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Digital and Educational Capabilities in the Post-Pandemic Era: Implications from Primary School Children's Digital Practices During COVID-19 Lockdown

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Disclosure statement

The author reports that there are no competing interests to declare.

Data availability statement

The participants of this study did not give written consent for their data to be shared publicly. Therefore, due to the sensitive nature of the research, supporting data are not available.

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This study employs the capability approach (CA) to explore the long-term significance of children's digital practices at home during the COVID-19 lockdown in 2020. Specifically, it aims to understand the digital skills or 'functionings' acquired by children during the lockdown, the extent to which all children had equal opportunities to develop these skills, and the broader implications for educational equity and social justice. It draws on a qualitative study that applied a mosaic approach involving 10 children aged 6–12 years and their parents from different regions of Spain. The findings show that children honed digital functionings during the lockdown, forging autonomy to pursue activities they valued: education and learning, creativity and self-expression, and social connections. From the CA perspective, the acquired digital and educational capabilities are lasting and can enhance the children's well-being in the post-pandemic era. The findings underscore the importance of encouraging critical reflection on the risks associated with digital engagement to enhance autonomy. Additionally, they highlight disparities in digital access and opportunities among children from different backgrounds during the lockdown, thereby calling for transformative approaches that reflect the diverse needs identified through horizontal collaboration with the communities and schools in question.

Keywords: COVID-19, digital technologies, mosaic approach, informal learning, capability approach, educational equity.

Introduction

This study explores the implications of children's digital practices at home during the COVID-19 lockdown in 2020 using the capability approach (CA) pioneered by Amartya Sen (1985, 1999) as the analytical framework. The main research questions are as follows: what digital skills do children acquire from experience? Do every child have the opportunity to develop these skills equally? And what significance do the opportunities hold for those who have them and for those who do not? These questions are of great importance for two reasons. First, existing literature is dominated by narratives of the negative consequences of intensified digital practices during the COVID-19 lockdown period, while overlooking what children learned from these practices. Second, these questions have not been sufficiently reflected in the formulation of post-pandemic educational practices and policies. Markelj and Sundvall (2023) and Williamson, Macgilchrist, and Potter (2021) suggest that the pandemic can function as a moment of reflection or "re-imagining" of digital pedagogy. However, the solutions that policymakers provide are not innovative but merely an extension of existing solutions (Tiana-Ferrer 2023; Zancajo, Verger, and Bolea 2022).

To address the aforementioned questions, this study develops an analytical framework based on the CA (Haenssgen and Ariana 2018; Robeyns 2005). First, we examine the digital skills or 'functionings' acquired by the participating children using the CA during the lockdown. Subsequently, we explore the functionings achieved (and not achieved) by the participating children during the lockdown in the post-pandemic era. Further, we investigate the broader implications for social justice and educational equity, considering that not all children had the same opportunities to develop digital functionings.

State of the literature regarding effects of the COVID-19 pandemic on children's digital practices

In many countries, children and adults have increased exposure to digital devices during the pandemic (e.g., Hedderson et al. 2023). Many studies have depicted a mainly negative picture, highlighting the associated risks, concerns, and problems. Some studies claim that increased screen time is associated with a range of physical (including obesity, hypertension, and type 2 diabetes) and mental issues (e.g. depression, sleep disorders, and anxiety) (e.g. Pandya and Lodha 2021).

However, several factors may have influenced this relationship. Indeed, different authors point to factors such as worsening food security and loss of regular childcare (Patrick et al. 2020), the measures taken by the government to limit personal contact and promote social distancing (Fuster Plomar 2022), or dissatisfaction with the need to play outside and explore the world and receive parents' attention (Montag and Elhai 2020).

We cannot simply assume that digital technology *only* had negative effects on the lives for children. Thanks to digital media, children were able to continue schooling and maintain communication with friends and families during that time (see also Matsumoto et al. 2025). Some studies suggest that the use of social media or video games relieves adolescents' feelings of distress and anxiety to some degree, even increasing feelings of happiness or creativity (e.g. Cauberghe et al. 2020). This does not suggest that ad hoc remote schooling is free of problems

(e.g. Cachia et al. 2021; Cheshmehzangi et al. 2023). Indeed, online communication cannot replace face-to-face socialisation (e.g. Cauberghe et al. 2020).

The purpose of this study is not to dismiss concerns about prolonged digital technology use during the pandemic. Indeed, they emerged to some extent in our study, as shown below (see also Matsumoto et al. 2025). However, it is equally important to have a comprehensive understanding of the implications of the practices, as recent studies show that the quality of digital engagement (content, context, and connections) matters more than quantity (e.g. Livingstone and Pothong 2022).

Capability approach and digital technologies

The CA emphasises that understanding one's achieved outcomes (or 'functionings', as called by CA theorists) is not sufficient for a comprehensive evaluation of people's well-being, as we need to understand the choices and freedoms (or 'capabilities') that people have. If we simply measure the outcomes, fasting and starving appear to be the same; not eating. The difference is that in starving, the person does not have an alternative, whereas in fasting, he or she does (Sen 1999). Thus, the availability of a set of alternatives ('capability sets') (e.g., Sen 1999, 75) is an important measure of the well-being of individuals (see also Matsumoto 2018).

Following Sen (2010), several studies have regarded (digital) technologies as an important element for expanding capabilities (Johnstone 2007; O'Donovan and Smith 2023; Oosterlaken and van den Hoven 2011; 2012), with new technologies providing unprecedented possibilities in life for people. However, there is no consensus yet regarding how technology can be incorporated into the CA (Andersson, Grönlund, and Wicander 2012; Haenssgen and Ariana, 2018). Specifically, the primary debate revolves around the relationship between technology and

the CA's main components. Haenssgen and Ariana (2018) summarise the main four viewpoints: whether: a) technology is only part of the "input", paying attention to its design (e.g. Sen 2010); b) it affects the "conversion factors", considering its effect on the environment (e.g. global proliferation of the internet) (e.g. Johnstone 2007; Lawson 2010); c) it affects not only "conversion factors" but also individual "agency," taking into account how people make choices (e.g. Zheng and Stahl 2011), or d) it affects all of the aforementioned elements (input, conversion factor, and agency), considering technology as an interrelated resource(Klein 2013).

