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Digital Competence, Validation and Differential Patterns between Spanish and Portuguese Areas as Assessed from the Latest PISA Report as a Pathway to Sustainable Education and Social Concerns

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Abstract: PISA reports aim both to analyze and describe the educational reality of each country and to assess different academic competences, including digital competence. In this paper, we are committed to the vision of digital literacy as an indispensable element of sustainable education and social concerns, which, together with the environment, the economy, social justice and human rights, form the basis of the concept of sustainability. From this point of view, it is considered that an improvement in digital competence has a positive impact on the use made of ICT and also on its link with sustainable development. The aim of this research is to comparatively analyze the results in terms of literacy itself, digital skills and digital resources and experiences according to the PISA 2018 report in four OECD countries: Spain, Portugal, Colombia and Brazil, specifically, two Latin countries (Brazil and Colombia) and two Hispanic countries (Spain and Portugal), and for the enjoyment in the use of digital devices between one country in each area (Brazil and Spain). The sample is composed of 54,323 participants (18,073 participants from Brazil and Colombia, Latin America, and 36,250 from Spain and Portugal, Iberian Peninsula), using as an instrument the surveys developed and implemented in the PISA 2018 dataset for the OECD sample, which is related to some aspect of digital skills. The main findings of this study confirm that the variables related to digital resources, digital literacy and digital skills are statistically significant in the four countries. Therefore, in view of this, we want to support the promotion of digital competence as a key element in the sustainable, educational and social development of a community. At a pedagogical level, this means that we are committed to different specific programs, innovative educational practices and the creation of resources that promote inclusion and educational quality, focusing on social concerns and the fit of each country and area for promoting sustainable education.

Keywords: digital competence; PISA report; digital resources; adolescents

1. Introduction

1.1. Digital Competence in the PISA Reports

There is no doubt about the great impact that technology has had in recent years in all areas of our lives in general, and in education in particular [1]. We can therefore affirm that we are facing a society in which schools are understood as a vehicle to ensure that all students benefit from digital technology, as well as a means to meet the needs of students and a means to enable them to meet their needs in an inclusive environment [2].

Given these facts, and their presence in education, in 2001, the European Union published guidelines for action as a guide to what ICT-enabled education should be [3,4]. These were upheld until 2006, when the reference framework for competence-based education was published, which made a great commitment to the development of digital competence, and considered it to be a key element in the training of future citizens [5] and understood it as the ability to handle digital devices in a critical, reflective, safe and responsible manner.

These contributions have extended to the present day, and there are even some planned for the near future. An example of this are the various plans organized at the European level, such as the "Digital Europe Program 2021–2027", which offers subsidies for plans in five areas: computing, artificial intelligence, cybersecurity, the use of digital technologies in all sectors of the economy and society and, of course, digital skills. Similar initiatives have been implemented even at the national level, where we find the plan "Spain can. Plan for recovery, transformation and resilience" [6], which aims at the digitalization of business and public administration as well as education through the digital empowerment of citizens. At the national level, we also find, among others: (i) the Plan for the Digitalization of Public Administrations (Government of Spain, 2021a); (ii) the National Plan for Digital Skills [7]; and (iii) the Plan for the Digitalization of Small and Medium-sized Enterprises (SMEs) [8].

Among these, within our field, we should highlight the National Digital Skills Plan (2023), which covers various measures (paying special attention to groups at risk of social exclusion) through a national network of digital training centers, specific actions for digital inclusion, free mass access offerings (MOOCs), various programs to promote the use of ICT in the education system, digital training for women and the participation of women in technological training pathways, the creation of open educational resources (OERs) for teaching with digital media, etc., without neglecting post-compulsory education, such as vocational training, which is attended to by the Digital Vocational Training Plan (FPDigital) for the digitalization of vocational training and the introduction of digital skills in the educational curriculum. Additionally, in university education, similar efforts have been made through the Uni Digital Plan for the modernization of the Spanish university system, which is committed to the learning of digital skills through both new qualifications and the renovation of existing qualifications [9].

As a result of this report, the member states of the European Union and the OECD began to incorporate digital competence in the field of education, based on different strategies, for example, different programs for the incorporation of technology in schools. The PISA (Program International Student Assessment) reports, which appeared in 2000, aimed not only to analyze and describe the educational reality of each country [10–13], but also to evaluate different academic competences, including digital competence. It is precisely this importance of ICT in schools in the 21st century that has led to the inclusion of these issues in the PISA report, which covers different types of information on the use and employment of ICT in education [14,15]. In this sense, it is the OECD countries that publish a (PISA) of statistics to guide the direction of the economy, industry and education in such countries. In the field of education, they investigate and present information related to mathematical, scientific and problem-solving content, as well as investigate the knowledge of students in different subjects, such as Information and Communication Technologies (ICTs) [16], and thus correspond to a triennial large-scale international educational survey, conducted by the Organization for Economic Co-operation and Development (OECD), which assesses the academic performance of 15-year-olds every three years [17]. Additionally, within the report itself, this competence is found within the global competence, which is made up of the following indicators: the proportion of computers per student, technological investment, the use of software or the relationship between the use of these and results in the three basic competences. However, the research carried out on the subject provides contradictory data on the impact of ICT in education [18], and there are even data that lead us to believe that students are overusing ICT [19].

There are different studies and reports carried out in Latin American countries that have taken into consideration digital competence, the enjoyment of digital devices and

the digital resources available both at school and at home [20], indicating as reference data the existence of 7 countries that used learning platforms, 22 that provided digital content, 13 that used didactic material content and social networks and 20 that provided education through radio or television programs. At the same time [21], in terms of access to digital media at school, countries such as Chile, Mexico, Uruguay, Uruguay, Nicaragua, Guatemala and Colombia are the poorest countries in terms of access to digital devices at school. At home, 52% of households have access to the Internet and 45% have access to a computer [22]. For this reason, the PISA reports have established themselves as appropriate tools for understanding the impact of ICT use and usage on the education of adolescents around the world [23]. In this paper, we are going to focus on the results of the latest report, the results of which were published in 2018, with the aim of analyzing the resources, enjoyment of digital experiences and digital literacy and skills in the countries of Spain, Portugal, Brazil and Colombia. Additionally, we carry out an analysis of the functional use of digital devices and the Internet by adolescents.

In this sense, the report itself, in relation to digital competence, takes into account different items related to "accessing, handling, integrating and evaluating information; constructing new knowledge from electronic texts" and therefore also assesses the cognitive competence required for the effective and efficient use of digital devices, as is the case with surfing the Internet, or searching for information, with actions referring to the ability to analyze the relevance and veracity of information available online.

Thus, the PISA report is committed to the assessment of media literacy, which it considers to be the ability to adhere to, examine and value the media, as well as the creation of multimedia content [5–20].

These facts occur at national, European and global levels: the need to train citizens in the necessary skills to use digital technologies critically and creatively. Additionally, it is the European Digital Competence Framework (DigComp) that provides an organization to analyze and improve digital self-competence through the implementation of different initiatives with the aim of developing digital competence, a critical digital spirit and digital citizenship. All of this is based on the provision of digital structures and equipment, organizational capacity, teacher training in digital competences and the learning of content focused mainly on digital privacy and ethical rules regarding its use. In fact, in most European Union countries, this has been translated into the implementation of these contents in the curricula [24,25]. In the case of Spain, there is even the so-called Digital Education Action Plan (2021–2027), which was created by the European Union in order to promote a reasonable and effective adaptation of the education and training systems of the EU member states.

From all these premises, the need to assess such knowledge of students through the PISA Report arises, as they are part of the learning that students must acquire during their education in today's society.

1.2. Digital Competency as a Path for Sustainability in Countries and Cultural and Geographical Regions

However, in this paper, we cannot fail to mention the current social and health situation we are living in, which is characterized by being closely linked to change, to reconceptualization and new modifications [26]. The pandemic caused by COVID-19 has given rise to new educational practices and approaches [27]. Furthermore, Information and Communication Technologies (ICTs) have become an indispensable element in our daily lives, on a social, educational and organizational level [28]. However, we must also critically analyze these facts, and highlight the fact that the pandemic has accentuated the social and educational inequalities that already existed in society, giving rise to the so-called digital divide [29,30]. It is therefore necessary to think about these issues in depth, and to rethink not only digital competence itself, but also the impact that this competence has on global citizenship and sustainability through issues such as accessibility, access, equal opportunities, etc. In short, it is a question of assuming that an improvement in digital

competence has a positive impact on the use made of ICTs and also on their correlation with sustainable development [31]. In this sense, the UN considers digital competence itself as an essential element of social sustainability, which, together with the environment and the economy, forms the basis of the concept of sustainability [32], without forgetting social justice and human rights [33].

We can affirm that all factors that promote the digital competence of citizens will therefore also promote a sustainable society [26].

However, when we talk about sustainability, we are referring to a term whose meaning is not unanimous [34], but for which there are a series of characteristics on which there is agreement in the specific literature, such as equity in learning, equal opportunities, social mobility, social justice, quality of life, cooperation, empowerment or cultural features [35]. Therefore, a society that is committed to being sustainable must also be committed to the promotion of equitable digital competence, in order to contribute to the improvement in social cohesion and sustainable community life [26]. This should be understood as all those actions aimed at increasing the well-being of society, whether at the economic, social or educational level [36].

