

Habits, norms and use of technologies at home from a gender perspective in early childhood

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Abstract

The use of technologies at home directly influences how children perceive them for their learning at school. Numerous studies have focused on the different ways in which digital technologies are used at home and in schools. These studies attempt to explain how previous experience and knowledge can be linked to the use of technologies at school, the differences between home and school literacies, or how socio-economic status influences the availability of technology in these socio-educational institutions. All of them show that technology has become part of children's lives. Consequently, the aim of this study was to obtain information about the habits, norms and use of technology by children aged 2-6 years in their homes and the differences between genders. To this end, a validated questionnaire was created. A total of 1016 parents completed the questionnaire. The results show the most used technologies, the time of use and whom they are used with, as well as the rules imposed and their opinion about this use. Likewise, there are significant differences that lead to carry out and discuss proposals for STEAM work in Early Childhood Education classrooms in order to empower students.

Keywords

Childhood; technology; family; gender; empowerment

I. Introduction

Early childhood (3-6 years) is a complex stage of growth, in which children develop all the fundamental components to see, hear, touch, think and learn and to expand their intelligence and all skills in general (Taufik et al., 2019). Children imitate the model and actions of adults, assuming roles and stereotypes. Gender roles and stereotypes are still present, leading to an increasing gender digital divide (Svenningsson et al., 2018). Mateos and Gómez (2019) consider it necessary to attend to the socio-cultural and psychosocial factors that continue to perpetuate the stereotypes which feed the preconception that the technological and digital world is a masculine element; such stereotypes are due to the little presence of girls, young women and women in the technological scope and in STEAM careers. Therefore, the authors of the mentioned study highlight the importance of attending to the first stages of life, "since the internalisation of the world around us and the way in which we belong to it are preeminently learned and structured during early childhood" (Mateos & Gómez, 2019, p. 28). In this sense, within the family, as the first socialising agent, the stimuli that are transmitted in early childhood influence the child's growth and the abilities that he/she acquires. The beliefs, messages, values and stereotypes reflected toward their own children influence their expectations and goals, being relevant in their academic studies and professional orientation; furthermore, the concept of gender can have an emotional and social impact on the child's skills, promoting differences in the abilities between boys and girls (González-Palencia & Jiménez, 2016; Bian et al., 2017; Saini, 2018; Šimunović & Babarović, 2020).

Regarding gender and roles, authors such as Axell and Boström (2021) pointed out that technology is strongly connected to the female/male dichotomy, reporting gender differences in the attitudes toward technologies in terms of education. From this perspective, it is considered that, from the age of two years, children begin stereotyping day-to-day actions, norms and habits, and families are considered as socialisers of expectations. The "norm" (hidden) is to consider that men can have greater knowledge in the technological scope, posing a barrier for women to approach this field (Oldenziel, 1999; Axell & Boström, 2021). In this whole process of development and acquisition of norms and habits, families also generate positive beliefs about the use of technologies by their children, and they believe that learning with technologies provides new and enjoyable learning opportunities for children, who can acquire basic technological skills and expand their curiosity (Nikolopoulou, 2019; Grané, 2021). Studies such as those of Palaiologou (2016) and Taufik et al. (2019) highlight that, in European countries, children use digital technologies (computers, Tablets, Smartphones, Apps, gadgets) more often, generating effects on their behaviours. The digital environment of children is increasingly rich and diverse, and studies about this topic have documented its evolution by countries and technology (Chaudron, 2015; Konca & Koksalan, 2017). In the early 21st century, the television and computers (Dunn et al., 2016; Lauricella et al., 2015) were the most studied devices; twenty years later, research is focused on Smartphones, Tablets, robots..., etc. (Romero-Tena et al., 2019; Rideout & Robb, 2020; Franco, 2021; Konca, 2021; Ramírez et al., 2021). These recent studies reflect that children spend more time using mobile devices than watching TV, thereby making the lives of families easier and supporting learning both at home and at school; the main reason for this is that, in most households, there are at least one Smartphone and one Tablet, which, in some cases, belongs to the child (Blum-Ross et al., 2018; Rideout & Robb, 2020; Konca, 2021). Therefore, we can assert that the prevalence of digital technologies is a characteristic of the daily life of families and, thus, of children (Griffith & Arnold, 2019; Pham & Lim, 2019).

All of the above mentioned led us to focus our attention on researching what happens at home with these technologies and how they influence the way in which children behave and interact with them. The findings of Lauricella et al. (2015) evidenced the direct relationship between the use of technologies by the parents, their attitudes, norms and behaviours in the supervision of their use and the later use made by their children. A more recent study (Lauricella & Cingel, 2020) reported

that the attitudes of the parents toward technology have a substantial influence on the children, suggesting that the use and attitudes of the parents toward technologies were strongly related to the use that the children made of media, even during adolescence. Studies such as those of Blackwell et al. (2014), Vittrup et al. (2014), McCloskey et al. (2018) and Gjelij et al. (2020) indicate that the time spent by children using screens and mobile devices could be due to an interaction between the factors of the child and those of the parents, and such time is strongly influenced by the attitudes of the latter.

