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Exploring the educational digital landscape in the Dominican Republic: a comparative study of competencies in different stages and socio-digital environments

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Abstract

The purpose of this study was to have a more holistic and complete vision of the digital competencies of the three main agents of the teaching–learning process (teachers, students and parents) of all educational stages, as well as the incidence of gender, territory and access to technological resources and the Internet at home. A non-quantitative and non-experimental design was used through surveys, with non-probabilistic sampling by intention and snowball method, and a sample of 1149 participants. The results show significant differences between the groups studied in the stages of Primary and Secondary Education, but not in Early Childhood Education and Higher Education, specifically between the student–teacher group, as well as for the teacher-parent group, with higher scores for teachers. In addition, a progressive increase in digital competencies was evident from Primary Education to Higher Education in students, similar in teachers but disparate in the group of parents, as well as gender and territorial disparities according to access to digital resources and the Internet at home. The results highlight the need to effectively integrate technology into the school curriculum from the earliest educational stages, as well as to provide continuous training to those groups whose skills require improvement, including subsidy initiatives for low-income families, or programs of access to computers, digital resources and the Internet in rural areas.

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Introduction

Digital competencies rank high in the list of skills and abilities that people need to function and develop in today's world (Subrahmanyam, 2022). The use of Information and Communication Technologies (ICT) in different areas of life has become an indisputable necessity (Rodríguez Fuentes et al., 2021). Society increasingly needs to make use of digital communication tools and media for daily interaction based on digital technologies (Levin & Mamlok, 2021), as a result of a need accelerated by the collateral effects of the COVID 19 pandemic (Koutska, 2023; Oguguo et al., 2023).

Digitalization has brought with it great challenges for the entire educational community (Pettersson, 2021, encompassing teachers, students and their immediate family members (Lubkov et al., 2020). It is crucial that students adapt to the era of digital transformation to guarantee excellence in the provision of educational services (Aydin, 2021) since it has been shown that digital training is a predictor of the academic success of students (Cabero-Almenara et al., 2023). However, it is important to recognize that there are disparities between individuals, both in their access to technology and their ability to take advantage of its benefits (Robinson et al., 2015; Tomczyk et al., 2023). In this respect the role of teachers is key, so they have to learn new methods for teaching in an accelerated and intensive way, being able to provide guidance on the use of new digital environments (Szymkowiak et al., 2021).

Very often, that the wrong assumption is made that there is no need to investigate the digital skills of students born in the digital age, the so-called "digital natives". It is assumed that, spontaneously, they are highly competent or advanced users of new digital technologies (Adjin-Tettey, 2020). This vision is biased compared to the reality exposed by the most current research and analysis. Aydin, (2021) highlights that students' experience of using ICT is also influenced by the educational level or the support that some parents provide to their children. As Rahayu and Haningsih (2021, p. 19) state, "to guide children, parents must be aware of their competencies and strive to obtain qualified digital competencies". This relationship is logical, since less advantaged students tend to be less likely to have parents who are digitally literate (Becker, 2000). In the context of Latin America, Internet access barely reaches 67% of families (CEPAL, 2020), with important differences according to socioeconomic level and geographical location. Therefore, there is a real challenge for families to access technological equipment and a high-quality network service.

This study focuses on the digital training of parents, students and teachers in the Dominican Republic, a country with a population of 10.6 million people (García-Segura & Peña, 2017). This country is facing significant challenges in the educational field and has many barriers to overcome: low financing capacity and insufficient funding for research and innovation projects and the absence of scientific policies in the majority of Dominican universities (Riggio-Olivares, 2020). Furthermore, in a study carried out in the southwest of the Dominican Republic (Santos et al., 2021)

it was evident that there were more negative than positive aspects in the education of students since there was a lack of technological equipment and internet access. However, the country has made progress in the development of digital competencies in the population and in the use of the Internet: 74.8% of the population is already a user (Mateo Alcántara and Pérez González, 2024).

One of the main focal points of the Digital Agenda for the Dominican Republic 2030 (Digital Agenda for the Dominican Republic, 2021), is the development of skills to efficiently use and adopt digital technologies, and consequently, train human talent for sustainable economic and social development. In this educational catharsis, the central question lies in determining to what extent the Dominican educational community is prepared to address the demands and opportunities of the digital age. In other words, are teachers, students and parents at all educational stages properly trained to face the digital transformation and maximize its benefits in the educational field? Does the type of territory influence the development and acquisition of these competencies? Does the type of gender or access to technological and Internet resources at home affect the acquisition of these competencies?

As stated by Reyes-Alardo et al. (2024), studying the digital competencies of the educational community in the Dominican Republic is crucial to addressing inequalities in access to and use of technologies in both rural and urban areas. This study also aims to improve educational quality and promote digital inclusion. In a global context where digital transformation is essential for economic competitiveness and social development (Dung & Tri, 2021), evaluating these competencies enables the design of effective training policies and programs, both nationally and internationally in similar contexts. The Dominican Republic shares geographical, cultural, and infrastructural characteristics with neighboring countries in Latin America. Understanding the digital skills of parents, students and teachers allows for the development of strategies that benefit not only the Dominican Republic but also other nations in the region with similar conditions. This comparative and regional approach can facilitate the implementation of more global and efficient educational policies and digital training programs, comprehensively addressing common needs and challenges in the surrounding geographical area. Furthermore, this study could provide a database to help mitigate the impacts of future crises, such as the COVID-19 pandemic, and support the objectives of the Digital Agenda for the Dominican Republic 2030 (Digital Agenda for the Dominican Republic, 2021), promoting sustainable economic and social development. For all of these reasons, this study provides a solid base of evidence to guide the creation and implementation of educational policies and training programs tailored to the real needs of the educational community in the Dominican Republic and nearby areas with similar characteristics.

Related works

Comparative studies among members of the educational community

Over the last few years, the number of scientific studies dedicated to researching digital competencies has increased significantly. This has mainly focused on

teachers (Gabarda Méndez et al., 2021; González et al., 2020) and students (Ortega-Rodríguez et al., 2022). There is little literature on parents or direct family members (Guillén-Gámez et al., 2023a; Linde-Valenzuela et al., 2022).

The lack of comparative studies that provide a detailed analysis of competencies among the different members of the educational community, and at different educational levels, represents a gap in the understanding of the specific digital dynamics of each group, both internationally and nationally in the Dominican Republic. Linde-Valenzuela et al. (2022) analyzed the digital literacy of 99 teachers, 203 future teachers, 82 parents and 110 students in the Primary Education stage in Spain. The authors found significant differences between teachers and families, as well as between teachers and students, in favor of the teaching group, whereas they did not find significant differences between students and parents. However, this study was carried out only at the Primary Education level whereas the current study contributes by adding all educational stages. In greater depth, Ramírez-Rueda et al. (2021) showed that there were no significant differences in attitudes, usage and beliefs between Primary Education teachers and parents, although significant differences were found between Early Childhood Education teachers and the parents' group. Another study with a similar methodological design was that of Zhu et al. (2018) which investigated the attitudes of 145 parents and 212 secondary school students in China towards the implementation of digital tablets in formal educational contexts. The empirical results indicated that students exhibit more favorable attitudes than their parents. However, the study lacked an evaluation of digital competencies between both groups, which is the contribution of this research, together with the teachers' group. Finally, in a similar context, Rasskazova and Soldatova (2014) measured the digital competence levels of 1203 secondary school students and 1209 parents in Russia, finding that, although the average level was higher in the sample of adolescents compared to the sample of parents, both levels were low. However, this study did not statistically compare both samples nor did it include the participation of teachers, showing a triangular gap in this type of study.

