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ORIGINAL

Measuring Rural Teachers' Digital Competence to Communicate with the Educational Community

Francisco David Guillén-Gámez[1] and María José Mayorga-Fernández[2]

[1]Department of Didactics and School Organisation, University of Córdoba, Spain
[2]Department of Didactics and School Organisation, University of Málaga, Spain

ABSTRACT

Teachers' communication with the educational community (students, families and teachers) may be different depending on the place where they reside. We ask ourselves whether teachers in rural areas are sufficiently prepared to carry out this communication through digital media. Thus, this study had as its aims to: (1) ascertain teachers' digital competence self-assessment about the utilisation of ICT resources to communicate with other teachers, students and families, according to gender, type of school, age and years of teaching experience; (2) analyse comparatively if significant differences exist in terms of digital competence level between the internal categories of each variable; (3) identify which digital resources are significant predictors. A non-experimental design was used with 847 rural teachers from different rural areas in Spain. The results showed an integrating attitude of every teacher-expert in their digital skills, regarding communication both with students and their families and with the other colleagues at the educational centre. We found differences in teachers' scores when comparing by gender and type of centre. Furthermore, we checked those applications such as Blogs, TikTok, Twitter and Moodle served were relevant predictors.

Keywords RURAL EDUCATION, EDUCATIONAL TECHNOLOGY, TEACHERS, COMPUTER LITERACY

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Corresponding Author
Francisco David Guillén-Gámez, dguillen@uco.es

Facultad de Ciencias de la Educación (Universidad de Córdoba). Calle San Alberto Magno, s/n, 14071, Córdoba, Spain.

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1 INTRODUCTION

Education is a child's right and, therefore, it must be accessible and present in all geographical areas (Smit, Hyry-Beihammer, & Raggl, 2015), both rural and urban ones. In the Spanish territory, although an urban society predominates, a large rural population exists. More specifically, rural areas represent 15%, intermediate rural-urban areas account for 52% and urban areas amount to 33% (Eurostat, 2020). Nevertheless, this educational context has been neglected and, at times, abandoned by educational policies (Gurría-Gascón & Nieto-Masot, 2020). Within the European context, rural regions constitute half of EU's territory (Dyba et al., 2020; Eurostat, 2015). Internationally, according to UN data, 55% of the world's population live in urban areas, a proportion that will reach 68 percent by 2050 (UN, 2018).

In the light of these figures, rural areas own great potential in all spheres of life (Sørensen, 2018) and it consequently becomes essential to put the focus of research on these types of areas.

Regardless of where rural communities are located: in remote regions, in the countryside, in forests or mountains (Dube, 2020) and, despite the fact that they generally have fewer connections (Townsend, Sathiaseelan, Fairhurst, & Wallace, 2013), the right to access the education system has been largely enhanced in recent years thanks to the development of the digital age (Li, Brar, & Roihan, 2021). All the same, large differences still exist between urban and rural geographic areas, both in respect of infrastructure quality (Molina-Pacheco & Mesa-Jiménez, 2018; Roberts, Beel, Philip, & Townsend, 2017) and concerning the performance of educational practices (Bhuasiri, Xaymoungkhoun, Zo, Rho, & Ciganek, 2012), where rural areas show lower availability, adoption and use levels when it comes to new educational technologies (Salemink, Strijker, & Bosworth, 2017).

These disadvantages likewise become evident among teachers who work in rural areas, due to the lack of digital resources (Park, 2017), the low social and economic viability of sustaining technological improvement (Cristobal-Fransi, Montegut-Salla, Ferrer-Rosell, & Daries, 2020) or even the absence of teacher training (Kumar & Kumara, 2018; Xie, Tosto, Chen, & Vongkulluksn, 2018): in short, this results in a persistence and increase of the aforementioned digital gap during the last few years. Furthermore, non-governmental organisations are tasked with providing infrastructure and ICT resources to rural schools in many geographical areas around the world, which means that these schools do not benefit from government subsidies and policies (Rana, Greenwood, Fox-Turnbull, & Wise, 2018). This situation greatly hinders the exchange of scientific knowledge and innovation in such rural areas (Jiang & Chen, 2018). Nonetheless, without a doubt, one of the main barriers for teachers is that "we are so busy in school and in our private time… so… how will we be able to find time to meet other teachers and work with them in any professional learning projects with technology?" (Jamil, 2018, p. 6).

Another added difficulty lies in the fact that, as Johnson and Lichter (2019) point out, rural villages with few inhabitants are the most likely to see another exodus, which eventually leads to the closure of rural schools. Consequently, several schools from different villages have necessarily been grouped together into a unified school, the so-called "Grouped Rural School" (GRS). As a result, if innovations in rural schools were already rare, they take place even to a lesser extent in GRSs (Romo, 2017).