Therefore, parents become the direct factor of influence on the children's use of technologies. Plowman (2015) identified that the daily use of technologies at home tends to ignore the role of childhood. Previous studies already highlighted this relationship, such as that of Plowman et al. (2012), who showed that there were two attitudes of parents toward technologies and their children, classifying them between cautious and eager. The mentioned author, in a later study, identified and developed several methods from ethnotheories or cultural beliefs of parents, with the aim of better understanding the role of technologies and their relationship in the lives of children aged 3 and 4 years (Plowman, 2015). The study of Takeuchi and Stevens (2011) pointed out the importance that each family grants to the different digital devices based on their use and the learning needs of their children. The study of Johnson (2015) determined that the influence of social aspects is an impact factor. Ihmeideh and Shawareb (2014) emphasised that the factors of use of digital technologies by the parents, their attitudes and the age of the children are the main markers of use. Stephen et al. (2014) found that the home context has a significant influence on the use of technology, particularly regarding the beliefs of the parents about technology. Moreover, there are multiple factors that contribute to the use of technology by children (Nevski & Siibak, 2016). Mertala (2017) stated that incompetent parenting (lack of abilities to regulate) derived from an excessive use of technologies by children at home; this author advised that regulating and supervising the use of technologies is considered a good parenting practice.

Considering that the family is a factor of direct influence on the children's use of technology, it is important to improve the relationship between technology, family and children. Based on the concept of Joint Media Engagement (JME) (Guernsey & Levine, 2015), when two or more people (parents and children, siblings or classmates) use the same media at the same time, they participate together in the content, and what they see encourages them to interact with each other and grant further meaning to what they are watching or doing (Dore & Zimmermann, 2020).

Other terms such as scaffolding (Siraj & Romero-Tena, 2017) and active mediation (Dore & Zimmermann, 2020) are regarded as the highest forms of JME, since they provide conversational support by one person who knows the child, thus technologies can be adapted at the individual level to help the child to make connections between the information presented and his/her own information.

It is also worth highlighting that some families, as was stated by Mendoza (2009), do not have norms or expectations regarding the use of digital technology by their children, and if they do, they either require previous knowledge, orientation and control by the parents over such use (Oliemat et al. 2018), or they are based on what Blum-Ross et al. (2018) called "parental mediation", which can be organised in: restrictive mediation (limits in terms of use, time and context), technical restrictions (limits to the use of a software or hardware), vigilance (the use of technologies to track and supervise access), and active mediation (conversing with the children, guiding them and helping them to interpret the use of technologies).

Therefore, from this perspective and taking into account previous research, there are three common types of mediation strategies. *Active mediation* involves the negotiation between parents and children with respect to the content watched when interacting with digital technology. The *covisualisation strategy* is that in which the parents are present and use digital technologies with

their children. Lastly, in the *restrictive strategy*, the parents establish norms about the content, location and duration of the use of digital technology (Livingstone & Helsper, 2008; Nikken & Jansz, 2014; Wu et al., 2014, Livingstone et al., 2015; Vaala et al., 2015; Konca, 2021).

In this whole context, a fundamental element is missing: children are taking their first steps in education and the school is another window to society. Consequently, the family and the school are two frameworks of reference, development, upbringing and socialisation of early childhood, with both of them contributing to the creation of identity (individual and social) and the network of relationships with others. It is worth pointing out that there is not a single model and type of family, but a diversity of notions and concepts of family unit, from different perspectives (Martínez, 2013). Therefore, although this article mentions parents due to the information reported by the reviewed studies, there is a great diversity of family structures (nuclear, extended, single-parent, reconstituted, etc.) in our society; such diversity has implications in the relationships with the school. The literature identifies clear differences between the access of children to digital devices in their home environment and their early learning environment, i.e., educational centres (Schriever, 2021). Dashti and Yateem (2018) revealed that 78% of children in their study used mobile devices at home, whereas only 18% of them used mobile devices in their early learning environment.

Edwards et al. (2017) studied the digital disconnection or differences between these two environments beyond the use of technology, emphasising that it had to be the same in both. The results of their study showed that the elements of activity, time, place and role influenced the way in which digital technologies are used in the environment of early childhood and why they are used in this life stage. Davidson et al. (2018) reported that there are mixed perspectives with respect to the relationship between the use of technologies by young children at home and at the contexts of early learning (school), although the home contexts seem to offer a greater diversity of digital practices.

In the struggle to reduce the divide between the household and the early childhood environment, technologies can allow children and their parents to access their learning at home, thereby supporting and consolidating the connections between school and home (Hooker, 2019).

Schriever (2018) observed that managing and responding to the parents' expectations related to technologies depended on the fact that the parents and the early childhood teacher had the same understanding of the children's experiences with digital technologies.