Comparative studies between educational agents of the different educational stages

Regarding the group of teachers, Guillén-Gámez et al. (2022) investigated the level of digital competence in providing online tutorials, comprising a sample of 233 Early Childhood Education teachers and 836 Primary Education teachers from Spain. The results bore out that, at a global level, there were significant differences in favor of the Primary Education group. However, this study did not contemplate a triangular design with the entire educational community. A more comprehensive study was carried out by Ramírez-Rueda et al. (2021) which analyzed the attitude, usage and beliefs about ICT of 62 teachers and 1002 parents between different educational stages from Spain. Regarding the group of parents, the authors highlighted the significant differences between the group of parents with children in Early Childhood Education and Primary Education, in favor of this second group. For the group of teachers, the authors did not find significant differences between

the group of Early Childhood Education and Primary Education. However, this study is not fully focused on digital competencies nor does it take into consideration the student group. With contradictory results to previous studies, Cabero-Almenara et al. (2022) analyzed the digital competencies of teachers to assist people with functional diversity. Based on a sample of 167 Early Childhood Education teachers, 449 Primary Education teachers, 295 Secondary Education teachers and 283 Higher Education teachers, the results showed that the teachers with the best digital skills were those who worked in lower education. However, this study did not provide a triangular vision of the entire educational community either.

Regarding the group of parents, current scientific research lacks an in-depth analysis of parents' digital competencies.as well as systematic comparisons between parents at different educational levels. This constitutes a significant gap in the understanding of parental influence on the digital development of children, which is one of the main contributions of this study. Among the few studies found, Özerbaş & Öçal (2019) analyzed the digital competencies of 356 parents with different levels of education from Ankara (Türkiye). The authors found that those parents with lower levels of education (Primary school or Secondary school) had lower scores compared to parents with higher education (Undergraduate, Postgraduate).

The absence of comprehensive comparative research on students' digital competencies throughout all educational stages, from early childhood to higher education, constitutes a significant gap in the scientific literature. Most existing studies have focused on specific educational stages, omitting a holistic analysis that would allow a deeper and more contextualized understanding of digital development throughout the entire educational trajectory. This study aims to make a contribution to bridging this knowledge gap.

The incidence of gender in rural and urban territories

Although research on digital competencies in the educational community has advanced, significant gaps persist in terms of differential analysis by gender in rural and urban environments. Studies have placed a higher focus on urban areas, leaving a substantial gap in the understanding of gender disparities in digital competencies in rural contexts. Furthermore, many of the studies do not clarify the type of territory analyzed. These gaps must be addressed to gain a more complete understanding.

Within the context of the family environment, Pons-Salvador et al. (2022) with a sample of 1,827 parents in Primary Education (1,213 mothers, 597 fathers, and 13 tutors), showed that fathers obtain a significantly higher average score in digital competence than mothers. In the same context, Özerbaş & Öçal (2019) analyzed the competencies of 400 Primary Education teachers and 396 parents who had children in the Primary Education stage, showing that there were gender differences in the group of parents in favor of the male gender, although no significant differences were evident in the group of teachers. With a more in-depth analysis, Guillén-Gámez et al. (2023a) analyzed the digital competencies of teachers, students and parents according to gender in the Spanish territory. Significant differences were only apparent for the parents' group, in favor of the male gender. However, this study

focused only on the Primary Education stage and did not comprise all educational stages, which is where this study makes a contribution.

In the group of teachers, Basgall et al. (2023) with samples of Secondary Education teachers from the Spanish territory, have also pointed out significant differences in favor of the male gender, while they did not find significant differences in Early Childhood Education teachers or in Primary Education. Guillén-Gámez et al. (2023b) analyzed the digital competencies of 847 teachers from the rural Spanish territory in the Primary Education stage. The results showed male-biased differences, particularly relating to digital competencies to communicate with students, as well as to communicate with parents, but not to communicate digitally with the rest of the teachers. The findings of Guillén-Gámez & Mayorga-Fernández, 2022) have shown similar results and in rural territories. Significant differences with similar results although without specifying the type of territory were also evidenced by other authors (Antonio et al., 2020) although others did not evidence this level of significance (Lucas et al., 2021; Ruiz-Palmero et al., 2023).

Studies regarding the digital competencies of students, according to gender, have yielded disparate results. In the context of Higher Education, while the studies by Jiménez-Hernández et al. (2020) and Çebi and Reisoğlu (2020) found significant differences in favor of the male gender with samples of 485 and 518 university students, respectively, García-Vandewalle et al. (2023) did not find significant differences with a sample of 266 Higher Education students. At the Primary Education stage, Siddiq and Scherer (2019) conducted a meta-analysis with 46 effect sizes on ICT literacy with respect to gender, finding significant differences in both Primary Education and Secondary Education students, with higher differences for the first group. Similar results were also evidenced by Ahmad et al. (2019), who found in a sample of 292 students from Malaysia (Asia), significant differences in favor of the male gender, both in those students from urban and rural territories, although the gap was greater for the latter group. However, none of these studies analyze gender taking into consideration the three educational agents (students, teachers and parents), both in rural and urban territories, which is another contribution of this study.

The impact of the territory on the use of digital resources and Internet access

Kahan (2019) has highlighted that those rural areas experience some of the greatest inequalities in broadband access, due to the country's technological infrastructure. Furthermore, "a lack of skill in using the computer and the Internet is likely to put a student in a competitive disadvantaged position" (Kuhlemeier and Hemker (2007, p. 461). In this sense, Hampton et al. (2021) states that "quality of access influencing what students do online, which affects their digital skills" (p. 2), consequently affecting the academic achievement (Cabero-Almenara et al., 2023). The research of Ben Youssef et al. (2022) with a total of 1,323 university students evidenced these theories by stating how poor investment in ICT affected the students' results. For the Dominican Republic, the context in which this study is developed, Gómez Mazara (2017) shows that only 28.11% of homes had access to a computer, while

Actis (2010) showed in his study that Internet access in Dominican homes was strongly skewed to the metropolitan-urban area. These findings may indicate equity challenges in access to technology and consequently in the digital competencies of members of the educational community.

Taking all this context into consideration, the need arises for more exhaustive and specific research into the digital competencies of the community. Therefore, the objectives of this study are:

O1. Know and compare the basic and global digital competencies of the members of the educational community (students-teachers-parents), for each educational stage.
O2. Know and compare the basic and global digital competencies of students between the different educational stages, as well as for teachers and parents.
O3. Analyze the basic and global digital competencies of each educational agent according to gender, for each type of territory (urban-rural).
O4. Analyze the basic and global digital competencies of each educational agent according to whether they have access to the Internet at home and technological resources (computers), for each type of territory (urban-rural).

Method

Design and participants

A non-probabilistic purposive sample was used due to the ease in management, time and money for data collection (Etikan et al., 2016). The type of sampling was non-probabilistic with an intention and snowball method (Emerson, 2015). The data was collected through an online form during the 2022/2023 academic year, which guaranteed the anonymity of the participants and confidentiality of the data. For this study, the authors have considered that, due to the chronological age of the Early Childhood Education student, they are not qualified to respond to a survey. The sample comprised 1149 participants.

Regarding the type of educational agent, 29.10% (n = 334) were students, where 69.50% were female (n = 232) and 30.50% were male (n = 102). The group of teachers was represented by 41.30% (n = 475), where 79.90% were female (n = 375) and 21.10% were male (n = 100). Finally, 29.60% (n = 340) were parents, where 82.10% were female (n = 279) and 17.90% were male (n = 61). Regarding the educational stage, 13.10% (n = 150) belonged to Early Childhood Education, 18.90% (n = 217) to Primary Education, 29.20% (n = 336) to Secondary Education, and 38.80% (n = 446) to Higher Education. Regarding whether the students had an internet connection and a computer at home, 72.80% (n = 243) stated that they did, while 27.20% did not (n = 91). For the group of teachers, 89.30% did have an internet connection and a computer at home (n = 424) compared to 10.70% who did not (n = 51). Finally, 77.90% of parents had an internet connection (n = 265) compared to 22.10% who did not (n = 75).

