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Incidence of Gender in the Digital Competence of Higher Education Teachers in Research Work: Analysis with Descriptive and Comparative Methods

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Abstract: The purpose of this study is to analyse and compare the level of digital competence of higher education teaching staff in research work through the use of ICT resources. For this purpose, an ex post facto design was employed together with an instrument composed of 30 items classified into seven dimensions: digital skills, digital ethics, digital flow, anxiety towards ICT, quality of ICT resources, intention to use ICT, and ICT integration. The sample consisted of a total of 1704 higher education teachers from all over Spain. The results showed that, overall, there were no significant differences in the level of digital competence of teaching staff between the two genders. However, significant differences were found in the following dimensions: digital skills, digital ethics, ICT anxiety, quality of ICT resources, and intention to use ICT. These findings highlight the urgent need for university institutions to propose training plans to improve the digital competences of their teaching and research staff in those dimensions that have been found to be deficient.

Keywords: education technology; ICT resources; research work; higher education; teaching staff; educational research methods; quantitative analysis

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1. Introduction

Currently, the significant advances that have taken place in information and communication technologies (ICT) have created a favourable and enriching environment for developing new and innovative education and research approaches in higher education [1,2], since they facilitate more efficient ways of managing the work of teachers [3].

In this context, teachers possessing adequate digital competence are necessary for two reasons: on the one hand, so that these professionals can help prepare their students for the labour market [4], since it has been found that teaching characteristics have the greatest influence as a contextual factor on students' use of digital resources [5]. And, on the other hand, to build knowledge, since society is oriented towards a process of mass technification, meaning there is an urgent need for digital empowerment [6,7]. It is thus necessary to focus on the development of digital competence in teacher education [8].

It is vitally important to consider that in the university environment, the teaching function is not limited only to designing lesson programs; teachers must also be creators of knowledge and active researchers [9]. However, as Correa [10] explains, teachers have not sufficiently developed their research competences, which consequently affects their technical skills and the development of the teaching profession. In this sense, ICT is an indispensable and beneficial contributor to the shared creation of knowledge [11] and informational and digital strategies make it possible to put into practice mechanisms for searching and processing relevant and up-to-date information [12]. Therefore, higher

education institutions require teachers with high levels of digital competence in research work [13], and with a scientific background that enables them to carry out research processes [14]. These aims are close to the objectives proposed, for example, in the Horizon Report [15].

However, despite the benefits that ICT bring to the world of education and, specifically, to the research work of teachers, there remain factors that can limit the use of ICT in higher education, including, for example, gender [16], attitude in terms of anxiety towards use of ICT [17], the level predisposition towards innovation [18], or the quality of resources or infrastructure of educational institutions [19,20].

2. Background

Many studies have been conducted to identify which barriers or factors affect the development of teachers' digital competence. This section is organized based on the factors analysed in this study in relation to gender differences.

2.1. Anxiety towards Technology

Saadé and Kira [21] state that the use of technology can have unpleasant side effects, leading to negative emotional states such as frustration, confusion, anger, or anxiety. Other researchers define 'technology anxiety' in teachers as a state of mind of fear or apprehension towards the constant use of digital resources in their teaching practice [22,23]. This anxiety has been considered by different researchers as techno-stress [24] which can be produced by information overload, computer problems, low availability of computer resources, few skills in the use of modern devices, prolonged use of ICT, among other factors [25].

Previous research affirms that female teachers tend to be more nervous and stressed when they have to integrate technology in the classroom [26–28]. For example, Halder and Chaudhuri [29] analysed the computer anxiety of 84 teachers at the University of Calcutta in India. The authors found significant differences between teachers, with higher anxiety scores among female teachers. Semerci and Aydin [30] partially corroborated these results. They analysed technology anxiety in 353 secondary school teachers in Ankara, Turkey, and found that, although there were no significant differences, there was higher anxiety among female teachers. These results are consistent with those obtained by Agbatogun [31].

