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# In the footsteps of Bourdieu towards digital capital

## A case study on the application of the concept of digital capital on the relationship between digital and educational inequalities

## Abstract

Bourdieu's sociological concepts and approach are well suited to capture and interpret the new phenomena of the information society. The present paper shows how these concepts and notions have been applied in recent literature, both theoretically and empirically. We focus on the notion of digital capital, which is considered a new factor in the process of Bourdieu's cultural reproduction concept. Thus our starting point is that status in digital inequalities, and thus digital capital, plays a significant role in determining educational inequalities and school performance. We illustrate this hypothesis by analysing data of PISA 2015 from Hungary, namely the impact of different dimensions of ICT use on test scores in mathematics, reading literacy and science. Our results suggest that digital capital plays a crucial role in shaping educational inequalities, but that the effects vary across dimensions of digital inequalities and ICT use.

## Keywords

digital capital, digital inequalities, educational inequalities, school performance, PISA

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# 1. Introduction

One of the most striking social transformations of recent years and decades has been induced by digitalisation, the transformation into an information society. Social scientists and sociologists have tried to grasp these structural changes, also with the concepts and ideas of Pierre Bourdieu, among others. In our study, we will show how digital sociology applies Bourdieu's concepts to these new phenomena, highlighting the concept of digital capital, which emerged in the late 2010s. The notion of digital capital is linked to the third level of research on the digital divide, which seeks to explore the effects of the use of digital devices on the position in the social structure. A case study is presented to link digital inequalities and educational inequalities along the lines of digital capital. We aim to answer whether digital capital is involved in shaping educational inequalities in the context of the information society.

# 2. Theoretical background

## 2.1 Digital inequalities

New digital technologies, including the internet, are spreading rapidly but unevenly. Whether examined at the global or societal level, new tools and technologies show an uneven distribution across continents, regions, countries and within a given society in relation to different social strata and groups (Bognár – Galácz 2004). It is primarily because of this inequality-forming effect that the information society and related technological innovations have become an interesting and worthwhile topic for sociological research.

When new information and communication technologies (ICT) first emerged, there were two views on their impact on social inequalities. One approach, the *normalisation hypothesis*, argues that technologies reduce and, over time, eliminate social inequalities by giving everyone access to different kinds of information, knowledge and opportunities. The opposing view is sceptical about the egalitarian role of new technologies, the *amplification model* supposes that new technologies do not reduce but rather increase and deepen social inequalities and create a new dimension of inequality (Pintér 2007, DiMaggio et al. 2001). Although both approaches have a theoretical basis, empirical evidence supports the latter hypothesis, i.e. that ICTs are spreading unequally and create inequalities.

These inequalities can be examined at several levels. On the one hand, at the global level: between countries and regions, and on the other hand, within society, in terms of differences

between strata and groups (Bognár – Galácz 2004). In addition to global and social digital inequalities, Norris (2001) highlights a third dividing line, namely the democratic digital divide. By this she means that some members of society are able to use the Internet effectively for civic engagement and political activism, while others do not benefit from these opportunities and advantages.

The social studies of ICTs have taken three different approaches at the different levels of changing penetration rates. These are classified in the literature as three levels: *first-level digital divide*, *second-level digital divide* and *third-level digital divide* (van Deursen – Helsper 2015, Scheerder – van Deursen – van Dijk 2017, Ragnedda 2018). Initially, access was at the forefront, as indicated by the first-level divide. At a higher penetration rate, the quality of use became a central issue, including quality of access, and hence the impact of broadband. Linked to the second-level divide is the unequal distribution of ICT skills and knowledge in society, with age being an important dimension. Some generations are „born into" the digital world, while others have been exposed to new technologies later in life and therefore have different ICT skills and knowledge. The third-level digital divide has come to the fore in social studies on ICT in the last few years. In the second half of the 2000s and the first half of the 2010s, numerous studies examined how dimensions of social inequalities determine differences in ICT use, but some authors have pointed out the need to move beyond this static approach and focus on the social consequences and impacts of ICT use (Scheerder – van Deursen – van Dijk 2017). Thus, since the second half of the 2010s, an increasing number of theoretical concepts and research have emerged that address and empirically investigate the social effects of Internet use based on the concept of the third-level digital divide (van Deursen – Helsper 2015, Ragnedda 2018, Lutz 2019, Gómez 2020). The crucial element of the theoretical framework of the third-level divide is the interpretation of ICT use as capital. Some authors consider the ability to use ICTs as a resource, as part of cultural capital, such as digital cultural capital (Ollier-Malaterre – Jacobs – Rothbard 2019). Others identify the acquisition of social benefits from ICT use and their interference with social status as a separate type of capital. In the literature, the concept of technological capital (Carlson – Isaac 2018) and the concept of digital capital (Ragnedda 2018) also appear. In our study, we relate to the concept of digital capital. In the next section we start by exploring the concept of capital in sociology, its origins and the ideas that have been developed about it.