There are tensions when parents and schools have different meanings regarding the purpose of technologies and how children experiment with them. Parental control expands beyond the household and reaches the school, intervening and mediating the experiences of their children with technologies with the aim of preventing greater exposure and use of ICTs (Schriever, 2021). Furthermore, early childhood teachers, on the one hand, attend to and manage the concerns of the parents (Smith, 2020), and, on the other hand, they must make decisions on the digital technologies that are used by the children, renegotiating their meaning and guaranteeing that they are used with educational purposes, based on playing and active learning (Schriever, 2021b). On their part, parents consider that the implementation of technologies in the educational processes poses an advance in knowledge, enhancing the integral development of their children and the acquisition of digital competences to thrive in society (Suárez-Álvarez, 2019).

All these findings lead us to consider that a positive connection between home and school is beneficial to children, and that early childhood teachers must work together with the parents and express the positive role of technologies at school. In this sense, in the scope of education, the development of technological knowledge involves inventive actions, creativity and technical and scientific knowledge. Thus, teacher training is a key element to make teachers associate the syllabus with the use of educational technology in early childhood classrooms, taking into account the experiences that children in this life stage accumulate in their respective homes.

II. Methodology

a. Objectives

The present study considers the household as a microsystem in which technologies and children coexist, under the supervision of the parents, which will mark the later use at school and in other contexts. In this line, the study is based on the ecological systems theory of Bronfenbrenner (1979), focusing on the reconceptualisation of the model developed by Johnson and Puplampu (2008), which addresses the ecological techno-subsystem. This ecological techno-subsystem revolves around three concepts: (i) the bio-ecology of the child, which would encompass everything related to his/her social development; (ii) digital technologies, which include TV, Smartphones, Tablets..., etc.; and (iii) the context itself, which would comprise the entire family context. We focused our attention on the microsystem in which technologies and children coexist, as well as the context in which technologies are used (Johnson, 2010). Both digital technologies and the context where they are used by children were studied in the framework of the microsystem, with the aim of determining the current use of digital technology in children aged 2-6 years in the home context and detecting the existence of differences regarding gender (parent/child).

We analysed this digital environment considering the following questions, aimed at the parents, who completed the questionnaire: what digital devices do you use at home, for how long, with whom and where are they available? Similarly, they were asked the following questions about their young children: what digital devices do they use at home, for how long, with whom and where are they available? Moreover, some data of the parents and their children were explored: gender, education level, age, country of origin, number of children..., etc.

The parents were also asked about the reasons to let their children use technologies and how they consider such use, as well as about norms established for it and whether they had received any information from the educational centre in which their children were schooled. These questions led us to set the following objectives:

- O1. To know which technologies are used by parents and children at home, and the time, place and how or whom they use them with.
- O2. To explore the valuation of parents about technologies, as well as their reasons and the norms they establish to let their children use them.
- O3. To identify whom children ask for help when they encounter a problem or doubt with respect to technology.
- O4. To detect whether the parents had received any information or support from the educational centre about the adequate use of technologies for their children.
- O5. To verify the existence of differences in the way of interacting with technologies in terms of gender:
 - O5.1. Parents' gender and the way of interacting with technologies.
 - O5.2. Children's gender and the way of interacting with technologies.

b. Sample

This questionnaire was completed by 1,016 parents, of whom 827 (81.5%) were mothers and 189 (18.5%) were fathers. The age of most of the respondents ranged between 36 and 42 years, with 38 years showing the highest percentage (10.2%). The youngest parent age was 22 years (0.8% $f=8$) and the oldest parent age was 53 years (0.4% $f=4$). The country of origin of most of the respondents was Spain (94.1%), although it is important to highlight that the rest of the parents were from Europe (Germany, Italy and Ukraine), Latin America (Chile, Nicaragua, Peru and Colombia), Africa (Algeria, Morocco) and Asia (China). Most of these parents had two children (59.4%), followed by those who had one child (28.1%) and three children (9.7%). The education

level of the parents was secondary education (29.3%) and higher education (26.2%), followed by vocational training (14.9%) and Baccalaureate (11.2%).

The gender of their young children is quite balanced, with 55.5% girls and 45.5% boys. The age of these children was 3 years (25.7%), 4 years (29.1%), 5 years (34.7%) and 6 years (9.6%). Of these children, 98.4% were born in Spain, and 31.4% of them have an older sibling.

c. Instrument

Considering the literature and antecedents in this topic, a questionnaire was developed based on the one created by Romero-Tena et al. (2019), replacing the open questions of the original version with closed questions to facilitate their analysis. This questionnaire had a total of 35 items, which were divided into three blocks: 1) information about the parent, requesting some demographic data and information on the use they make of technologies; 2) information about the children and the use they make of technologies at home, delving into time, location, type of use, whom they use them with, norms..., etc.; and 3) information related to whether the educational centre had provided the families with any training/counseling about technologies and their use by their children. To reach the final version of the questionnaire, an expert judgement was employed, making the relevant modifications based on the experts' contributions and observations.