2.2. Flow Experience (Flow State)

Csikszentmihalyi [32] defines the experience of 'flow' as the combination of enjoyment and intrinsic interest in an activity. Hoffman and Novak [33] found that the more immersed people were in a flow state, the higher their expectations regarding future intentions to use technology were. In relation to this area of research, few studies have been conducted focusing on the gender of teachers, with the focus being mainly on students. For example, Yang and Quadir [34] analysed the flow experience in 50 students, finding that the female gender had a significantly higher occurrence of flow experience than the male gender. Nonetheless, Hsu [35] concluded that male students had a higher occurrence of flow experience than female students. However, other authors have determined the absence of significant differences between the genders [36] in relation to flow experience.

2.3. Digital Skills for Searching, Managing, Analysing and Communicating

Research skills can be defined as a person's practical mastery of searching for information, managing and analysing data, and knowing how to communicate that data with respect to a research problem [37], in this case, through the use of digital resources [38]. The use of ICT creates new situations, for which teachers do not always possess the necessary skills [17].

A number of studies have analysed digital skills according to gender. Alazam et al. [39] analysed the skills of 329 teachers, finding significant differences in relation to the use of data analysis software such as Excel, with male teachers achieving higher scores. However, Saripudin et al. [40] found contradictory results regarding skills related to use

of analysis software (Excel), with no significant differences between the two genders. Sivakumaren et al. [41] analysed the digital research skills of 773 academics by gender. Among the results found, skills in bibliographic management and sites, as well as research skills in research profiles, were higher in females than in males, although there were no significant differences. Avani and Mohamed [42] obtained similar results, highlighting that the female gender used more bibliographic managers than the male gender.

2.4. Digital Ethics

The digital culture of the 21st century entails a great ethical challenge regarding research in the scientific community [43]. It is considered that a good researcher should have adequate knowledge about the basic principles of research ethics [44], which includes good ICT practices [45].

In relation to gender, Smith and Pino [46] analysed the ethical and academic behaviours of 675 students at the University of Georgia in the USA, finding that females scored higher than males on more ethical behaviours. Chee et al. [47] obtained similar results in their study analysing the ethical behaviour of 721 students, also from the University of Georgia, where the female gender showed higher ethical values compared to the male gender. Other studies have produced similar results [48,49].

2.5. Intention and Integration

Studies on ICT have shown the importance of an individual's usage intentions in predicting technology integration behaviour [50,51]. The stronger an individual's intention to use an ICT resource, the more likely it is that integration will materialise [52].

When analysing the gender variable in relation to the intention to use ICT, different studies corroborate the results obtained, establishing that the gender variable does not have a significant influence [53–55]. In relation to integration, studies have found that male teachers integrate technology more frequently [56]. However, other research shows contrary results. For example, Liu et al. [20] analysed the integrations made by 1235 teachers in the state of Florida, USA, finding that male teachers were less likely to incorporate technology in their classrooms. Nevertheless, other studies have found that gender is not related to ICT integration in the classroom [57,58].

2.6. Years of Age of the Teaching Staff

The study of the age variable has been deeply analysed in the scientific community, finding disparate results. For example, Hinojo-Lucena et al. [59] found that the low level of digital competence of teachers was negatively related to both age and years of teaching experience. However, more recent studies such as that of Lucas et al. [60] showed that not only the age of the teaching staff affected their digital competence with higher levels in the younger teaching staff, but that gender also influenced, in favour of the male teaching staff.

Taking into consideration the literature on the factors that affect the development of teaching staff's digital competence, it can be concluded that there are insufficient studies on the use of digital resources by teaching staff in research work, as most of the existing studies have focused on the use of ICT in general. Therefore, the purpose of this study are:

(1) Analyse and compare the digital competence of teachers by age ranges (up to 40 and over 40 years), for each gender, in the use of ICT resources in research work
(2) Statistically compare if there are significant differences in the gender variable, in each age range, for each dimension of the instrument.