## 2.2. The concept of digital capital

The concept of capital, which has its origins in economics, has also long been used in sociology, especially in various interpretations of social capital. The classical economic concept of capital can be traced back to Marx. In his approach, capital is property from which the owner is able to derive a surplus profit in relation to his expenditure. One form of this is money capital, from which, through investment, the individual generates more money. In another form, it is through the ownership and operation of the means of production that the individual realises, over and above his inputs, an additional return (Farkas 2013). The post-World War II economic processes, the rapid pace of development and research that has been conducted to interpret them have led to the emergence of a new form of capital, namely human capital. T.W. Schultz identified

as drivers of rapid economic development, among others, the spread of literacy, the expansion of education and hence the advancement of knowledge and expertise, improved health, longer life expectancy and lower infant mortality. The concept and measurement of human capital was developed by Gary Becker, whose work established a new trend in economics (Rossen 1998). According to human capital theory, it is through individual investment in education, training and vocational training that individuals earn a higher return than their investment, since through this investment they increase their productive capacity and productivity and thus earn higher incomes in the labour market (Varga 1998. 13).

In sociology, the concept of capital has become widely used through social capital. The concept of social capital has been interpreted in many different ways. Basically, two lines of research can be distinguished on the basis of a micro- versus macro-level division of the analysis (Orbán – Szántó 2005). One line of research starts from the individual and focuses on the benefits of social capital for the individual. In other words, how the individual can access and mobilise resources embedded in networks of relationships to achieve his or her own goals. The other set of theories approaches the utility of social capital from the perspective of the community. According to these theories, social capital contributes to the achievement of certain collective goals.

The best known theories of social capital in sociology are those of Pierre Bourdieu and James Coleman. Pierre Bourdieu extended the concept of capital in economics, which he considered to be an important basis for the place of capital in the social structure (Anheier – Gerhards – Romo 1998). He distinguished three basic types of capital: economic, cultural and social. These types of capital are interchangeable and can be converted into other types of capital (Bourdieu 2004 [1983]). There is a fourth type of capital, symbolic capital, but its contours remain rather vague (Farkas 2013). Economic capital is made up of resources that can be expressed in money or can be monetised. It includes monetary income itself, financial resources and assets. Bourdieu argues that the concept of human capital in economics is reduced to the monetary expression of investment in education and learning, thus ignoring important dimensions that are encompassed by the concept of cultural capital as he defines it. *„[...] theorists of human capital condemn themselves to ignoring the most hidden and socially most effective investment in education, namely the transmission of cultural capital in the family.*" (Bourdieu 2004. 125). Cultural capital exists in different forms, of which Bourdieu distinguishes three types. Incorporated cultural capital is acquired during socialisation, primarily in the family. It includes the individual abilities, skills, talents and knowledge that are internalised and built into our personality. It takes a longer period of time to transfer, as it is a process of nurturing. This form of cultural capital is not validated by the institutions of society. The second form, institutionalised cultural capital, is created through the recognition and validation of the relevant social institutions, primarly through educational degrees and certificates. In fact, it is nothing other than a form of incorporated capital manifested in various certificates. In addition to incorporated cultural capital, it also requires economic capital. The third type is objectified cultural capital, which can be more directly linked to economic capital, since it includes the objectified forms of cultural capital. This form therefore refers to objects that have cultural value. The reception and enjoyment of this objectified form presupposes incorporated cultural capital (Bourdieu 2004).

In Bourdieu's interpretation, the third type of capital that affects the position in the social structure is social capital. He defines it as *„the set of actual and potential resources associated with the possession of a durable network of more or less institutionalised relations of mutual*

*acquaintance or recognition."* (Bourdieu 2004. 130). This resource is thus based on belonging to a group, it is the resources available through relationships, social ties. The extent of social capital depends on the extent of the network of relationships, the capital of the individuals in the network of relationships and the extent to which they make these resources available (Bourdieu 2004). For Bourdieu, too, the individual character of social capital is dominant, i.e. it is primarily of use to the individual. Connections based on reciprocity and mutuality can be effectively mobilised by the individual to fill important positions or to build a career (Orbán – Szántó 2006).

The other major theorist of social capital is James Coleman, who first applied the concept to the social context of education, before extending it in a broader sense (Orbán – Szántó 2006). His approach is also micro-level, and he understood social capital as the use of an individual's network of relationships as a resource. In his conceptualisation, social capital „*is, unlike other forms of capital, embodied in the structure of relations between actors."* (Coleman 2006. 112). The social network of relationships serves primarily as a resource for the individual, enabling him or her to achieve certain goals. At the same time, it also has the character of social capital as a public good. The benefits of certain types of social capital are not enjoyed exclusively by those who create it, but also by others, so that individuals invest less than necessary in the creation of social capital (Coleman 2006. [1988]).

Putnam, on the other hand, stresses the communal character of social capital and its collective utility. Social capital, as a social organisation, is characterised by networks of relationships, norms and social trust that promote mutually beneficial coordination and cooperation. In communities where social capital is strong, norms of reciprocity and mutual trust are common, which facilitate coordination and communication (Putnam 2006. [1995]).

In recent years, a new concept of capital has emerged within sociology, building on earlier theories of social capital and developing them further to create the concept of digital capital. It is primarily Bourdieu's theoretical notions that are the starting point for a new line of sociology, digital sociology, which attempts to understand the social aspects of ICT use and digital phenomena and their effects on social structures. Digital sociology can be both the study of social effects of ICTs and the application of digital technologies in the research methodology of social sciences (Ignatow – Robinson 2017). In the following, we will show which concepts of Bourdieu and how they can be applied to the study of ICT-related phenomena.