We also applied Cronbach's alpha to determine the internal consistency (0.978), which led to consider that the different reliability indices are quite acceptable, since correlations between 0.8 and 1 are "very strong" and, consequently, they indicate high reliability levels for the different instruments created.

c. Procedure

The questionnaire was developed in physical format and was completed by the parents. The data were gathered in October-November 2020. Before completing the questionnaire, the parents were briefed on the purpose of the study and they were requested to give their informed consent to collect the data derived from the investigation, guaranteeing their confidentiality and anonymity at all times. Participation was voluntary.

Descriptive and central tendency analyses were performed (O1-O4). In addition, contrast statistics were applied to compare the obtained scores (O5). Specifically, Mann-Whitney U-test, with Cohen's *d*, was used to determine the magnitude of the differences between the groups. Moreover, we verified that the data did not show a normal distribution, using asymmetry and kurtosis analyses. The Kolmogorov-Smirnov goodness-of-fit test confirmed this verification ($p = .000$) for all items (non-normal distribution). The obtained data were analysed using SPSS statistical software.

III. Results

a. Results related to the technological context and beliefs

The literature shows that parents' attitudes toward technologies and the use they make of them mark the use that their children make of these, even up to advanced ages. Thus, one of the objectives of this study was to know which technologies are used by parents and children at home, as well as for how long, where, how and whom they use them with (O1). Among the parents that participated in the study, the most commonly used technologies (daily) are the TV (46.6%) and Smartphones (50.2%). The computer is used several days per week (31.8%), followed by Tablets

(10.4%) and cameras (11%). They barely or never used consoles (41.9%), robots (41.5%), mp3/4 (43.5%), video players (37.6%) and photo cameras (some of these technologies may be integrated in Smartphones, which is why the participants did not make a specific distinction using a specific technology). All technologies except the computer and the mobile phone (alone-private) are used together as a family and always in a common or familiar space.

Regarding the use that the children make of the different technologies, they always access them accompanied by their parents and in a common area. The technology with which the children spend the longest time is the TV (60-120 minutes daily), followed by Tablets (30 minutes) and Smartphones (18-20 minutes).

After observing that all children are integrated in a family context in which they make use of technologies, we delved into aspects that may help to clarify the parents' reasons to allow their children to use these technologies, as well as their perception of technologies in relation to their children. Lastly, we also explored the norms they establish for their use (O2).

Most of the participants believe that the use that their children make of technologies at home is adequate (80.4%), followed by those who consider it excessive (15.6%). The main motivation for allowing children to use technologies is having fun (68.6%) and learning (61.6%). Most of the parents denied that they let their children use them to calm down (93.4%), get distracted so that they let them do other things (86.6%) or as a reward for doing something well (78.1%).

The vast majority of the participants stated that they have some norms of use (96.9%), which are mainly based on the time of use (70.8%) and the act of asking for permission to use them (56.3%). Almost half of the parents allow their children to use them only at certain times (51.9%) and under their supervision (43.4%). A lower percentage of parents link these norms to the particular content of the application (38.1%).

Since training and counseling about the adequate uses of technologies is considered fundamental in the development of children, we tried to identify who plays that role by asking whom their children ask for help when they have a problem or doubt with technology (O3). The parents stated that when their children do not know how to do something with technology they seek help, firstly, from the most accessible adult in the environment (73.4%) to tell them how to solve it, followed by an older sibling (10.2%) and the mother (6.6%). Regarding the question of whether they had received any training/counseling about technologies and their use by children (O4), 81.9% answered that they did not receive any information. Perhaps schools should improve their leadership in terms of counseling parents for a correct use of technologies.

b. Results related to the parents' and children's gender

With the aim of determining whether there are differences in the gender of the parents and children in terms of their relationship with technologies (O5), firstly, the relationship with technologies was defined through the following variables: types of technological use, time of use and place of use. Mann-Whitney U-test, with Cohen's d, was used to determine the effect size. Next, Table 1 shows the obtained results regarding the parents' interaction with technologies and their gender (O5.1) (Table 1).

	Time of use	Type of use	Place of use
Mann-Whitney U	66834.000	73420.000	75652.000
Wilcoxon's W	410040.000	91186.000	93418.000
Z	-3.045	-1.412	-.765

Asymptotic sig. (bilateral)	.002	.158	.444
Cohen's d	.2342	-	-

Table 1. Mann-Whitney U-test with "parent gender" as grouping variable

As is shown in Table 1, there were no significant differences in the type of technological use and the place of use regarding the parents' gender, which seems quite logical considering that all participants stated that they make a daily use of technology. On the other hand, we can confirm, with 99% confidence level, that there are statistically significant differences in the time that the parents dedicate to the use of technology in terms of gender (Table 2). Based on the value of d, the magnitude of such differences can be considered moderate.