Faced with this context, if teachers want to comply with the new educational requirements, they must not only make use of the necessary infrastructures and resources but also be provided count on extensive digital training (Othman, 2020) that allows them to implement technologies with a more pedagogical than technological approach (Käck, 2019). In this sense, digital resources have a direct effect on the behaviour of teachers (Artuso & Graf, 2020), who definitely need to reconsider how they teach so that they can effectively integrate ICTs into quality training processes (Pettersson & Näsström, 2020), adapting ICT to each context, especially in the rural environment (De Souza & Garcia, 2019). However, according to (Yang, Zhu, & Macleod, 2018), rural teachers do not fully adapt emerging technolo-

gies to their educational context, which not only hinders the teaching-learning processes but also hampers interactions with the educational community (Donitsa-Schmidt & Ramot, 2020), even though it has been demonstrated that online communication favours student attention in rural areas Koerwer (2007). As Räisänen and Tuovinen (2020) point out, in order to achieve digitalisation in rural areas, we need confident people who, in addition to being good communicators, know how to promote digital innovation. Concerning this, it becomes necessary to state that rural teachers willing to integrate ICT into the teaching-learning process must have a positive attitude towards that ICT integration (Wang, Tigelaar, & Admiraal, 2019). Research has shown that strong links exist between positive attitudes towards digital educational resources and the likelihood of ICT integration (Taimalu & Luik, 2019).

In brief, traditional face-to-face teaching is arguably no longer sufficient in the current era, which makes it essential to reinvent new ways of teaching and communication (Plessis & Mestry, 2019), redesigning methodologies and activities (Stenman & Pettersson, 2020) and using e-Learning platforms (Golikov et al., 2018), digital educational resources (Hunt et al., 2015), or even smartphone apps (P. P. Nedungadi, Menon, Gutjahr, Erickson, & Raman, 2018). These new educational processes go beyond classroom walls, making it more urgent than ever to establish new and operational channels of ongoing communication and interaction between teachers, students and families (Macdonald & Hill, 2021) —especially so in rural environments— to provide the educational support required (De Metz & Bezuidenhout, 2018). Nevertheless, in order to establish such channels, teachers must have a high degree of digital competence, at expert level, so that they can draw the maximum benefits from educational technology when it comes to improving their teaching and learning processes. This applies to communication in particular, both with students and with their families, and even with other colleagues, i.e. involving each and every member of the educational community.

In view of these new educational demands and the need to face them, the authors of this work ask ourselves: Are teachers in rural areas prepared to communicate with the educational community on a digital basis? What self-assessment of their digital competence do they have? Are there digital applications that affect its development?

2 RELATED WORKS

Although digital technologies currently help to promote equity, inclusion, access and communication in education, this can only be achieved if teachers own the necessary skills to use, design and sustain high-quality teaching with in digital environments.

In the international context, Stenman and Pettersson (2020) produced an analysis about primary and secondary school teachers' level of digital competence for e-learning in rural areas of Sweden (n= 10). Using a mixed methodology, participants reported a good competence level when it came to pairing subject contents with ICTs. However, they highlighted a lack of knowledge on how to take advantage of technology to improve communication in online teaching. Dube (2020) carried out a qualitative study with students and teach-

ers from South African rural schools (n=15). The findings resembled the previous ones, a lack in digital competence appeared visible due to the unavailability of resources to connect to the Internet, as well as of a learning management system and low-tech software. In turn, Dahal (2021) analysed the perceptions of rural teachers and students (n=9) from Nepal about school infrastructure and digital literacy. A qualitative design based on observation and interviews showed to reveal gaps: in teacher training (micro level); at school level with the available technological resources (meso level); and regarding teacher training through educational policies (macro level). Rana et al. (2018) and Rana, Greenwood, and Fox-Turnbull (2020) conducted several qualitative studies in various remote and rural Nepalese areas (Himalayan, Hilly and Terai) with teachers from five Primary Education schools. The results emphasised that one of the main barriers is the lack of educational policies developed to provide ICT infrastructure and resources in rural contexts compared to urban ones. Regardless of the location in which teaching took place, the **World Bank (2020)** argued that very few teachers had received adequate training in learning environments and digital tools to work online during that complicated year.

As for Spain, Álvarez Álvarez and García-Prieto (2021) undertook a quantitative analysis about the digital communication between educational community members during confinement. These authors used a sample of 306 teachers who developed their professional activity in 157 Spanish schools. The results highlighted that e-mail and popular applications (Blogs, Google+, WhatsApp, Telegram) have contributed to minimising both the digital divide and the exclusion of students. However, this study did not examine teachers' self-perception of their technological skills. Less favourable findings stemmed from the research work authored by Ruiz (2020): Spanish rural teachers make a limited use of ICT due to poor training in digital skills. In the same context, Moral-Pérez, Martínez, and Piñeiro (2014) used questionnaires and interviews to investigate the digital training level of 117 rural teachers from Asturias (Spain). The results exposed that only half of them were adequately trained to harness ICTs didactically. More encouraging outcomes were evidenced by Raso, Hinojo, and Sola (2015) when they checked that most of the teachers from a sample of 59 teachers working in rural public schools located in the Granada province (Spain) used ICTs to create teaching materials, with male teachers feeling more autonomous than their female counterparts.