The extension of the field (champ) concept to digital culture seems obvious. In Bourdieu's interpretation, the field is a particular organised segment of social space, constituted by the social distance between members of society, by the system of valid inequalities. Inequalities are organised along the lines of different resources and capitals. The main element of the field is the competition between people for the acquisition and retention of resources and stakes accepted in the field (Bourdieu 2010 [1994]). The online space can also be understood as a field organised along digital inequalities, with digital capital as the dominant resource (Ignatow – Robinson 2017). Another important element of Bourdieu's theoretical foundations is habitus, which mediates between the field and practical action. Habitus is in fact a mental and symbolic imprint of the social situation that generates practical action. Its manifestation is a system of enduring attitudes and dispositions built into the personality. One of the best examples of the empirical analysis of habitus is Bourdieu's *La Distinction*, in which he examines inequalities between social classes through differences in tastes (Bourdieu 1984 [1979]). The concept of habitus has

also gained ground in digital sociology and many have attempted to measure it. One form of this is the linguistic analysis of digital content, including sentiment analysis (Ignatow – Robinson 2017). Julien (2015) has explored the applicability of Bourdieu's concepts to online activities and interactions through internet memes. The so-called „event meme" is interpreted as the phenomenon that is an expression of digital habitus[1] .

Bourdieu's concept of digital space and its interactions is of particular importance in the interpretation of the central element of the online field, the foundation of digital habitus, digital capital itself. The concept of digital capital is related to different levels of digital divides. As described earlier, the study of the digital divide initially focused on dichotomous inequalities in ICT access and use (first level digital divide), and then shifted to inequalities among users in use, which were called digital inequalities (second level digital divide).

In recent years, a new approach to the digital divide has emerged, namely the analysis of the third level digital divide. This is based on the recognition that since different usage patterns are closely related to the social status of the individual, groups with a more favourable social status can benefit more from ICT use than those with a less favourable status. Using empirical data, van Deursen and van Dijk (2014) showed a correlation in Dutch society where people with lower educational attainment spend more time using the internet, but are not able to use it as a resource. However, more educated users can also gain additional social benefits from less internet use. An analysis based on the concept of third level digital divide has been carried out by Deursen and Helsper (2015), in which the use of the internet and its benefits in different areas of an individual's life (e.g. material, relational, educational, political) were measured and compared with traditional social inequalities. Their analysis showed that education is the most determinant factor in the use of the internet as a resource.

This approach thus links digital inequalities to social structure by trying to capture the offline effects of ICT use and online activities, their inequalities mediated in social reality (Ragnedda 2018). This is where the concept of digital capital becomes central, providing a theoretical foundation for empirical studies that has been lacking so far. Building on Bourdieu's concept of capital, Ragnedda (2018) defines digital capital as the accumulation of digital competences and digital technologies. Like other types of capital, it has the important characteristic of being fungible. Digital capital is therefore directly or indirectly convertible into any other capital, whether economic, social, cultural, human or political. In fact, digital capital bridges the gap between online and offline life opportunities, creating an interaction between them. An individual's existing capital (economic, social, cultural, human and political) influences the extent to which digital capital feeds back and converts into offline capital, which influences the individual's social position. Thus, by this mechanism, those who already have favourable capital can use it more effectively to increase their digital capital, thereby further enhancing their original capital. The same mechanism can also work in reverse, so that lower offline capitals result in lower digital capital, which in turn reinforces and re-produces the individual's unfavourable social position. The other two intermediate ideal cases are high levels of offline capital but low levels of digital capital, or conversely, low levels of offline capital but high levels of digital capital. An example of the first combination is the ageing professor who has high levels of economic, cultural, social

[1] The ‚event meme' interprets a current world event by combining an existing meme with the specific language of the internet (an expression of habitus itself) (Julien 2015).

and human capital but lacks digital competences and capabilities, and therefore has low digital capital. In this case, he cannot effectively increase his original capital with his digital capital. The other variation is exemplified by the clever, ingenious criminal who has low economic, cultural, social and human capital, but whose digital competences are outstanding, so that he can effectively use his digital capital to increase his original capital, e.g. economic capital, for example, through cybercrime. In his study, Ragnedda explains the interaction of digital capital with different types of offline capital. Of these, the interaction between cultural capital and digital capital is the most relevant for the present thesis. Cultural capital includes skills, education and knowledge that an individual can use for the benefit of other capital, including digital capital. The consequences of this interaction are then drawn for both online and offline life. What are the possible manifestations of the interaction between these two types of capital? The positive interaction in second level digital inequalities results in a level of tertiary digital divide where individuals are able to use the information they acquire online as value, to verify the credibility and reliability of information/resources, to deepen and process online information. The negative interaction results in the opposite of all this (Ragnedda 2018).