	Parent gender	N	Average range	Sum of ranges
Parents' time of use	Mother	827	495.22	410040.00
	Father	189	567.00	106596.00
	Total	1016		

Table 2. Average range by parent gender

Note: a. Grouping variable: parent gender

The average ranges presented in Table 2 show that the fathers tend to use technology for a longer time, that is, in general, males spend more time using technology than females.

The analyses conducted with respect to the children's gender and their way of interacting with technologies (O5.2) are shown in Table 3.

	Time of use	Type of use	Place of use
Mann-Whitney U-test	121872.000	112025.000	119980.000
Wilcoxon's W	281202.000	271355.000	222358.000
Z	-1.204	-3.795	-2.081
Asymptotic sig. (bilateral)	.228	.000	.037
Cohen's d	-	.137	.064

Table 3. Mann-Whitney U-test, with "children's gender" as grouping variable

Note: a. Grouping variable: children's gender

As can be observed in Table 3, there are no significant differences in the time of technological use with respect to the children's gender. However, we can assert, with 99% confidence level, that there are statistically significant differences in the type of use and, with 95% confidence level, in the place of use based on the children's gender. According to the value of d, the magnitude of such differences can be considered small. The average ranges in the use of technologies presented in Table 4 show higher values in males.

	Gender	N	Average range
Children's use	Male	452	542.66
	Female	564	481.13
	Total	1016	

Table 4. Average range by children's gender

IV. Discussion and conclusions

The aim of this study was to know the habits, norms and use of technologies at home in children aged 2-6 years, as well as the differences between genders. The obtained results indicate, on the one hand, that adults play the roles of models, facilitators and guides; on the other hand, their attitudes toward and use of technologies indicate how young children interact with the latter. These results are in line with those reported by Johnson (2015), Lauricella and Cingel (2020) and Konca (2021).

Likewise, these attitudes and patterns repeated by the children from their parents are strongly related to their expectations, goals, roles, stereotypes and training. Despite indicating that there are no significant differences in gender regarding the adults' type and place of use of technologies, the data show differences in terms of time and mode of use. As was observed, the time of use is longer in the fathers than in the mothers, which is also the case when the children need to know and do something with technologies, asking the most accessible adult in the environment to help them solve their problems and doubts. In this sense, we could confirm the arguments of Oldenziel (1999), Mateos and Gómez (2019) and Axell and Boström (2021), who pointed out that technology has a great connection with gender, reporting, as in our study, differences in gender roles (mothers and fathers).

Another two aspects that we aimed to highlight were: 1) whether the children made an adequate use of technologies, following the norms of use; and 2) which digital devices predominated in their homes (TV, Smartphones, Tablets, digital cameras or mobile devices). Firstly, the data show that, despite living in households with digital variety, the children make an adequate use of technologies according to the opinion of most of the parents, which is in agreement with the findings of Palaiologou (2016) and Taufik et al. (2019). This adequate use is based on entertainment, playing, fun and learning, as was also highlighted by Oliemat et al. (2018), Nikolopoulou (2019) and Grané (2021). Such use, in turn, is marked by a set of norms that are strongly related to the time of use and whether permission is granted to use technologies under the parents' supervision.

Secondly, TVs, Smartphones and Tablets were the most prevalent digital devices in the homes of the participants, whereas computers, digital cameras and consoles were the least used devices. Surprisingly, the results of this study were similar to those reported by Merdin (2017) and Ofcom (2019). However, it was revealed that the availability of these devices, as well as the children's access to them, were different, and, as was previously mentioned, the most accessible devices in the participants' households were TVs, Smartphones and Tablets. The greatest difference between the availability and accessibility of any type of device was in Smartphones, which seemed to be seen by the parents as a device for personal use. Moreover, it was suggested that the family property of digital technologies did not necessarily imply that the children used those technologies.

In addition to the gender stereotypes presented, the study of Šimunović and Babarović (2020) has shown that parents usually have stereotypical ideas or a lack of training in the scope of sciences, technologies, engineering, art and mathematics. A clear example appeared in our study, as the

parents reported a lack of training and highlighted the school as an instrument of change in terms of counseling and orientation. The beliefs, roles, perceptions and attitudes of the parents toward early childhood have proved to be fundamental socialisation and teaching factors. As a suggestion to continue advancing in this respect, we propose a joint work between families and schools based on education in STEAM (science, technology, engineering, art and mathematics), mediated by technologies, with the aim of helping young children to acquire knowledge and a culture of scientific, creative and critical thinking, as well as to develop problem-solving and innovation skills. A Joint Media Engagement (JME), based on scaffolding and mediation, between parents and teachers can influence the way in which children process and understand the media. Digital media, as was stated by Dore and Zimmermann (2020), may pose a means and provide indicators of routines and habits for the parents, thus responding in real time to the actions and expectations of young children.