Regarding the use of particular digital resources, García, Fernández, and Vera (2018) found in a sample of 54 rural teachers from Murcia (Spain) that 3D printing, Virtual Reality and Augmented Reality were hardly ever used —unlike Blogs. In another Spanish rural context of Almería, on this occasion, Reyes (2019) examined the self-perceptions of 15 Primary Education students together with their teacher's. The results showed that the teacher was lacking in digital training, the little utilisation of digital resources focusing on Guadalinex, OpenOffice or especially the digital whiteboard, which was hardly ever used. P. P. Nedungadi et al. (2018) applied an ethnographic design to analyse the interaction produced via WhatsApp between 19 teachers and 5 cluster coordinators from rural India (in the Uttarakhand villages), identifying an improvement not only in students' academic performance but also in tutorial guidance, motivation, attendance, pedagogical content and problem-solving

among school coordinators.

Likewise, gender may arise as a useful variable when it comes to explaining teachers' ICT competence development levels. Although several studies have analysed the degree of digital competence in education according to gender (Hammou & Elfatihi, 2019), hardly any seems to have done so in a rural context. Dominguez et al. (2018) found in a quantitative design carried out with 68 men and women that females had lower digital competence levels than males in a rural community from southern Yucatan (Mexico), mainly concerning access to technology and its use. P. Nedungadi, Mulki, and Raman (2018) also identified significant differences between male and female ICT inclusion levels in Indian rural schools, with males having higher ones. These differences most probably had to do with the fact that women received little or no support from family members on issues related to employability or entrepreneurship (Sánchez & Sánchez, 2017). However, these results are not corroborated by other studies which did not find significant gender-based differences between the attitudes of 324 male and female students from two urban and rural Senior High Schools in Ghana, although they did reveal differences between rural and urban students (Sarfo, Amartei, Adentwi, & Brefo, 2011).

Other predictors investigated include age and teaching experience as well. Wang et al. (2019) examined the factors that could explain why 462 teachers from 25 rural schools located in three different areas throughout Western China did not always use digital resources in the same way. According to their findings, teachers older than 55 and those with less than three years' experience were more unlikely to utilise digital educational resources. These results match those of Raso et al. (2015) —the youngest Spanish teachers are the ones who most frequently resort to e-mail for communication purposes— and Jamil (2018), whose focus was on analysing the perceptions of 207 Secondary Education teachers working in rural areas of Bangladesh (South Asia) by means of a mixed design. A possible explanation for these results could be that junior teachers in their first years of teaching went had a steeper learning curve: using ICTs within a school environment, innovating where possible and managing in the classroom (Russell, O'Dwyer, Bebell, & Tao, 2007).

As evidenced by the literature, the studies examined have focused on finding out about the degree of integration of ICT into teaching-learning processes in rural areas, nearly always through qualitative designs with interviews or ethnographic observation and seldom resorting to quantitative designs. Added to this, no research was undertaken to analyse teachers' digital skills to communicate on a regular basis —using digital resources— not only with colleagues and coordinators at educational centres but also with students and their families. In this sense, the main objective sought with this quantitative study precisely consisted in determining how teachers harness ICTs to stay in touch with students as well as with their families. We have broken down this general objective into three specific goals:

- O1. To ascertain teachers' digital competence self-assessment about the utilisation of ICT resources to communicate with other teachers, students and families, according to gender, type of school, age and years of teaching experience.
- O2. To analyse comparatively if significant differences exist in terms of digital competence level between the internal categories of each variable (gender, type of school,

age and years of experience).

- O3. To identify which digital resources are significant predictors.

3 METHODS

3.1 Approach, Design and Sample

This is a quantitative study which can be more specifically defined as non-experimental and ex post facto. We opted for this approach because hardly any studies on teaching digital competence among teachers from rural areas had used it, most having relied on qualitative approaches instead.

A non-probabilistic purposive sample was used due to the ease in management, time and money for data collection (Etikan, Musa, & Alkassim, 2016). The questionnaires were sent via e-mail during the months of January and February 2021, the e-mails being subsequently collected from the websites of the different Spanish universities. The survey was completed anonymously, thus preserving data confidentiality. The sample comprised a total of 847 teachers from schools located in Spanish rural areas. More precisely, 73.5% (n= 622) belonged to rural schools, while 26.5% (n= 225) developed their teaching activity in GRSs. Regarding gender, 68.6% (n= 581) were females with an average age of 41.80 years and 15.02 years of teaching experience, whereas 31.4% (n= 266) were males averaging 43.84 years of age and 17.05 years of teaching experience.

