Online Journal of Communication and Media Technologies, 2023, **13**(1), e202305
e-ISSN: 1986-3497

OPEN ACCESS

Research Article

Impact of video games on the strategic use of digital tools for education in primary

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Citation: Rangel-Pérez, C., Botey, M., Carrero, O., & Alard, J. (2023). Impact of video games on the strategic use of digital tools for education in primary. *Online Journal of Communication and Media Technologies, 13*(1), e202305. https://doi.org/10.30935/ojcmt/12848

ARTICLE INFO

Received: 10 Sep 2022
Accepted: 20 Nov 2022

ABSTRACT

Given the need for greater information technology literacy, as reflected in SDG 4 of the 2030 Agenda, it is necessary to motivate interest in information and communication technologies (ICT) from childhood. The aim of this study is to verify that the use of video games enables the development of an interest in children that favors digital competences related to leisure and education. To this end, the relationships among some of the most used video games by children (Brawl Stars, Roblox, and Fortnite) are analyzed. A sample of 371 children (aged 8 to 12) attending primary school in Spain was taken. Structural equation models were used to analyze the relationships between measurable and latent variables. The results show (i) the mediating role of fun use of ICT in achieving the educational use of ICT effect and (ii) the different levels of ICT use depending on gender.

Keywords: ICT, video games, childhood, digital competence, SDG 4, strategy

INTRODUCTION

Restrictions on movement due to the health pandemic caused by the SARS-CoV-2 virus have caused people to spend more time at home using technological tools and the Internet as a means of escape, socialization and even learning, something that is particularly the case for children (Núñez-Gómez et al., 2020a). Although children prefer face-to-face socializing and play, there is a shift towards online, either via the family's smartphone, tablet or console, in the case of primary school children, or via their own device in the case of secondary school children (Gaptain, 2020).

Studies show that exposure to mobile device screens has increased by 200% since the start of the pandemic (Qustodio, 2020). In this sense, the health situation has served to provide parents with first-hand knowledge of their children's use of these devices (Empantallados & GAD3, 2020), with their favorite fun activities being communicating with friends, watching videos, accessing social networks, and playing online games (EU Kids Online, 2020). In terms of platforms (Gaptain, 2020), YouTube (primary and secondary school children), TikTok (primary school) and Instagram (secondary school) stand out. The video games most used by children between four and nine years old are Roblox, Brawl Stars, and Minecraft, and from 10 years old

onwards are Brawl Stars, Roblox and Fortnite (Gil et al., 2020; Portaltic, 2020). In this sense, there are authors (Elias et al., 2012; Gee, 2011; Gee & Hayes, 2012; Sourmelis et al., 2017) who claim that the use of video games favors skills that can be applied to the educational environment, also known as the principle of metagaming (Kahila et al., 2020).

Lockdowns have also implied that technological tools have had an intensive use related to learning (Núñez-Gómez et al., 2020b). The teaching of information and communication technologies (ICT) has been a strategic focus for many countries (EU Kids Online, 2020), and a need that is reflected in the 2030 Agenda in SDG 4, Quality education, which states the need to promote education in information technologies so that men and women have more opportunities for better work and entrepreneurship (UN, 2021). In the case of Spain, it is in the basic curriculum of compulsory Primary education where this interest is included in objective "i": "to be initiated in the use, for learning, of ICT, developing a critical spirit towards the messages they receive and elaborate" (Ministry of Education, Culture and Sport, 2014). This coincides with studies that reveal that information and creative skills are not widespread among Spanish children (EU Kids Online, 2020).

In view of the above, the objectives of this research are, firstly, to study the relationships established in childhood between the use of ICT for fun and education based on the use of the most popular video games in Spain at the time of this study, such as Fortnite, Roblox, and Brawl Stars (Aliagas-Marin et al., 2021; Gil et al., 2019, 2020; Qustodio, 2020). The second aim is to analyze which socio-demographic variables influence children's use of ICT for fun and education. All of this is based on a sample of 374 children between eight and 12 years old in primary school in Spain. Hence, the two hypotheses of this work are, as follows:

1. **H1**. There is a direct relationship between the use of video games and a higher frequency of children's use of ICT tools for fun and for education.
2. **H2**. Children's gender directly influences the frequency of use of ICT tools for fun and for education.