In this sense, enhancing education in STEAM in homes and schools would lead to the development, from the age of 2 years, of a set of basic skills, such as receptive vocabulary, expressive vocabulary, auditory comprehension, connection/discrimination and early count; that is, it prepares children for their integral development. Likewise, in later stages, it potentiates digital competence, in particular, and the development of all the competences of primary education, in general (Chen & Chang, 2017; Chien & Chu, 2018). Therefore, both parents and schools must consider technologies as enhancers of equal opportunities and gender equality, and become socioeducational agents that guide and support the learning mediated by the use of technologies, which is initially transmitted by the parents and continues at school.

It is necessary to continue exploring the relationship between gender, habits and use of technologies with respect to the patterns, beliefs and roles of the families toward young children and their impact on early childhood schools, in order to contribute, from a gender perspective, to the development of early childhood syllabi that empower parents, teachers and children.

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References

- Axell, C., & Boström, J. (2021). Technology in children's picture books as an agent for reinforcing or challenging traditional gender stereotypes. *International Journal of Technology and Design Education* 31, 27–39. <https://doi.org/10.1007/s10798-019-09537-1>
- Bian, L., Leslie, S. J., & Cimpian, A. (2017). Gender stereotypes about intellectual ability emerge early and influence children's interests, *Science*, 355, pp. 389-391. DOI: 10.1126/science.aah6524
- Blackwell, C. K., Lauricella, A. R., & Wartella, E. (2014). Factors influencing digital technology use in early childhood education. *Computers & Education Journal*, 77, 82-90. doi:10.1016/j.compedu.2014.04.013.
- Blum-Ross, A., Donoso, V., Dinh, T., Mascheroni, G., O'Neill, B., Riesmeyer, C., & Stoilova, M. (2018). *Looking forward: Technological and social change in the lives of European children and young people. Report for the ICT Coalition for Children Online*. ICT Coalition.
- Chaudron, S. (2015). *Young children (0–8) and digital technology: A qualitative exploratory study across seven countries*. European Commission Joint Research Centre. <https://doi.org/10.2788/00749>

- Chen, Y. K., & Chang, C. C. (2017). Exploring the development and evaluation of integrating emerging technology into a STEAM Project. *International symposium on emerging technologies for education*.
- Chien, Y. H., & Chu, P. Y. (2018). The different learning outcomes of high school and college students on a 3D-printing STEAM engineering design curriculum. *International Journal of Science and Mathematics Education, 16*(6), 1047–1064. doi: 10.1007/s10763-017-9832-4
- Dashti, F. A., & Yateem, A. K. (2018) Use of mobile devices: A case study with children from Kuwait and the United States. *International Journal of Early Childhood, 50*(1), 121–134.
- Davidson, C., Danby, S. J., Given, L. M., & Thorpe, K. (2018). Producing contexts for young children’s digital technology use: Web searching during adult-child interactions at home and preschool. In S.J. Danby, M. Flear, C. Davidson & M. Hatzigianni (eds). *Digital Childhoods: Technologies and Children’s Everyday Lives* (pp. 65-82). Springer Nature.
- Dore, R. A., & Zimmermann, L. (2020). *Coviewing, scaffolding, and children’s media comprehension*. The International Encyclopedia of Media Psychology. <https://doi.org/10.1002/9781119011071.iemp0233>
- Dunn, J., Gray, C., Moffett, P., & Mitchell, D. (2016). ‘It’s more fun than doing work’: Children’s perspectives on using tablet computers in the early years of school. *Early Child Development and Care, 188*(6), 819–831. <https://doi.org/10.1080/03004430.2016.1238824>
- Edwards, S., Henderson, M., Gronn, D., Scott, A., & Mirkhil, M. (2017) Digital disconnect or digital difference? A socio-ecological perspective on young children’s technology use in the home and the early childhood centre, *Technology, Pedagogy and Education, 26*(1), 1-17, <https://doi.org/10.1080/1475939X.2016.1152291>
- Franco, S. (2021). Uso de las TIC en el hogar durante la primera infancia. *EduTec. Revista Electrónica De Tecnología Educativa, 76*, 22- 35. <https://doi.org/10.21556/edutec.2021.76.2067>
- Gjelaj, M., Buza, K., Shatri, K., & Zabeli, N. (2020). Digital Technologies in Early Childhood: Attitudes and Practices of Parents and Teachers in Kosovo. *International Journal of Instruction, 13*(1), 165-184. <https://doi.org/10.29333/iji.2020.13111a>
- González-Palencia, R., & Jiménez, C. (2016). La brecha de género en la educación tecnológica. *Ensaio: Avaliação e Políticas Públicas em Educação, 24*(92), 743-771 doi: 10.1590/S0104-403620160003000010
- Grané, M. (2021). Mediación digital parental. ¿Es necesaria una educación digital en la primera infancia? *EduTec. Revista Electrónica De Tecnología Educativa, 76*, 7-21. <https://doi.org/10.21556/edutec.2021.76.2037>
- Griffith, S. F., & Arnold, D. H. (2019) Home learning in the new mobile age: Parent-child interactions during joint play with educational apps in the US. *Journal of Children and Media, 13*(1), 1–19.
- Guernsey, L., & Levine, M. H. (2015). *Tap, click, read: Growing readers in a world of screens*. Jossey-Bass.
- Hooker, T. (2019) Using ePortfolios in early childhood education: Recalling, reconnecting, starting and learning. *Journal of Early Childhood Research, 17*(4), 376–391.
- Johnson, G. M. (2010). Internet use and child development: The techno-microsystem. *Australian Journal of Educational and Developmental Psychology, 10*(780), 32–43.
- Johnson, G. M. (2015). Young children at risk of digital disadvantage. In K. L. Heider & M. R. Jalongo (Eds.). *Young Children and Families in the Information Age: Applications of Technology in Early Childhood* (pp. 255–275). Springer.
- Johnson, G. M., & Puplampu, K. P. (2008). Internet use during childhood and the ecological techno-subsystem. *Canadian Journal of Learning & Technology, 34*(1), 19- 28. <https://doi.org/10.21432/T2CP4T>
- Konca, A. S., & Koksalan, B. (2017). Preschool children’s interaction with ICT at home. *International Journal of Research in Education and Science, 3*(2), 571–581. <https://doi.org/10.21890/ijres.328086>
- Konca, A.S. (2021) Digital Technology Usage of Young Children: Screen Time and Families. *Early Childhood Education Journal*. <https://doi.org/10.1007/s10643-021-01245-7>