3.2 Instrument

The questionnaire designed by Rufete, Cascales, and Gomariz (2020) helped served to measure the level of teachers' digital competence development as far as the use of ICT resources to enhance student-family-teacher communication is concerned, or expressed differently and more specifically, our aim was measuring the level of self-assessment that teachers believe they have. Unfortunately, this instrument lacked the psychometric properties required to be considered valid and reliable for measuring this digital competence. Hence, Guillén-Gámez, Mayorga-Fernández, and Contreras-Rosado (2021) to carry out a satisfactory model of the instrument in which all the necessary psychometric properties were verified so as to ensure its validity and reliability. Below can be found the three dimensions around which this study revolved:

1. Tutor's interactions with students (amounting to 9 items). The role of a tutor in relation to the students can be understood as a type of communication through digital resources which includes a follow-up and feedback of students' academic learning with more personalised attention; alongside guidance and help regarding doubts that students may have about their academic and work future;
2. Tutor's functions in relation to the teaching staff (6 items in total). The emphasis is laid here on teachers' abilities to participate both in collaborative work and in tasks of coordination with other fellow teachers who develop their work in the same educational centre by means of digital resources; and

3. Tutor's functions regarding students' families (8 items). These items are oriented on the skills that a tutor has to provide parents with useful information about their children's educational process through digital media. Interactivity with parents via digital resources is also promoted, additionally offering support and motivation when they have doubts about their sons and daughters' learning.

The level of development of teachers' digital competence was measured using a five-point Likert scale, where the value 1 is associated with very low and the value 5 with very high.

As for the reliability of the instrument used, different types of coefficients helped to verify it (Cronbach's alpha, Spearman-Brown, Guttman and Omega McDonald). Table 1 shows the values obtained in each index, for each dimension and for global competence. All the coefficients yielded very satisfactory results.

Table 1 Instrument reliability

Reliabilty/Dimension	DIM 1	DIM 2	DIM 3	TOTAL
Cronbach	0.878	0.881	0.844	0.948
Spearman-Brown	0.860	0.861	0.843	0.893
Guttman	0.826	0.858	0.816	0.890
Omega McDonald	0.929	0.944	0.906	0.995

The validated test was performed by means of EFA (Exploratory Factor Analysis) and CFA (Confirmatory Factor Analysis). A Spanish sample (n= 847) divided into two randomly drawn subsamples permitted to analyse the instrument's internal structure (following the recommendations found in Hinkin, Tracey, and Enz (1997). The sample used for EFA included 553 randomly selected subjects, while the remaining ones served to perform the CFA.

In EFA, the maximum likelihood method is used with oblique rotations in SPSS V.24 software jobs. Kaiser-Meyer-Olkin index was appropriate (KM = 0.910), Bartlett's quadratic test result being significant (χ^2 5188,534.009; sig. <0.05). EFA detected three latent factors and the model explained 66.18% of score value variance in the instrument. To be precise, dimension A obtained 43.95% of the true variance in the instrument, with 13.02% corresponding to dimension 2 and 9.21% to dimension 3. For CFA, we utilised the AMOS V.24 software. The instrument showed adequate psychometric properties as recommended by Bentler (1989): CMIN / DF (mean square / degree of freedom <3) = 3.551, p = <0.05; CFI (comparative fit index> 0.7) = 0.923; TLI (Tucker-Lewis index> 0.7) = 0.901; NFI (normalized fit index> 0.7) = 0.901; RMSEA (mean square error of approximation <0.1) = 0.068, with thresholds between 0.063 and 0.073. Figure 1 shows the confirmatory model which provides the standardised regression weights of the latent items and dimensions in this model. A description of those items can be found in the article by Guillén-Gámez et al. (2021).

In addition to the items mentioned above, the authors asked demographic questions at the beginning of the questionnaire in order to meet objective number 3 of their study. The choice of specific ICT tools paid attention to those digital resources which society frequently