Although this study is limited to the relationship between video games and the use of ICT tools for fun and for education in a specific country and in a specific age group, the novelty of this work lies precisely in reflecting on how the use of video games by children in their leisure sphere helps them to acquire skills that are later applied to the school environment. In fact, the contributions of this research focus on trying to provide evidence between the use of video games and their translation into a better use of ICT, which will help both the academic and educational community, as well as parents and tutors, to use video games in a way that enhances children's digital skills.

This paper is structured as follows: firstly, it reviews the state of the literature related to ICT for fun and for education in childhood; secondly, it presents the methodology followed in this study based on an inferential statistical study of the variables and a structural equation model that describes the causal relationships between the variables; thirdly, it presents the results of the data; and lastly, it presents the discussion and main conclusions of the study.

ICT and Fun in Childhood

SmartScreen consumption is one of children's favorite leisure activities (Ortega-Mohedano & Pinto-Hernández, 2021). Children between three and eight years old consider the Internet as a source of entertainment (Blackwell et al., 2014; Holloway et al., 2013); between seven and eight years old they start interacting on digital platforms to express their ideas and have fun (Núñez-Gómez et al., 2020b); and between eight and 11 years old they prefer watching YouTube to traditional television channels (Ofcom, 2019).

According to data from EU Kids Online (2020), the amount of time children spend online has doubled in recent years to more than two hours a day on average because, among other factors, much content that was previously consumed on traditional television is now online. In addition, due to restrictions on movement due to the COVID-19 health pandemic, parents are now more permissive with their children when using the Internet given children's needs for socialization, fun, and learning (Nuñez-Gómez et al., 2020b).

In terms of technological tools that children tend to use for recreational purposes, tablets are the most popular due to their ease of use, followed by smartphones, due to their multifunctionality (Chaudron, 2015). In fact, according to recent studies (AIMC, 2019), children between three and 13 years old in Spain have an average of 4.1 devices in their homes, including smartphones, tablets, television, and video game consoles. Children consider the Internet and mobile devices as leisure tools, where they interact with their friends on

social networks and watch videos on YouTube (Blackwell et al., 2014; EU Kids Online, 2020; Holloway et al., 2013; Núñez-Gómez et al., 2020b; Ofcom, 2019). In terms of gender and digital leisure, in general, boys tend to use more video games, and girls tend to use the devices to take videos and photos (Núñez-Gómez et al., 2020b). Other studies highlight women's practical use of technology and their interest in what can be obtained from it, rather than the technology itself (Espino & González, 2016). According to Sánchez and Mendoza (2010), there are also differences in ICT use by gender in adults, with 83% of women using ICT for communication-related activities compared to 69% of men; and 77% of women using ICT for educational uses compared to 71% of men.

Within use of ICT for fun, the increase in the use of video games due to COVID-19 stands out (Nuñez-Gómez et al., 2020b). Wijman (2020) estimates that the video games industry grew by almost 20% in 2020 with an estimated value of 174.9 billion dollars worldwide. The fastest growing segment was smartphone gaming with 49% of global revenues, up 25.6% from the previous year. China and the USA account for 49% of total spending in the entire video game market. PS5 and Xbox Series consoles increased their sales by 58% over the previous year (Herrero, 2020). In Spain, video game figures also grew due to COVID-19. According to the Spanish Video Games Association, in 2020 the video games sector generated €1,747 million in Spain, 18% more than in 2019 (AEVI, 2020). Physical sales accounted for a total of €790 million, up 4.8%, and online sales generated a total of €957 million, up 32%. The most popular video game genres are action, adventure, sports, and role-playing games. Roblox, Brawl Stars, and Minecraft are the video games most used by children aged 4 to 9 years and from 10 years old onwards are Brawl Stars, Roblox, and Fortnite (Gil et al., 2019, 2020; Portaltic, 2020; Qustodio, 2020; Wiederhold, 2021).