Gómez's (2020) empirical study is based on the theoretical foundations of digital capital, as outlined in Bourdieu's theses. Using a qualitative method and in-depth interviews, they sought to explore and analyse the mechanisms by which the three main types of capital, economic, cultural and social capital, are transformed into digital capital among young people in Madrid, and then converted back into the original capital. The modes of conversion-reconversion provide a picture of how digital inequalities re-produce and deepen social inequalities. The analysis distinguishes between objectified and incorporated digital capital, based on Bourdieu's notions of cultural capital. Incorporated digital capital is internalised through habitus, which is determined by digital skills, dispositions, motivations, interests, expectations and digital practices shaped by past experiences. Objectified digital capital is defined in terms of digital equipment, ICT tools used and technological infrastructure. There is a circular link between the types of original (offline) capital and digital capital. The conversion of original capital is first achieved with objectified digital capital through the customisation of technological equipment. The conversion of objectified capital into incorporated digital capital is achieved through digital literacy, and finally, incorporated digital capital is converted back into economic, cultural or social capital through offline effects from different ICT uses. Based on the results of the interview research, the author confirmed the role of digital capital as „bridging capital", i.e. as a mediator between different types of capital and between online and offline spaces. At the same time, it was concluded that digital capital should not be seen as a completely new type of capital, but as a subtype of cultural capital, since digital technology cannot be separated from the cultural context of society (Gómez 2020).

The study of Ragnedda, Ruiu and Addeo (2020), which conceptualises and operationalises digital capital and then constructs a so-called digital capital index, aims to provide a basis for a comparative empirical study of digital capital. It is based on two pillars, digital access and digital competence, which are built on several dimensions. The dimension of digital access, which is part of the index, covers almost the same areas as the DiMaggio – Hargittai model of digital inequality, with one or two differences. The Digital Capital Index can provide a starting point for identifying and intervening to reduce digital inequalities.

## 3. Research questions

Empirical research based on the conceptual framework of digital capital has started to appear in the last few years. Most of the empirical work on ICT use and its social impact to date lacks this kind of theoretical embeddedness. In this paper, by presenting a case study we apply the concept of digital capital in the context of cultural re-production, thus to the relationship between digital inequalities and school performance. We seek to answer how different dimensions of digital inequalities affect school performance. Which ICT usage patterns can be considered as digital capital that can be converted into school performance? In this way, we can gain an insight into whether ICT use as digital capital can be considered a resource which, alongside economic and cultural capital, has an influential power on school performance and the status in the system of educational inequalities.

## 4. Methodology

To examine the correlations, we used data from PISA 2015 in Hungary, which simultaneously provide information on students' ICT use and their performance at school. School performance is measured by test scores in three fields – mathematics, reading literacy and science – in the PISA surveys[2] . In our analysis, these test scores[3] were the dependent variables. Descriptive statistics for the dependent variables are presented in the table below (Table 1).

*1. Table 1: Descriptive statistics for the dependent variables. Source: PISA 2015. Edited by the author.*

| | N | Minimum | Maximum | Mean | Variance |
|---|---|---|---|---|---|
| Mathematics performance | 5658 | 185,9 | 782,7 | 476,6 | 93,7 |
| Reading performance | 5658 | 163,5 | 754,6 | 468,9 | 97,5 |
| Science performance | 5658 | 156,8 | 763,8 | 477,0 | 95,9 |

The linear regression models include as independent variables different dimensions of ICT use, which we have classified as DiMaggio – Hargittai (2001) dimensions of digital inequality. These are (1) technical equipment, (2) autonomy of use, (3) skills and knowledge, (4) social support and (5) purpose of use. For each dimension we adapted related variables from the PISA database. The dimension of technical equipment is examined through

[2] For more on the PISA methodology, see OECD 2017

[3] Students' school performance is given in test scores in the PISA database. It should be noted, however, that these scores are not concrete test scores, but so-called plausible values. This is because, in order to maximise the accuracy of the measurement and to limit the time frame, students taking the PISA assessment do not complete the same test booklets. Therefore, plausible values for each student's performance are entered in the PISA database and calculated using modern Item Response Theory (IRT), including the Rasch model (for more details see OECD 2017. 141).

the availability and use of ICT devices at home. Autonomy of use is captured through the duration of Internet use. After all, the amount of time a student spends online outside school each day is to some extent a reflection of the degree of freedom or restriction of access to and use of the Internet. There are two ways of approaching students' ICT skills, based on the PISA questions. A distinction can be made between general knowledge and knowledge that enables autonomous use. Subjective ICT knowledge and competence is summarised in two indices in the PISA database. One index (COMPICT) represents a general user knowledge, the other index (AUTICT) refers to a more in-depth, autonomous user ability. Social support for ICT use was assessed using the index available in the PISA database (SOIAICT), which captures the extent to which ICT use is embedded in students' peer interactions and communication. Finally, we mapped the purpose of Internet use and the ways of using the Internet among Hungarian 15-year-old students. On the one hand, we analysed general Internet use activities at home and the ways of using the Internet to support learning, schoolwork and progress with studies. To investigate the association of Internet use patterns with school performance, we used principal components[4] . By applying principal components for general ICT use, we were able to distinguish three types of use, namely (1) use for communication and entertainment, (2) use for gaming, and (3) use for orientation and information retrieval. In the case of Internet use for learning and study, we were able to distinguish two main components. The first principal component („Principal_Comp_Learning") includes activities that more closely relate to the use of ICT tools for learning, such as using the Internet to gather information for schoolwork or to understand course material, and communicating with fellow students about schoolwork on the social networking site[5] . The second principal component („Principal_Comp_SCHOOL_ELSE") includes all the other activities from this set of variables, from downloading apps to help learning, to using ICT to do homework or checking the school's website. These ICT uses have been grouped together as other school-related activities that support the pursuit of studies, i.e. not closely related to learning. A detailed description of the independent variables is summarised in the table below (Table 2).