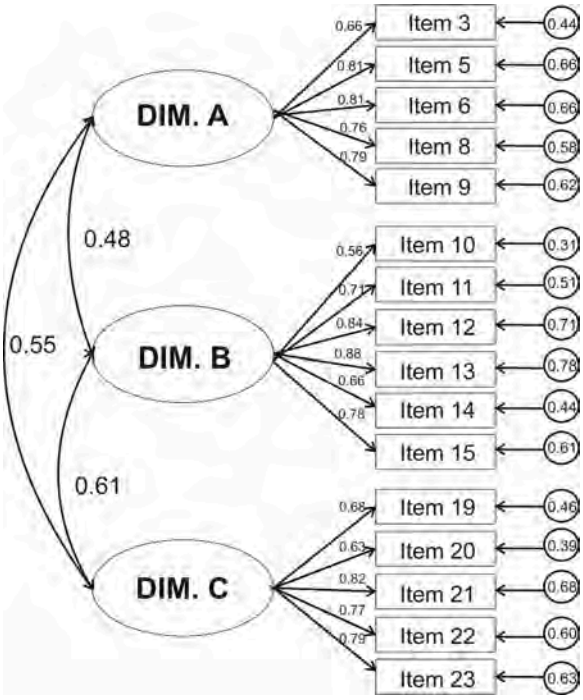

Figure 1 Confirmatory model

uses to communicate. More precisely, teachers were asked if they also utilised these tools to communicate with the rest of the educational community in a type of formal communication.

3.3 Procedure and Data Analysis

Firstly, a differential analysis about the level of development of teachers' digital competence was performed according to two variables: gender and type of school. Although the data did not meet the assumption of normality, according to Srivastava (1959), non-normality would not have a serious effect on data distribution in large samples (in our case, n = 847). Therefore, the statistical analyses were carried out with parametric techniques. More specifically, Student's t-test for independent samples and ANOVA were used. We coded the variables analysed as follows: gender was coded as dichotomous nominal (male-female); the type of school variable was coded as dichotomous nominal (rural school-GRS school); the variable years of age was coded as nominal polytomous, with three categories (teachers under 39 years of age; teachers between 40 and 49 years of age; and teachers aged 50 or older); and finally, years of teaching experience was coded as nominal polytomous, with three categories (from 0 to 10 years of experience; between 11 and 20 years of experience; and more than 20 years of experience).

Secondly, Student's t-test was applied to determine whether significant differences existed in the variables gender and type of school with respect to the overall digital competence development level in teaching, in relation to answer the question "do they use

digital resources to communicate with members of the educational community (pupils, teachers and families)"?

Finally, the effect size was calculated in those variables where differences had appeared. Hattie (1992) interpreted the magnitude of effect size for educational contexts according to Cohen's formula: values below 0.1 with "developmental effects"; between 0.2 and 0.3 with "teacher effects"; and above 0.4 with "zone of desired effects". This can be recognised in the tables by the letter "d".

4 RESULTS

This section comprises two subsections: in the first one, a differential analysis is made based on the level of development of teachers' digital competence corresponding to each dimension of the instrument, according to gender, type of school, age and years of teaching experience; the second one in turn provides a differential analysis which takes into account the previously analysed variables in which significant differences were found, according to whether or not teachers use a wide range of digital resources to communicate with the rest of the educational community.

4.1 Digital Competence According to Different Academic and Demographic Variables

Table 2 shows the level of development of teachers' digital competence for each instrument dimension according to by gender and school type. With regard to gender, it can be seen that the digital competence level for both genders is medium-high for each dimension of the instrument, as well as in the level overall competence. However, it appears obvious that male teachers score slightly higher than their female counterparts in every dimension, showing significant differences in all of them except for dimension two (Tutor's functions in relation to the teaching staff). As we are working within an educational context and following Hattie's (1992) interpretations, the effect sizes are found to have a medium effect. Remarkably, teachers of either gender have a higher level of digital competence in dimension 2; and yet there are no significant differences.

As for the type of school variable, the digital competence development level in teaching is also medium-high for both types of school in every instrument dimension. Interestingly, no significant differences show up in dimension 1, where the digital competence level of teachers from both types of schools is lower in comparison with the rest of the dimensions in which significant differences were identified between the scores of teachers belonging to both types of school.

Table 3 illustrates the level of development of teachers' digital skills for each instrument dimension according to age and years of teaching experience. For the age variable, it can be seen that the level of teachers' digital competence is also medium-high, with no significant differences between the three age groups analysed, neither for the individual instrument dimensions nor for the overall assessment. Concerning the variable years of experience, the results resemble those for the age variable, as the competence level is medium-high and

Table 2 Teachers' digital competence by gender and type of school

	Gender differences				Type of school			
	Male	Female	sig.	d	GRS	Rural	sig.	d
DIM 1	3.39±1.03	3.00±1.12	0.01*	0.37	3.22±1.00	3.09±1.14	0.18	-
DIM 2	3.73±0.91	3.61±0.96	0.15	-	3.85±0.89	3.58±0.96	0.01*	0.30
DIM 3	3.44±0.92	3.23±0.96	0.02*	0.23	3.44±0.85	3.25±0.98	0.03*	0.22
Global	3.52±0.84	3.27±0.81	0.01*	0.30	3.49±0.78	3.30±0.84	0.01*	0.24

D1: Tutor's functions with students; D2: Tutor's functions in relation to the teaching staff; D3: Tutor's functions regarding students' families. * Significance level at 0.05; d: effect size

no significant differences exist in the level of development of teachers' digital competence between the three age groups under study in the different instrument dimensions and in the overall assessment.