ICT and Early Childhood Education

Betancur et al. (2014) state that the way in which children and young people relate to the world around them has changed due to the implementation of new technologies. This is because the new practices that link young people with ICT bring with them new cultural, social and academic forms, which Aguaded and Cabero (2013) frame within the term e- society. Thus, Cabero and Ruiz (2018) state that kids are more open to working with strangers on the Internet, developing new mechanisms of inclusion that go beyond the previous knowledge of the individual with whom they are interacting, a reality that turns ICT into a new support for knowledge construction and learning (Belonovskaya et al., 2020; Cabero et al., 2017).

According to recent studies (Nuñez-Gómez et al., 2020a), children believe that mobile devices are useful for learning, a trend that increases as children get older. Not surprisingly, 49.7% of children under 10 years old yearn for more of these technologies in the classroom. The most frequently used ICT tools in education in Spain are (Qustodio, 2020) Google Classroom, Photomath, Duolingo, and Kahoot, therefore, those tools in which children must know how to use email, create content to be able to share it, consult reports or notes, or even use apps to access content, among other tasks (Google, 2021).

ICT and especially video games have meant a breakthrough in the design of new learning methodologies (Marín & Martín-Párraga, 2013). Video games have changed the way children work, communicate (Beck & Wade, 2004) and reconstruct knowledge (Lacasa et al., 2011), a circumstance that Koster (2013) justifies by the satisfaction they exert on children and that predisposes them to better assimilate new knowledge. In this sense, video games can be a tool for teachers to help students create, model, and modify their reality (Marín & Martín-Párraga, 2013).

In the use of video games, the principle of metagaming (Kahila et al., 2020) must be taken into account, which distinguishes between the software that makes the game playable and everything that surrounds its performance, such as online forums, websites or strategy guides that involve the player in an extra implication that leads them to use and consume other ICT (Gee, 2011), as if it were a game apart from the game (Elias et al., 2012). The use of video games leads to the creation of informal learning spaces, including the use of ICT to gather valuable information that allows them to differentiate themselves from their competitors during the game (Gee & Hayes, 2012). Four readings can be drawn from video game practice (Garfield, 2000): first, what a player brings to the game; second, what a gamer gets out of the game; and third and fourth, what happens between games and what happens during the game in addition to the game itself. The metagame concept starts before the purchase or installation of the game, as gamers turn to ICT before deciding to get opinions

Table 1. Frequency and proportion of children for each variable group in block 1

		Count	Column n %
x1. How old are you?	8 years old	28	7.5
	9 years old	129	34.8
	10 years old	81	21.8
	11 years old	96	25.9
	12 years old	37	10.0
x2. Are you a boy or a girl?	Girl-1	191	51.5
	Boy-0	180	48.5
x3. Your school is?	Private-2	68	18.3
	Charter-1	266	71.7
	Public-0	37	10.0
x5. How often do you play Fortnite or Roblox or Brawl Stars?	Never-1	91	24.5
	Almost never-2	45	12.1
	Occasionally-3	58	15.6
	Almost every day-4	60	16.2
	Every day-5	117	31.5

from third parties in the form of written or audio-visual reviews (Lee et al., 2016), a situation that, for Lin et al. (2019), offers valuable information even for video game developers themselves.

From a constructivist perspective, children reconstruct knowledge from video games (Lacasa et al., 2011), something that Frasca (2009) sees as possible because the channel lends itself to a wider range of interpretations than the traditional educational system. Apart from that, such is the weight of video games among young people that it has changed the way they work and communicate (Beck & Wade, 2004), a circumstance that Koster (2013) justifies by the intrinsic emotional aspects that surround it. In other words, playing brings satisfaction to the child, which predisposes him or her to better assimilate new knowledge (Koster, 2013).