- Lauricella, A. R., Wartella, E., & Rideout, V. (2015). Young children's screen time: The complex role of parent and child factors. *Journal of Applied Developmental Psychology*, 36, 11–17. <https://doi.org/10.1016/j.appdev.2014.12.001>
- Lauricella, A.R., & Cingel, D.P. (2020). Parental Influence on Youth Media Use. *Journal of Child and Family Studies*, 29, 1927–1937. <https://doi.org/10.1007/s10826-020-01724-2>
- Livingstone, S., & Helsper, E. J. (2008). Parental mediation of children's internet use. *Journal of Broadcasting and Electronic Media*, 52(4), 581–599. <https://doi.org/10.1080/08838150802437396>
- Livingstone, S., Mascheroni, G., Dreier, M., Chaudron, S., & Lagae, K. (2015). *How parents of young children manage digital devices at home: The role of income, education and parental style*. EU Kids Online, LSE.
- Martínez, S. (2013). *La relación familia-escuela. La representación de un espacio compartido*. [Tesis doctoral]. Universidad de Barcelona. <http://diposit.ub.edu/dspace/handle/2445/48969>
- Mateos, S., & Gómez, C. (2019). *Libro blanco de las mujeres en el ámbito tecnológico*. Secretaría del Estado para el Avance Digital. Ministerio de Economía y Empresa.
- McCloskey, M., Johnson, S. L., Benz, C., Thompson, D. A., Chamberlin, B., Clark, L., & Bellows, L. L. (2018). Parent perceptions of mobile device use among preschool-aged children in rural head start centers. *Journal of Nutrition Education and Behavior*, 50(1), 83–89.
- Mendoza, K. (2009). Surveying parental mediation: Connections, challenges and questions for media literacy. *Journal of Media Literacy Education*, 1(1), 28–41.
- Nikolopoulou, K. (2019) Mobile Technologies and Early Childhood Education. In M. Tsitouridou, J. A. Diniz & T. A. Mikropoulos T. (eds) *Technology and Innovation in Learning, Teaching and Education*. (p. 444-457). Springer. https://doi.org/10.1007/978-3-030-20954-4_33
- Nikken, P., & Jansz, J. (2014). Developing scales to measure parental mediation of young children's internet use. *Learning, Media and Technology*, 39(2), 250–266. <https://doi.org/10.1080/17439884.2013.782038>
- Oldenziel, R. (1999). *Making technology masculine: Men, women and modern machines in America, 1870-1945*. Amsterdam University Press.
- Oliemat, E. Ihmeideh, F., & Alkhawaldeh, M. (2018). The use of touch-screen tablets in early childhood: Children's knowledge, skills, and attitudes towards tablet technology. *Children and Youth Services Review*, 88, 591–597. <https://doi.org/10.1016/j.childyouth.2018.03.028>
- Pham, B., & Lim, S. S. (2019) Vietnamese pre-schoolers' tablet use and early childhood learning: An ecological investigation. *Journal of Children and Media*, 13(3): 241–259.
- Plowman, L. (2015). Researching young children's everyday uses of technology in the family home. *Interacting with Computers*, 27(1), 36–46. <https://doi.org/10.1093/iwc/iwu031>
- Plowman, L., Stevenson, O., Stephen, C., & McPake, J. (2012). Preschool children's learning with technology at home. *Computers and Education*, 59(1), 30–37. <https://doi.org/10.1016/j.compedu.2011.11.014>
- Palaiologou, I. (2016). Children under five and digital technologies: implications for early years pedagogy. *European Early Childhood Education Research Journal*, 24(1), 5–24. <https://doi.org/10.1080/1350293X.2014.929876>
- Ramírez Orellana, E., Cañedo Hernández, I., Orgaz Baz, B., & Martín-Domínguez, J. (2021). Evaluar competencias digitales en Educación Infantil desde las prácticas de aula. *Pixel-Bit. Revista De Medios Y Educación*, 61, 37-69. <https://doi.org/10.12795/pixelbit.85580>
- Rideout, V., & Robb, M. B. (2020). *The Common Sense Census: Media use by kids age zero to eight, 2020*. Common Sense Media. https://static1.squarespace.com/static/5ba15befec4eb7899898240d/t/5fb2e58acc0b050e6bd149ed/1605559694662/2020_zero_to_eight_census_FINAL_WEB.pdf
- Romero-Tena, R., Puig-Gutiérrez, M. & Llorente-Cejudo, C. (2019). Technology use habits of children under six years of age at home. *Ensaio*, 27(103), <http://dx.doi.org/10.1590/s0104-40362019002701752>Saini, A. (2018). *Inferior. Cómo la ciencia infravalora a la mujer y cómo las investigaciones reescriben la historia*. Círculo de tiza