Table 3 Teachers' digital competence according to age and teaching experience

	Age				Years of teaching experience			
	30 or younger	Between 40 and 49	50 or older	sig.	10 or less	Between 11 and 20	20 or more	sig.
DIM 1	3.14±1.05	3.09±1.18	3.14±1.10	0.81	3.12±1.07	3.07±1.15	3.21±1.09	0.49
DIM 2	3.64±0.91	3.66±1.00	3.64±0.92	0.91	3.66±0.92	3.62±0.97	3.68±0.95	0.84
DIM 3	3.31±0.93	3.27±1.02	3.33±0.87	0.86	3.30±0.94	3.22±0.97	3.40±0.93	0.25
Global	3.36±0.78	3.33±0.86	3.36±0.85	0.91	3.36±0.78	3.29±0.83	3.42±0.88	0.52

D1: Tutor's functions with students; D2: Tutor's functions in relation to the teaching staff; D3: Tutor's functions regarding students' families

Until now, we had verified the main effects on each variable, but not the interaction effects between the variables that turned out to be significant (gender * type of school type). In other words, an ANOVA model was carried out which included the variables gender and type of centre as well as their interaction. The general model was significant, $F(3, 847) = 6.029$, $p. < 0.05$. Regarding the gender variable, it also proved to be significant, $F(1, 847) = 12{,}156$, $p. < 0.05$); and so did the variable type of centre, $F(1, 847) = 6.225$, $p. < 0.05$). However, the interaction effect between both variables was not significant, $F(1, 847) = 3{,}173$, $p. > 0.05$.

Taking into consideration that statistically significant differences have only been found regarding teachers' digital competence level according to gender and type of school, we are going to carry out a more in-depth analysis of these variables. We will specifically check for possible differences in the level of development of teachers' overall digital competence when it comes to using a battery of digital resources to communicate with the educational community as a whole, taking into account the variable gender and the type of educational centre to which they belong.

4.2 Analysis in Relation to Teachers' Overall Digital Competence According to Gender, Type of School and Digital Resources

Table 4 shows the level of development of teachers' overall digital competence for both genders with respect to whether or not they use a battery of digital resources to communicate with the other educational community members. With respect to the female gender, it becomes clear that the teachers who use all the digital resources to communicate with the educational community have higher scores than those who do not, except for the app "educational centre platform". In addition, significant differences arise between teachers who use Blogs, TikTok, Facebook, Twitter, ClassDojo and Moodle and their colleagues who do not. More precisely, TikTok, Facebook and ClassDojo have a medium effect size (teacher effects) compared to Blogs, Moodle and Twitter's large effects (zone of desired effects). As for males, teachers using digital resources clearly seem to obtain slightly higher scores than those who never use them, with the exception of the application "Centre platform". Furthermore, significant differences exist between teachers who resort to Blogs, Centre platform, WhatsApp, TikTok, Facebook, Twitter and Moodle and their colleagues who never do so. In specific terms, effect sizes vary between "teacher effects" and "Zone of desired effects".

Table 4 Significant predictors with respect to gender

	Female				Male			
	Yes	**No**	**sig.**	**d**	**Yes**	**No**	**sig.**	**d**
Blogs	3.46	3.10	0.01*	0.45	3.77	3.29	0.01*	0.61
Centre platform	3.29	2.98	0.18	-	3.58	3.09	0.01*	0.59
Instagram	3.48	3.26	0.16	-	3.85	3.50	0.17	-
WhatsApp	3.32	3.24	0.35	-	3.65	3.13	0.01*	0.45
TikTok	3.84	3.25	0.01*	0.74	4.89	3.50	0.01*	1.68
Facebook	3.61	3.22	0.01*	0.49	3.88	3.45	0.01	0.63
Twitter	3.90	3.17	0.01*	1.04	3.89	3.43	0.01*	0.53
Google+	3.32	3.19	0.11	-	3.46	3.64	0.23	-
ClassDojo	3.41	3.20	0.02*	0.27	3.68	3.41	0.03*	0.33
Moodle	3.49	3.16	0.01*	0.43	3.77	3.32	0.01*	0.56

Table 5 describes the level of development of teachers' overall digital skills for both types of educational centres, focusing on whether or not they use a wide range of digital resources to communicate with the other agents in the educational community. In relation to rural schools, it becomes evident that those teachers who use digital resources for communication have reached higher digital competence development levels than those who do not, with the only exception of Centre platform. More precisely, the level of competence is similar in the case of WhatsApp, regardless of whether teachers use it or not. Instead, significant differences appeared between teachers in rural schools using Blogs, Centre platform, TikTok, Facebook, Twitter, ClassDojo and Moodle. Effect sizes ranged from medium to large. Regarding the GRS group, similar results were found to those obtained for teachers belonging to rural schools: teachers using a battery of digital resources to communicate own higher digital competence development levels than those who never use them, except for the Cen-

tre platform resource. Significant differences were specifically observed in relation to the use of Blogs, TikTok, Twitter and Moodle, with large effect sizes.