3. Method

Design and participants. An ex post facto survey design was used. Data were collected in January 2021. To collect the data, the research team collected the emails of the teaching staff through the websites of the universities. Subsequently, we contacted all the teachers by email, inviting them to participate in an online questionnaire. Prior consent to participate in the study was requested from the teaching staff, taking into account the

Helsinki Declaration, with the protocol first having been approved by the Ethics Committee of the university itself.

Non-probabilistic purposive sampling was carried out, resulting in a sample of 1704 higher education teachers from all over Spain. Table 1 shows the distribution of the sample, which was classified by age range of the teaching staff (up to 40 years and more than 40 years), as well as according to gender and its corresponding average age. It is observed that the teachers of the range up to 40 years of age have an approximate age of 35 years, while for the teachers with more than 40 years of age, the average age is 51 years.

Table 1. Teacher sample distribution.

	Teaching Staff Up to 40 Years		**Male with More than 40 Years**	
	Male	Female	Male	Female
N	199	159	762	582
Average age	35.18	34.75	51.76	51.69

Instrument. To measure the level of development of teachers' digital competence in research tasks, the questionnaire instrument created by Guillen-Gámez et al. [61] was employed. The questionnaire consisted of 29 items classified into seven endogenous and exogenous dimensions through a causal model, as follows: D1—digital skills to search for information, manage it, analyse it, and communicate results (five items); D2—digital ethics in digital research (four items); D3—digital flow in research work (three items); D4—anxiety towards the use of ICT resources for research (five items); D5—quality of ICT resources related to research (three items); D6—intention to use ICT for research work (five items); D7—integration of ICT resources for research (four items). A seven-point Likert scale was used to measure each item. The causal model is shown in Figure 1.

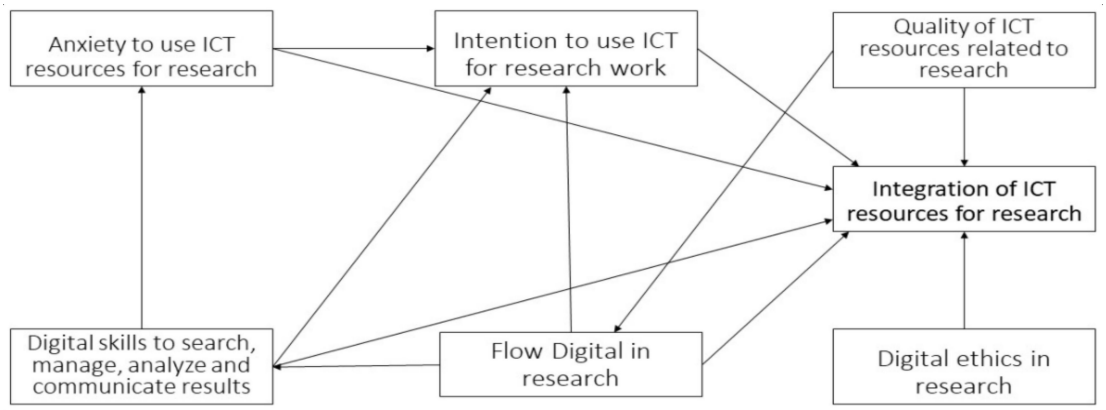

Figure 1. Causal model of the instrument.

As can be seen in the causal model, the dimension integration of ICT resources for research (D7—integration) is influenced by all the dimensions proposed in the aforementioned model. Regarding (D1—digital skills), it is noteworthy that ICT management skills can influence their integration [39], even generating negative sensations [17], so the anxiety dimension towards technology (D4—anxiety) also has repercussions directly. Every researcher who integrates ICT in their tasks must know digital ethics [43], hence the influence of the second dimension (D2—digital ethics). On the other hand, the quality of the ICT resources that researchers have can condition their integration [62], as can be seen in the influence exerted by the fifth dimension (D5—quality). Finally, it can be highlighted that the greater the intention to use ICT, the greater the probability of integration [52], in this sense the sixth dimension (D6—intention) (Intention to use) also exerts a notable influence. For all these reasons, it can be said that the proposed model is a robust model.