Instrument

To meet the purposes of the study and measure the digital competence of the different agents of the educational community, the instrument by Carrera et al. was used. (2011), validated and translated into English by the authors of this study. The 20 items of the questionnaire are related to six areas of digital competence in basic tasks, which were measured on a seven-point Likert scale, where the value 1 was associated with the label "I do not have the skills to do it", while the value 7 was associated with the label "I have the skills to do it." The dimensions were the following: DIM1 (Skills in management and transfer of technological data), with a total of 4 items, such as "DIM1.5-I know how to configure mobile phones, printers, Wi-Fi, Bluetooth on a computer"; DIM2 (Software and hardware skills), with a total of 4 items, such as "DIM2.1-I know how to differentiate if a computer or laptop is better than another according to its characteristics"; DIM3 (Web navigation skills), with a total of 3 items, such as "DIM3.7-I know how to recognize different browsers and their characteristics for browsing the Internet"; DIM4 (Skills in using word processors), with a total of 3 items, such as "DIM4.4- I know how to format a text by changing the heading, the font, the margins or the distance between lines, among others"; DIM5 (Data processing and management skills), with a total of 3 items, such as "DIM5.7- I know how to create graphs from entered data"; and DIM6 (Multimedia presentation design skills), with a total of 3 items, such as "DIM6.5- I know how to add effects and transitions between slides to a presentation".

The validity of the instrument was verified by using two factor analysis techniques: Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The EFA was performed using IBM SPSS V.24 software, while the CFA was performed using AMOS V.24 software. In the EFA process, the Oblimin rotation system and the Principal Axis Factoring method were used. The validity of the model was supported by a very high Kaiser–Meyer–Olkin index (KM = 0.975) and a also significant Bartlett's Chi square test ($p. < 0.05$, $X^2 = 45{,}184.141$, $df = 630$). The model explained 87.17% of the true variance in participants' scores. The coefficients obtained met the standards established by Bentler (1989) with satisfactory values in: chi-square goodness-of-fit test (CMIN/DF), IFI (Incremental Fit Index), comparative fit index (CFI), normalized fit index (NFI) and TLI (Tucker-Lewis index). Adequate values were observed in the root mean square error of approximation (RMSEA). The coefficients associated with each index can be seen in Table 1.

Regarding global internal consistency, the instrument had satisfactory coefficients of Cronbach's Alpha ($\alpha = 0.98$), Spearman-Brown ($\alpha = 0.95$), Split-half of Guttman ($\alpha = 0.95$), McDonald's Omega ($\alpha = 0.99$). Satisfactory coefficients were also evident in the average variance extracted (AVE) and maximum shared variance (MSV) for each factor of the instrument.

Data analysis procedure and techniques

Various types of analyzes have been carried out. Firstly, the normality of the data was checked through Kolmogorov–Smirnov for each analysis carried out, not meeting

Table 1 Model goodness-of-fit indicators

Models	CMIN	gl	C.M./df	IFI	CFI	TLI	NFI	RMSEA	90% CI
2	329.736	153	2.155	0.988	0.988	0.985	0.978	0.057	0.048–0.065

*Own elaboration

this assumption. ($p < 0.05$). Subsequently, non-parametric techniques were used, Mann–Whitney (U) to compare the scores between two groups, and Kruskal–Wallis (KW) for comparisons between three groups. In relation to the magnitudes of the effects identified in situations where significant differences are observed between the groups, the eta squared was calculated (η^2). A value of $\eta^2 = 0.01$ indicates a small effect, $\eta^2 = 0.06$ indicates a medium magnitude effect, while $\eta^2 = 0.14$ suggests a large effect (Richardson et al., 2020). However, it is important to keep in mind that this coefficient may present biases in small samples. Therefore, Cohen's d index was also determined to mitigate this bias and provide additional assessment of the observed effect sizes, where a value equal to or less than 0.02 is a small effect, 0.15 is medium, and greater than 0.35 is a significant effect (Cohen, 1988).

Results

Analysis of digital competencies among educational agents, for each educational stage

Figure 1 shows the basic and global digital competencies (arithmetic mean) of the three educational agents, for each educational stage. For the early childhood education stage, it is observed that the digital competencies for teachers ($M = 5.34 \pm 1.77$) and parents ($M = 5.18 \pm 2.21$) are similar and medium–high, with no statistically significant differences between both groups ($U = 2443.500$; $p. = -0.867$).

For the Primary Education stage, a fairly low score is observed for the students ($M = 2.26 \pm 1.44$), being slightly higher for the group of parents ($M = 3.59 \pm 2.30$), and high for the teachers ($M = 5.92 \pm 1.24$). Specifically, significant differences were found between the three groups ($KW = 107.258$; $p. = 001$) with a very large effect size ($d = 1.968$; $\eta^2 = 0.492$). Specifically, significant differences were found between the student–teacher groups ($U = 553{,}000$; $Z = -10.396$; $p. = 0.001$), with a large effect size ($d = 2.311$; $\eta^2 = 0.572$); as well as between the teacher-parent groups ($U = 586.500$; $Z = -4.310$; $p. = 0.001$) with a large effect size ($d = 0.859$; $\eta^2 = 0.156$); but not for the student-parent groups ($U = 993.00$; $Z = -2.225$; $p. = 0.026$) since to be significant according to the Bonferroni method it should be less than 0.0167.

For the Secondary Education stage, it is observed that the groups of students ($M = 4.92 \pm 1.58$) and parents ($M = 4.70 \pm 1.79$) have similar competencies in a medium range, with higher scores in the group of teachers ($M = 6.02 \pm 1.22$). Significant differences were found between both groups ($KW = 51.385$; $p. = 0.001$) with a large effect size ($d = 0.835$; $\eta^2 = 0.148$). Specifically, significant differences

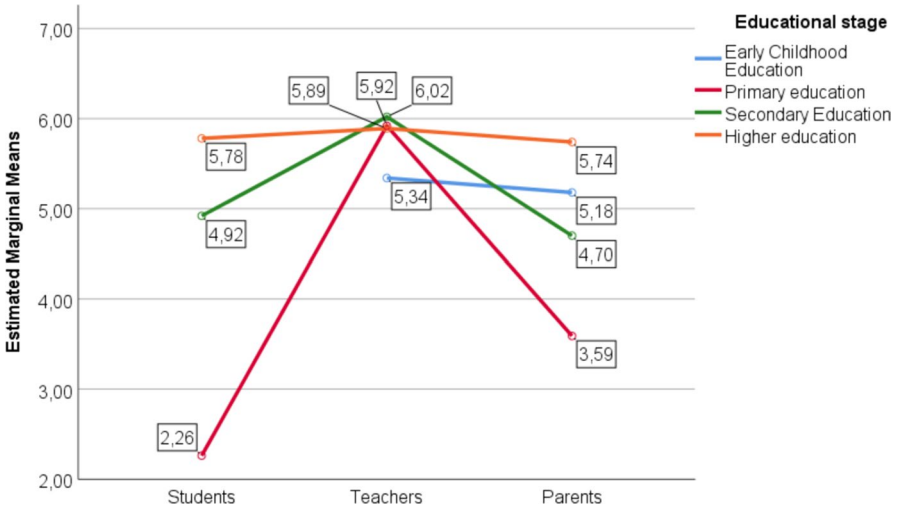

Fig. 1 Global CD between the three educational agents, for each educational stage

were found between the student–teacher groups (U = 4266,000; Z = −6.348; p. = 0.001) with a large effect size (d = 0.872; $\eta^2 = 0.16$); as well as teachers-parents (U = 2734.500; Z = −5.813; p. = 0.001) with a large effect size (d = 0.880; $\eta^2 = 0.162$); while between students-parents no significant differences were found (U = 5093.000; Z = −0.648; p. = 517).