Table 5 Significant predictors regarding the type of centre

	Rural				GRS			
	Yes	**No**	**sig.**	**d**	**Yes**	**No**	**sig.**	**d**
Blogs	3.53	3.11	0.01*	0.51	3.62	3.33	0.03*	0.38
Centre platform	3.34	2.93	0.01*	0.57	3.46	3.49	0.86	-
Instagram	3.60	3.28	0.12	-	3.51	3.49	0.94	-
WhatsApp	3.33	3.34	0.14	-	3.53	3.44	0.52	-
TikTok	3.91	3.29	0.02*	0.74	4.02	3.26	0.04*	0.72
Facebook	3.74	3.23	0.01*	0.66	3.58	3.48	0.57	-
Twitter	3.81	3.21	0.01*	0.74	4.09	3.37	0.01*	0.99
Google+	3.35	3.20	0.13	-	3.42	3.31	0.18	-
ClassDojo	3.49	3.21	0.01*	0.34	3.55	3.45	0.43	-
Moodle	3.54	3.15	0.01*	0.48	3.76	3.35	0.01*	0.57

* Significance level at 0.05; d= effect size

5 DISCUSSION

This work focused on ascertaining the self-perception of teachers at schools located in rural areas about their level of digital competence to communicate with other educational community members. At this stage of development, the influence of variables such as gender, type of centre, age and years of teaching experience was considered. The results have showed that the level of self-perception about their digital competence of teachers working in rural areas is medium-high, regardless of their gender. This may indicate that these teachers have adequate training in relation to new technologies, in keeping with the results obtained by Moral-Pérez et al. (2014), Stenman and Pettersson (2020) and Othman (2020), among others and, contrary to the findings of Ruiz (2020), Dube (2020) and Dahal (2021), according to whom teachers in rural areas are lacking in digital knowledge and training **World Bank, 2020)** (Kumar & Kumara, 2018; Xie et al., 2018).

Irrespective of the results above, it is worth noting that male teachers scored slightly higher. This coincides with the conclusions drawn in the study by Dominguez-Castillo, Cisneros-Cohernour, and Barberà (2018) where female teachers showed a lower level of digital competence development than their male counterparts, and Raso et al. (2015), who found that male teachers felt more autonomous to use ICTs than their female colleagues. In the same vein, P. Nedungadi et al. (2018) stated that men included ICTs in their teaching to a greater extent, i.e. ICTs were part of their day-to-day teaching in the classroom and their level of development was consequently higher. This may be due to the fact that female teachers, even today, continue to have less support for tech training (Sánchez & Sánchez, 2017). However, it should be noted that no significant differences were arose in the second questionnaire dimension, which indicates that both men and women have reached the same

level of development regarding their digital competence to use ICT resources to communicate with their colleagues. A plausible explanation for these results could lie in the fact that male and female teachers work collaboratively, thus ensuring bidirectional communication and development.

In relation to the type of centre (rural-GRS), it deserves to be highlighted that the participating teachers have a medium-high digital competence development level. More specifically, significant differences become visible in the second and third dimensions of the instrument, that is, differences exist between the digital competence development level of teachers in rural centres and GRSs regarding communication with colleagues and families, but none were found with pupils. To be precise, the GRS group scored higher, which probably has to do with the fact that, because they group together different institutions, these centres have to use ICTs to a greater extent in order to establish adequate communication with the educational community, even though innovations are less frequent Romo (2017). Nevertheless, it constitutes a priority for both rural schools and GRSs to know how to adapt ICTs to their respective contexts and needs (Yang et al., 2018). To this end, it becomes essential to rethink ICT use so as to provide quality teaching-learning processes (Pettersson & Nässtrom, 2020), with a more pedagogical approach (Käck, 2019), prioritising their use as channels for interaction (Donitsa-Schmidt & Ramot, 2020) and communication (Koerwer, 2007; Plessis & Mestry, 2019).

With respect to the age variable, the results of this study have evidenced that teachers have a medium-high development level as regards digital competence. Age was not a relevant factor, or expressed differently, based on this study, this variable does not appear as a determining factor for teachers' ability to reach a particular level of digital competence development. This poses a contrast with the study by Russell et al. (2007) by showing that younger teachers had a higher level of digital competence, and also with the results achieved by Raso et al. (2015) by providing evidence that younger teachers used digital resources more often to communicate in an educational way, for example by means of e-mail. As for the teaching experience variable, it did not seem to condition digital competence development either. These findings do not match those obtained by other studies which confirmed that both age and years of experience did have an influence on the digital competence variable (Wang et al., 2019).