MATERIALS AND METHODS

To carry out this exploratory research to analyze the relationships between variables and constructs in a given population, a questionnaire previously validated in the use of ICT (Domínguez-Alfonso et al., 2018) was used to which two blocks of questions were added: (block 1) sociodemographic questions (age, gender, postcode, public, or private school) and questions related to frequency of playing Fortnite, Roblox, or Brawl Stars (block 3). Block 2 was composed of the ten questions associated exclusively with "frequency of ICT use" from the original questionnaire, which consists of 60 questions separated into four factors. A group of experts adapted the questionnaire to the language of children and assessed the content validity of the factors proposed for this study. This validation was carried out using Aiken's V. coefficient. This is a method of evaluation by judges, which is often used in social science studies to verify the rigor of the items that constitute a construct (Martin-Romera & Molina-Ruiz, 2017).

The sample involved the voluntary and supervised participation of 371 primary school children in Spain 8-12 years old, indicating a convenience sample. The fieldwork was conducted between February and March 2021, a period in which health restrictions and perimeter confinements continued in Spain due to COVID-19. The variability of the sample (Wilcox et al., 1994) and its representativeness are verified, as proportions are observed that represent the different categories studied defined by the variables age, gender, type of center, frequency of playing Fortnite or Roblox, or Brawl Stars (**Table 1**). Although Roblox is an online gaming platform, where children can play and create different video games, in this research Roblox will be understood as a regular video game as it is described in the literature and is recognized by children in different studies (Aliagas-Marin et al., 2021; Qustodio, 2020; Rospigliosi, 2022; Wiederhold, 2021).

The variables x5a: Do you play Fortnite?, x5b: Do you play Roblox? and x5c: Do you play Brawl Stars? are also available, however, only a descriptive study will be carried out on them to identify some significant characteristics of each group, since when subdividing by games a large part of the sample responds 'never' or 'almost never' (**Table 2**); this generates problems of lack of frequency when making inferences.

Table 2. Breakdown of frequency & proportion of children by each variable associated with use of Fortnite, Roblox, or Brawl Stars (x5a, x5b, & x5c)

		Never	Almost never	Occasionally	Almost every day	Every day
5a. How often do you play Fortnite?	Count per row	215	46	41	31	38
		58.0%	12.4%	11.1%	8.4%	10.2%
5b. How often do you play Roblox?	Count per row	231	44	39	23	34
		62.3%	11.9%	10.5%	6.2%	9.2%
5c. How often do you play Brawl Stars?	Count per row	188	59	37	26	61
		50.7%	15.9%	10.0%	7.0%	16.4%

Table 3. Frequency & proportion of children for each variable group associated with factors measuring frequency of ICT use (Domínguez-Alfonso et al., 2018), block 2

		Never	Almost never	Occasionally	Almost every day	Every day
ICT factor: Education						
9. You read websites, magazines and/or digital books	Count per row	163	77	75	25	31
		43.9%	20.8%	20.2%	6.7%	8.4%
12. Do you use internet apps to do your homework?	Count per row	187	29	66	46	43
		50.4%	7.8%	17.8%	12.4%	11.6%
13. Do you use the e-mail?	Count per row	34	43	88	87	119
		9.2%	11.6%	23.7%	23.5%	32.1%
16. Do you read blogs that interest you?	Count per row	218	44	37	25	47
		58.8%	11.9%	10.0%	6.7%	12.7%
ICT factor: Fun						
6. How often do you play video games?	Count per row	78	54	119	59	61
		21.0%	14.6%	32.1%	15.9%	16.4%
7. How often do you use a computer to play video games?	Count per row	132	61	68	50	60
		35.6%	16.4%	18.3%	13.5%	16.2%
17. Do you listen to music on the Internet?	Count per row	144	20	85	35	87
		38.8%	5.4%	22.9%	9.4%	23.5%
15. How often do you download music, games, films, and programs?	Count per row	31	244	47	29	20
		8.40%	65.80%	12.70%	7.80%	5.40%
18. Do you watch films or series on the Internet?	Count per row	55	88	43	110	75
		14.8%	23.7%	11.6%	29.6%	20.2%
19. Do you participate in online chats?	Count per row	114	67	58	49	83
		30.7%	18.1%	15.6%	13.2%	22.4%

The 10 variables extracted from the validated questionnaire (Domínguez-Alfonso et al., 2018) have been grouped into two factors that identify the frequency of ICT use for fun and for activities related to education or formal learning (**Table 3**).