For the Higher Education stage, it is observed that digital competencies are similar and high, both in students (M = 5.78 ± 1.15), teachers (M = 5.89 ± 1.41) and parents (M = 5.74 ± 1.49), with no significant differences between the three groups (KW = 4.237; p = 0.120).

Analysis of digital competencies among participants in the different educational stages, for each educational agent

Figure 2 shows the basic and overall digital competencies of the participants in each educational stage, for each educational agent separately. Regarding the group of students, a clear positive and ascending trend is observed, from Primary Education (M = 2.26 ± 1.44) to Higher Education (M = 5.78 ± 1.15). Significant differences were found between both groups (KW = 153.809; p = 001) with a large effect size (d = 1.841; $\eta^2 = 0.459$). Specifically, significant differences were found in the three multiple comparisons, as seen in Table 2.

Regarding the group of teachers, similar scores are observed in all educational stages, although quite satisfactory, being slightly lower in Early Childhood Education (M = 5.34 ± 1.77), compared to Primary Education (M = 5.92 ± 1.24), Secondary Education (M = 6.02 ± 1.22) and Higher Education (M = 5.89 ± 1.41). Between both stages, significant differences were found (KW = 11.972; p = 0.007) with medium effect sizes (d = 0.279; $\eta^2 = 0.019$). Specifically, significant differences were

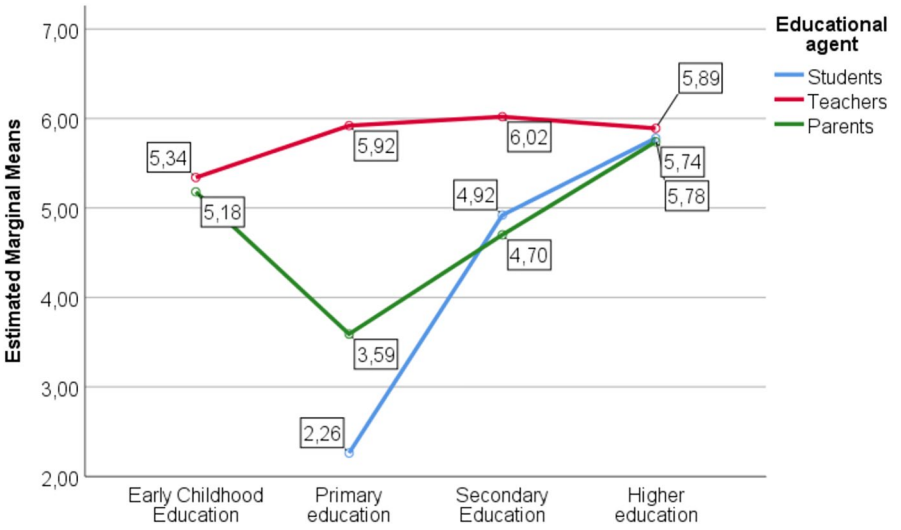

Fig. 2 Digital competence among participants in the different educational stages, for each educational agent

Table 2 Multiple comparisons between participants from the different educational stages, for each educational agent

Stage	Group	Group	Mann–Whitney U	Z	p	d	η^2
Students	Primary	Secondary	1394,500	−10,013	0.001*	1.786	0.444
		Higher education	598,500	−10,987	0.001*	2.378	0.586
	Secondary	Higher education	4677,000	−4,279	0.001*	0.580	0.078
Teachers	Early Childhood	Primary	3529,000	−1,834	0.067	–	–
		Secondary	4278,500	−3,142	0.002*	0.437	0.046
		Higher education	6039,000	−2,918	0.004*	0.367	0.033
	Primary	Secondary	5044,500	−1,328	0.184	–	–
		Higher education	7018,500	−1,089	0.276	–	–
	Secondary	Higher education	10,191,000	−,316	0.752	–	–
Parents	Early Childhood	Primary	509,000	−2,800	0.005*	0.632	0.091
		Secondary	1856,000	−2,409	0.016*	0.413	0.041
		Higher education	4602,000	−,759	0.448	–	–
	Primary	Secondary	854,500	−2,161	0.031	–	–
		Higher education	1126,500	−4,474	0.001*	0.669	0.101
	Secondary	Higher education	4406,500	−4,970	0.001*	0.655	0.097

*Significance level at 95%

found between the Early Childhood-Secondary and Early Childhood-Higher Education teacher groups, as seen in Table 2.

Finally, for the group of parents, there is no clear trend in the scores. Parents with students in Early Childhood Education ($M = 5.18 \pm 2.21$) and with students in Higher Education (5.74 ± 1.49) are the groups with the greatest digital competencies, followed by Secondary Education (4.70 ± 1.79) and Primary Education ($M = 3.59 \pm 2.30$), with the lowest competencies for this last group. Between both groups, significant differences were found ($KW = 36.072$; $p = 0.001$) with a large effect size ($d = 0.661$; $\eta^2 = 0.098$). Specifically, it can be seen in Table 2 that significant differences were found in most of the multiple comparisons, with the exception of Early Childhood Education-Higher Education ($U = -0.759$; $p = 0.448$) and Primary Education-Secondary Education ($U = 854.500$; $p = 0.031$), since it did not meet the Bonferroni criterion ($p < 0.0167$).

Analysis according to the territory and gender

Figure 3 shows the basic and overall digital competencies of the three educational agents according to gender, for each type of territory. In the urban territory, it is observed that students have similar competencies, both in the female gender ($M = 4.39 \pm 1.98$) and in the male gender ($M = 4.38 \pm 2.05$), with no significant differences between both groups ($U = 4913.500$; $Z = -0.148$; $p = 0.882$). For the group of teachers, a difference is observed between the female gender ($M = 5.71 \pm 1.51$) and the male gender ($M = 6.22 \pm 1.07$), with significant differences ($U = 7274.000$; $Z = -2.708$; $p = 0.007$), and with a medium effect size ($d = 0.299$; $\eta^2 = 0.022$). For the group of parents, a slightly higher score is observed in the male gender ($M = 5.82 \pm 1.38$) compared to the female gender ($M = 5.37 \pm 1.79$), although not significant between both groups ($U = 3676.500$; $Z = -1.379$; $p = 0.168$).

In rural areas, it is observed that the group of students has similar competencies in both genders, with no significant differences between the two ($U = 1453.500$; $Z = -0.045$; $p = 0.964$). For the group of teachers, significant differences were found in gender ($U = 1179.500$; $Z = -2.504$; $p = 0.012$) with an effect size between medium-large ($d = 0.429$; $\eta^2 = 0.014$), with higher competencies in the male gender ($M = 6.23 \pm 1.05$) compared to the female gender ($M = 5.73 \pm 1.46$). Finally, significant differences were also found in the group of parents of students ($U = 1291{,}500$; $p = 0.023$), with a medium effect size ($D = 0.33$; $\eta^2 = 0.027$), with higher scores in the male ($M = 5.49 \pm 1.85$) versus the female gender($M = 4.57 \pm 2.14$).