Haenssgen and Ariana (2018) developed a unified visual framework that harmonises and systemises the relationship between technology and the main elements of the CA. The current study makes two major contributions to the existing literature. First, it examines how this visual framework can be applied to *digital* technologies. Second, it conceptualises the relevant digital functionings/capabilities and explores their broader implications, particularly for children, resulting from their engagement with digital technologies.

The study's framework

This study establishes a visual framework based on those developed by Robeyns (2005) and Haenssgen and Ariana (2018) (see Figure 1). Haenssgen and Ariana (2018) incorporated technologies and constructed a technology-augmented version of the visual framework of CA originally developed by Robeyns (2005). I have added new components to focus on the examination of digital functionings, capabilities, and their implications. The framework allows a contextualised yet systematic analysis of the components relevant to Sen's more abstract ideas of CA.

In the framework, first, digital technology is considered part of 'inputs' as technical objects. This study focuses on the digital devices used by children (e.g. mobile phones, tablets, digital TVs, desktop computers, and laptops). Accessing the same inputs does not allow everyone to achieve the same functionings. This depends on the conversion or contextual and circumstantial factors (Robyns 2020; Sen 1992). Conversion factors are often classified into three types: a) *individual or personal conversion factors*, such as physical conditions, sex, and reading skills; b) *social conversion factors*, such as public policies, social norms, and practices; and c) *environmental conversion factors*, which emerge from physical and built environments, including climate, conditions of buildings and roads, and transport means (Robeyns 2020). Haenssgen and Ariana (2018) add a fourth type, the *technological conversion factor,* to consider the socio-technological context and system. For example, the use of technology depends on local technological knowledge.

The idea of conversion factors is a key component of CA in this study. It can consider the role of external factors, that is, the *unique* context and *dynamicity* of factors within social and institutional structures that permit individuals to convert resources into capabilities, thereby gaining freedoms at a given moment (Robeyns 2005). This idea allows the examination of the implications and significance of functionings achieved in one circumstance (pandemic) to another (post-pandemic).

(Figure 1 near here)

Among the possible capabilities to be achieved, the individual makes *choices* about which one to obtain. Choices are not simply determined by individual preferences. Rather, they are influenced, either encouraged or constrained, by one's social context (e.g. immediately by friends' preferences and, more generally, by values promoted by the mass media, his or her culture) (Nussbaum 2000; Robeyns 2005). There are also other important factors–such as parental mediation in the case of this study–that could exercise 'external control' as termed by Haenssgen and Ariana (2018).

Fundamentally, the established framework allows for the analysis of the digital 'functionings' achieved by participating children during the lockdown period. It considers different 'inputs', 'conversion factors', and other factors that affected the 'choices' of the digital functionings achieved during this period. Furthermore, it helps explore what 'capability sets' the achieved digital functionings would provide children with for their lives *after* the pandemic by examining the effects of different 'conversion factors' that exist in the post-pandemic society. Specifically, it explores the capability set *beyond* the digital dimension to consider the broader implications of the findings for educational practices.

Digital capabilities as opportunities

Sen's CA approach does not provide concrete guidelines regarding the types of capabilities most relevant to individual well-being (Robeyns 2005). To operationalise digital capabilities, we draw on the concept of online opportunities (Livingstone 2016). This concept was developed by the eminent EU Kids Online and Global Kids Online projects on children's Internet practices (Livingstone et al. 2015). The projects broadly defined online opportunities as 'whatever users encounter that poses a possible benefit' in contrast to and parallel to online risks (Livingstone

2016, 15). They are further classified into four categories: educational learning and digital literacy, creativity and self-expression, identity and social connection, and participation and civic engagement (Staksrud et al. 2009).

This study adapted the conceptualisation of online opportunities for several reasons. First, the concept of opportunities is embedded in the CA; Sen uses the term 'real opportunities' to describe capabilities (Sen 1999, 75). Second, the concept(s) of opportunities (and risks) is described, as in CA, with well-being as an outcome in mind, specifically for children as in this study (Livingstone 2016). Third, three of the four categories (except participation and civic engagement) coincided with those that emerged in the study as activities that the participants *valued* and continued to engage in: entertainment, education, and social contact, as mentioned earlier (see also Matsumoto et al. 2025). This demonstrates that the categorisation is relevant to their lives, which Sen considers important, and not an abstract generalisation which may not apply to the social reality in which they live (Sen 2004). Moreover, although the term strictly refers to *online* opportunities arising from Internet practices, the categories apply to offline digital practices. Hence, the conceptualisation in this study is not based on other major frameworks of similar concepts, such as digital 'capabilities', as defined by JISC (2015) or digital competencies (DigComp) (Vuorikari et al. 2022), which draw on different theoretical foundations, although in any case, the categorisations overlap largely.

Considering the data gathered and the categorisation of online opportunities, this study adopted the following categories of digital opportunities/capabilities:

1. *Education learning and digital literacy*, including access to educational resources, contact with others who share similar interests, and the possibility of self-initiated or collaborative learning;
2. *Creativity and self-expression*, including access to diverse resources and opportunities to participate or create individually or with others;
3. *Identity and social connection*, including access to (personal, health, or sexual) advice, participation in social networking, sharing experiences with others, and expression of identity;
4. *Critical awareness and management of risks, such as* commercial, aggressive, and sexual risks.

While maintaining the first three categories from Staksrud et al. (2009), I did not employ the category 'participation and civic engagement', as data in relation to it were not obtained in the study (see Methodology below). Instead, I added a fourth category: critical awareness and risk management. From the data, some children became aware and found ways to manage risks and problems arising from digital (online) practices. I have considered it essential to explore the category as it relates to critical thinking (e.g. Nussbaum, 2006) and autonomy, which are extremely valued in the CA as elements that foster freedoms (Ferracioli and Terlazzo 2014; Walker and Unterhalter 2007) and enhance the capability of 'practical reasons' coined by Nussbaum (2000). They serve as key concepts for drawing broader implications from the study, as discussed in the Prospects and Discussion section.