The items were divided into two factors: those representing frequency of ICT use associated with fun and another group related to education. The results obtained exceeded the minimum level for all items (*Aiken's V. coef.>.8*) of the two factors analyzed and the two questions applied.

Choice and Relevant Features of the SEM Modelling Technique

SEM models are a multivariate statistical tool for testing and estimating causal relationships from statistical data and causality-based hypotheses. These studies allow the study of the relationship between latent and observed variables. The advantages of using this methodology include simultaneously testing the direct and indirect relationship between variables, the inclusion of more than one dependent variable and their respective measurement errors. Among the limitations of SEM is that it requires samples with more than 200 observations (the sample of this study is 371 observations).

There are several types of goodness-of-fit statistics for an SEM model: global fit (GFI–goodness of fit index, AGFI–adjusted goodness of fit index), residual fit (RMR–root mean square residual), relative fit (NFI–normed fit index or delta 1, CFI–comparative fit index) and the population discrepancy index (RMSEA–root mean square error of approximation). None of them provides all the information needed to assess the model and usually a set of them is used and reported simultaneously (Schreiber et al., 2006).

Description of the Processes Carried Out to Obtain Results

First, an inferential analysis was carried out on the relationships of the variable frequency of playing (x5) and the rest of the variables. Subsequently, the psychometric robustness of the two identified factors was studied, checking the reliability (consistency or stability of a measure) and validity (degree to which the test presents the structure of factors and content for which it has been defined) (Cohen et al., 2011). The reliability study was carried out using Cronbach's alpha.

The validation of the proposed psychometric structure was carried out using two multivariate techniques that explore and test the dimensional structure of the instrument: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is a technique that aims to make explicit the underlying structure of a data matrix and calculates a set of latent dimensions, called factors. However, CFA may not be sufficient to guarantee the validity of a scale (Batista-Foguet & Coenders, 1998, 2004). CFA pre-hypothesize both the number of factors and their relationships, using hypothesis tests to corroborate the structure (Kline, 2005).

The SEM modelling technique was used to study the relationships between the variables treated and the influence on the frequency of ICT use in children. The statistical analyses were carried out with the IBM SPSS® version 24 program and its IBM AMOS® 23 module for SEM analysis.

RESULTS

Variables Significantly Related to Frequency of Play

In this section we study the relationship between the variable "how often do you play Fortnite or Roblox or Brawl Stars?" (*x5*) with the rest of the variables studied, through the Chi-Square test of independence. It is obtained that all the items in block 2 have a significant *relationship at 95%* with the variable frequency of play (*x5*), both the items of the factor frequency of use of ICT associated with education, and the items of the factor frequency of use of ICT for fun.

Regarding the possible relationship between frequency of playing and the variables in block 1, it was found that the three variables (age, gender and type of school) were significantly related to frequency of playing, *the first two at 95% and the type of school at 90% significance.*

Variables Significantly Related to the Frequency of Each of the Games Consulted

In this section, the relationship of each of the variables: x5a: Do you play Fortnite? x5b: Do you play Roblox? and x5c: Do you play Brawl Stars? is analyzed compared with the rest of the variables studied, using the Chi-square test of independence.

Regarding the possible relationship of the frequency of playing Fortnite, Roblox, and Brawl Stars separately with the variables in block 1, it has been found that:

1. The variable x1-age, which is related with 95% significance only to the variable x5a-Fornite, shows that children play Fortnite more frequently, with 12-year-olds having the highest frequency of playing ('almost every day' and 'every day') with 50.4%, followed by 11-year-olds with 37.7%. In general, the older the children are, the more they play.
2. The variable x2-gender, with a 95% significant relationship in the three variables, shows that boys play Fortnite and Brawl Stars more frequently, while girls play Roblox more frequently.
3. With the variable x3-type of center, there is no relationship with any of the variables x5a, x5b and x5c.