Undoubtedly, the essential channel for this is the educational sphere [37]. This is why the development of education is currently one of the greatest educational challenges in achieving so-called social sustainability. For it must be education that becomes the key element of accessibility to digital competence, both at the level of general education and lifelong learning [26].

At the pedagogical level, this translates into a commitment to different specific programs, innovative educational practices and the creation of resources that are committed to inclusion and educational quality [37–39]. Various international organizations, such as the OECD and UNESCO, set the objectives of sustainable development. So, what digital competences are being applied to develop sustainability in compulsory education?

1.3. The Present Study

The works found that take digital literacy into consideration correspond to the research [40] that, in this case, carries out a comparative study of four OECD countries, two Mediterranean and two Baltic: Spain, Italy, Estonia and Lithuania, and evaluates reading performance and its relationship with the implementation of ICT. Several different institutional reports have attempted to assess digital literacy from a multidimensional point of view, such as the Australian National Assessment Program for ICT Literacy (NAP-ICT) and the International Computer and Information Literacy Study (ICILS) [41–43]. Therefore, we have not found any precedents in the Latin American or Ibero-American context that have been carried out, which justifies the relevance of this research.

We should also highlight the work of [18], which aimed to analyze the effects of social networks, their use and attitude with respect to digital reading performance through a longitudinal study on the last three PISA reports. It is relevant that our search yielded a large number of papers related to digital reading [44,45].

We also wish to point out the work by [46], who, in this case, take into consideration the use of ICT, but only in the home environment and with the aim of investigating their relationship with academic performance.

The works of [46,47], who, in this case, measure ICT use and its influence on motivation, self-efficacy and persistence, is also of interest. Additionally, with regard to motivation, we found the work of [48], who in this case validate the items of the PISA 2018 report referring to motivation to study and future expectations of adolescents, but without taking into account digital literacy in their work.

From this arises the justification for this research, since it highlights the need for studies that focus on digital literacy as a protagonist and validates the methods used to measure it. We consider not only digital literacy in terms of other subjects, but also variables such as the time spent, the actions carried out or the digital resources available. For all of these reasons, we believe that research is needed that focuses on digital literacy in our immediate

context, such as the Latin American and Ibero-American context, taking as a reference the countries of Spain and Colombia (in terms of the use of the Spanish language) and Portugal and Brazil (in terms of the use of the Portuguese language).

In view of the evidence and arguments and gaps in previous studies, the problem or research question that we seek to answer in this study can be stated as follows: By comparing different Hispanic and Portuguese and Iberian and Latin American cultural settings, in relation to the constructs of digital competence measured by the PISA reports, is their validation (measurement models) confirmed, and do they allow us to identify differential patterns reflected by geographical, cultural and language differences?

In order to solve the problem or answer the research question, the objective of this research is posed as the comparative analysis of the results in terms of alpha literacy, digital skills and digital resources and experiences according to the latest PISA report (2018) in four OECD countries: Spain, Portugal, Colombia and Brazil: specifically, two Latin countries (Brazil and Colombia) and two Hispanic countries (Spain and Portugal), and for the enjoyment of the use of digital devices between one country in each area (Brazil and Spain). We will consider these factors from a confirmatory analysis, or measurement models, of the construct validity of the aspects of digital competence measured in the latest PISA survey as well as identify differential patterns between countries and domains.

Therefore, the reports produced by each country were the sources of consultation for data extraction. However, we must clarify that the variables used are different according to the focus of research, and in this case, a comparative study of the four countries indicated in terms of literacy and available resources (the clarification of which is best done in detail in the methodology, and not here), is carried out. This objective is materialized in the following forecasts or hypotheses to be tested:

H1. *Relevant differences are observed in the contributions in empirical evidence of the results by different cultural spheres (Hispanic and Latin American) in terms of personal digital resources.*

H2. *Differential patterns contributed by the variables will be identified in relation to digital competences in different cultural backgrounds (Hispanic and Latin American).*

H3. *Geographical and cultural variables play a relevant mediating role in the causal relationship between digital literacy competences and digital literacy skills.*

2. Materials and Methods

2.1. Sample

The sample is composed of 54,323 participants, of which 17.8% (N = 10,619) belong to Brazil, 59.8% belong to Spain (N = 35,943), 9.9% belong to Portugal (N = 5,932) and 12.5% belong to Colombia (N = 7,522). The mean age of the sample is 15.83 years old (SD = 0.28) (Table 1).

Table 1. Description of the sample according to country, language of application of the questionnaire and gender. The number of participants is represented by N, and in brackets is the percentage % included.

	Females	Males	Total	Portuguese	Spanish
Brasil (BRA)	5436 (51.2)	5183 (48.8)	10,619	10,619	
Colombia (COL)	3827 (51.3)	3627 (48.7)	7454		7454
Total Latinoamérica (LAT)	9263	8810	18,073		
España (ESP)	15,163 (49.9)	15,216 (50.1)	30,379		30,379
Portugal (PRT)	2917 (49.7)	2954 (50.3)	5871	5871	
Total Pen Ibérica (PIB)	18,080	18,170	36,250		
Totales	27,343	26,980	54,323	16,490	37,833

Note: in Spain, the questionnaire was applied in Spanish (N = 30,379), but other samples received questionnaires in the other official Spanish languages (Catalan, Basque, Galician, Valencian; N_F = 2,675; N_M = 2,655; Total = 5,305; not added in Table 1, but included in analysis); Spanish participants = N_F = 17,838; N_M = 17,871; N_{Total} = 35,709. In the other countries, the questionnaire language and country overlap.

2.2. Surveys

We used surveys developed and implemented in the PISA 2018, OECD, relating to some aspect of digital skills. Specifically, for this study, two types of surveys (ST and IC) were used. One type of survey focused on digital resources (ST012Q05-08, four items asking about how many mobile phones, how many computers, how many tablets and how many e-book readers participants had at home), digital literacy (ST158, seven items) and digital skills (ST166, five items referring to digital skills with email). The other type, on the other hand, focused on digital availability (IC001 and IC009, 11 + 11 items referring to both resources at home and resources at school) and enjoyment with digital tools and experiences (IC013-016, 21 items).

The internal consistency analysis of the scales indicates a standardized Cronbach's alpha for digital resources of $\alpha = 0.658$, $\alpha = 0.752$ for digital literacy and $\alpha = 0.572$ for digital skills. For the survey part, a standardized alpha of 0.91 is achieved, and for digital readiness, the alpha is $\alpha = 0.82$.

The exploratory factor analysis EFA identified the three expected factors in the survey related to digital skills, literacy and resources, as confirmed by the confirmatory factor analysis CFA, and is presented in the results. The MacDonald's composite or omega reliability gives coefficients of 0.71, 0.76 and 0.65. The construct validity, evidenced by the average variance extracted AVE or convergent validity, gives coefficients close to 0.50, and the discriminant validity (square root of the AVE) gives scores higher than the intercorrelations between the latent variables or factors (with 0.192 being the highest), with coefficients between 0.60 and 0.70. The KMO measure of sampling adequacy and Bartlett's sphericity of sampling give significant results ($p < 0.001$), as does the goodness-of-fit test. The total variance explained by the three factors is 42.5%. In relation to the survey on digital availability and enjoyment, the most interesting aspect is the analysis of enjoyment of digital experiences. While comparable results to the previous variables are found with the EFA, a further CFA analysis is presented in the results.

2.3. Data Analysis

PISA dataset: The first step was to download the data in an SPSS format from the latest sampling conducted by PISA in different OECD and collaborating countries. From these datasets, data were extracted for Spain, Portugal, Brazil and Colombia; this allowed a comparison between countries with different cultural and geographical backgrounds (Iberian Peninsula and Latin America) and all Ibero-American countries, which share the same two languages: Portuguese, in Portugal and Brazil, and Spanish, in Spain and Colombia, with comparable cultural, linguistic, historical and geographical traditions, in divergent aspects (two languages, two geographical areas) and in coinciding aspects (language and geographical area). This allowed for a descriptive and comparative analysis to identify differential patterns in digital competences.

Once the dataset matrices for each country and for the four selected countries had been assembled, cross-tabulations were made to describe the samples by gender, country, language and geographical area. Secondly, we proceeded to the construct validity analyses of the surveys for the two types of surveys: (i) on digital resources, digital literacy and digital skills (these data are available for the four countries); and (ii) on the availability and enjoyment of digital devices, tools and experiences (these data are only available for Brazil and Spain).