Methodology

Qualitative methodology inspired by the mosaic approach

This study draws data from the qualitative part of a larger European project "Kids' Digital Lives

During COVID-19 Times. Digital practices: A comparative mixed-methods study on digital practices, safety, and well-being" (KiDiCoTi) by the European Commission's Joint Research Centre (JRC) (JRC, 2020). The study's objective was to examine children's engagement with digital technology during the lockdown, and children's and their parents' attitudes toward such digital activities.

Together with European counterparts, we designed common protocols inspired by the mosaic approach (Clark and Moss 2011). The mosaic approach is theoretically underpinned by the 'new' sociology of childhood, which recognises children as competent participants (James 2007; James and Prout 2015). The importance of giving a voice to children regarding their digital practices and well-being is well recognised, as studies often rely on the perspectives provided by their caregivers (Stoilova et al. 2021). To promote the active participation of children in the research process, this approach is essentially a multi-method approach in which children can choose to express themselves and participate in different ways. It considers each piece of the data generated through different methods as a piece of the mosaic and seeks to bring together the pieces through dialogue, reflection, and interpretation (Clark and Moss 2011).

Three instruments were constructed using this approach. We designed semi-structured interview guides as the main instruments, one for children and the other for parents, to explore issues related to access, practices and skills, parental mediation, perception and attitude to digital technology, risks and opportunities, and implications for the future. Using these as a base, we conducted interviews through online video conferencing platforms, as it was difficult to visit homes during the pandemic. We interviewed the focal child (approximately 30 minutes) with or

without the parent's presence, as preferred by him or her, and afterwards, the parent (approximately 30-45 minutes).

Simultaneously, two other instruments were designed and employed before the interviews. One was a questionnaire targeting parents to obtain basic information about the families and their situation related to digital technology (the number of devices and applications they use, if children have access to each, etc.). The other was an activity sheet for children titled Time Capsule. It consisted of activities such as drawing, writing, or selecting images from those that were offered, about the child's family, his or her daily activities and schedule, what digital devices he/she used, how he or she felt during the pandemic, and what he/she missed doing. The essential information gathered through the questionnaire served as the basis for the interview, thus preventing it from becoming too lengthy. The activities the children conducted helped them prepare for the interview, having them think about the relevant themes, and the materials served to stimulate their responses during the interviews. They also allowed children to participate in different ways and served as mosaic pieces to understand their perspectives and experiences more holistically (Clark and Moss 2011).

Participants

The participants consisted of 10 families with children aged between 6 and 12 years (see Annex 1), and data were collected between June and December 2020; most interviews were held after the lockdown (officially ended on 21 June 2020 in Spain). To maintain anonymity, I refer to each family and the children interviewed using designated codes. They consist of the country code (in the case of Spain, ES), the number assigned to each family (1-10), the sex of the child (g for girls and b for boys), and age. I also refer to children who were interviewed using pseudonyms.

Sampling was performed using two methods. First, some families from previous related studies (Matsumoto et al. 2016; Aliagas et al. 2017) were contacted to allow longitudinal analysis in the future (ES1, ES3, ES7, and ES8). Second, we reached families through personal and professional networks. To facilitate the exploration of the heterogeneity of digital experiences during the lockdown, the selection criteria emphasised diversity in terms of children's age, sex (six girls and four boys), and family composition (for instance, we had a variety in the number of siblings (0 to 3), a single-parent family (ES3), and a family (ES7) with an adopted child). We also considered geographical diversity (Madrid (ES2-4), Galicia (ES1), and Catalunya (ES5-10)), taking advantage of conducting online interviews. However, it was not conducive for the study to include more low-income families or ethnic minorities, particularly Roma children, to see if and how they experienced *digital poverty* (e.g. Holmes and Burgess, 2022), a difficulty often commented on among studies conducted during the pandemic (e.g. Luengo Horcajo and Manso Ayuso, 2020; Díez Gutiérrez and Gajardo Espinoza, 2020*)*. As this is a critical aspect, we enhanced our study's findings by incorporating insights from existing research to assess their implications. We also acknowledge that the sample lacked, for instance, children with physical diversity or children of same-sex parents.

Data analysis

The methodological procedure of this study was approved by the Research Ethics Committee of the Autonomous University of Barcelona. Except for one family in Catalonia, all the interviews were digitally video-recorded after obtaining consent from the families through an informed consent form. We produced transcriptions for each interview in the original language (Spanish or Catalan). The researchers' notes, transcriptions, data on the questionnaires, and children's works

on the activity sheets were then thematically analysed (see Braun and Clarke 2006; 2021), following the protocol of analysis developed together with European counterparts.

Further, I have re-analysed the data according to the analytical framework developed for this study. Overall, clear patterns of common and diverse digital functionings emerged from the data. Nonetheless, I recognise that the findings in these two categories could be deepened and should be reconfirmed in future studies. For instance, the category of participation and civic engagement established by Staksrud et al. (2009) was excluded from the study. This was not something too significant in the participants' lives, as it did not emerge in any interview when asked about the activities they liked or missed during the lockdown. This may be due to the young age of the participants. However, I recognise that asking questions about this theme concretely could clarify whether they participated in related activities and their perspectives on them. Another area that could have been explored in more depth is children's awareness of risks. We posed general questions regarding this theme, as the study was not intended to evaluate the participants' levels of awareness. However, posing specific questions, for instance, if they shared their real names or personal information, what would they do if a stranger started talking to them online, and so on, could spark deeper discussions on the theme and help understand their degree of awareness and approaches to the management of potential risks.

Findings

Digital technology 'inputs' and 'conversion factors' during the COVID-19 pandemic

In Spain, a strict lockdown, including the closure of schools, was enforced on 15 March 2020. Children were not allowed to leave home until 26 April 2020 when the measures were loosened.

Their schooling continued virtually while many parents worked from home.

