized that

the educational effect, in particular, has an important role in the assumptions about both usage gap and knowledge gap in the literature.

The effect of parents' levels of education on having digital skills was significant for the achievements of both Korean and Chilean students. This finding is also confirmed by the literature (Gui, & Argentin, 2011; Van Dijk, 2006). Studies show that individuals with a low educational background can benefit less from online environments and do not perform effective activities even if they use the internet for a longer period of time (van Deursen & van Dijk, 2014). Therefore, it can be argued that parents who are experienced in the internet tend to engage in personally advantageous activities. This case regarding digital skills is also seen as very important for students. Clark (2011) stated that the parent-child relationship is two-way, and drew attention to a relationship where parents can develop their digital skills through learning from children and help them by transferring their own experiences to children. This support, also known as active mediation (Chen, & Chng, 2016), occurs when parents talk to their children about the use of digital media and provide them with guidance and advice. However, in cases where effective use is not available, it can be said that the contribution offered to students is low. In this respect, it has been observed that the parental effect seen in the research results is compatible with the literature and is an important determinant for students. It can be said that parents' level of education, which has significant effects on the CIL achievements of students in both countries, has a more significant contribution to the achievements of Chilean students.

For the solution of the problems caused by digital divide, significant tasks are incumbent on governments and decision-making mechanisms. In the broader sense, some critical steps include providing technical and infrastructure needs of the schools and contributing to teachers' professional development (Rowsell et al., 2017). First,

finance should be obtained for supplying devices and internet access needed by students. On the other hand, mainstreaming 21st century skills would also increase social contribution which is a need currently. As proposed by Shenglin et al. (2017), synchronizing education systems with the rapidly developing labor markets as well as encouraging digital innovation and entrepreneurship by governments would also contribute to a great extent. Additionally, making the internet and ICT use accessible to add value to society would also culminate in sound results.

7. Limitations and future studies

Hawkins and Oblinger (2006) drew attention to the importance of level-1 factors (internet connection, technological support, etc.) in level-2 digital divides. However, it is known that the variables of gender, education level and technology experience which are known as level-2 factors (Hargittai, 2002) contribute to the level-3 complex qualities (productivity, creativity, etc.). In this study, students' existing skills (CIL) related to complex behaviors were examined. However, the innovative effects created by digital divides are a limitation of the research.

On the other hand, for the policy steps to be developed based on the results of the countries considered in this study, there should be closer examinations for each country. Taking the results of such different studies together will enable policy makers to take effective decisions.

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- Students' computer experiences have effect on their computer and information literacy skills.
- The effect of gender on having digital skills is observed in favor of females.
- The effect of parents' levels of education on having digital skills is significant for the achievements of both Korean and Chilean students.
- Parents' level of education variable stands out for the Chilean model while the internet connection variable is remarkable for the Korean model.