The surveys: The internal consistency of the different parts of the survey was calculated with the IBM Corp SSPS 26.0 Scales module, providing the standardized Cronbach's alphas. In addition, an analysis of construct validity was carried out; on the one hand, an exploratory factor analysis (EFA) was performed, using the maximum likelihood method, which is recommended when there are interrelationships between the factors or latent variables. Direct oblimin rotation, the KMO sampling adequacy and Bartlett's sphericity measures were calculated; the Chi2 goodness-of-fit test and the total variance explained by each latent variable and by the set were measured; the loadings graphs were considered

to visually confirm the latent variables extracted; and the number of latent variables, the correlation matrix between the latent variables and the pattern matrix were also considered. In addition, factor scores were calculated for each participant, using Bartlett scores. All these analyses were carried out with SPSS v26. With the lambda coefficients or factorial weights of the pattern matrix, through Excel, we calculated the composite reliability or Macdonald's omega, which was expected to be 0.70 or higher; the average variance extracted AVE or convergent validity CV, which was expected to be 0.50 or higher; and the discriminant validity DV (square root of the AVE), whose coefficients must be higher than the intercorrelations between the latent variables. Convergent and discriminant validity were considered a good measure of the construct validity of a scale or survey in this case. A CFA confirmatory factor analysis was also performed with AMOS v26 (measurement models) on the basis of the pattern matrices, using the plug-ins of Gazkin's Pattern Matrix Model Builder (http://statwiki.gaskination.com/index.php/Plugins, accessed on 1 June 2022).

Several CFAs were carried out, by country and jointly, which also made it possible to consider the invariance of the measurement model. In order to illustrate its adequacy, diagrams are presented for the first of the digital skills, literacy, availability and digital enjoyment components. The model fit check is considered adequate when the NFI, TLI and CFI coefficients are above 0.90, and higher scores are considered evidence of a good fit of the model to the data together with the RMSEA, which has to be below 0.080. When this fit is confirmed with different samples, it is evidence of the invariance of the measurement model.

Differential patterns between countries: On the other hand, differential patterns between countries were identified. For this purpose, the general linear model's module GLM of SPSS v26 was used. This made it possible to extract the differences between countries in the different dependent variables of digital competence analyzed for this study. This was carried out in three steps: the multivariate test, which was significant for both types of variables (ST and IC); tests for intersubject effects; and post hoc tests for the case of the ST variables (all four countries) as ICs are only available for two countries, Brazil and Spain. Mean scores and their standard deviations were provided for each dependent variable, statistical significance and effect size or practical significance. For the effect size, indicated by the eta-squared statistic ($\blacksquare^2$), Cohen's (1988) rule is considered = 0.01–0.06 (small effect); > 0.06–0.14 (medium effect); > 0.14 (large effect).

3. Results

3.1. Measurement Models

Various analyses have been carried out, although the most interesting in terms of the fit observed are the two presented here, and allow the calculations of the Spanish and Brazilian samples. On the one hand, the three-factor model of digital skills, literacy and resources is confirmed; on the other hand, an analysis of interest is provided with the bifactorial component of the enjoyment of digital experiences (general and foreign or social).

3.1.1. Digital Skills, Literacy and Resources

A good fit of the model to the data is obtained. The coefficients for the Spanish sample are good: NFI = 0.951; TLI = 0.929; CFI = 0.951; RMSEA = 0.037. The invariance of the model is also confirmed for the Brazilian sample: NFI = 0.959; TLI = 0.943; CFI = 0.961; RMSEA = 0.040. See the graph for Brazil (see Figure 1).

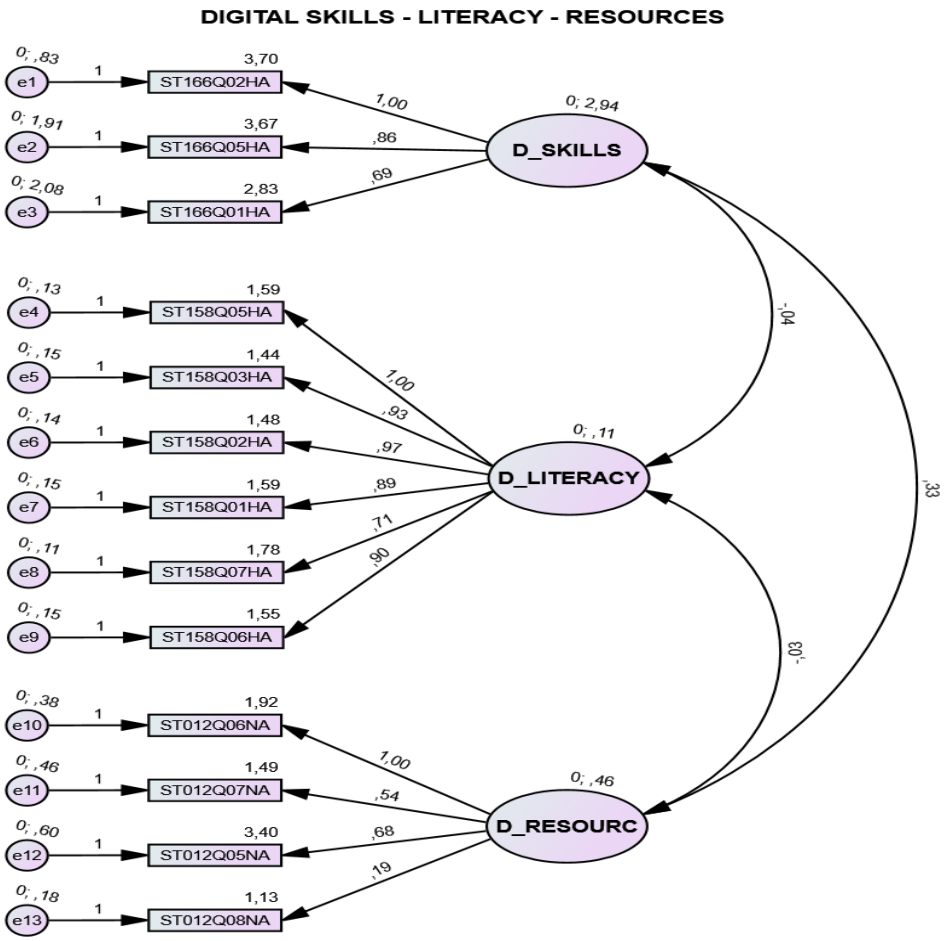

Figure 1. Illustration of the measurement model (CFA) for the digital skills, literacy and resources components of the survey, with the Brazilian sample.

3.1.2. Digital Enjoyment

A good fit of the model to the data is obtained. The coefficients for the Spanish sample are good: NFI = 0.931; TLI = 0.889; CFI = 0.931; RMSEA = 0.067. The invariance of the model is also confirmed for the Brazilian sample: NFI = 0.939; TLI = 0.903; CFI = 0.940; RMSEA = 0.065. See the graph for Spain (see Figure 2).

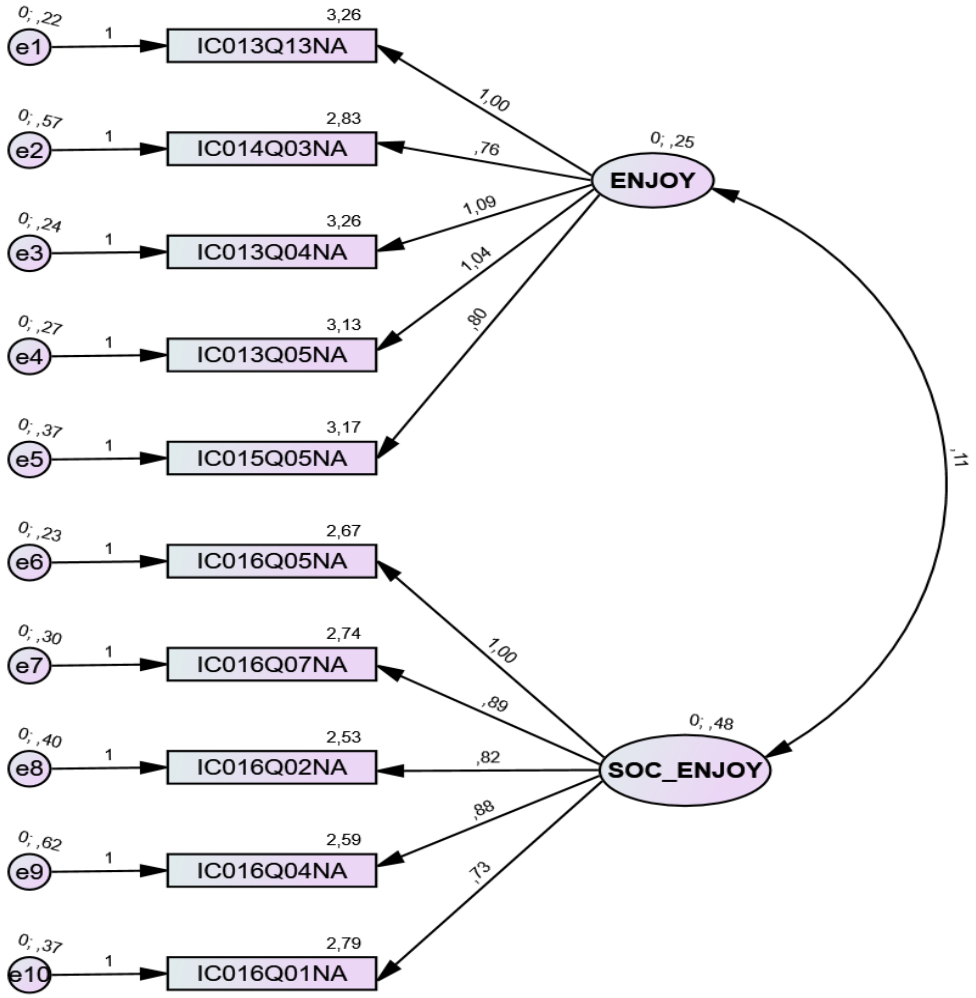

Figure 2. Illustration of the measurement model (CFA) for the digital enjoyment survey component, with the Spanish sample.