A wide variety of digital devices and Internet access to conduct various digital activities were available in the participating families' homes, albeit to different degrees. Families possessed one to two tablets, two to four computers, one to four smartphones, and one to three TVs. The majority also had a game console and a digital camera, and five families had smartwatches. Most families already had these devices before the lockdown. Additionally, half of the participating families acquired approximately one new device (e.g. a tablet, a computer, a TV, or a smartphone), mainly for children, either for their schoolwork (participation in online classes or doing homework) or leisure (to connect with their friends).

All except two families (ES1 and ES5) had high-speed broadband Internet access at home and a 4G connection through mobile phones. ES5, who lived in the countryside of the Catalunya Region, only had low-speed Internet, and ES1 in Galicia had only 4G data to connect through smartphones and with limitations on the amount of data they could use each month. This affected the online activities of ES1, such as the number and duration of video calls.

The level of ICT equipment and access to the Internet that the participating families possessed in their homes do not wholly represent Spanish society. Table 1 demonstrates housing ICT product equipment and Internet access at the national level by household income level based on a national survey conducted in 2020. As the Table shows, almost all households in Spain are equipped with mobile phones, including low-income households (which receive less than 900 euros of net monthly income) (99%). This is consistent with the situation demonstrated in our family sample. The table also shows a very high level of Internet access in most households

(95% and above), except for low-income households (86%). Similarly, our sample represents this, with one out of 10 families not having broadband. However, in comparison with the data demonstrated in the table, one can see that the participating families have a higher level of possession of computers and tablets than the national average. This reflects the predominance of middle- and high-class families in our sample. The implications of this difference are explored in the discussion section.

(Table 1 near here)

Factors that affect 'choices' of digital 'functionings' during the pandemic

The analysis of data revealed four essential factors that affected the individual choices of digital functionings achieved during the pandemic: 1) individual preferences; 2) the age of children; 3) parental mediation; and 4) the socio-political context of the lockdown. These are interrelated and related to the conversion factors described above.

Generally, children perceived digital devices as essential tools for entertainment, education, and social contact during the lockdown (Matsumoto et al. 2025). However, as revealed in the next section, there were remarkable differences in the digital functionings achieved by the 10 participating children, especially in the category of creativity and self-expression. These manifest as individual preferences, with each individual deciding to use different devices or applications for various purposes and interests.

Age also appeared to affect preferences. Younger users (6 to 8-9 years old) preferred tablets, conceiving them as versatile and intuitive devices to meet their needs and interests such as watching videos or playing games. By contrast, older children (9-10 to 12 years old) preferred different devices depending on the task. In general, they preferred smartphones for socialisation; that is, to communicating and playing with friends. Some older children (i.e. David (ES4b11), Ana (ES6g12), and Diego (ES8b11)) had computers or laptops with which they preferred to do school-related work, while the tablet was used for leisure purposes (e.g. creating or editing videos).

Another important factor is various parental mediation practices (see Matsumoto et al. 2025). We classified the families into three categories: 1) strict families that used restrictive measures (with strong norms limiting time and access) (ES1, ES3, ES7); 2) tolerant families that allowed their children to use devices freely without rigid rules (ES5, ES6); and 3) moderate families that used flexible measures (ES2, ES4, ES8, ES9, ES10). However, these strategies did not work in a single direction. They did not always coincide with the level of interest in technology demonstrated by the children. Additionally, children did not always passively follow norms. They found ways to navigate the rules, such as sharing a screen with a sibling when the time limit was set for each child per device so that they could enjoy twice the time (David's family, ES4). In some cases (as in Marta's family (ES3) in Madrid), children participated in the setup of timetables and norms.

Finally, the socio-political context of the pandemic had an enormous effect on children's choices, particularly in two ways. First, schooling was undertaken virtually via digital means.

Hence, children did not have choices regarding the means to learn but to use the digital platforms and applications provided by the school. The context also restricted children to digital means for the pursuit of their interests and entertainment or to communicate with friends and families that lived apart. These circumstances might have 'forced' the development of digital functionings that would not have been chosen in other circumstances.

Digital 'functionings' achieved during the pandemic

During the lockdown, children developed various digital functionings. Below, we present the key findings for the four categories of opportunities/capabilities established within the analytical framework.

Education learning and digital literacy

Children's digital literacy improved, and they gained more autonomy in managing different applications and tools for both formal and informal learning. Regarding school-related work, on the one hand, many highlighted their improvement in managing the platforms and related tools provided by schools. Many used Google Classroom or Drive, and the use of the associated tools was mentioned in conversations, such as learning to attend online classes by themselves through Google Meet, managing emails, creating presentations, or accessing Moodle classes provided by the school. The father of Carmen (ES7g11) said: 'During the lockdown, as from the school, they began to teach online… she has had to 'hurry up' [*espabilar*] and has adapted quite well to all these changes.'

These improvements were highlighted, especially for some of their experiences during the lockdown. Diego (ES8b11) from Catalonia drew an image of a desktop computer with the

Google icon, with Google Classroom and Drive in letters on the activity sheets, in which they were asked to write or draw ‘What I have learned during the lockdown’ (see Figure 2 below). The same boy told in the interview that it was during the lockdown he learned to ‘do a Google presentation, Google document, Google form... many new things that we didn't know before.’ The mother also confirmed that he has ‘grown up’ learning to organise his ‘digital library’ on the platform himself. This manifests as increased autonomy in the management of schoolwork, to which I will return later.

(Figure 2 near here)

Some older participants also reported more frequent use of laptops for ‘work’ and the consequent improvements in its use (Daniel (ES5b9), Ana (Es6g12), Carmen (ES7g11), Diego (ES8b11)). This theme repeatedly emerged in an interview with Ana (ES6b12) from Catalonia. She commented that, before, she was using a tablet or mobile device more and only using a laptop computer to do some projects. However, during the lockdown, she learned to use it better by having ‘more practice’.

In some families with younger children, the children learned to use online applications through mathematical exercises (Maria (ES2g7), Paula (ES9g6), Irene (ES10g7)). In Irene's case, the school asked her to do weekly exercises using the Bmath application. The mother says that Irene got ‘hooked’ on it, opening the application herself, not only doing the ‘compulsory’ exercises but also others on her initiative.