Analysis according to the territory and availability of technological devices (computers)

Figure 4 shows the global digital competencies of the three educational agents according to whether they have access to the Internet at home and an electronic device, for each type of territory. In the urban territory and for the student group, it is observed that those who have electronic devices at home and access to the Internet

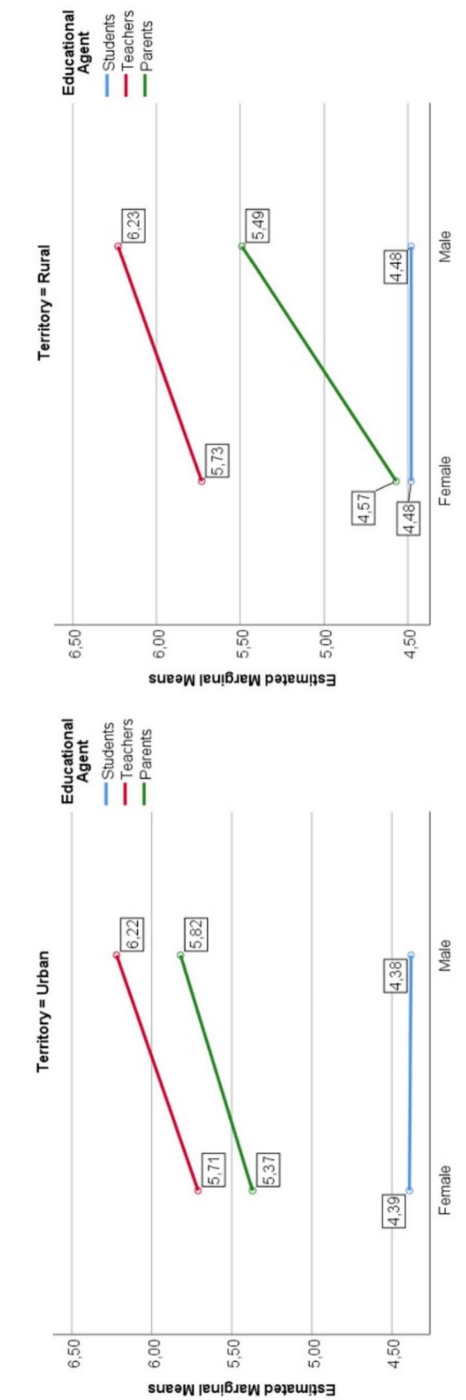

Fig. 3 Digital competencies of educational agents according to territory and gender

have better digital competencies (M = 4.54 ± 1.99) compared to students who do not have it (M = 3.87 ± 1.96), with significant differences between both groups (U = 3524.500; Z = −2.024; p = 0.043), with a small-medium effect size (d = 0.275; η^2 = . 0.019). Similar results were found in the group of students' parents, with significant differences between both groups (U = 2610,500; Z = −2.409; p = 0.016), with a small-medium size (d = 0.321; η^2 = 0.025), with superior abilities in those who possessed this type of resources (M = 5.58 ± 1.64) compared to those who did not possess it (M = 4.84 ± 1.99). On the other hand, for the group of teachers, no significant differences were found between both groups (U = 3461,000; Z = −1,400; p = 0.162), obtaining very satisfactory competencies for this group.

In rural areas, similar results were found in the three groups. Figure 4 shows that, in the student group, significant differences were found between those who had technological resources at home (M = 4.83 ± 1.90) and those who did not (M = 3.83 ± 2.18) (U = 1075.000; Z = −2.313; p = 0.021), with a long effect size (d = 0.446; η^2 = . 0.047). For the group of parents, significant differences were also found (U = 1026.000; Z = −2.244; p = 0.025), with a large effect size (d = 0.437; η^2 = 0.046), being higher in those parents with access to technology at home (M = 5.09 ± 1.87) versus those who lacked access (M = 3.98 ± 2.36). On the other hand, for the teacher group, no significant differences were found between both groups (U = 1250.500; Z = –0.902; p = 0.367), obtaining very satisfactory competencies for this group.

Discussion

The purpose of this study has been to explore and compare the basic digital competencies of key members of the educational community (students, teachers and parents), at different educational levels (from early childhood education to university). In addition, we sought to analyze these competencies according to gender and geographical environment (urban or rural), as well as examine these digital competencies in relation to Internet access and technological resources at home.

Regarding the first objective (O1) in the Early Childhood Education stage, the digital competencies between teachers and parents are observed to be more or less equal, with both groups showing a medium–high level, contradicting the results of Ramírez-Rueda et al. (2021). These results may be due to the fact that these authors analyzed beliefs towards educational technology and not basic digital competencies regarding the use of educational technology. In Primary Education, a significant gap is evident between the three groups, with teachers' digital competencies being notably superior, corroborating the findings of Linde-Valenzuela et al. (2022) and contradicting those of Ramírez-Rueda et al. (2021). A plausible explanation for this digital divide between parents and students can be attributed to parents' limited training in digital tools, as well as the limited availability of technological resources at home. These signs could affect the transfer of digital competencies from parents to their children. At the Secondary Education stage, although students and parents show similar digital competencies, they are surpassed by teachers. These findings

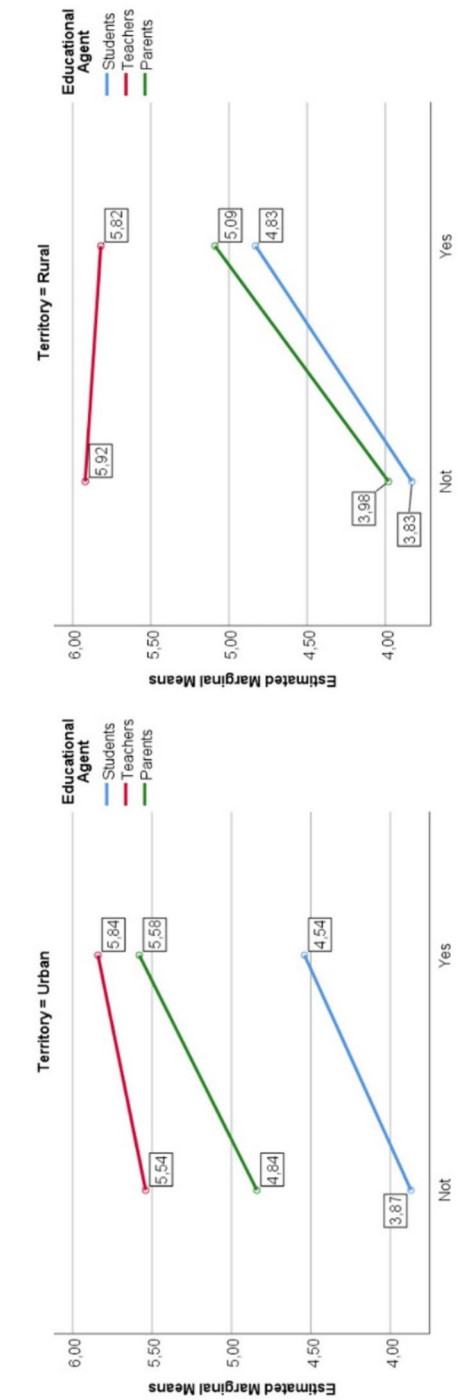

Fig. 4 Digital competencies of educational agents according to the territory and type of connection and technological device

differ from the study by Rasskazova and Soldatova (2014), by evidencing differences in digital competences between parents and students, and partially from those of Zhu et al. (2018), although these last comparisons must be taken with caution since the authors measure attitudes towards technology and not digital competencies. These results suggest that teachers may have received more extensive training in the use of educational technology during their professional education, allowing them to familiarize themselves with and master the use of digital tools. Furthermore, it is possible that teachers have broader access to digital resources. This could be a further avenue of research. In Higher Education, digital skills are shown to be advanced and similar across the three groups, indicating greater homogeneity in digital competence at this level.