The reliability and validity criteria of the instrument were satisfactory (Table 2). Reliability was measured through Cronbach's alpha and composite reliability (CR), and adequate levels were found in each dimension. Regarding validity properties, the instrument possessed convergent validity and discriminant validity, and the structural model was assessed. Convergent validity was measured for each dimension through the average variance extracted (AVE), which found a good model fit with values above 0.50, as is recommended by the scientific literature [63]. The structural model was evaluated through the coefficient of determination R^2, path coefficients, and the bootstrapping technique from the value obtained through the t-Student. These statistical techniques showed a satisfactory fit of the instrument. In addition, the SRMR criterion yielded a coefficient of 0.78, which is lower than the value of 0.8 recommended by Hu and Bentler [64].

Table 2. Reliability of the instrument.

	D1	D2	D3	D4	D5	D6	D7
Cronbach's alpha	0.84	0.92	0.78	0.91	0.79	0.87	0.78
CR	0.89	0.94	0.87	0.93	0.88	0.91	0.86
AVE	0.61	0.79	0.70	0.73	0.70	0.67	0.61

4. Results

This section will be divided into two subsections. The first subsection presents the descriptive analysis of the results analysed descriptively, by dimension according to gender. The second subsection presents a comparative analysis to identify the presence of significant differences between the dimensions of the instrument according to gender.

4.1. Descriptive Results of the Instrument by Gender

Table 3 shows the mean for each teacher classified by age ranges (up to 40 years and more than 40), as well as by gender. Regarding the first dimension (D1) and teachers up to 40 years of age, it is observed that males have slightly higher scores than females in four of the five items. In teachers over 40 years of age, these differences are found in the five items, in favour of the male sex. In general, both groups of teachers have a high level of digital skills for research tasks.

Table 3. Descriptive analysis by gender.

Description	Up to 40		Over 40	
	M	F	M	F
D1—Digital Skills to Search for Information, Manage it, Analyse it and Communicate Results				
I have skills to analyse quantitative data (Spss, Excel, Jamovi, Amos, R, Minitab).	4.95	4.89	4.95	4.35
I know how to search scientific databases (ScienceDirect, ProQuest, PsycINFO, Redalyc.org, Scielo, Academia.edu . . .).	6.07	5.85	6.02	5.72
I know how to use Boolean operators (And, not, or, xor) to refine my searches for scientific articles.	5.32	4.96	5.31	4.49
I am skilled in using bibliographic managers (Mendeley Zotero Endnote, Refworks) which allow me to store bibliographic citations and use them in my studies according to different citation standards.	4.67	4.59	4.73	4.23
I have skills to manage my scientific social networks, add my published studies and/or consult their reading statistics.	5.33	4.91	5.21	4.65