3.2. Differential Patterns between Countries

3.2.1. Cross-Country Differential Patterns in Digital Resources, Digital Literacy and Digital Skills

The multivariate contrasts between the digital competence dependent variables studied for digital resources, digital literacy and digital skills are statistically significant between the four countries, and with a large effect size ($\lambda_{Wilks} = 0.523$; F = 564.901; gl = 60–139,683; $p < 0.001$; $\blacksquare^2 = 0.194$). When testing for intrasubject effects, most of the dependent variables give statistically significant results, with significant effect sizes, as do the post hoc contrasts, as can be seen in Tables 2 and 3 below.

Table 2. Results of the application of the general linear model (GLM), considering country of origin as the grouping variable and the use of digital resources, digital literacy and digital skills as dependent variables.

	VARIABLES PISA	Brazil	(N = 6900)	Colombia	(N = 5567)	Spain	(N = 29,448)	Portugal	(N = 4927)	Total	(N = 46,842)	F	p	η^2
		M	σ	M	σ	M	σ	M	σ	M	σ			
						DIGITAL ASSETS								
How many in your home: <Cell phones> with Internet access (e.g., smartphones)	ST012Q05NA	3.48	0.844	3.30	1.020	3.91	0.346	3.80	0.531	3.76	0.620	2392.064	0.001	0.133
How many in your home: Computers (desktop computer, portable laptop, or notebook)	ST012Q06NA	2.01	0.935	2.13	0.960	3.00	0.866	2.94	0.877	2.74	0.980	3343.393	0.001	0.176
How many in your home: <Tablet computers> (e.g., <iPad>, <BlackBerry PlayBook>)	ST012Q07NA	1.51	0.778	1.70	0.902	2.48	0.960	2.25	0.921	2.22	1.002	2744.790	0.001	0.150
How many in your home: E-book readers (e.g., <Kindle>, <Kobo>, <Bookeen>)	ST012Q08NA	1.14	0.448	1.35	0.783	1.56	0.771	1.23	0.561	1.44	0.733	867.006	0.001	0.053
						LITERACY								
Taught at school: How to use keywords when using a search engine such as <Google©>, <Yahoo©>, etc.	ST158Q01HA	1.59	0.491	1.46	0.498	1.60	0.489	1.43	0.495	1.57	0.496	273.471	0.001	0.017
Taught at school: How to decide whether to trust information from the Internet	ST158Q02HA	1.48	0.500	1.27	0.445	1.32	0.467	1.36	0.479	1.34	0.474	275.837	0.001	0.017
Taught at school: How to compare different web pages and decide what information is more relevant for your school work	ST158Q03HA	1.44	0.496	1.35	0.476	1.42	0.493	1.38	0.485	1.41	0.491	46.279	0.001	0.003
Taught at school: To understand the consequences of making information publicly available online on <Facebook>, [. . .]	ST158Q04HA	1.51	0.500	1.19	0.391	1.16	0.370	1.21	0.409	1.22	0.416	1404.516	0.001	0.083
Taught at school: How to use the short description below the links in the list of results of a search	ST158Q05HA	1.60	0.490	1.46	0.498	1.65	0.477	1.46	0.498	1.60	0.490	394.478	0.001	0.025
Taught at school: How to detect whether the information is subjective or biased	ST158Q06HA	1.55	0.498	1.57	0.496	1.53	0.499	1.45	0.498	1.53	0.499	53.139	0.001	0.003
Taught at school: How to detect phishing or spam emails	ST158Q07HA	1.79	0.408	1.61	0.489	1.64	0.480	1.45	0.497	1.64	0.481	506.613	0.001	0.031
						DIGITAL LITERACY								
How appropriate in reaction to this email: Answer the email and ask for more information about the smartphone	ST166Q01HA	2.88	1.873	2.86	1.643	3.04	1.720	3.05	1.785	2.99	1.743	28.538	0.001	0.002
How appropriate in reaction to this email: Check the sender's email address	ST166Q02HA	3.81	1.941	3.91	1.710	4.35	1.602	4.51	1.567	4.24	1.682	313.310	0.001	0.020
How appropriate in reaction to this email: Click on the link to fill out the form as soon as possible	ST166Q03HA	2.50	1.707	2.66	1.558	2.44	1.546	2.38	1.544	2.47	1.574	37.289	0.001	0.002
How appropriate in reaction to this email: Delete the email without clicking on the link	ST166Q04HA	2.56	1.735	2.94	1.631	3.19	1.789	3.34	1.807	3.09	1.781	289.295	0.001	0.018
How appropriate in reaction to this email: Check the website of the mobile phone operator to see whether [. . .]	ST166Q05HA	3.76	2.022	3.78	1.801	4.27	1.709	4.38	1.704	4.15	1.784	265.310	0.001	0.017

Note: multivariate tests: $\lambda_{Wilks} = 0.523$; F = 564.901; gl = 60–139,683.

Table 3. Post hoc contrasts that are significant in multivariate analyses by cross-country comparison for both digital resources and digital literacy and digital skills, as measured by PISA results.

PISA VARIABLES		Brazil vs. Colombia	Brazil vs. Spain	Brazil vs. Portugal	Colombia vs. Spain	Colombia vs. Portugal	Spain vs. Portugal
			DIGITAL RESOURCES				
How many in your home: <Cell phones> with Internet access (e.g., smartphones)	ST012Q05NA	0.001	0.001	0.001	0.001	0.001	0.001
How many in your home: Computers (desktop computer, portable laptop, or notebook)	ST012Q06NA	0.001	0.001	0.001	0.001	0.001	0.001
How many in your home: <Tablet computers> (e.g., <iPad>, <BlackBerry PlayBook>)	ST012Q07NA	0.001	0.001	0.001	0.001	0.001	0.001
How many in your home: E-book readers (e.g., <Kindle>, <Kobo>, <Bookeen>)	ST012Q08NA	0.001	n.s.	0.001	0.025	0.001	0.001
			DIGITAL LLITERACY				
Taught at school: How to use keywords when using a search engine such as <Google©>, <Yahoo©>, etc.	ST158Q01HA	0.001	0.001	0.001	0.001	0.001	0.001
Taught at school: How to decide whether to trust information from the Internet	ST158Q02HA	0.001	0.001	0.001	0.001	0.001	0.001
Taught at school: How to compare different web pages and decide what information is more relevant for your school work	ST158Q03HA	0.001	0.020	0.001	0.001	0.018	0.001
Taught at school: To understand the consequences of making information publicly available online on <Facebook>, [. . .]	ST158Q04HA	0.001	0.001	0.001	0.001	0.028	0.001
Taught at school: How to use the short description below the links in the list of results of a search	ST158Q05HA	0.001	0.001	0.001	0.001	n.s.	0.001
Taught at school: How to detect whether the information is subjective or biased	ST158Q06HA	n.s.	n.s.	0.001	0.001	0.001	0.001
Taught at school: How to detect phishing or spam emails	ST158Q07HA	n.s.	0.001	0.001	0.001	0.001	0.001
			DIGITAL SKILLS				
How appropriate in reaction to this email: Answer the email and ask for more information about the smartphone	ST166Q01HA	0.001	0.001	0.001	0.001	0.001	n.s.
How appropriate in reaction to this email: Check the sender's email address	ST166Q02HA	0.018	0.001	0.001	0.001	0.001	0.001
How appropriate in reaction to this email: Click on the link to fill out the form as soon as possible	ST166Q03HA	0.001	0.001	0.001	0.001	0.001	0.001
How appropriate in reaction to this email: Delete the email without clicking on the link	ST166Q04HA	0.001	0.001	0.001	0.001	0.001	0.001
How appropriate in reaction to this email: Check the website of the mobile phone operator to see whether [. . .]	ST166Q05HA	n.s.	0.001	0.001	0.002	0.002	0.001

Note: n.s. Not statistically significat.

The results obtained are presented below. Firstly, in terms of the digital devices in the home, such as mobile phones with Internet connection, computers, tablets or e-books. Next, we present the results obtained in relation to the self-assessment of digital literacy, where we present the results related to the use of search engines, critical and reliable Internet search, digital privacy and the detection of spam or possible phishing emails. Finally, the results obtained in terms of email use and usage are presented.

As can be seen in Table 2, there are differences in terms of email skills, where we find greater discrepancies between countries in each of them, with the greatest skills being those related to checking the sender (MPTR = 4.51 vs. MESP = 4.51 vs. MESP = 4.51). 51 vs. MESP = 4.35; F = 313.310; $p < 0.001$; ■^{2} = 0.020) and following email links (MPTR = 2.38 vs. MESP = 2.44; F = 37.289; $p < 0.001$; ■^{2} = 0.002).

In terms of digital resources, the following graph shows the differences between countries. Clearly, in all countries, the most used digital device is the smartphone, followed by computers, tablets and e-books. The statistically significant differences, as well as the effect sizes, can be seen in Figure 3.