Regarding the second objective (O2), the analysis of digital competencies reveals a clear positive and upward trend in the group of students, evidencing a significant increase from Primary Education to Higher Education. Although there are no related studies to support these findings, it suggests that as students' progress in their education, they are likely to be offered more opportunities and resources to develop their digital competencies. This could be due to the integration of technology in the school curriculum, participation in technology training programs, and exposure to a wider variety of digital tools in more advanced educational contexts. Therefore, it would be of great interest to study how technology is integrated into the school curriculum of each educational stage, as well as the typology and frequencies of digital resources used by each type of student. In the case of the teacher group, slightly lower scores are observed in Early Childhood Education, with significant differences compared to the groups of Secondary Education and Higher Education teachers. These findings were also corroborated by Ramírez-Rueda et al. (2021), and are different from those of Guillén-Gámez et al. (2022) since these authors showed significant differences between Early Childhood Education and Primary Education teachers. The slightly lower scores for Early Childhood Education teachers may be due to the challenges of integrating technology into students' early learning, given the higher emphasis on play and social skills at this stage. For this group of parents, there is no clear trend in the scores. Parents with of pre-school children and those who are parenting, Higher Education students are the groups with the greatest digital competencies. These findings are in line with those found by Ramírez-Rueda et al. (2021) who highlighted the significant differences between the group of parents with children in Early Childhood Education and Primary Education, in favor of this second group, although partially different from those of Özerbaş & Öçal (2019). The lack of a clear trend can be attributed to the fact that there are parents who are more familiar with digital tools and platforms used in specific stages, such as higher education, where online research and digital collaboration entails the use of more digital resources. Furthermore, these results could also be due to differences in the availability of technological resources at home or the educational level of the parents. For this study, the authors have selected the group of parents according to the educational stage of their child. The educational level attained by the parents was not factored in. Future research on this topic is recommended.

As to the third objective (O3), in both urban and rural areas a similarity is observed in digital competencies between students' genders, without significant differences.

This corroborates the results of García-Vandewalle et al. (2023), but contradicts the findings of Ahmad et al. (2019), Jiménez-Hernández et al. (2020) and Çebi and Reisoğlu (2020). A plausible explanation may be that due to widespread access to technology and online educational resources, equalizing opportunities for development in digital competencies between genders are present from an early age. It is therefore crucial to continue promoting gender equality policies in digital education to ensure the preparation of all students for today's digital society. Regarding the group of teachers, a significant difference is evident in the competencies between genders in both rural and urban territories, where males show a slightly higher score compared to females. These findings are in line with those of Basgall et al. (2023), Guillén-Gámez et al. (2023b), Guillén-Gámez & Mayorga-Fernández (2022), Antonio et al., 2020, although contradictory to those of Lucas et al. (2021) and Ruiz-Palmero et al. (2023). These results suggest that there may be disparities in the training and digital experience between genders of teachers, due to professional development opportunities. Although these findings are consistent with previous research, they contradict some studies, highlighting the need for additional research to better understand the underlying causes of these disparities. Finally, with respect to the group of parents, no differences in gender were found in the urban territory, but they were found in rural areas. As there are disparities depending on the territory, partial results were evidenced by other authors such as Pons-Salvador et al. (2022) Özerbaş & Öçal (2019) and Guillén-Gámez et al. (2023a) who did find significant differences. The differences found in rural, but not urban, settings may be due to a combination of socioeconomic and cultural factors. There may be differences in access to technology and digital training opportunities between men and women, influenced by aspects such as the availability of resources and cultural tradition, opening a new line of research on these aspects.

Regarding the last objective (O4), the results obtained in our research highlight a clear association between access to electronic devices and digital competencies in both urban and rural environments. Both students and parents who have devices and Internet access show superior digital competencies compared to those who lack these resources, evidencing a significant digital divide. However, it is important to highlight that this pattern is not observed in the group of urban and rural teachers, who present similar and satisfactory skills regardless of access to technology at home. These findings are consistent with the literature reviewed, which highlights inequalities in Internet access, especially in rural areas, and its impact on digital competencies and academic performance (Ben Youssef et al., 2022; Kahan, 2019). In the specific context of this study, the Dominican Republic, studies such as that of Gómez Mazara (2017) and Actis (2010) showed a low availability of computers and unequal access to the Internet. This suggests important equity challenges in access to technology and, consequently, in the digital competencies of members of the educational community.

Practical and scientific implications of the results

A fundamental issue is the reflection on the findings of this study, which could have both political and practical implications for the Dominican Republic as well as for regions with similar territorial and cultural characteristics.

Firstly, the fact that most studies focus on students and teachers, particularly in higher education, reveals a clear gap in research on other groups such as parents. This highlights the need to broaden the research focus to include parents, who play a crucial role in supporting and developing their children's digital competencies. Furthermore, the lack of studies that objectively compare the digital competencies of key members of the educational community using the same evaluation instrument underscores the importance of studies like this one, which adopts a consistent methodology. This study's methodological design avoids potential measurement biases and provides more reliable and comparable data, thus facilitating the creation of more effective and equitable policies and training programs.

Secondly, the identification of a significant gap in digital skills between teachers, students, and parents at different educational levels highlights the need for specific training programs, especially for parents in the primary and secondary education stages, where a notable disparity is observed. If educational policies focus on improving digital competencies with targeted courses for parents based on their specific needs, this could help reduce the digital divide and enhance the support that parents can provide to their children.

Third, the observation that students in urban and rural areas exhibit different levels of digital competence underscores the urgent need to invest in technological infrastructure and educational resources related to the use of technological devices to access the Internet. This involves implementing policies that ensure equitable, high-quality access to the Internet and technological devices in both schools and homes, providing all students with equal opportunities to develop essential digital skills. These measures will not only promote educational equality but also contribute to the sustainable economic and social development of communities, particularly in rural areas. By doing so, young people will be better prepared to actively participate in the global digital economy, helping to mitigate regional disparities in access to educational and employment opportunities.

Finally, although equality in digital skills between genders has been observed among students in both urban and rural settings, significant disparities remain among teachers, particularly in rural areas. This indicates an urgent need for professional development programs that address these differences. These programs should focus on providing equitable training opportunities in technology and digital pedagogy for all educators, regardless of gender or geographic location.

Conclusions

This study has exhaustively addressed the evaluation of basic and global digital competencies in different key actors in the educational community, from students to teachers and parents, covering various educational levels and geographical environments. The results reveal a significant digital gap between the groups, with teachers consistently showing superior digital competencies at all educational stages except Early Childhood education. These findings suggest the need for continuous training programs for parents and students, as well as educational policies focused on improving digital competencies from an early

age. Additionally, the importance of access to technology and digital resources at home is highlighted, especially in rural areas where these disparities are more profound. This study also highlights the need to address gender differences in digital competencies, both in teachers and parents.

Regarding the limitations of this study, it is important to consider its weaknesses and think about ways to improve them in future research. The study also suggests the possibility of strengthening the analysis through future research that expands the sample size, focusing on specific aspects. It would be possible to evaluate in a more detailed way the incorporation of technologies in early childhood education, which is crucial for the adequate development of essential digital skills today. The expansion of the sample should include the three groups involved: teachers, parents, and students. From that point, the integration of technologies could be evaluated considering gender differences and specific training needs to promote equal opportunities. It would also be useful to focus on the impact of parental support and student response, as it is recognized that parental involvement can significantly influence children's academic outcomes and other aspects of their educational development. This would also make it possible to address the territorial component, considering the specific conditions of rural areas and the needs of programs that improve access to technology in those areas. In this way, it could be ensured that these regions are not left behind in terms of digital and educational advancement. The last limitations of the study are related to the non-representative sample that makes it difficult to generalize the results to the entire educational community. Also, the intentional sampling used can bias the results and make their applicability to the general population more difficult. Therefore, it would be interesting to expand the type of design and sampling typology with the purpose of achieving better external validity.