There were also cases of children, especially younger ones, who did not develop schoolwork-related digital literacy to the same extent. For instance, in the case of Irene, although the mother saw the utility of mathematical applications, she was concerned about the long hours spent using digital devices during the lockdown. Consequently, she organised the children's schoolwork online and bought a printer so that they could complete much of the work on paper. Irene commented that she had never used computers. However, this does not mean that she did not develop digital skills during the lockdown. The mother commented that she had learned to use emails, manipulate the tablet in general, edit photos, etc.

Many families, from younger to older children, reported improvements in technical digital literacy in general, beyond schoolwork, and gaining more autonomy. Carmen (ES7g11) received a new laptop and a mobile phone during the lockdown. She said that there were applications she had to learn to use (e.g. WhatsApp and Gmail), and she did so by asking for her parents' help at the beginning, but as she used them more, she learned to manage them herself. Other families also reported that their children learned to manage applications and solve problems themselves (e.g. ES5, ES6, ES8, ES10), both for education and in pursuit of their interests, as detailed below.

Creativity and self-expression

In this category, children developed varied digital functionings based on their interests, having access to a wide range of digital resources. A common functioning developed by children of different ages (reported by six participants) was the ability to create and/or edit videos and photos with different content. Diego (ES8b11) learned to use various applications to edit videos and photos, and to create diverse content to share on social media. They, as a family, created

'challenge videos', thinking together for a couple of hours to come up with a challenge and shared it through social media. Ana (Es6g12) learned to create animation videos using applications such as Gacha Club. Since her parents did not allow her to post videos of herself on social media, she decided to create characters and make videos with them on the application and then post them on TikTok and YouTube. Paula (ES9g6) learned how to make videos with the Clips application during a summer camp offered by Apple, using a digital camera she had received as a gift. On one occasion, she utilized this application to make a congratulatory video that combined photos, music, and audio to celebrate her father's birthday.

Similarly, other children learned to pursue other artistic interests through digital media. Marta (ES3g10) was interested in drawing and found an application to draw on a tablet and learned to use it. A few others learned to make music digitally, such as Pablo (ES1b8), who made rap music with the help of his father.

For others, access to digital resources was important for developing their artistic interests *offline*. Maria (ES2g7), Diego (ES8b11), and Irene (ES10g7) looked for videos on how to make handcrafts (e.g. bracelets or *origami*) and created them themselves following the instructions. Paula (ES9g6) used both online and offline resources (i.e. videos, storybooks, books on how to draw) and collaborated with her family to pursue her interests in mythology and *manga*. The mother said:

> [Paula] alternated a lot between books and videos that explained mythology. For example, [her father] would explain the stories in the book she was reading, then they would watch them on video, and then they would draw them. [Her brother] likes drawing a lot and he

> has many books to learn to draw, so [Paula] would take [her brother]'s books and start drawing, and then she would watch videos [with titles such as] 'how to draw manga', 'how to draw...', and she alternated those two ways.

Children also demonstrated increased autonomy in their pursuit of creativity and self-expression. Many parents commented that their children learned how to use different (new) applications to pursue their interests. Here, YouTube tutorials appeared to be an essential problem-solving resource (e.g. Maria (ES2g7), David (ES4b11), and Ana (ES6g12)). For instance, Ana (ES6g12)'s mother said that Ana looked for YouTube tutorials when she wanted to use particular features of Gacha Club to create animation videos. The participants frequently highlighted the usefulness of YouTube tutorials in looking for information on a wide range of interests, for example, to know why the sky is blue (Pablo, ES1b8) or to cook a certain dish (Diego, ES8b11). Several families also reported that their children learned how to download games during the lockdown, although many required their parents' permission to do so.

Identity and Social Connection

The importance of connecting with school friends stood out in the category of 'identity and social connection'. To do so, children learned to talk through video calls or play video games together. Seven participants indicated video calls with their friends as their favourite daily activity during the lockdown. For instance, Maria (ES2g7) began making video calls with her friends when the lockdown began. The father elaborated on how this occurred and its importance for her.

> She is a very outgoing girl, and she really likes to be with her friends. [So, at the beginning of the lockdown,] she didn't take it [lockdown] well. She loved attending school. And one day at the beginning… they started calling each other on WhatsApp with their school friends, but… it depended on mobile phones and tablets. Well, in the end, I don't know how it came out, but at some point, they started calling each other through Hangouts.
>
> ....
>
> When she started with Hangouts, she could already play with her friends. She organised her meetings, they sent to each other 'good night' and 'good morning' when they got up, they informed each other that they had already eaten, they took photos together, [saying] 'look at my hairstyle' and they sent photos to each other. [They did] these things every day.

Some children also looked for creative ways to use video calls to do things with their friends that they used to do in person. For instance, Carmen (ES7g11) commented on doing a 'sleepover' via video call, while Marta (ES3g10) talked about putting on makeup during a video call with a friend.

Videogames were another way for many participants to connect and play with their friends. The games they played, such as Fortnite, Roblox, or Minecraft are games that allow socialisation with other players. Maria (ES2g7) said "I didn't use Hangouts or Roblox before. However, in a call I made with my friends, they recommended them to me". She started playing Roblox with her friends while talking to them on Hangouts. They used avatars with different names in the game and talked on Hangouts to identify each other in the game. In the case of Diego (ES8b11), he learned different techniques from his friends playing together: "Sometimes my friend would say to me, for example, 'look what I'm putting together' so I would go to Hangouts and see what he was putting together. And sometimes I told him the same".

Critical awareness and management of risks

In general, children's awareness of the potential risks associated with their digital engagement was limited to overuse. Many thought it was necessary to have some limitations when asked to set up rules and timetables for themselves. Marta (ES3g10), who had several migraines after doing her homework on screen, said, 'It's fun for me [to use digital devices], but, deep inside, I know it's not entirely good'. None of them complained about the rules that their parents had established, although they commented that they would like to use their devices a little more if they had the option. However, this awareness did not necessarily translate into compliance with the rules established by or with the parents. Some bypassed the rules, shared the screen with their siblings to double the time (e.g. David (ES4b11)), or resisted strongly when parents told them to turn off the devices (e.g. Pablo, ES1b8). Pablo's mother commented that "the other day his father told him 'I uninstalled Brawl Stars [his favourite videogame] for you' and the reaction he had... was a frustration of 'no, dad, everything I had achieved…' as if something very precious had been broken".