The three variables (x5a, x5b, x5c) are related to all the variables of the ICT for fun factor. However, regarding ICT for education, the variable x5c-Brawl Stars is significant at 95% with all the variables of this factor, the variable x5b-Roblox is only significant with x9 and the variable x5a with x12. It could be concluded that the Brawl Stars game is the one that promotes ICT for education the most, since it is observed that children who play Brawl Stars more frequently provide higher percentages in the highest frequencies of the variables that make up the ICT for education factor. This result should be taken with caution, since, as mentioned above, given that some frequencies are lower than 5, the results of the Chi-square may not be valid.

Table 4. Rotated component matrix for PFA

	Component	
	Fac1	Fac2
9. You read websites, magazines and/or digital books	.887	
13. Do you use e-mail?	.831	
12. Do you use Internet apps to do your homework?	.828	
16. Do you read blogs that interest you?	.815	
7. How often do you use a computer to play video games?		.916
6. How often do you play video games?		.810
17. Do you listen to music on the Internet?		.803
19. Do you participate in online chats?		.639
16. Do you read blogs that interest you?		.622
18. Do you watch films or series on the Internet?		.488

Note. Extraction method: Principal component analysis & Rotation method: Varimax with Kaiser normalization

A small study was also carried out relating each of the variables associated with gambling (x5a, x5b, x5c) with the average income obtained from the postal district in which the respondents live; this variable did not show significance with the variable not broken down by gambling, so it has not been included in the following phases of the study. Significance at 95% was obtained for the variable x5a taking only boys (not girls), with middle-income children showing the highest frequency of play ('almost every day' and 'every day') with 38.4%, followed by low-income children with 24.6% and finally high-income children with 21.6%. In other words, middle-income children play Fortnite more frequently than those from families on high or low incomes.

Internal Consistency and Validation of the Psychometric Factor Structure

The internal consistency of each dimension or factor of the scale was estimated using Cronbach's α coefficient. The values of this index in the total sample were *0.867 and 0.816 for the subscales* of ICT usage for fun and ICT usage for education, respectively. These values allow us to conclude that the internal consistency is high in both dimensions, exceeding the *cut-off point of 0.75* generally accepted for instruments in health sciences (Streiner & Norman, 1989).

For the validation of the proposed psychometric structure, the PFA was carried out, which provides the definition of the two factors representing the frequency of use of ICT for fun and ICT for education. Previously, the suitability of the PFA was checked with the Kaiser-Meyer-Oklin statistic (*KMO=0.797*) and Bartlett's test of sphericity (*p-value=0.00*); the values of the statistics were favorable (García-Jiménez et al., 1995).

A PFA was then carried out using the principal component extraction method and Varimax rotation, which yielded two factors with an eigenvalue greater than 1 that accumulated an explained variance of *0.61*. The matrix of coefficients of the rotated factors (**Table 4**) shows the grouping of the items, coinciding with the proposed groupings, and which also explains 61.6% of the variability of the items studied.

On the other hand, in the application of the CFA, we start from a model with the two dimensions obtained in the PFA. The standardized covariance between the two factors is *0.21*. As for the absolute fit of the model, the goodness-of-fit indicators are within acceptable limits (*NFI=0.951; CFI=0.968; RMSEA=0.069; GFI=0.056; GFI=0.956,* and *AGFI=0.922*) except for the RMR=0.129 indicator (residual goodness-of-fit index), which exceeds the acceptable value of *0.10*. Based on these indices together, we could say that the model is reasonably close to the data, and that we can maintain it as an explanation of the data.

Relationships Between Studied Variables and Factors (Path Diagram)

Finally, once the psychometric structure of the factors representing the frequency of use of ICT associated with fun and ICT associated with education has been validated, the relationships between these factors and the variables in block 1 (age, gender, frequency of play, type of school) are studied. The structural equation model representing these relationships is shown in **Figure 1**, all of them with *95% significance*.