Table 3. *Cont.*

Description	Up to 40		Over 40	
	M	F	M	F
D2—Digital Ethics in Digital Research				
Before submitting a study for publication, I digitally check and apply the publication standards used in each publisher/journal (APA v.7; Chicago, Harvard . . .).	6.20	5.96	6.05	6.09
I check the original source and results of a study cited by other authors in their original publications.	6.09	5.93	5.85	5.85
I check that the literature selected for my study comes from journals with a certain degree of scientific prestige (e.g., using double-blind peer review).	6.08	5.98	5.98	5.86
I check that there is no self-plagiarism or plagiarism of other studies in my studies.	6.04	5.96	6.01	5.91
D3—Digital Flow in Research Work				
I find it rewarding to use ICT resources in my research work.	5.71	5.43	5.61	5.37
I enjoy using software for data analysis, both quantitative (SPSS, JAMOVI, R . . .) and qualitative (Atlas.ti, Nvivo . . .) when planning my research.	4.44	4.14	4.32	3.93
I feel motivated if I think that by using digital software for data design and analysis I can more easily publish my scientific achievements in high-impact journals.	4.65	4.69	4.49	4.33
D4—Anxiety Towards the use of ICT Resources for Research				
I don't get overwhelmed at the thought of having to learn how to use digital resources to collect data and analyse it with software afterwards.	5.15	4.77	5.15	4.52
I don't get anxious having to constantly check the impact indexes of journals to see if they have moved up or down quartiles.	4.41	4.09	4.42	3.63
I don't get tired of having to constantly use ICT to position and share my scientific publications and improve my digital reputation through the h-index and/or the i10 index.	4.49	3.94	4.38	3.72
I don't get nervous when I have to teach a colleague and/or student some ICT resource related to research (Mendeley, SPSS, AMOS, Google form, Atlas.ti . . .).	5.80	5.52	5.69	5.26
In general, I would not mind having to learn how to use ICT resources for my research.	5.91	5.81	5.68	5.59
D5—Quality of Research-Related ICT Resources				
My department or research group purchases licences for ICT resources that require additional payment.	4.36	4.10	4.21	3.94
My department or research group provides me with all the ICT resources I require for my research.	5.01	4.70	4.85	4.58
My department or research group has powerful devices (PCs/laptops) so that the technological resources work quickly and smoothly.	5.11	4.62	4.91	4.60
D6—Intention to use ICTs for Research Work				
Assuming that my educational institution provides me with ICT resources for research work, I intend to use them at some point in the near future.	5.77	5.94	5.78	5.93
I plan, in the near future, to continue learning how to use ICT resources to further my research work.	5.63	5.68	5.49	5.58
I intend to continue to improve my training in the use of online scientific databases for my research.	5.68	5.70	5.54	5.72
I intend to continue using and/or employ bibliographic managers for my future studies.	5.64	5.66	5.53	5.63
I want to improve my use of social networks to transfer my research and interact with other researchers.	4.72	4.90	4.68	4.86

Table 3. *Cont.*

Description	Up to 40		Over 40	
	M	F	M	F
D7—Integrating ICT Resources for Research				
I use bibliographic managers	4.87	4.37	4.73	4.43
I use social networks to disseminate my scientific publications	3.97	3.50	3.94	3.41
I use Google+ collaborators to host my research data	4.33	4.70	4.42	4.86
I use data analysis software (either quantitative and/or qualitative)	5.14	5.12	5.18	4.73

Regarding the second dimension (D2), and for teachers up to 40 years of age, it is observed that in the four items the scores are slightly higher in males than in females. For teachers over 40, there are hardly any differences in scores between the two genders. In general, the scores for both categories of teaching staff and genders are very high, close to value 7 on the Likert scale. In other words, complying with ethical standards is equally important for both genders.

In the third dimension (D3), and for teachers up to 40 years of age, in two of the three items of the dimension, the male gender has slightly higher scores than the female gender. For the teaching staff over 40 years of age, the scores are higher in the male sex in all three items. In general, it is observed that the teaching staff has a medium value in this dimension (except for the first item in which a medium-high value is observed).

In the fourth dimension (D4) the items were recorded in the same methodological direction as the rest of the instrument. For this reason, the items are written in negative, since a high score would indicate a low level of anxiety towards technology, and consequently, a good level in digital competence. For teachers up to 40 years of age, males obtained slightly higher scores than females, in all items. For teachers over 40 years old, males also obtained higher scores. In general, it is observed that the teachers obtained a medium value in two items and a medium-high value in three items, interpreting that there is some anxiety towards some ICT resources to use them in research tasks.

In the fifth dimension (D5) and for teachers of both age ranges, males had slightly higher scores than females. In general, it is observed that teachers perceive an average value in the quality of ICT resources that their university institution or research group has for research work.

In the sixth dimension (D6) there are contradictory results up to those found so far, since in both age ranges, the female sex has higher scores than the male sex. For example, it is observed that female teachers have a greater intention to assume the use of digital resources, continue training digitally in databases for information consultation, in the intention of using bibliographic managers or improve their social networks to gain visibility in its scientific merits.