In addition to the issues associated with overuse, awareness of other risks was observed in only a few cases. Maria (ES2g7) told us about the experience of being 'hacked' online and that she never used her real name on Roblox. She created a new account when she thought that strangers would come to play with her. The father commented:

> One day, she told me that she wanted to delete a Roblox account and create a new one. I told her 'but why, stay with that one that you already have many things built'. She said 'No, it's that I have many 'friends' that I don't know and I want to change it, I want to do another one'. She said, 'They are going to hack me'. I don't know if she understands hacking. [She] created a new account. She started from scratch.

Diego (ES8b11) told us that he always ensured that the camera was disconnected each time he used it for school video calls because the camera could be hacked. Another case was Marta

(ES3g10) who told us she never clicked on ‘accept’ when cookie consent messages appeared on websites. Except for these three cases, we did not hear any comments on the risks or measures taken to avoid them.

Furthermore, all answered “no” when asked if they had any worrying experiences online. In some cases, the absence of such an experience was due to parents’ high level of control in this regard; Carmen’s father said, “We are very close to her [activity] and we have controlled all access to the Internet. We verify at all times that she does not access any type of social networks, chat, or sites”.

Prospects and Discussion

The findings show that child participants improved their digital literacy, gaining more autonomy for both academic and ludic uses during the lockdown. They also learned to use various digital resources to pursue their digital and nondigital interests. They further improved their ability to creatively use digital technology to connect and play with friends when they were unable to get together. These findings largely coincide with those found in other European countries that participated in the wider project. Across countries, it was concluded that children acquired and practiced new digital skills due to and for online schooling (Vuorikari et al. 2020), communicating with friends and extended family members, and realising creative activities (e.g. Denmark (Johansen and Enemark Lundtofte 2020), Croatia (Kotrla and Perković 2020), Portugal (Dias and Brito 2023), France (Loicq and Féroc Dumez 2021)).

In this section, I explore the significance and implications of the findings in the post-pandemic era, both for the participant children and more widely for social justice and educational

equity, considering other groups of more disadvantaged families and children. For this purpose, I first consider the social changes that occurred and their perceived effects on children's choices of activities when the lockdown ended.

The prospect of changes in conversion factors and choices in the post-lockdown period

An essential change in the conversion factors into the post-lockdown period was the gradual de-escalation of social distancing measures. From 26 April 2020, the lockdown measures began to loosen, and face-to-face schooling reopened in September 2020, initially with some special measures (i.e. strict hygienic measures and the reduction of teacher-student ratios) (Trujillo Sáez 2021).

These contextual changes offered choices that children had strongly wished for but could not have during the lockdown: to get together with their friends physically and return to face-to-face schooling (Camas, del Prado Martín-Ondarza, and Sánchez-Serrano 2022). On the Time Capsule activity sheets, nine out of ten participants indicated meeting their friends in the section 'What I missed during the lockdown'. For instance, Paula (ES9g6) has drawn smiley faces of her friends with the comment 'visiting my friends'. Many children also manifested a desire to return to face-to-face schooling because of their wish to be with their friends. For instance, Ana (ES6g12) strongly preferred in-person schooling because she could talk more, be in touch with her friends, and play together.

Virtual communication did not replace the desire to see friends in person. In response to a question about what made him feel sad during the lockdown, for example, David (ES4b11) said, "The fact that I could not hug my friends or be around them or talk together. Only on video

calls". After the lockdown, he would rather play a board game or play on the street with friends, things they had not been able to do together.

Several participants indicated that they wanted to continue their digital practice with their friends. Daniel (ES5b9) said that he wanted to continue playing video games and sharing information about the progress with his friends. Some wanted to share the digital functionings they acquired during the lockdown with their friends, such as taking pictures and editing them with friends (Marta, ES3g10), or teaching others how to incorporate videos in presentations and increase audio-visual creativity (Diego, ES8b11).

Relevance of the digital functionings as the digital and educational capability sets after the pandemic

Considering the changes after the pandemic discussed above, the digital functionings that the participating children achieved during the lockdown have significant implications for their lives afterwards. First, the digital functionings achieved remain a part of the choices in children's post-pandemic lives. While not every child plans to play online games with her/his friends or continue virtual learning, they remain alternative, tangible skills that they can choose to exercise if they wish to. As seen from the CA approach, the children are better off after the experience as they possess more capabilities to exercise for the matters they care about. Moreover, the digital functionings achieved are relevant as educational capabilities in post-pandemic life. Education is considered a basic capability both for human freedom and for the expansion of other capabilities (Hart 2012; Nussbaum 2000; Sen 1999; Walker and Unterhalter 2007). Taking the concept of education broadly, the capabilities to be educated refer to real opportunities for both informal learning and formal schooling (Terzi 2007). From this perspective, the digital functionings that

children acquired can be considered educational functionings that remain as educational capabilities after the pandemic. Through digital means, they have expanded opportunities, abilities, and channels to participate in schooling, conduct schoolwork, and learn informally about their interests.

Additionally, *the autonomy* that children have developed, albeit to different degrees, is a functioning that will continue to be valuable in life. Autonomy is fundamental in CA, because a lack of or constrained autonomy implies a limitation on the ability to choose (Ferracioli and Terlazzo 2014; Walker and Unterhalter 2007). The atypical lockdown situation has pushed children to develop autonomy. They 'stretched' freedoms in the restricted situation, with different degrees of mediation by parents and the school, learning to engage in activities they valued more autonomously than before.