Finally, analysing what digital resources were used by teachers in rural areas in order to communicate with the different members of the educational community revealed that several digital resources have a significant impact on this professional competence when it comes to such variables as gender and type of centre.

Concerning the gender variable, significant differences were found for both categories depending on whether teachers used Blogs, TikTok, Facebook, Twitter and Moodle or not to communicate with the educational community. As a possible explanation for this, the fact that they require greater knowledge of their use for educational purposes makes these digital resources less common and popular among teachers in their professional practice. It should likewise be noted that both genders show a medium level in the resource platforms of Educational Centres. Perhaps this relates to political and social variables rather than to

academic ones, given that, as has been shown in scientific literature, rural centres tend to have less infrastructure (Dahal, 2021; Molina-Pacheco & Mesa-Jiménez, 2018; Park, 2017; Roberts et al., 2017) and often face problems associated with little social and economic viability to invest in technologies (Cristobal-Fransi et al., 2020) or little governmental involvement (Gurría-Gascón & Nieto-Masot, 2020; Rana et al., 2020, 2018).

Regarding the type of school variable, it becomes evident that those teachers who use digital resources for communication have higher levels of digital competence development than those who never resort to them. Significant differences also appeared for both school types in the utilisation of Blogs, TikTok, Twitter and Moodle. Regarding WhatsApp, Instagram and Google+ applications, no striking differences were found between teachers who use them and those who do not. A reason for these results could be that these digital resources are widespread in society and thus used on a daily basis. Despite this, the study by P. P. Nedungadi et al. (2018) concluded that the use of applications such as WhatsApp had a positive influence on influenced both the performance and motivation of students.

In short, the main differences when it comes to using Blogs, TikTok, Twitter and Moodle clearly arise in the variables gender and type of school. It is worth pointing out that fewer innovative educational practices are found in rural areas (Bhuasiri et al., 2012; Salemink et al., 2017), where teachers are, however, increasingly implementing ICTs for academic purposes. This contradicts the findings made by Kumar and Kumara (2018).

6 CONCLUSIONS

After conducting an in-depth analysis of the scientific literature and drawing a comparison between its findings and the results of teachers' self-assessment on their digital competence in this study, some contradictions arise, since, according to different authors, rural teachers do not have an adequate level of development as far as digital competence is concerned (Dahal, 2021; Dube, 2020; Kumar & Kumara, 2018; Xie et al., 2018). The results achieved in this work seem encouraging, since they show a high degree of involvement of teachers about how to continue communicating with other educational community members through digital media.

Despite the fact that communication channels via digital applications are expanding little by little within the educational community as a whole, greater economic investment is considered necessary to improve communication channels with families and students, so that fluid and multidirectional communication can be ensured. To this end, the wide range of digital resources used by the teaching staff involved in this study makes it possible for digital communication between all community members to remain alive and effective. Furthermore, the implementation of these digital applications can be regarded as an educational innovation, both in the classroom and at a broader school level (Jiang & Chen, 2018). We agree with Stenman and Pettersson (2020) that more and more teachers are beginning to redesign their methodologies and activities via digital resources and platforms (Golikov et al., 2018) from a pedagogical point of view (Barron, Tracy, Howell, & Kaminski, 2015).

Although we have undoubtedly made great headway in achieving this transformation towards a more digital world, training strategies must be designed and implemented that take into account the pros and cons of introducing these digital resources both in the teaching-learning processes and in the interactions and communication with the entire educational community. These need to be analysed in depth. Perhaps a good, cost-effective option for educational centres is to promote massive courses such as MOOCs, focusing on those digital applications where the teaching staff are lower skilled.

With respect to the limitations faced in this study, we must reflect on its weaknesses and how to address them in future research works. Its main weakness may well be the type of sample used. Related studies deal with to rural teachers from different cultures and countries and are therefore difficult to compare. A different specific digital gap may exist in each territory, caused by social, economic or political aspects or by the educational level of the teaching staff. Furthermore, we applied purposive sampling, which indicates that the sample is not random and, consequently, the results obtained should not be extrapolated to the general population of all rural schools. It would be interesting to have representative samples of teachers from similar rural areas in the European continent so that a collective view on this group's digital competence level could be given.

Another limitation relates to the type of design adopted (non-experimental, ex post facto). It would also be useful to implement pre-experimental designs where MOOC courses focusing on the digital resources examined in this work are put into practice. By means of pre- and post-test designs, this method would allow us to ascertain the extent to which teachers' competences for communication with the educational community have been strengthened.

Lastly, our study has centred on around teachers' self-assessment, where significant differences usually exist regarding gender, which in turn is inconsistent with objective assessment processes. Therefore, we must be cautious with these results and think critically about how to continue analysing both? this predictor and digital competence in the near future, through self-assessments or knowledge assessments.

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