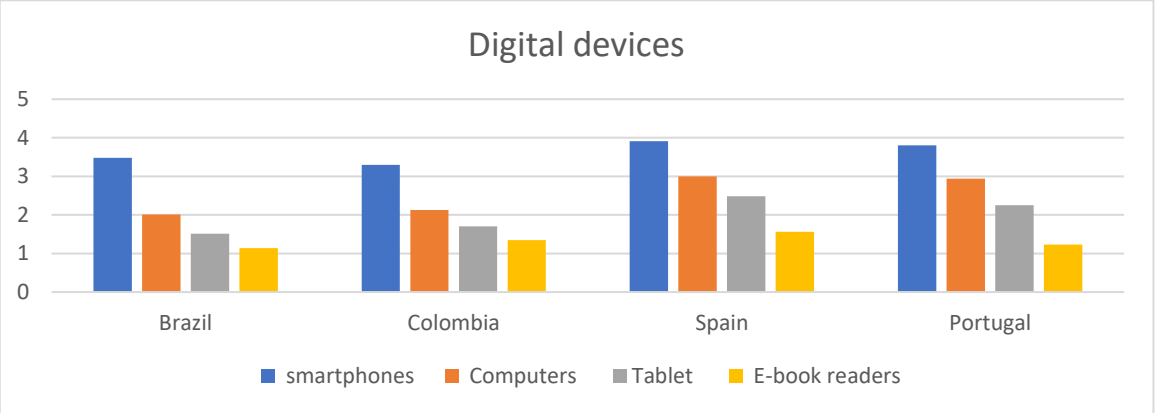

Figure 3. Distribution of digital device use by country.

In terms of literacy, the following graph shows the differences between countries, which are mainly to be found in skills such as checking the veracity of information, analyzing the relevance of information, the consequences of publishing certain content and detecting spam emails (Figure 4).

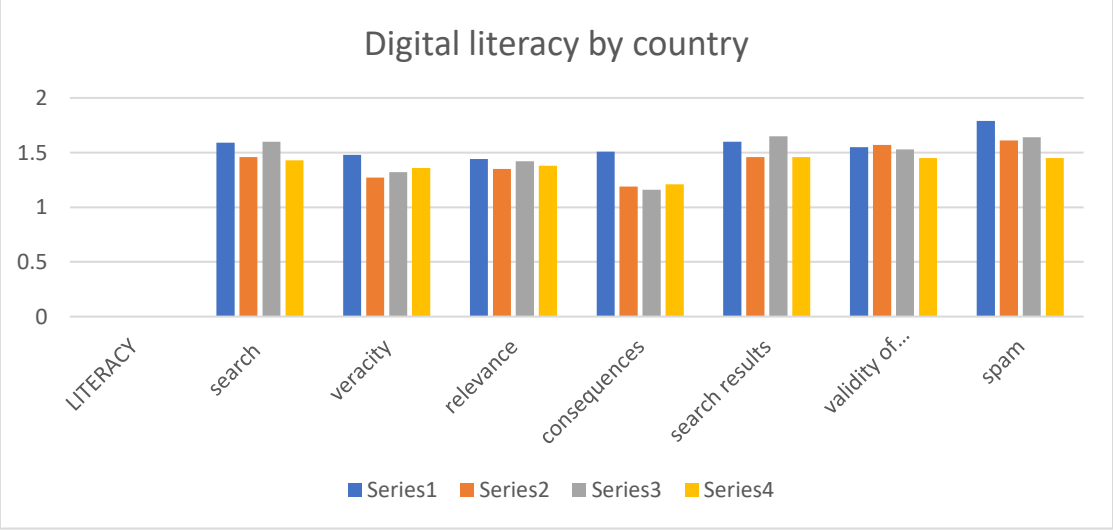

Figure 4. Distribution of actions related to digital literacy by country.

Post Hoc Contrast

When comparing the differences between countries, statistically significant differences can be seen in practically all the dependent variables and between countries ($p < 0.001$), except for some isolated exceptions with lower p's, and only in some cases are there no significant differences. See the results in Table 3. It is interesting to note that in the use of digital resources, the exception is the use of digital book readers, in which Spain and Colombia are compared (MCOL vs. MESP = 0.025).

On the other hand, in terms of digital literacy, we also find statistically significant differences in practically all the dependent variables and between countries ($p < 0.001$), except when comparing different websites and deciding which information is more relevant between Brazil and Spain (MBRA vs. MESP = 0.020), and between Colombia and Portugal (MCOL vs. MPOR = 0.018), from which we deduce that this difference is mainly due to cultural differences between one territory and another, since the difference is established between Hispanic and Latin American countries.

In this sense, we must also highlight the exception in the case of digital privacy, where we compare Colombia and Portugal (MCOL vs. MPOR = 0.028).

Finally, in terms of digital skills, statistically significant differences can be seen in practically all the dependent variables and between countries ($p < 0.001$), except for checking and verifying the email address, where the difference between Brazil and Colombia (MBRA vs. MCOL = 0.018) shows that within the same Latin American context, these differences tend to be lower. Additionally, in terms of checking the web address or website, differences exist between Colombia and Spain, and between Colombia and Portugal, which highlights the fact of the influence of the context, since in this case, the discrepancy between a Latin American country and two Hispanic countries is demonstrated (Figure 5).

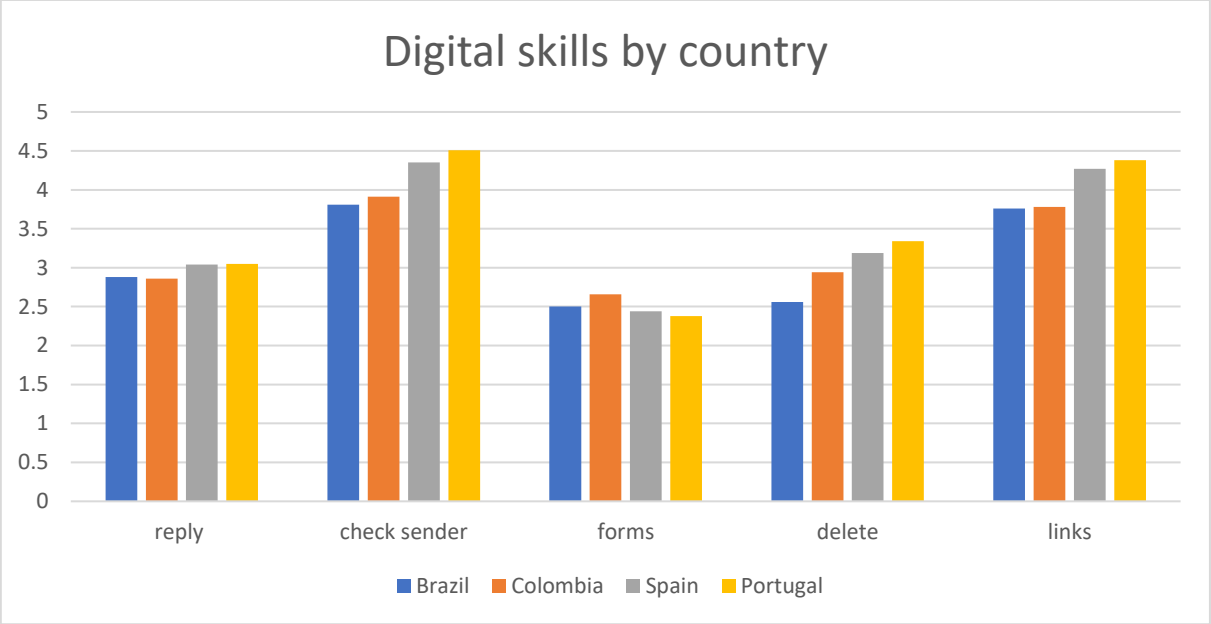

Figure 5. Distribution of digital skills by country.

3.2.2. Differential Patterns between Brazil and Spain in the Dependent Variables of Digital Availability and Enjoyment

Statistically significant multivariate contrasts are evident with a large effect size ($\lambda_{Wilks} = 0.627$; F = 311.909; gl = 42–22,030; $p = 0.001$; $\blacksquare^2$ (SE) = 0.373). Tests for inter-subject effects provide statistically significant differences in most variables, as can be seen in Table 4.

Table 4. Results of the application of the general linear model (GLM), considering as the grouping variable the country of origin (in this case, Brazil vs. Spain; Colombia and Portugal not applicable) and as dependent variables, the availability of digital experiences and enjoyment.