The fit of the model is expressed by the following indicators*: Chi-square (χ^2)=195.8; df=66; p=0.00; NFI=0.914; IFI=0.941; RMSEA=0.073; CFI=0.941; RMR=0.118; GFI=0.927,* and *AGFI=0.884.* All are within the acceptable range of fit except for the RMR, which exceeds *0.10*. Nevertheless, it can be said that the model describes the structure of the data considerably well. From this model, the values of the total standardized effect (direct and indirect) of each variable on the rest of the variables are obtained (**Table 5**).

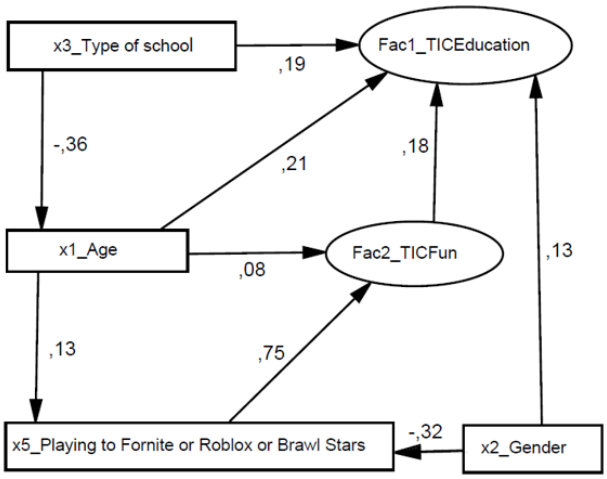

Figure 1. SEM model, path diagram (Source: Authors' own elaboration)

Table 5. Standardized total effects

	Effect-producing variables				
Impact-receiving variables	x2_Gender	x3_Type of center	x1_Age	x5_Frequency of play	Fac2_ITC fun
x1	0	-0.364	0	0	0
x5_Frequency of play	-0.324	-0.048	0.132	0	0
Fac2_ICT fun	-0.242	-0.066	0.181	0.747	0
Fac1_ICT education	0.085	0.097	0.246	0.136	0.182

According to the results of the analysis, the effect of frequency of play (*x5*) on factor 2 (*effect=0.747; x5->Fac2*) indicates that children who play frequently enhance ICT activities for fun. Furthermore, the effect of *factor 2 on factor 1* (*effect=0.182; Fac2->Fac1*), expresses that frequent use of ICT for fun also leads to increased use of ICT for education. Therefore, frequency of play also boosts the use of ICT for education (*effect=0.136; x5->Fac1*), albeit indirectly, using ICT for fun. The analysis of the variables in the previous section also shows a clear relationship between frequency of play (*x5*) and ICT use. Although the SEM methodology complements this information by confirming the causality proposed in the first hypothesis and indicating the differences in the level of effect between ICT for fun and ICT for education.

The effect of gender *(x2*) on gaming frequency (x5) (*effect=-0.324; x2->x5*) indicates that boys play Fortnite, Roblox and Brawl Stars much more than girls. Furthermore, *the values effect=-0.242 (x2->Fac2*) and effect=0.085 (*x2->Fac1*) express respectively that boys use ICT for fun more frequently than girls and girls use ICT for education more frequently than boys.

Studying the age, the older the age, the greater the frequency of gaming (*effect=0.132, x1->x5*) and therefore the greater the use of ICT for fun (*effect=0.181 x1->Fac2*); however, it is also observed that the older the age, the greater the use of ICT for education (*effect=0.246 x1->Fac1*).

Regarding the type of educational center (x3), private schools generate a higher frequency of ICT use for education than public schools (*effect=0.097; x3->Fac1*), and public schools generate a higher frequency of play and greater use of ICT for fun *(effect=-0.048; x3->x5 and effect=-0.066; x3->Fac2*).

DISCUSSION AND CONCLUSIONS

Given the interest that children have in video games, it is important to analyze their influence on the use of ICT related to fun and education. Beyond entertainment, video games help to acquire more digital competences thanks to the principle of metagaming, which involves the development of other skills (Kahila et al, 2020) and which for Sourmelis et al. (2017) also involves working on the skills needed in today's working life. This focus on developing technology literacy is reflected in SDG 4 of the 2030 Agenda (UN, 2021) to promote access to higher quality jobs for all, which is also reflected in the basic primary school curriculum in Spain (Ministry of Education, Culture and Sport, 2014), and is one of the competences that has been gaining importance in recent years as it enhances computer literacy (Morales, 2009). According to Gewerc et al. (2017),

digital literacy will make it possible to foster a more egalitarian and inclusive society that allows access to the opportunities and economic development that technology brings with it.