- Schriever, V (2018) Digital technology in kindergarten: Challenges and opportunities. In: Khan, A, Umair, S (eds) *Handbook of Research on Mobile Devices and Smart Gadgets in K-12*, (pp. 57-76). IGI Global.
- Schriever, V. (2021) Early childhood teachers' perceptions and management of parental concerns about their child's digital technology use in kindergarten. *Journal of Early Childhood Research*, 19(4):487-499. <https://doi.org/10.1177/1476718X211030315>
- Schriever, V (2021b) The impact of digital technologies on the role of the early childhood teacher. In: Holloway, D, Willson, M, Murcia, K, et al. (eds) *Young Children's Rights in a Digital World: Play, Design and Practice*. Springer International Publishing.
- Šimunović, M., & Babarović, T. (2020) The role of parents' beliefs in students' motivation, achievement, and choices in the STEM domain: a review and directions for future research. *Social Psychology of Education*, 23, 701–719. <https://doi.org/10.1007/s11218-020-09555-1>
- Siraj Blatchford, J., & Romero-Tena, R. (2017). De la aplicación a la participación activa de las TIC en Educación Infantil. *Pixel-Bit. Revista De Medios Y Educación*, (51), 165-181. <https://doi.org/10.12795/pixelbit.2017.i51.11>
- Smith, J. (2020) Teachers' perspectives on communication and parent engagement in early childhood education programs for migrant farmworker children. *Journal of Early Childhood Research*, 18(2): 115–129.
- Stephen, C., Stevenson, O., & Adey, C. (2013). Young children engaging with technologies at home: The influence of family context. *Journal of Early Childhood Research*, 11, 149–164.
- Suárez-Álvarez, R. (2019). Comunidad Escolar 2.0: la familia y la escuela ante los retos de la cultura digital. *Doxa Comunicación. Revista Interdisciplinar de Estudios de Comunicación y Ciencias Sociales*, 29, 326.
- Svenningsson, J., Hultén, M., & Hallström, J. (2018). Understanding attitude measurement: Exploring meaning and use of the PATT short questionnaire. *International Journal of Technology and Design Education*, 28(1), 67–83.
- Takeuchi, B. L., & Stevens, R. (2011). *The New Coviewing: Designing for Learning through Joint Media Engagement*. The Joan Ganz Cooney Center https://www.joanganzcooneycenter.org/wp-content/uploads/2011/12/jgc_coviewing_desktop.pdf
- Taufik, A., Apendi, T., Saidi, S., & Istiarsono, Z. (2019). Parental Perspectives on the Excellence of Computer Learning Media in Early Childhood Education. *Jurnal Pendidikan Usia Dini*, 13(2), 356-370. <https://doi.org/10.21009/JPUD.132.11>
- Vaala, S., Ly, A., & Levine, M. .H. (2015) *Getting a read on the app stores: A market scan and analysis of children's literacy apps*. The Joan Ganz Cooney Center at Sesame Workshop.
- Vittrup, B., Snider, S., Rose, K. K., & Rippey, J. (2016). Parental perceptions of the role of media and technology in their young children's lives. *Journal of Early Childhood Research*, 14(1), 43–54. <https://doi.org/10.1177/1476718X14523749>
- Wu, C. S. T., Fowler, C., Lam, W. Y. Y., Wong, H. T., Wong, C. H. M., & Loke, A. Y. (2014). Parenting approaches and digital technology use of preschool age children in a Chinese community. *Italian Journal of Pediatrics*, 40(1), 1–8. <https://doi.org/10.1186/1824-7288-40-44>