However, the combination of autonomy with little development of critical risk awareness found in this study is a concern. Children acquiring autonomy in their digital practices and yet lacking critical reflection have been reported in other studies (e.g., de Groot et al. 2023). Critical awareness and management of online risks are essential from the CA perspective. Nussbaum, another prominent thinker of the CA, considers critical thinking to be essential; it relates to what Nussbaum (2000) terms the capability of 'practical reasons'. It is a capability that combines, in essence, autonomy with critical reflection, as it refers to reason and making good choices by engaging in "critical reflection about the planning of one's life" (78; see also Walker and Unterhalter 2007). From this perspective, the participating children are yet to fully develop practical reasons regarding their digital engagement. From the scarce comments made regarding their management and awareness of risks, the children do not appear to be able to reason

critically despite their autonomous digital activities. After the pandemic, education, including but not limited to formal schooling has an important role to play. Children who have had the opportunity to develop digital functionings during the pandemic need to be able to decide how, when, and which functionings they should exercise to live a life they value, while managing the risks entailed in their decisions. In Sen's words, education is partly "about helping children to develop the ability to reason about new decisions any grown-up person will have to take" (Sen 2006, 106).

Potential gaps between the participants' children's digital experiences and disadvantaged children's during the lockdown and their implications for the post-pandemic policies

Based on our findings, we did not observe significant differences in the experiences or digital functionings achieved by children based on their families' socioeconomic backgrounds or the quality of Internet access at home. However, owing to the qualitative nature of our study involving only 10 sample families, we could not establish conclusive relationships. We acknowledge that disadvantaged families, with the exception of one low-income family, were underrepresented in the study (see Sections 3.2 and 4.1 for more details). This underrepresentation is also evident at the European level in the qualitative segment (see Cachia et al. 2021). It is thus crucial to consider the implications of these findings for more disadvantaged groups of children from a social justice perspective.

The survey conducted as part of the same project targeting older children (i.e. 10 to 18 years old) showed that children from households with below-average income in almost all participating countries, including Spain, reported feeling less confident in their ability to cope

with online learning activities compared with children from households with average or above-average income (see Vuorikari et al. 2020). Similarly, several studies have pointed out that the digital divide concerning children's formal learning has been exacerbated during the COVID-19 pandemic (e.g. Cabrera, Pérez, and Santana 2020; Gil Quintana and Vida de León 2022; López-Noguero, García-Lázaro, and Gallardo-López 2021; Luengo Horcajo and Manso Ayuso 2020; Montenegro, Raya, and Navaridas 2020; Vigo-Arrazola et al. 2025). With schools closed, children had to depend on the resources available at home to learn, with parents playing a critical role in helping their children with schoolwork and managing digital platforms (e.g. Cabrera, Pérez, and Santana 2020). Previous studies have shown that parents try to support their children in general; however, various factors, many of which are structural, place disadvantaged families in unfavourable conditions to do so. In particular, the limited access to the Internet and digital devices (except mobile devices) was the major obstacle for families with fewer economic resources or from minor cultural groups. This issue significantly hindered children from these families in accessing and progressing in their formal learning during the lockdown, especially in households with multiple children who had to share the already limited resources. Additionally, despite their willingness to provide support, many families lacked pedagogical, social, and cultural resources. Some parents mentioned difficulties due to their limited knowledge and skills with respect to subject contents (e.g. English) or the use of digital media, such as handling emails for communication with the school or digital educational platforms (e.g. Cabrera, Pérez, and Santana 2020). Other relevant factors included parents' efforts to balance and maintain their work, whether telework or working outside home (e.g. Luengo Horcajo and Manso Ayuso 2020). Many also experienced further challenges during the pandemic, such as losing their jobs or limited job opportunities, which made them struggle to meet the basic needs of their family

members (Cabrera, Pérez, and Santana 2020). These multifaceted challenges disproportionately affected the ability of children from disadvantaged families to participate in online learning and develop their digital skills during the pandemic.

Consequently, not all children had the same opportunities to develop their digital functionings during the lockdown as the children in this study. The long-term impact of these differences on children's post-pandemic digital competencies and well-being is yet to be determined. The Organisation for Economic Co-operation and Development (OECD)'s member countries, including Spain, are aware of the wide digital and learning gaps and have taken different measures to mitigate them (OECD 2021), including investment and promotion of the digitalization of the educational system (Nacional de Tecnologías Educativas y de Formación del Profesorado (INTEF) 2022). However, some studies criticise these efforts as mere intensification and acceleration of existing solutions (Tiana-Ferrer 2023), not "new solutions better suited to revert the direct effects of the pandemic" (Zancajo, Verger, and Bolea 2022, 121). I concur with this view based on my experience of working with schools that have complex socio-pedagogical realities.[1] In particular, measures should adjust to the real, distinct needs of each school's community (Sancho-Gil, Rivera-Vargas, and Miño-Puigcercós 2020). Transformative policies oriented towards social justice and educational equity can only be sparked through horizontal collaboration and consultation with the schools and communities in question (Vigo-Arrazola et al. 2025).

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[1] National R+D+i project "Challenging stigmatization: Creative and inclusive discourses and practices with digital media in schools of 'special complexity'" (DesEi) (PID2020-112880RB100) (2021-2025) and National R+D+i project "Inclusion of student and community voices for a creative and sustainable education in a digital context: Policies and practices in compulsory education" (ALCOM) (PID2023-148480OB-I00) (2024-2027).

Conclusion

Applying the CA, this study illuminated the significance of children's digital practices during the COVID-19 lockdown as helping them to acquire long-term digital and educational capabilities that can increase their well-being. This demonstrates the limitations of the predominant narrative that focuses on the negative consequences of increased screen time. Children are not passive consumers of screen time; rather, they can develop functionings to carry out activities that matter to them with increased autonomy. The CA also highlighted the importance of nurturing the capability of *practical reasons* to accompany the more autonomous digital practices that children have developed. The original adaptation of the CA in this study is expected to enhance the development of the CA and its application in the context of digital technology and education.

The study also discusses social justice and educational equity perspectives, recognising the lack of children from disadvantaged backgrounds in the sample. Although digital learning gaps are widely recognised, the measures taken are not sufficient to address them. Hence, in the future, researchers should conduct larger longitudinal studies with a sample inclusive of children from different disadvantaged backgrounds (cultural minorities, limited economic resources, or rural areas) with different degrees of digital capabilities and examine how they may influence children's lives in the long term.