	VARIABLES PISA	**Brazil**	**(N = 4177)**	**Spain**	**(N = 17,896)**	**Total**	**(N = 22,073)**	**F**	**p**	**η^2**
		M	σ	M	σ	M	σ			
	AVAILABILITY AT HOME									
Available for you to use at home: Desktop computer	IC001Q01TA	2.01	0.941	1.63	0.846	1.70	0.878	664.051	0.001	0.029
Available for you to use at home: Portable laptop, or notebook	IC001Q02TA	1.89	0.932	1.32	0.645	1.43	0.742	2180.058	0.001	0.090
Available for you to use at home: <Tablet computer> (e.g., <iPad>, <BlackBerry PlayBook>)	IC001Q03TA	2.31	0.859	1.51	0.741	1.66	0.827	3736.723	0.001	0.145
Available for you to use at home: Internet connection	IC001Q04TA	1.19	0.558	1.05	0.279	1.07	0.354	581.229	0.001	0.026
Available for you to use at home: <Video games console>, e.g., <Sony PlayStation>	IC001Q05TA	1.99	0.927	1.48	0.693	1.57	0.770	1640.505	0.001	0.069
Available for you to use at home: <Cell phone> (without Internet access)	IC001Q06TA	2.30	0.866	2.26	0.802	2.27	0.814	11.559	0.001	0.001
Available for you to use at home: <Cell phone> (with Internet access)	IC001Q07TA	1.16	0.499	1.05	0.289	1.07	0.341	332.279	0.001	0.015
Available for you to use at home: Portable music player (Mp3/Mp4 player, iPod or similar)	IC001Q08TA	2.08	0.938	1.59	0.753	1.68	0.815	1321.549	0.001	0.056
Available for you to use at home: Printer	IC001Q09TA	2.09	0.925	1.47	0.768	1.59	0.836	2024.536	0.001	0.084
Available for you to use at home: USB (memory) stick	IC001Q10TA	1.43	0.714	1.13	0.396	1.19	0.487	1348.785	0.001	0.058
Available for you to use at home: <ebook reader>, e.g., <Amazon Kindle>	IC001Q11TA	2.61	0.730	2.20	0.855	2.27	0.848	840.867	0.001	0.037
Available for you to use at school: Desktop computer	IC009Q01TA	1.99	0.837	1.64	0.820	1.71	0.834	622.875	0.001	0.027
Available for you to use at school: Portable laptop or notebook	IC009Q02TA	2.46	0.778	2.12	0.897	2.18	0.886	524.606	0.001	0.023
Available for you to use at school: <Tablet computer> (e.g., <iPad>, <BlackBerry PlayBook>)	IC009Q03TA	2.69	0.656	2.53	0.781	2.56	0.761	135.807	0.001	0.006
	AVAILABILITY AT THE SCHOOL									
Available for you to use at school: Internet connected school computers	IC009Q05NA	1.98	0.840	1.35	0.648	1.47	0.731	2782.212	0.001	0.112
Available for you to use at school: Internet connection via wireless network	IC009Q06NA	2.05	0.883	1.68	0.856	1.75	0.874	649.133	0.001	0.029
Available for you to use at school: Storage space for school-related data, e.g., a folder for own documents	IC009Q07NA	2.32	0.827	1.94	0.926	2.01	0.920	604.567	0.001	0.027
Available for you to use at school: USB (memory) stick	IC009Q08TA	2.39	0.823	1.90	0.933	1.99	0.934	992.378	0.001	0.043
Available for you to use at school: <ebook reader>, e.g., <Amazon Kindle>	IC009Q09TA	2.69	0.628	2.73	0.620	2.72	0.622	11.680	0.001	0.001
Available for you to use at school: Data projector, e.g., for slide presentations	IC009Q10NA	1.86	0.881	1.33	0.684	1.43	0.755	1801.444	0.001	0.075
Available for you to use at school: Interactive Whiteboard, e.g., <Smartboard>	IC009Q11NA	2.53	0.763	1.63	0.852	1.80	0.907	3919.262	0.001	0.151
	ENJOYMENT									
Agree: I forget about time when I'm using digital devices.	IC013Q01NA	2.84	0.874	2.77	0.866	2.78	0.868	23.750	0.001	0.001
Agree: The Internet is a great resource for obtaining information I am interested in (e.g., news, sports, dictionary).	IC013Q04NA	3.20	0.734	3.31	0.703	3.29	0.710	76.063	0.001	0.003
Agree: It is very useful to have Social Networks on the Internet.	IC013Q05NA	3.05	0.734	3.16	0.720	3.14	0.724	80.907	0.001	0.004
Agree: I am really excited discovering new digital devices or applications.	IC013Q11NA	2.98	0.757	2.83	0.798	2.86	0.792	115.729	0.001	0.005
Agree: I really feel bad if no Internet connection is possible.	IC013Q12NA	2.88	0.823	2.99	0.852	2.97	0.847	60.800	0.001	0.003
Agree: I like using digital devices.	IC013Q13NA	3.17	0.724	3.29	0.672	3.27	0.684	100.539	0.001	0.005
Agree: I feel comfortable using digital devices that I am less familiar with.	IC014Q03NA	2.77	0.816	2.86	0.828	2.84	0.827	44.502	0.001	0.002
Agree: If my friends and relatives want to buy new digital devices or applications, I can give them advice.	IC014Q04NA	2.93	0.751	2.95	0.793	2.95	0.785	2.073	0.150	0.000
Agree: I feel comfortable using my digital devices at home.	IC014Q06NA	3.18	0.701	3.33	0.683	3.30	0.689	168.542	0.001	0.008
Agree: When I come across problems with digital devices, I think I can solve them.	IC014Q08NA	2.89	0.753	3.00	0.759	2.98	0.759	65.799	0.001	0.003
Agree: If my friends and relatives have a problem with digital devices, I can help them.	IC014Q09NA	2.90	0.765	3.01	0.774	2.99	0.773	68.286	0.001	0.003
Agree: If I need new software, I install it by myself.	IC015Q02NA	2.93	0.816	2.78	0.901	2.81	0.887	91.312	0.001	0.004
Agree: I read information about digital devices to be independent.	IC015Q03NA	2.85	0.771	2.61	0.864	2.65	0.852	284.550	0.001	0.013
Agree: I use digital devices as I want to use them.	IC015Q05NA	2.95	0.738	3.21	0.705	3.16	0.719	473.369	0.001	0.021
Agree: If I have a problem with digital devices I start to solve it on my own.	IC015Q07NA	2.82	0.792	2.98	0.768	2.95	0.775	139.732	0.001	0.006
Agree: If I need a new application, I choose it by myself.	IC015Q09NA	3.06	0.714	3.14	0.721	3.13	0.721	44.610	0.001	0.002
Agree: To learn something new about digital devices, I like to talk about them with my friends.	IC016Q01NA	2.80	0.762	2.80	0.773	2.80	0.771	0.001	0.974	0.000
Agree: I like to exchange solutions to problems with digital devices with others on the Internet.	IC016Q02NA	2.68	0.784	2.51	0.856	2.55	0.845	134.649	0.001	0.006
Agree: I like to meet friends and play computer and video games with them.	IC016Q04NA	2.74	0.858	2.58	1.013	2.61	0.987	90.777	0.001	0.004

Table 4. *Cont.*

	VARIABLES PISA	Brazil	(N = 4177)	Spain	(N = 17,896)	Total	(N = 22,073)	F	p	■²
Agree: I like to share information about digital devices with my friends.	IC016Q05NA	2.78	0.772	2.66	0.847	2.69	0.835	63.597	0.001	0.003
Agree: I learn a lot about digital media by discussing with my friends and relatives.	IC016Q07NA	2.81	0.768	2.73	0.826	2.75	0.816	31.977	0.001	0.001

Note: multivariate tests: $\lambda_{Wilks} = 0.627$; F = 311.909; gl = 42–22,030; $p = 0.001$; ■² (SE) = 0.373. We only include the statistically significant results ($p < 0.05$) ■² (eta-squared statistic) = estimates of size effects. The Cohen (1988) rule signals = 0.01–0.06 (small effect); > 0.06–0.14 (medium effect); > 0.14 (large effect).

When we compare the differences between Spain and Brazil, statistically significant differences can be seen in all the dependent variables and between both countries ($p < 0.001$) when we focus on the digital devices available in the home, including: computer, laptop, tablet, Internet connection, video games, smartphone, e-book and USB memory sticks. This situation is similar to the digital devices available at school.

On the other hand, in terms of enjoyment, when comparing the differences between Spain and Brazil, statistically significant differences can be seen in almost all the dependent variables and between both countries ($p < 0.001$), for example, in terms of forgetting about time during their employment, using the Internet for fun to look for information about their interests or to make friends, as well as not feeling well when they are not connected to the Internet. However, there are exceptions, and there are no statistically significant differences when it comes to advising friends or family about buying a digital device or app (MBRA = 2.93 vs. MESP = 2.95; F = 2.073; $p < 0.001$; ■^{2} = 0.000) and talking to friends to learn more about digital devices (MBRA = 2.80 vs. MESP = 2.80; F = 0.001; $p < 0.001$; ■^{2} = 0.000).

In terms of the digital resources available at home, comparisons between Brazil and Spain show that the Brazilian average is higher for all devices, although some of them, such as mobile phones, are on a par with each other. However, in others, such as the use of tablets or video games, the differences are greater. The statistically significant differences and effect sizes for each dependent variable can be seen in Figure 6.