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Declarations

Conflict of interest All authors have accepted the submission of the article to the Journal, accepting the issuance of rights.

Ethics approval This study has not been carried out with human or animal participants.

Consent to participate The authors do not have any type of interests. In addition, we have not used human samples, so we have not had to request consent.

Consent for publication All authors have accepted the submission of the article to the Journal, accepting the issuance of rights.

Code availability Not applicable.

References

Actis, J. L. (2010). Brecha digital en la República Dominicana: Análisis de la disponibilidad en lo hogares y del uso individual de computadoras e internet. *Ciencia y Sociedad, 35*(2), 291–358.

Adjin-Tettey, T. D. (2020). Can 'digital natives' be 'strangers' to digital technologies? An analytical reflection. *Inkanyiso: Journal of Humanities and Social Sciences, 12*(1), 11–23.

Ahmad, N. A., Ayub, A. F. M., & Khambari, M. N. (2019). Gender digital divide: Digital skills among Malaysian secondary school. *International Journal of Academic Research in Progressive Education and Development, 8*(4), 668–687.

Antonio, A., Probitchado, R., Ricohermoso, C., Saavedra, A., & de la Rama, J. M. (2020). Gender differences in technological competence among science teachers: Implications. *International Journal of Advanced Science and Technology, 29*(7), 13257–13268. https://doi.org/10.13140/RG.2.2.31976.29441

Aydin, M. (2021). Does the digital divide matter? Factors and conditions that promote ICT literacy. *Telematics and Informatics, 58*, 101536. https://doi.org/10.1016/j.tele.2020.101536

Basgall, L., Guillén-Gámez, F. D., Colomo-Magaña, E., & Cívico-Ariza, A. (2023). Digital competences of teachers in the use of YouTube as an educational resource: Analysis by educational stage and gender. *Discover Education, 2*(1), 1–13. https://doi.org/10.1007/s44217-023-00054-x

Becker, H. J. (2000). Who's wired and who's not: Children's access to and use of computer technology. *The Future of Children*. https://doi.org/10.2307/1602689

Ben Youssef, A., Dahmani, M., & Ragni, L. (2022). ICT use, digital skills and students' academic performance: Exploring the digital divide. *Information, 13*(3), 129. https://doi.org/10.3390/info13030129

Bentler, P. M. (1989). *EQS structural equations program manual*. BMDP Statistical Software.

Cabero-Almenara, J., Guillén-Gámez, F. D., Ruiz-Palmero, J., & Palacios-Rodríguez, A. (2022). Teachers' digital competence to assist students with functional diversity: Identification of factors through logistic regression methods. *British Journal of Educational Technology, 53*(1), 41–57. https://doi.org/10.1111/bjet.13151

Cabero-Almenara, J., Gutiérrez-Castillo, J. J., Guillén-Gámez, F. D., & Gaete-Bravo, A. F. (2023). Digital competence of higher education students as a predictor of academic success. *Technology, Knowledge and Learning, 28*(2), 683–702. https://doi.org/10.1007/s10758-022-09624-8

Çebi, A., & Reisoğlu, İ. (2020). Digital competence: A study from the perspective of pre-service teachers in Turkey. *Journal of New Approaches in Educational Research (NAER Journal), 9*(2), 294–308. https://doi.org/10.7821/naer.2020.7.583

CEPAL. (2020). Las oportunidades de la digitalización en américa latina frente al COVID-19. Cooperacion Andina de Fomento y Naciones Unidas. https://www.cepal.org/es/publicaciones/45360-oportunidades-la-digitalizacion-america-latina-frente-al-covid-19

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Erbaum Press.

Digital Agenda for the Dominican Republic. (2021). https://agendadigital.gob.do/wp-content/uploads/2022/01/Agenda-Digital-2030.pdf

Dung, N. T., & Tri, N. M. (2021). Digital transformation meets national development requirements. *Linguistics and Culture Review, 5*(S2), 892–905.

Emerson, R. W. (2015). Convenience sampling, random sampling, and snowball sampling: How does sampling affect the validity of research? *Journal of Visual Impairment & Blindness, 109*(2), 164–168.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Gabarda Méndez, V., García Tort, E., de Lourdes Ferrando Rodríguez, M., & ChiappeLaverde, A. (2021). Pre-school and primary school teachers: technological training and digital competence. *Innoeduca. International Journal of Technology and Educational Innovation, 7*(2), 19–31. https://doi.org/10.24310/innoeduca.2021.v7i2.12261

García-Segura, L. A., & Peña, J. C. (2017). *The digital revolution in developing countries: Brief analysis of the Dominican Republic*. Cyberspace: Risks and Benefits for Society, Security and Development. https://doi.org/10.1007/978-3-319-54975-0_4

García-VandewalleGarcía, J. M., García-Carmona, M., Trujillo Torres, J. M., & Moya Fernández, P. (2023). Analysis of digital competence of educators (DigCompEdu) in teacher trainees: The context of Melilla, Spain. *Technology, Knowledge and Learning, 28*(2), 585–612.

Gómez Mazara, F. (2017). El computador como determinante del acceso a internet en hogares de la República Dominicana. *Ciencia, Economía y Negocios, 1*(1), 39–85.

González, M. J. M., Rivoir, A., Lázaro-Cantabrana, J. L., & Gisbert-Cervera, M. (2020). How does the digital teaching competence matter? An analysis of initial teacher training programs in Uruguay. *Innoeduca International Journal of Technology and Educational Innovation, 6*(2), 128–140. https://doi.org/10.24310/innoeduca.2020.v6i2.5601

Guillén-Gámez, F. D., Colomo-Magaña, E., Cívico-Ariza, A., & Linde-Valenzuela, T. (2023a). Which is the digital competence of each member of educational community to use the computer? Which predictors have a greater influence? *Technology, Knowledge and Learning*. https://doi.org/10.1007/s10758-023-09646-w

Guillén-Gámez, F. D., Colomo-Magaña, E., Ruiz-Palmero, J., & Tomczyk, Ł. (2023b). The digital competence of the rural teacher of primary education in the mentoring process: a study by teaching speciality and gender. *Journal of Research in Innovative Teaching & Learning*. https://doi.org/10.1108/JRIT-05-2023-0050

Guillén-Gámez, F. D., Linde-Valenzuela, T., Ramos, M., & Mayorga-Fernandez, M. J. (2022). Identifying predictors of digital competence of educators and their impact on online guidance. *Research and Practice in Technology Enhanced Learning, 17*(1), 1–19. https://doi.org/10.1186/s41039-022-00197-9

Guillén-Gámez, F. D., & Mayorga-Fernández, M. J. (2022). Measuring rural teachers' digital competence to communicate with the educational community. *Journal of New Approaches in Educational Research, 11*(2), 323–341. https://doi.org/10.7821/naer.2022.7.1053

Hampton, K. N., Robertson, C. T., Fernandez, L., Shin, I., & Bauer, J. M. (2021). How variation in internet access, digital skills, and media use are related to rural student outcomes: GPA, SAT, and educational aspirations. *Telematics and Informatics, 63*, 101666. https://doi.org/10.1016/j.tele.2021.101666

Jiménez-Hernández, D., González-Calatayud, V., Torres-Soto, A., Martinez Mayoral, A., & Morales, J. (2020). Digital competence of future secondary school teachers: Differences according to gender, age, and branch of knowledge. *Sustainability, 12*(22), 9473. https://doi.org/10.3390/su12229473