*Table 2: Presentation of independent variables along the digital inequality dimensions. Edited by the author.*

| **The digital inequality dimension** | **Adapted ICT use dimension** | **Original variables** |
|---|---|---|
| 1. Technical equipment | Availability and use of ICT tools in the home | **Are any of these devices available for you to use at home?** *(Yes, and I use it, Yes, but I don't use it, No)*<br>– Internet connection<br>– Desktop computer<br>– Portable laptop or notebook<br>– Tablet computer<br>– Mobile phone with internet access |

[4] For more on the methodological background and the construction of the principal components, see Vincze (2021).

[5] This activity, which is quite common among young people, may be more closely linked to learning because social media channels are used to discuss schoolwork, and to help each other understand tasks or material. In fact, it can be likened to a kind of study group, which directly supports learning and processing of the curriculum

| | | |
|---|---|---|
| 2. Autonomy of use | Time of Internet usage | During a typical weekday/ weekend day, for how long do you use the Internet at home?<br>– No time<br>– 1-30 minutes per day<br>– 31-60 minutes per day<br>– 1-2 hours per day<br>– 2-4 hours per day<br>– 4-6 hours per day<br>– More than 6 hours a day |
| 3. Skills, knowledge | Subjective ICT skills: General (COMPICT] | **Thinking about your experience with digital media and digital devices: to what extent do you disagree or agree with the following statements?**<br>*(Strongly Disagree,Disagree,Agree, Strongly Agree)*<br>– I'm also good with digital tools that I'm less familiar with<br>– If a friend or relative wants to buy a new digital device or app, I can advise them.<br>– I'm good with digital devices at home.<br>– When I have a problem with a digital device, I think I can solve it.<br>– If a friend or relative has a problem with a digital device, I can help them. |
| | Subjective ICT skills: autonomous use (AUTICT) | **Thinking about your experience with digital media and digital devices: to what extent do you disagree or agree with the following statements?**<br>*I strongly disagree,I disagree,I agree, I totally agree)*<br>– If I need a new computer program, I install it myself.<br>– I read about digital tools to be independent.<br>– I use digital tools the way I want.<br>– When I have a problem with a digital device, I try to solve it myself first.<br>– When I need a new app, I choose it myself. |
| 4.Social support | Embedding ICT use in social interactions and communication (SOIAICT) | **Thinking about your experience with digital media and digital devices: to what extent do you disagree or agree with the following statements?**<br>*I strongly disagree,I disagree,I agree, I totally agree)*<br>– To learn about digital devices, I like to talk about them with my friends.<br>– I like to exchange experiences with others on the internet about problems with digital devices<br>– I like to share information about digital devices with my friends.<br>– I like to meet my friends and play computer games and video games with them<br>– I learn a lot about digital media from talking to my friends and relatives |

| | | |
|---|---|---|
| 5. Purpose of use | General use | **How often do you use digital devices for the following activities outside of school?** *Never or almost never, Once or twice a month, Once or twice a week, Almost every day, Every day)*<br>– Using e-mail<br>– Playing collaborative online games.<br>– Playing one-player games<br>– Chatting online (e.g. MSN)<br>– Participating in social networks (e.g. Facebook, MySpace, etc.)<br>– Playing online games via on social networks<br>– Browsing the internet for fun (such as watching videos on YouTube)<br>– Reading news on the internet (e.g. current affairs).<br>– Obtaining practical information from the internet.<br>– Download music, films, games or software from the internet.<br>– Upload your own created contents for sharing.<br>– Download new apps on a mobile device. |
| | Use for learning purposes | **How often do you use digital devices outside school for the following activities?**<br>*Never or almost never, Once or twice a month, Once or twice a week, Almost every day, Every day)*<br>– Browsing the internet for schoolwork<br>– Use e-mail to communicate with other students about school work.<br>– Use e-mail to communicate with teachers, to hand in homework or other school assignments.<br>– Use social networking sites to communicate with other students about school work.<br>– Use social networking sites to communicate with teachers about school work.<br>– Download, upload or browse data (e.g. timetables or lesson materials) on your school's website.<br>– Reading notices on the school website, e.g. about teacher absences.<br>– Doing homework on the computer.<br>– Doing homework with a mobile device.<br>– Download learning apps for your mobile device.<br>– Download knowledge learning apps for your mobile device. |

As control variables, the socio-economic-cultural background variable, the ESCS index[6] and the student gender variable were included in the analysis. In Hungary, the mean of the ESCS index is -0.177, i.e. lower than the OECD average, with a standard deviation of 0.94, which is very close to the standard deviation of OECD countries (Table 3).