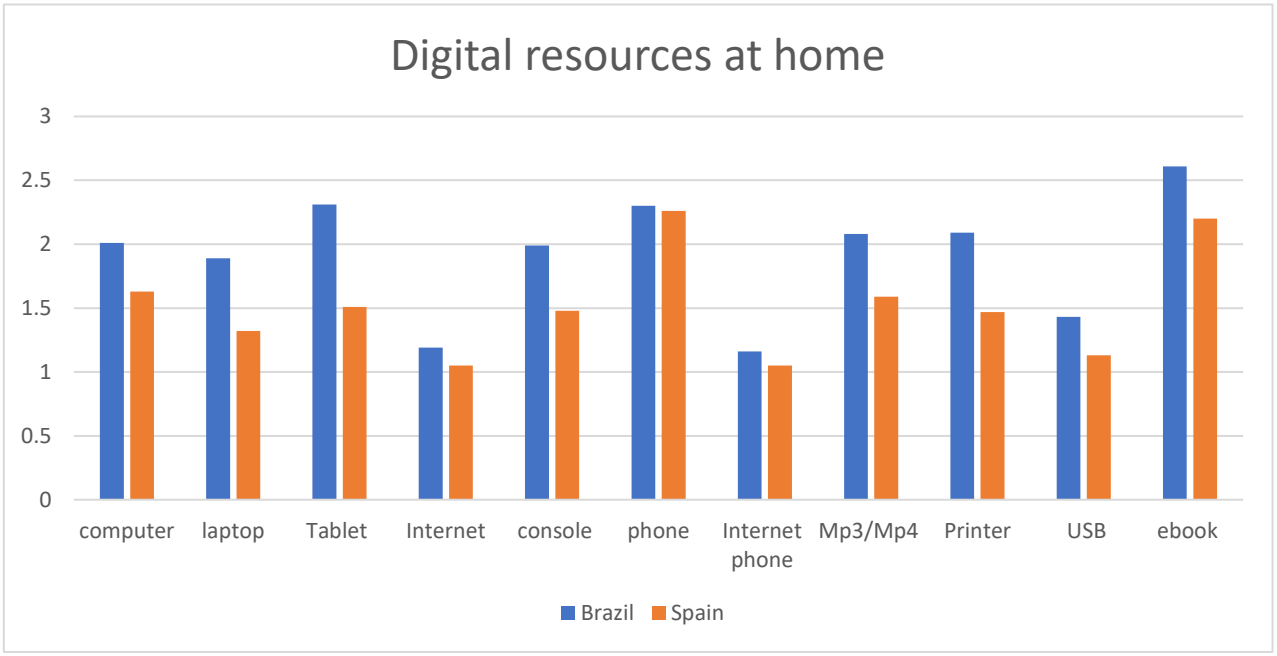

Figure 6. Distribution of digital resources at home.

On the other hand, in terms of resources available at school, Brazil is also the country with the highest average scores, except in the case of the availability of books at school, where Spain has the highest average (Figure 7).

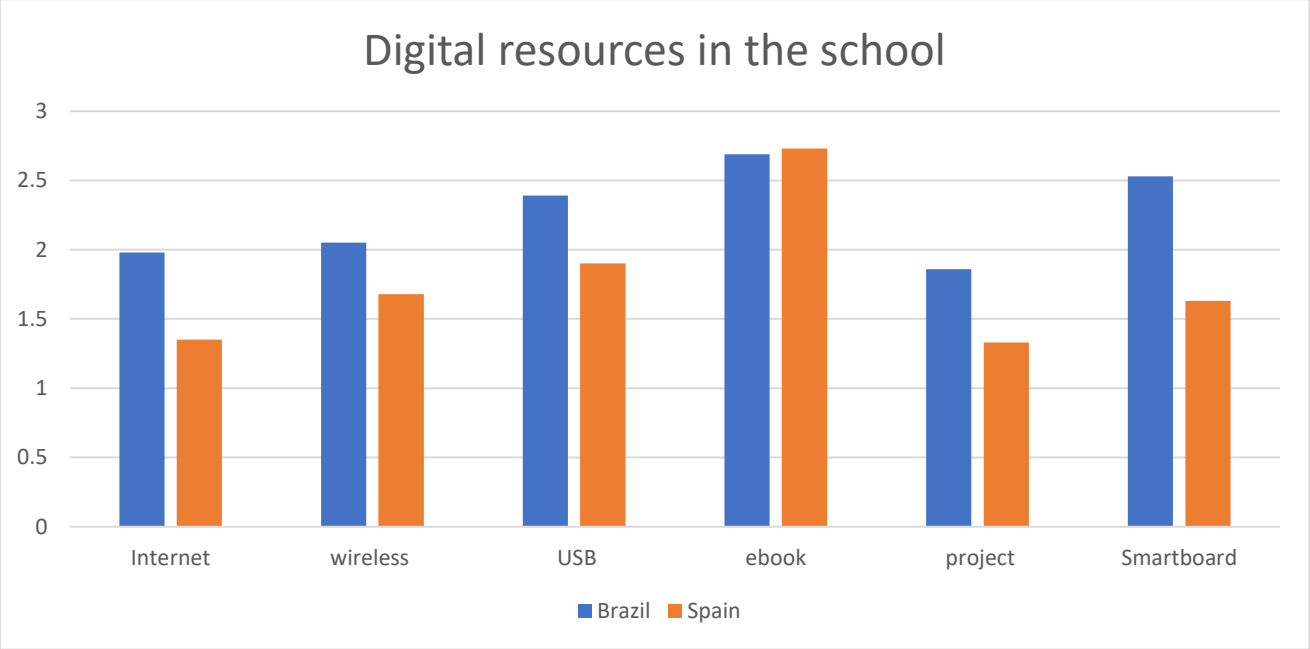

Figure 7. Distribution of digital resources in the school.

In terms of enjoyment, we find some statements with higher average scores in Spain than in Brazil, such as considering the Internet as a great resource, liking the use of digital devices and using them as desired or choosing applications. However, the opposite is true for other statements, such as forgetting about time when online, learning about digital devices, playing online games or sharing information about digital devices with friends (Figure 8).

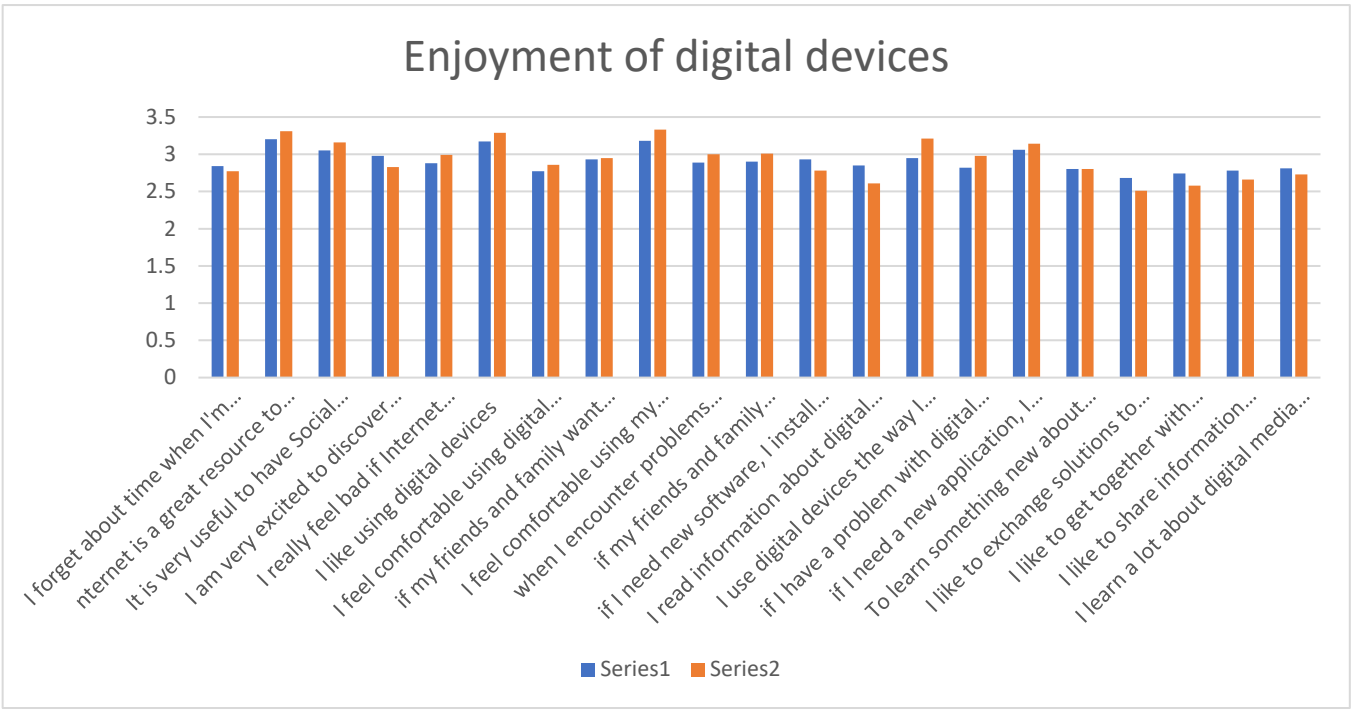

Figure 8. Country-specific enjoyment of digital devices.

4. Discussion and Conclusions

The present study has made it possible to answer the research question or research problem by asking the following question: Can we affirm that the original constructs of the PISA survey on some aspects of digital competence are validated by distinguishing between Latin American and Hispanic countries (taking into account geographical, cultural and language differences) and that differential patterns are obtained in terms of these constructs? In this way, it was possible to confirm the validity of the PISA digital competence construct, and the existing differential patterns have been verified.