Kahan, J. (2019). It's time for a new approach for mapping broadband data to better serve Americans. It's time for a new approach for mapping broadband data to better serve Americans - Microsoft On the Issues. https://blogs.microsoft.com/on-the-issues/2019/04/08/its-time-for-a-new-approach-for-mapping-broadband-data-to-better-serve-americans/

Koutska, I. (2023). Educational technology 'introduced' by the COVID-19 pandemic. *Innoeduca. International Journal of Technology and Educational Innovation, 9*(2), 115–133. https://doi.org/10.24310/innoeduca.2023.v9i2.15481

Kuhlemeier, H., & Hemker, B. (2007). The impact of computer use at home on students' Internet skills. *Computers & Education, 49*(2), 460–480. https://doi.org/10.1016/j.compedu.2005.10.004

Levin, I., & Mamlok, D. (2021). Culture and society in the digital age. *Information, 12*(2), 68. https://doi.org/10.3390/info12020068

Linde-Valenzuela, T., Guillén-Gámez, F. D., & Devitt, A. (2022). Digital literacy of teachers, families, and students for virtual participation in school: A multiple comparison analysis. *IEEE Revista Iberoamericana De Tecnologias Del Aprendizaje, 17*(1), 1–8. https://doi.org/10.1109/RITA.2022.3149800

Lubkov, A. V., Gordienko, O. V., & Sokolova, A. A. (2020). A humanitarian approach to the digitization of education. *Education and Self Development, 15*(3), 89–96. https://doi.org/10.26907/esd15.3.08

Lucas, M., Bem-Haja, P., Siddiq, F., Moreira, A., & Redecker, C. (2021). The relation between in-service teachers' digital competence and personal and contextual factors: What matters most? *Computers & Education, 160*, 104052. https://doi.org/10.1016/j.compedu.2020.104052

Mateo Alcántara, W., & Pérez González, O. (2024). Formación conceptual y tecnologías digitales en el Cálculo Diferencial para Ingeniería. *Varona, 79*, 1–17.

Oguguo, B., Ezechukwu, R., Nannim, F., & Offor, K. (2023). Analysis of teachers in the use of digital resources in online teaching and assessment in COVID times. *Innoeduca. International Journal of Technology and Educational Innovation, 9*(1), 81–96. https://doi.org/10.24310/innoeduca.2023.v9i1.15419

Ortega-Rodríguez, P. J., Gómez-García, M., Boumadan, M., & Soto-Varela, R. (2022). Media literacy of university students for creating digital contents. *Innoeduca. International Journal of Technology and Educational Innovation, 8*(2), 69–82. https://doi.org/10.24310/innoeduca.2022.v8i2.14169

Özerbaş, M., & Öçal, F. (2019). Digital literacy competence perceptions of classroom teachers and parents regarding themselves and parents' xx own children. *Universal Journal of Educational Research, 7*(5), 1255–1264. https://doi.org/10.13189/ujer.2019.070511

Pettersson, F. (2021). Understanding digitalization and educational change in school by means of activity theory and the levels of learning concept. *Education and Information Technologies, 26*(1), 187–204. https://doi.org/10.1007/s10639-020-10239-8

Pons-Salvador, G., Zubieta-Méndez, X., & Frias-Navarro, D. (2022). Parents' digital competence in guiding and supervising young children's use of the Internet. *European Journal of Communication, 37*(4), 443–459. https://doi.org/10.1177/02673231211072669

Rahayu, N. W., & Haningsih, S. (2021). Digital parenting competence of mother as informal educator is not inline with internet access. *International Journal of Child-Computer Interaction, 29*, 100291. https://doi.org/10.1016/j.ijcci.2021.100291

Ramírez-Rueda, M. C., Cózar-Gutiérrez, R., Colmenero, M. J. R., & González-Calero, J. A. (2021). Towards a coordinated vision of ICT in education: A comparative analysis of preschool and primary education teachers' and parents' perceptions. *Teaching and Teacher Education, 100*, 103300. https://doi.org/10.1016/j.tate.2021.103300

Rasskazova, E. I., & Soldatova, G. V. (2014). Assessment of the digital competence in Russian adolescents and parents: Digital competence index. *Psychology in Russia, 7*(4), 65–74. https://doi.org/10.11621/pir.2014.0406

Reyes-Alardo, L. V., Guzmán-Mena, L., Cruz, R., & Munoz, D. (2024). From digital exclusion to digital inclusion: How is the Dominican Republic fostering a digital culture? *From digital divide to digital inclusion: Challenges, perspectives and trends in the development of digital competences* (pp. 217–241). Springer Nature Singapore.

Richardson, M. D., Lemoine, P. A., Stephens, W. E., & Waller, R. E. (2020). Planning for cyber security in schools: The human factor. *Educational Planning, 27*(2), 23–39.

Riggio-Olivares, G. (2020). Evolución y estado actual de la ciencia y la tecnología en República Dominicana. *Ciencia y Sociedad, 45*(2), 7–32. https://doi.org/10.22206/cys.2020.v45i2.pp7-32

Robinson, L., Cotten, S. R., Ono, H., Quan-Haase, A., Mesch, G., Chen, W., & Stern, M. J. (2015). Digital inequalities and why they matter. *Information, Communication & Society, 18*(5), 569–582. https://doi.org/10.1080/1369118X.2015.1012532

Rodríguez Fuentes, A., Caurcel Cara, M. J., Gallardo-Montes, C. D. P., & Crisol Moya, E. (2021). Psychometric properties of the questionnaire "Demands and potentials of ICT and apps for assisting people with autism"(DPTIC-AUT-Q). *Education Sciences, 11*(10), 586. https://doi.org/10.3390/educsci11100586

Ruiz-Palmero, J., Gámez, F. D. G., & Tomczyk, L. (2023). Permanent training as a predictor of success in the digital competence of Education teachers carrying out the online tutorial action. *Revista Electrónica Interuniversitaria De Formación Del Profesorado, 26*(1), 1–12. https://doi.org/10.6018/reifop.542181

Santos, L. M., Grisales, D., & Rico, J. S. (2021). Percepción y Accesibilidad Tecnológica de Universitarios en el Suroeste de República Dominicana durante el Covid-19. *Revista Internacional De Educación Para La Justicia Social, 10*(1), 145–165. https://doi.org/10.15366/riejs2021.10.1.009

Siddiq, F., & Scherer, R. (2019). Is there a gender gap? A meta-analysis of the gender differences in students' ICT literacy. *Educational Research Review, 27*, 205–217. https://doi.org/10.1016/j.edurev.2019.03.007

Subrahmanyam, G. (2022). *Trends mapping study: Digital skills development in TVET teacher training*. UNESCO–a global leader in education.

Szymkowiak, A., Melović, B., Dabić, M., Jeganathan, K., & Kundi, G. S. (2021). Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people. *Technology in Society, 65*, 101565. https://doi.org/10.1016/j.techsoc.2021.101565

Tomczyk, L., Mascia, M. L., Gierszewski, D., & Walker, C. (2023). Barriers to digital inclusion among older people: a intergenerational reflection on the need to develop digital competences for the group with the highest level of digital exclusion. *Innoeduca. International Journal of Technology and Educational Innovation, 9*(1), 5–26. https://doi.org/10.24310/innoeduca.2023.v9i1.16433

Zhu, S., Yang, H. H., MacLeod, J., Shi, Y., & Wu, D. (2018). Parents' and students' attitudes toward tablet integration in schools. *International Review of Research in Open and Distributed Learning, 19*(4), 222–241.

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