[6] This index is composed of three components: (1) the highest educational attainment of parents, (2) the employment status of parents, and (3) the cultural goods (number of books) and other educational resources available at home. The ESCS index is a standardised index designed to have a mean of 0 and a standard deviation of 1 for OECD countries (OECD 2017. 339–341).

*Table 3: Descriptive statistics of the ESCS index in the Hungarian subsample. Source: Pisa 2015. Edited by the author.*

| | N | Minimum | Maximum | Mean | Variance |
|---|---|---|---|---|---|
| ESCS index | 5570 | -6,79 | 3,01 | -0,177 | 0,94 |

Previous research by Vincze (2021) comparing the digital inequality dimensions described above separately in linear regression models with school performance for all three literacy categories, controlling for social background and gender, has shown that they mostly positively affect school performance. In this case study, we show how ICT use across the digital inequality dimensions jointly affect mathematics, reading literacy and science outcomes. Which dimensions are more important in determining performance and which are less important? This will give us an idea of which ICT uses act as resources and which can be considered as digital capital.

To answer these questions, the variables used to examine digital inequalities are included in a joint regression model. Our dependent variables remain the (estimated) test scores in mathematics, reading and science. The explanatory variables are the variables representing the digital inequality dimensions, gender and the ESCS index. The models were constructed separately for mathematics, reading and science performance using the stepwise method to include the variables.

## 5. Analysis

In the joint linear regression model for mathematical performance (Table 4), two variables were not included as their regression coefficients were not significant, namely PC device usage and use for gaming[7]. The explanatory variables are not subject to multicollinearity, as values of variance inflation factor (VIF) of the variables included in the model are generally below 2[8] . The variables included in the model together explain 31.6% of the mathematics performance[9].The regression model is significant[10]. Based on the beta coefficients, we can infer which explanatory variables have the largest effect on the dependent variable. Unsurprisingly, the ESCS index of social background is the most significant determinant of performance, in a positive way (beta=0.386). Students with a more favourable social background therefore score higher on the test. Among all the ICT variables included, ‚other school-related use' was found to be the most significant factor (beta=-0.209), but the correlation was negative. Thus, those who frequently use the Internet for school-related purposes perform worse on the test. There is therefore a negative relationship between school-related internet use and academic performance. Based on the absolute value of the beta coefficient, the next most important determinant is the embeddedness of ICT in social communication (SOIAICT). This variable also has a negative effect on mathematics performance (beta=-0.155). Among ICT variables with a positive effect, the time factor, the time spent using ICT between 1 and 4 hours per week, is the most important (beta=0.119). In the joint model, the use for getting information follows with a beta value (0.099)

[7] Use of PC devices t=0.716 p=0.474. Principal Comp_Game t=0.509 p=0.611.

[8] A VIF index above 5 indicates strong multicollinearity (Kovács 2008: 48).

[9] The adjusted $R^2$ for the regression model without gender and ESCS variables, i.e. with only variables adapted to the digital inequality dimensions, is 0.172.

[10] Based on ANOVA test F=67,718 p=0,000.

as the ICT factor with a positive influence, ahead of the skill variables, the type of device used and other use modes. Learning mode of use, mobile device use and general subjective ICT skills are the least influential factors on mathematics performance.

*Table 4: The joint effect of digital inequality dimensions[11] on mathematics performance. Source: PISA 2015, edited by the author.*

| | Unstandardised coefficients | | Standardised coefficients | | | Collinearity statistics | |
|---|---|---|---|---|---|---|---|
| | B | Std. error of the estimate | Beta | t | Sig. | Tolerance | VIF |
| Constant | 456,715 | 7,89 | | 57,887 | 0 | | |
| ESCS | 37,022 | 1,328 | 0,386 | 27,872 | 0 | 0,927 | 1,078 |
| Principal_Comp_SCHOOL_ELSE | -18,912 | 1,31 | -0,209 | -14,434 | 0 | 0,844 | 1,185 |
| Moderate Internet usage time (1-4 hours)[a] | 21,253 | 2,413 | 0,119 | 8,809 | 0 | 0,978 | 1,023 |
| AUTICT | 8,826 | 1,764 | 0,095 | 5,005 | 0 | 0,488 | 2,048 |
| SOIAICT | -13,59 | 1,483 | -0,155 | -9,165 | 0 | 0,625 | 1,6 |
| Principal_Comp_Gathering information | 8,799 | 1,307 | 0,099 | 6,731 | 0 | 0,823 | 1,215 |
| GENDER[a] | 19,024 | 2,693 | 0,106 | 7,063 | 0 | 0,785 | 1,274 |
| Principal_Comp_Communication_Entertainment | 7,879 | 1,398 | 0,085 | 5,635 | 0 | 0,777 | 1,287 |
| Internet usage[a] | 37,05 | 7,555 | 0,07 | 4,904 | 0 | 0,88 | 1,137 |
| Use of mobile devices[a] | -16,92 | 4,822 | -0,05 | -3,509 | 0 | 0,885 | 1,13 |
| COMPICT | 3,452 | 1,638 | 0,037 | 2,107 | 0,035 | 0,561 | 1,782 |
| Principal_Comp_LEARNING | -2,778 | 1,325 | -0,031 | -2,097 | 0,036 | 0,807 | 1,239 |