Finally, in the seventh dimension (D7) there is a certain trend between genders, for both age ranges. That is, for both age ranges, male teachers have higher scores in using bibliographic managers, social networks and software for data analysis, while females have higher scores in using collaborative "google plus" applications. In general, the scores on the level of integration of ICT in research work is medium, with values around the value 4 of the 7-point Likert scale.

In order to be able to compare the differences between genders, for each age range of teachers, the scores for the different items of each dimension have been grouped into an overall mean. Figure 2 shows the overall mean of each dimension by age range and gender. For teachers up to 40 years of age, it is observed that male teachers have higher scores in all dimensions of the instrument, except in the seventh dimension in which female teachers have slightly higher scores. For teachers over 40 years old, male teachers have higher scores in five of the 7 dimensions, since in the second dimension both genders obtained similar scores, while in the sixth dimension the male teachers obtained lower scores compared to their female counterparts.

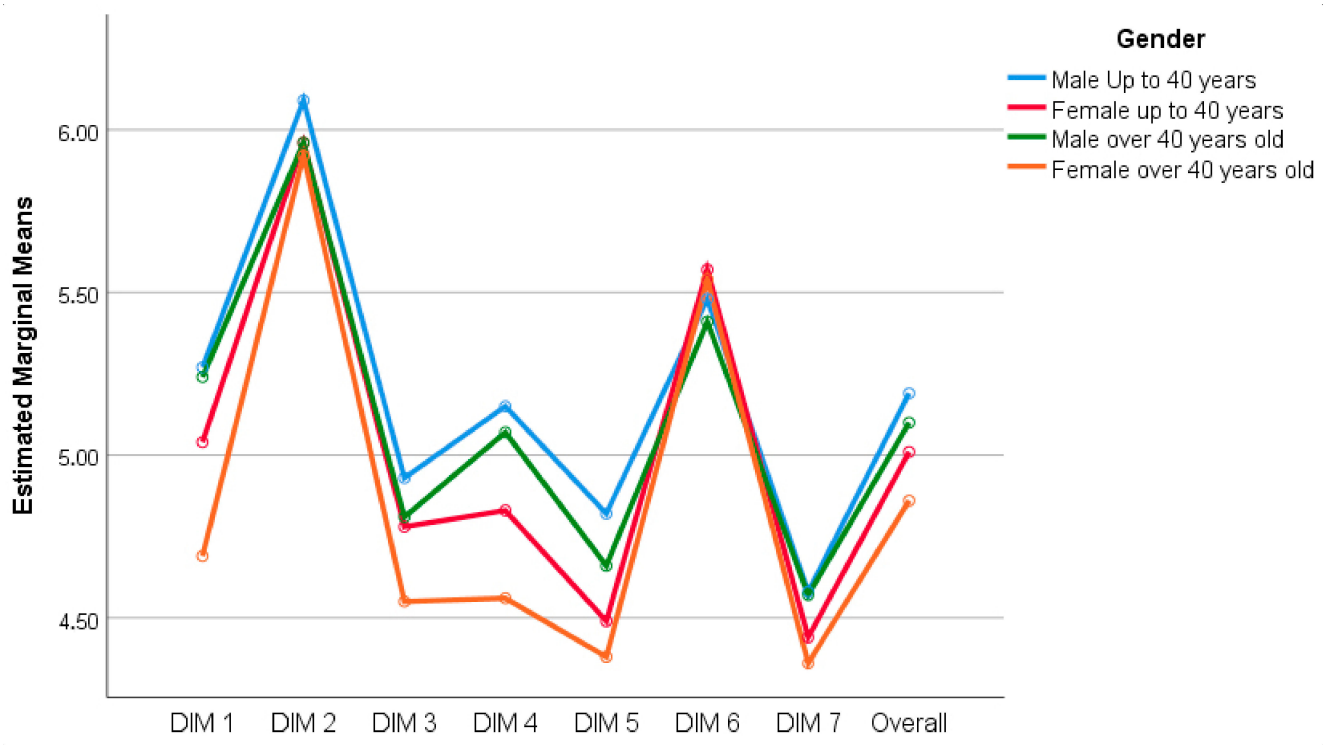

Figure 2. Mean score for each dimension of the instrument, for each gender.