Furthermore, it was possible to achieve the objective of comparatively analyzing the results in terms of literacy, digital skills and digital resources and experiences according to the PISA 2018 report in four OECD countries: Spain, Portugal, Colombia and Brazil: specifically, two Latin countries (Brazil and Colombia) and two Hispanic countries (Spain and Portugal), and for the enjoyment of the use of digital devices between one country in each area (Brazil and Spain) in adolescents, given that this evolutionary moment corresponds to the part of the population with the highest prevalence of Internet use [49]. Therefore, the objective has been achieved. However, variables such as enjoyment and availability of digital resources are only compared in the case of Spain vs. Brazil, since the official OECD database for the PISA 2018 report does not have these data for the countries of Colombia and Portugal. It follows that we can even consider that the assessment of digital literacy in the latter countries is biased with respect to the rest.

The hypotheses put forward can be confirmed by the fact that there are differences in personal digital resources in different cultural spheres (Hispanic and Latin American) as well as the identification of differential patterns provided by the variables related to digital competence by different cultural backgrounds (Hispanic and Latin American), and the effect that geographical and cultural variables have on digital literacy competences.

The main findings of this study confirm that the variables related to digital resources, digital literacy and digital skills, are statistically significant across the four countries. A plausible interpretation, in light of previous recent studies presented in the background, indicates the fact that for adolescents in industrialized countries, the Internet has become an indispensable tool in the development of their identity and socialization [50].

Among digital resources, we find, for example, mobile phones, Internet access, home computers and tablets. Results are similar to those provided by [51]. This fact demonstrates the fact that both digital devices and the Internet have now become an essential part of the daily lives of adolescents in particular, and of society in general [52].

Additionally, in terms of literacy, we find aspects such as searching the Internet, publishing information, knowing how to choose truthful and relevant information [53,54]. Additionally, in relation to digital skills, we find different actions related to emails, such as consultation, reactions or use. In this sense, other studies have affirmed the fact that the Internet, together with digital devices, has become for adolescents a support for information, learning and discovery, but also for communication and entertainment [55,56]. It is therefore essential to talk about digital literacy, understood as a multiarea competence in relation to the use of digital technology, which involves actions such as the ability of a subject to analyze, compose and originate digital content, solve digital issues, co-communicate and relate to others in a safe and appropriate way [57].

On the other hand, regarding the availability of digital experiences and enjoyment, in this case between Brazil and Spain, our research shows the existence of statistically significant multivariate contrasts. Thus, participants were shown to have computers, tablets, Internet connection, video games, telephone with Internet access or printers at home. These results are consistent with those reported by [58], who indicate that Internet use has become a critical problem in recent years, as between 88 and 98% of adolescents use the Internet at home or at school [59–63]. While in the school environment, they acknowledge having computers with Internet access, their own document folders, USB storage devices or projectors [64–67].

On the other hand, in the case of enjoyment, the sample acknowledges losing track of time when using digital devices, as they consider the Internet to be a great resource both for obtaining information and for making friends. In this sense, recent research has shown that the use of social networks among 13–17-year-olds is around 93–97% [68,69], so we can affirm that, in a way, the Internet has become a place where adolescents build their identity, relate to others and share tastes, preferences and language with their peers [49].

They also enjoy themselves while using them. In this regard, there are numerous recent studies that even state that the amount of time adolescents spend online has doubled in the last ten years [70,71].

Sustainability and Digital Competence

The comparative study included four countries with Spanish languages, Spain and Colombia, and Portuguese languages, Portugal and Brazil, belonging to two diverse cultural and geographical regions with similarities and differences, Latin America and the Iberian Peninsula; in these countries, various constructs of digital competence, measured by the surveys of the latest PISA, allow the identification of patterns on which to act to promote and improve social, educational and economic sustainability, and to increase the quality of life of the people living in these regions and countries. In either case, we find ourselves in a society that is increasingly concerned about certain issues related to the sustainability of its own educational, economic and social models [72], of which form part of what is known as sustainable development. It is therefore a society in which ICTs are present in all processes related to teaching and learning and have become an indispensable element in education through their digitalization, which offers a much more flexible type of learning, globalized in time and place and student-centered, and it is practically strange to teach without the use of ICTs. Therefore, it is more than necessary to teach digital competence [73].

Among the three basic principles of sustainable development, it is the principle of equity that is most closely related to education and has the greatest importance in the world at large [74]. Despite the good intentions embedded within the principle, which mainly correspond to equal opportunities and sustainable development, we have to be aware that research related to the topic has mainly focused on equal opportunities and equal outcomes [75], with little work focusing on aspects related to sustainability and emotional issues, such as social support, participation or different psychological determinants that may have an influence [76].

Thus, both intra- and intergenerational equity measures are postulated here as a major key to the development of countries [77]. However, it should be noted that events such as globalization, crises related to immigration, war, capitalism or negative prejudices towards certain social groups have a negative impact on societies in terms of the sustainability of countries [78].

It is in this field where ICTs take on a leading role through autonomous learning and where sustainability is postulated as a tool for reflection on a personal level and the construction of societies based on social justice, equity and sustainability on a social level [79]. It is therefore not just a matter of teaching and learning mere knowledge, but also of promoting an emotional education based on values and attitudes, i.e., an education whose purpose is the integral development of the human being, in order to minimize social aspects such as poverty, exclusion or repression [80].

Along with this, the concept of Education for Sustainable Development, or Education for Sustainability (EfS), towards which we must move [81,82], appears, which can be understood as education that aims to create awareness through different skills and values that guarantee full participation in society, whether at the local, national or international level, with the aim of creating a more equitable society [72]. From these ideas, therefore, we can glimpse an idea of education that can be taught in any curricular area, and to which ICTs are postulated as a resource that can ensure its implementation. See the works that evaluate sustainability in virtual education [73–80]. We must not fall into the error of maintaining the same traditional education system without encouraging improvements in

learning, so we must commit to learning in which ICTs are accompanied by pedagogical approaches focused on innovation and quality [81].

In short, educational sustainability means being committed to inclusion, equity, equality and quality [81–83]. Additionally, it implies doing so in two main spheres: the first being the very education offered to students, and the second being inclusion, equality and quality [84]. Furthermore, this is where we must ask ourselves, at the international level, can digital devices be a tool to promote such indicators? In order to do so, we must undoubtedly focus on sustainable education where ICTs and digital devices, and, of course, digital competence [80], require taking advantage of new knowledge, as well as enormous vivacity and adaptability [81].

What do we mean when we talk about digital competence in the aftermath of the pandemic? An accurate answer may be all those competences that help us to achieve sustainable digital environments [72], under the vision of digital literacy as an indispensable element in the formation of effective and efficient citizens on a personal, professional and social level [80]. This leads us to rethink what our students should learn, how they should learn it and why they should learn it [75], and this is impossible to achieve without a huge change in school and culture. For this reason, the commitment to digital literacy is not only the responsibility of the teacher, or of the education system, but also involves a process of change in all social and economic spheres [81].

In conclusion, we must point out that the variables related to digital resources, digital literacy and digital skills are statistically significant among the four countries. These data are relevant for educational and social practice as they demonstrate the importance of assessing digital competence at school. Today, we are facing a situation where more than half of the school-age population has been introduced to online learning through the pandemic (Digital Education Action Plan, 2021–2027); therefore, this has been a turning point in the use of digital devices in education. Learning is now linked to access to the Internet, phones and other digital devices, which have become the means for learning a particular subject. This translates into a shift in traditional teaching, which changes the focus of attention and places it on the students. Additionally, in particular, the pandemic caused by COVID-19 has sharpened the educational and social need for digital literacy [79], which is currently understood as the mastery of different skills, abilities and competences required to use technology, media and digital tools, without neglecting critical and reflective attitudes and behaviors in their use [66]. This has also been echoed by the European Framework of Digital Competences for Citizens, which has supported different training plans, both European and national.

In addition to taking these limitations into account, future solutions or prospects for the limitations of the present study are related to identifying whether these results have changed or are maintained in the data provided by the PISA report that will be published at the end of this year. In addition, the aim is also to analyze the possible influence that the pandemic caused by COVID-19 may have had on the use and enjoyment of the same technologies.

This work attempts to encompass digital competence itself as a leading component in social sustainability, which, together with the environment, the economy, social justice and human rights, forms the basis of the concept of sustainability. This fact makes it necessary to think about the said competence of citizens, taking as a hypothesis the fact that an improvement in digital competence has a positive impact on the use made of ICT and also on its connection with sustainable development. For this reason, at a social level, it is necessary to bet on the promotion of digital competence as a key element in the sustainable, educational and social development of a community. This fact corresponds with one of the greatest educational challenges that we face in achieving real social sustainability. At the pedagogical level, all these hypotheses are specified in different specific programs, innovative educational practices and the creation of resources that are committed to inclusion and educational quality. However, it is not just a matter of teaching and learning mere knowledge, but also of promoting an emotional education based on values and attitudes,

that is, an education whose purpose is the integral development of the human being, in order to minimize aspects such as poverty, exclusion or repression. This is united with the concept of Education for Sustainable Development, or Education for Sustainability (EfS).

The limitations of this work correspond to the fact that the way in which these items have been evaluated corresponds to self-report measures. However, we consider it appropriate to use validated scales for assessing digital competences in terms of digital literacy. In addition, despite the importance and consideration of sustainability and digital competence, there is currently little research on assessing the level of achievement, progress and improvement of sustainability in education [37,66]. This is coupled with a dearth of measurement tools.

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