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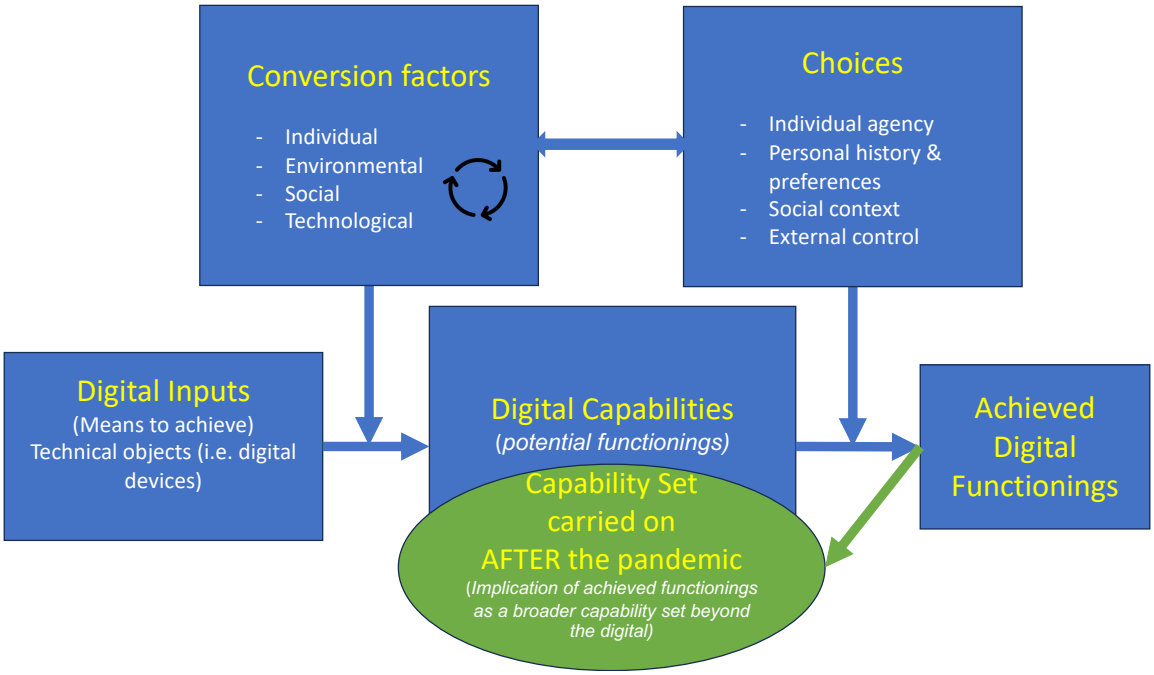
Table 1. Housing's ICT product equipment in 2020

	Desktop or laptop computers (tablet not included)	Tablet computers	Homes with broadband connection	Homes with mobile phones
Total housings	76,2	58,4	95,3	99,5
Net monthly household income: Less than 900 euros	51,2	32,8	85,9	98,9
Net monthly household income: From 900 to less than 1,600 euros	70,4	51,5	95,2	99,5
Net monthly household income: From 1,600 to less than 2,500 euros	88,5	70,7	98,9	99,8
Net monthly household income: 2,500 euros or more	96,3	81,2	99,8	99,9

Source: Nacional Statistics Institute of Spain (2021)

Figures


Conversion factors
- Individual
- Environmental
- Social
- Technological
Choices
- Individual agency
- Personal history & preferences
- Social context
- External control
Digital Inputs
(Means to achieve)
Technical objects (i.e. digital devices)
Digital Capabilities
(potential functionings)
Capability Set carried on AFTER the pandemic
(Implication of achieved functionings as a broader capability set beyond the digital)
Achieved Digital Functionings

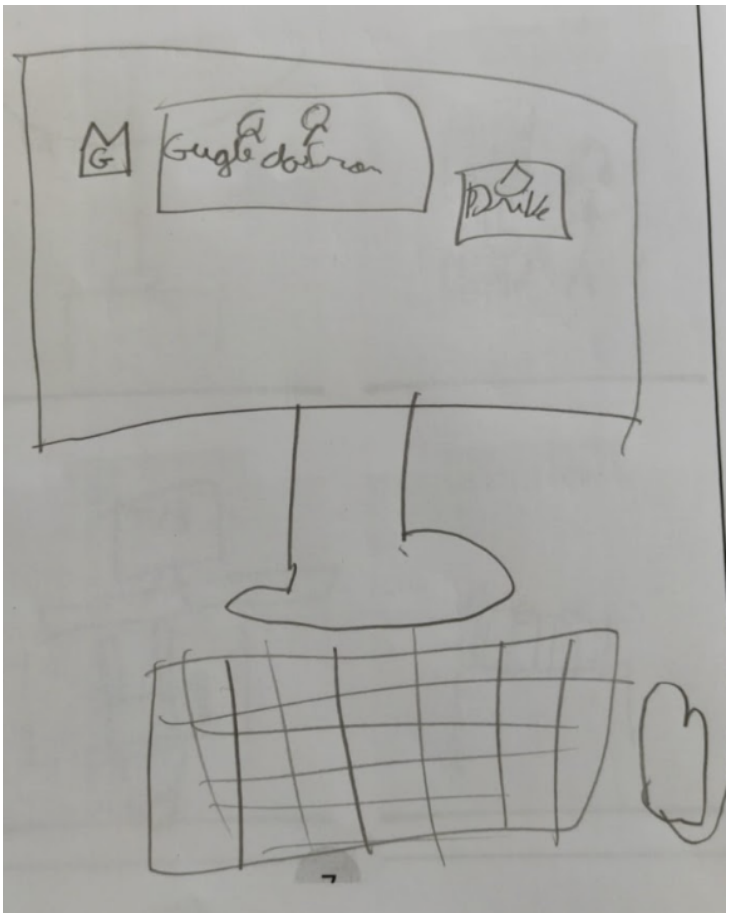


Figure captions

Figure 1: A digital technology-augmented capability approach for the study.

Source: Adapted from Haenssgen and Ariana (2018, 104) and Robeyns (2005, 98).

Figure 2: A drawing of '*What I have learned during the lockdown'* by Diego (ES8b11)