*Dependent variable: mathematics score*
*Note: adjusted $R^2$ =0.316.[a] dummy variable*

[11] AUTICT= Percieved autonomy related to ICT use, SOIAICT= ICT as a topi cin social interaction, COMPICT= percieved general ICT competence

In the evolution of reading literacy test scores, variables representing the digital inequality dimensions and socio-demographic variables together explain 36.1% (Table 5), almost 5 percentage points more than the variables from mathematics performance[12] . Three variables were excluded from this model due to the non-significance of the regression coefficients, namely PC device use, mobile device use and use for gaming[13] . The final regression model is significant[14] . The reading literacy score is also most positively determined by the social background index (beta=0.372). The standardised regression coefficients for the ICT variables show similar relationships as for mathematics achievement. The value of the beta coefficient is also highest for school-related use and the direction is similarly negative (beta= -0.279). The variable adapted to the social support dimension also has a negative effect on reading literacy scores. Positive and relatively more significant effects are found for „use for getting information" (beta=0.114) and moderate Internet usages time (beta=0.104). The least significant factors are use for learning (beta=-0.056), internet usage (beta=0.058) and communication-entertainment usage (beta=0.067).

*Table 5: The joint effect of digital inequality dimensions on reading performance. Source: PISA 2015, own ed.*

| | Unstandardised coefficients | | Standardised coefficients | | | Collinearity statistics | |
|---|---|---|---|---|---|---|---|
| | B | Std. error of the est. | Beta | t | Sig. | Tolerance | VIF |
| Constant | 460,747 | 7,382 | | 62,418 | 0 | | |
| ESCS | 36,82 | 1,322 | 0,372 | 27,848 | 0 | 0,928 | 1,078 |
| Principal_Comp_ SCHOOL_ELSE | -25,913 | 1,303 | -0,279 | -19,885 | 0 | 0,846 | 1,182 |
| GENDER[a] | -20,199 | 2,68 | -0,11 | -7,537 | 0 | 0,786 | 1,273 |
| Moderate Internet usage time (1-4 hours)[a] | 19,102 | 2,402 | 0,104 | 7,954 | 0 | 0,978 | 1,022 |
| Principal_Comp_Gathering information | 10,465 | 1,301 | 0,114 | 8,046 | 0 | 0,824 | 1,213 |
| COMPICT | 7,208 | 1,628 | 0,076 | 4,426 | 0 | 0,563 | 1,776 |
| SOIAICT | -13,945 | 1,476 | -0,154 | -9,445 | 0 | 0,625 | 1,6 |

[12] Including only ICT variables in the model results in an explained variance of 23%.

[13] PC type device use t=0.595 p=0.552. Mobile device use t=-0.504 p=0.615. MAIN_COMP_GAME t=-1.121 p=0.262.

[14] Based on ANOVA test F=105.609 p=0.000.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AUTICT | 8,189 | 1,755 | 0,086 | 4,665 | 0 | 0,488 | 2,047 |
| Internet usage[a] | 31,932 | 7,284 | 0,058 | 4,384 | 0 | 0,938 | 1,066 |
| Principal_Comp_ Communication_Entertainment | 6,347 | 1,382 | 0,067 | 4,592 | 0 | 0,788 | 1,269 |
| Principal_Comp_ LEARNING | -5,188 | 1,318 | -0,056 | -3,935 | 0 | 0,808 | 1,238 |

*Dependent variable: reading literacy score*
*Note: Adjusted $R^2 = 0.361$.[a] dummy variable*

The joint effect of ICT variables adapted to the digital inequality dimensions shows a similar pattern for science performance (Table 6). The explained variance of the model is 32.3%[15]. The variables omitted from the model are again PC device use and use for gaming[16] . The resulting model is significant[17] . There is one difference in the order of the beta coefficients for the strength of the effects compared to the other two competency areas. Among the ICT variables with a positive effect, the index of skills for autonomous use (AUTICT) proves to be the most significant (beta = 0.118), ahead of the variables representing the mode of use to obtain information and the time of use. Presumably, the ability to use ICT autonomously embodies a competence that is better exploited in the field of science.

*Table 6: The joint impact of digital inequality dimensions on science performance. Source: PISA 2015, own ed.*

| | Unstandardised coefficients | | Standardised coefficients | | | Collinearity statistics | |
|---|---|---|---|---|---|---|---|
| | B | Std. error of the est. | Beta | t | Sig. | Tolerance | VIF |
| Constant | 462,187 | 7,951 | | 58,128 | 0 | | |
| ESCS | 36,006 | 1,339 | 0,371 | 26,897 | 0 | 0,927 | 1,078 |
| Principal_Comp_ SCHOOL_ELSE | -24,221 | 1,32 | -0,265 | -18,343 | 0 | 0,844 | 1,185 |
| AUTICT | 11,003 | 1,777 | 0,118 | 6,191 | 0 | 0,488 | 2,048 |

[15] Including only ICT variables in the model results in an explained variance of 19.5%

[16] Use of PC devices t=0.6 p=0.548. Principal_Comp_use for gaming t=-1.784 p=0.074.