4.2. Statistical and Comparative Gender Analysis

In order to check whether the differences found in the scores shown in Figure 2 with respect to teachers' gender were significant in each age range, a statistical analysis of these scores was carried out. Table 4 shows the values of the Kolmogorov–Smirno test to verify the assumption of normality, for each age range. It can be observed how this assumption is not fulfilled since the values are less than 0.05. Thus, the Mann–Whitney test was used for the comparison of hypotheses, by which mean ranges of each distribution are compared.

Table 4. Normality of the data.

Dimensions	Up to 40		Over 40	
	Statistic	*p*.	Statistic	*p*.
D1—Digital skills	0.131	0.000	0.097	0.000
D2—Digital ethics	0.171	0.000	0.184	0.000
D3—Digital flow	0.116	0.000	0.098	0.000
D4—Anxiety towards ICT	0.097	0.000	0.077	0.000
D5—Quality of ICT resources	0.114	0.000	0.097	0.000
D6—Intention to use ICT	0.118	0.000	0.106	0.000
D7—Integration of ICT	0.070	0.000	0.078	0.000
Global digital competence	0.088	0.000	0.045	0.000

Table 5 shows those dimensions where significant differences in scores were found between the genders, for each age range. Regarding teachers up to 40 years of age, it is observed that there are no significant differences between both genders in any dimension of the instrument. However, some significant differences were found in teachers over 40 years of age. For example, it is observed that there were significant differences in: the first dimension (D1), where male teachers had higher scores; in the third dimension (D3), it is observed that the effect sizes found in those significant dimensions had a size between small-medium (Cohen's d considered that 0.2 is considered a 'small' effect size, 0.5 represents a 'medium' effect size, and 0.8 a 'large' effect size).

Table 5. Statistical comparison for each dimension of the instrument between the two genders.

Dimensions	Up to 40				Over 40			
	U	Z	*p*	d	U	Z	*p*	d
D1—Digital skills	14,192.000	−1.676	0.094	-	170,774.000	−7.237	0.000	0.40
D2—Digital ethics	15,145.500	−0.704	0.482	-	214,871.500	−0.984	0.325	-
D3—Digital flow	14,925.500	−0.923	0.356	-	200,871.000	−2.967	0.003	0.16
D4—Anxiety towards ICT	14,018.000	−1.855	0.064	-	176,596.000	−6.411	0.000	0.46
D5—Quality of ICT resources	14,070.000	−1.804	0.071	-	200,751.000	−2.984	0.003	0.16
D6—Intention to use ICT	14,357.500	−1.508	0.132	-	209,801.500	−1.659	0.097	-
D7—Integration of ICT	15,081.000	−0.761	0.446	-	205,647.500	−2.286	0.022	0.12
Global digital competence	14,197.500	−1.668	0.095	-	185,331.500	−5.128	0.000	0.29

5. Discussion

This paper investigates gender differences in the development of digital competence of higher education teachers in their research work, to determine if they significantly affect the integration and actual use of technology in the following dimensions: skills, ethics, flow, anxiety, quality of resources, intention, and integration.

This study has found that higher education teachers have high mean digital competence development in relation to the skills required to search, manage, analyse and communicate the results of their research; this result is contrary to that obtained by Correa [10] since, according to that study, teachers do not have adequate research competences, which affects their technical abilities and skills. Within this dimension, teachers reported possessing lower skills in the use of bibliographic managers, in contrast to the findings of the study by Sivakumaren et al. [41], where teachers obtained higher scores for this dimension. In this dimension, in both age ranges analysed, male teachers obtained slightly higher scores than female teachers, results contrary to those obtained by Sivakumaren et al. [41].