With regard to the objective defined as studying the relationships established in childhood between the use of ICT for fun and ICT for education based on the use of the most popular video games in Spain, such as Fortnite, Roblox and Brawl Stars, it is observed that these games influence a greater use of ICT for fun and ICT for education. Thus, it can be concluded that ICT for fun channels the influence that the frequency of playing games has on the use of ICT tools for education.

In relation to the objective of analyzing which socio-demographic variables influence children's use of ICT for fun and ICT for education, we can affirm that gender, age and type of educational institution determine the use of certain ICT. Boys play the video games Fortnite, Roblox, and Brawl Stars more than girls, although if we distinguish by gender, we can conclude that boys play more Fortnite and Brawl Stars, while girls play more Roblox. Moreover, older boys (12 years old) play Fortnite the most. Apart from that, boys use ICT for fun more due to the greater use they make of video games in general, and girls use ICT for education more. In fact, of the three video games studied, the one most associated with ICT for education was Brawl Stars. Girls' interest in ICT for education may stem from their use of mobile devices related to consultations on specific subjects, their passion for photos and videos, and their practical vision of technology, which makes them more interested in what can be obtained (Espino & González, 2016; Núñez- Gómez et al., 2020b). In both sexes, it is observed that the older they are, the more they use ICT for education. Pupils at private educational institutions make greater use of ICT for education, given the fact that many of them are obliged to use these devices; while at public educational institutions, pupils make greater use of ICT for fun.

In view of the above, we can confirm the two hypotheses put forward in this study, although with some qualifications. Although there is a direct relationship between the use of video games and a greater frequency of use of ICT for fun and ICT for education tools by children (**H1**), this study highlights that the effect on the use of ICT for education is using ICT for fun. For example, the child playing Fortnite needs to access different websites to consult how to make his or her Skins more attractive or to use different forms of communication to share ideas with his or her team. Therefore, we could affirm that the use of video games fosters children's intellectual curiosity with ICT for fun. The second hypothesis is also confirmed given that children's gender directly influences the frequency of use of ICT for fun or ICT for education (**H2**). The study shows that, beyond gender and interests, socio-demographic variables related to age, income, and the type of school attended (public, subsidized or private) also have a direct influence on the frequency of ICT use.

As the use of educational applications is expected to continue to grow, given that access to mobile devices continues to increase worldwide and many of them are used by children (Qustodio, 2020), it is necessary to continue training children and adults to improve their skills in the use of ICT. Beyond the negative perceptions of video games that exist around the world, especially those related to addictions and excessive play time, these technological tools have proven to be a vehicle for developing greater skills in the use of ICT for education, especially in knowing how to use educational platforms to exchange and access information, use email and use educational apps. Therefore, we should take advantage of the influence of video games to improve children's ICT skills by encouraging the accompanied use of ICT between adults and children in order to enhance digital skills, critical thinking and curiosity.

With a view to future research that goes beyond the limitations of this study, it would be advisable to select a sample of the same age range in other countries to be able to compare the results of this study. It would also be advisable to extend the age range from 13 to 18 years old to be able to compare results between different generations and educational stages.

Author contributions: CR-P, MB, OC, & JA: involved in conceptualization of the project, acquisition of data, & drafting and revising the work for intellectual content & **MB:** involved in the analysis and interpretation of the data. All authors approve final version of the article.

Funding: The authors received no financial support for the research and/or authorship of this article.

Ethics declaration: Authors declared that the research method was carried out in accordance with national guidelines and regulations and approved by the Academic Research Ethics Committee of ESIC University, Spain. Informed consent was also obtained from all subjects and/or their legal guardian(s).

Declaration of interest: Authors declare no competing interest.

Data availability: Data generated or analyzed during this study are available from the authors on request.

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