[17] Based on ANOVA test F=153,816 p=0,000.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SOIAICT | -13,947 | 1,494 | -0,157 | -9,333 | 0 | 0,625 | 1,6 |
| Moderate Internet usage time (1-4 hours)[a] | 17,273 | 2,431 | 0,095 | 7,104 | 0 | 0,978 | 1,023 |
| Principal_ Comp_Gathering information | 8,674 | 1,317 | 0,096 | 6,584 | 0 | 0,823 | 1,215 |
| Internet usage[a] | 34,263 | 7,614 | 0,064 | 4,5 | 0 | 0,88 | 1,137 |
| Principal_comp_ Communication_ Entertainment | 6,803 | 1,409 | 0,073 | 4,827 | 0 | 0,777 | 1,287 |
| Principal_comp _LEARNING | -5,103 | 1,335 | -0,056 | -3,823 | 0 | 0,807 | 1,239 |
| GENDER[a] | 9,843 | 2,714 | 0,054 | 3,626 | 0 | 0,785 | 1,274 |
| COMPICT | 4,8 | 1,651 | 0,051 | 2,908 | 0,004 | 0,561 | 1,782 |

*Dependent variable: science score*
*Note: Adjusted $R^2 = 0.323$.[a] dummy variable*

The joint linear regression models suggest that ICT use characteristics by digital inequality dimensions have a determinant effect on school performance. Models including only ICT variables, before including socio-demographic explanatory variables, explain almost 20% of the variance in scores - 23% for reading performance. The magnitude of the effects of the variables in relation to each other revealed that, apart from social background, the most important determinant of performance in all three competency areas, apart from school-related frequent internet use, is the use of the internet. However, this effect is negative, i.e. the more often a student uses the internet related to schoolwork, the lower the score on the tests. Similarly, internet use more closely related to learning has a negative impact on school performance, albeit to a lesser extent. This relationship has already been observed in the individual analysis of the digital inequality dimensions (Vincze 2021). However, the joint model also shows that the dimension ‚other school-related use' has a larger effect on maths, reading literacy and science scores than subjective ICT skills and other uses.

What might be behind this correlation? On the one hand, we can assume that there is a reverse causality, i.e. that lower-achieving students turn to the internet more often to supplement their learning and studies. Moreover, frequent use of school-related activities does not necessarily imply their effectiveness, e.g. frequent downloading of mobile applications for learning. At the same time, it can be speculated that there are other factors behind the frequency of these activities, such as the integration of the use of ICT into the teaching methods. In this case, the negative relationship may be due to an over-emphasis by teachers on the use of ICT devices, for example for homework, and thus the emphasis on ‚form' over ‚content'. This may be suggested by the PISA report on the correlation between computer use, which draws attention to the negative impact of

too frequent use of ICT in schools and in classrooms on school performance (OECD 2015. 153). This possible correlation requires further exploration and investigation, which is beyond the scope of this paper, but may be an interesting avenue for further research.

Also, the correlation that frequent communication with friends about ICT devices (SOIAICT) has a relatively significant negative effect on performance in all three competency areas in the multivariate regression models needs to be explained. It is hypothesized that the frequent topic of ICT devices in social communication and interaction may represent a latent factor of the importance and centrality of ICT devices to the individual. In this way, there may also be an emphasis on ‚form' over ‚content' in the individual's life, i.e. ICT devices as objects of use, as opposed to their effective use. This assumption also needs further research.

School performance is positively influenced to a relatively greater extent by information use mode, moderate Internet usage time and higher levels of skills for autonomous use in multivariate regression models. Thus, these dimensions seem to be the most important contributors to resource-increasing use, and are involved in increasing digital capital.

## 6. Summary

The aim of our study was twofold: on the one hand, we tried to present the possibilities of applying Bourdieu's concepts and their manifestations in the international literature in the context of the information society. Bourdieu's notion of the *field* is well applicable to the digital space, where the defining inequalities are *digital inequalities* and where the stakes are the acquisition or enhancement of *digital capital.* On the other hand, following Bourdieu, we have sought to interpret the role of digital capital as a factor influencing school performance alongside traditional capital. To illustrate this, we have used a case study to show the impact of ICT usage patterns, which we have mapped to the digital inequality dimensions, on school performance. The results of the analysis showed that some ICT use modes – information use mode, moderate Internet usage time and higher levels of subjective skills for autonomous use – contribute to increasing school performance, while others – ‚other school-related use mode', learning use mode and the embeddedness of ICT use in peer communication and interaction – tend to decrease it. The former thus contribute to increasing digital capital, while the latter contribute to reducing it.

The role of digital capital in cultural reproduction is beyond the scope of this study, but it could be an important avenue for further research. Vincze's (2021) previous research suggests that family background is a key determinant of ICT use patterns and dimensions of digital inequality. Thus, it can be assumed that digital capital also plays a role in the process of cultural reproduction. In other words, it is not enough to acquire the appropriate cultural capital in the family to achieve cultural reproduction, but it is also necessary to acquire the appropriate level of digital capital, which is also strongly influenced by family background. Of course, this hypothesis requires further investigation, extending the analysis in space and time, but it could be an interesting starting point for applying Bourdieu's concepts and notions in a new context.

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