In relation to digital ethics, the results showed high competency in both genders, although male teachers, under 40 years of age, obtained slightly higher scores than female teachers, these results are contrary to those obtained by Smith and Pino [46], Chee et al. [47]; Alleyne and Persaud [48] and Harðardóttir et al. [49]. Regarding the age range of more than 40 years, hardly any differences were observed. These results show that teacher researchers are aware of the ethical principles governing research [44,45].

When analysing digital flow in research work, it can be seen that development of this skill was scored medium-high by both genders, although male teachers, in both age ranges, found slightly greater gratification than female teachers when using ICT resources in their research work. These results coincide with those obtained by Hsu [35] but are contrary to those produced by Yang and Quadir [34], where women obtained higher scores, and Bressler and Bodzin [36], who found no differences according to gender.

A review of the literature shows that, even today, ICTs can still generate adverse emotions such as anxiety, frustration, etc. [17], results that have been corroborated in this study, since the participants, especially the male gender, for both age ranges, presented a medium level of anxiety. There results were contrary to those obtained by Awofala et al. [26], Halder and Chandhuri [29], and Deniz [28], since according to contributions females possessed a higher level of anxiety, as in the studies of Agbatogun [31] and Semerci and Aydin [30], although no significant differences were found.

Higher education institutions, for their part, need to provide research teachers with quality resources to be able to successfully complete their projects [19,20] and to be able to implement their research findings [13]. This study found that participants considered that they have the necessary technological resources at their disposal for this purpose, being male teachers, in both age ranges, those with slightly higher scores.

Regarding the intention to use ICT for research work, despite the facts that ICT improves work management [3] and today's society is highly technological [6,7], the participants who took part in this study have a medium-high intention for both female teachers, in both age ranges analysed. These results contrast with those obtained by Baydas and

Goktas [53], Teo and Milutinovic [54] and Sánchez-Mena et al. [55], since their studies found no significant differences by gender in regard to intention to use. It should not be forgotten that the intention to use ICT leads to its integration into teaching and research work, according to data obtained by Olugbara and Letseka [52], Anderson and Maninger [50], and Venkatesh et al. [51]. In this study, it was found that the level of integration for both genders was medium-high, although slightly higher in males (age range of less than 40 years) in relation to the use of data analysis programs, bibliographic managers and the use of social networks to disseminate publications. These findings contrast with those obtained by Liu et al. [20] but are contrary to those reported by Tondeur et al. [56], Arkorful et al. [57] and Perrotta [58], where no significant differences were found in regard to gender, as in this study the male gender reported a higher level of ICT integration.

Some studies argue that gender can be considered a limitation in regard to the use of ICT [16]. Therefore, in this research, a comparative study was carried out to analyse the presence of significant gender differences and by age range in each of the dimensions being analysed. Once the analysis had been carried out, it was observed that there were no significant differences in the less than 40 years group in any of the dimensions analysed, although there were significant differences in five of the seven dimensions studied for the age range over 40; specifically, there were significant differences in favour of the male gender in: D1 (digital skills), which is in line with the results obtained by Alazam et al. [39] where men had greater usage skills. In this dimension (D1), the size of the effect found for this type of teaching staff had an almost moderate value. That is, in addition to the fact that these differences between the two genders were significant, these differences were moderate. Dimension 3 (Flow) results coincided with those obtained by Hsu [35] and were contrary to those obtained by Bressler & Bodzin [36], since these authors did not find differences according to gender in the flow experience. In this dimension (D3), the effect size was significant, but with a small size. In other words, the differences in the scores on the digital Flow experience between both genders were small; D4 (anxiety towards ICT), in a result contrary to those obtained by Semerci and Aydin [30] and Agbatogun [31], who found no significant differences according to gender. For this dimension (D4), the effect size was very close to the moderate size. That is, the differences in the scores between both genders on the anxiety of using ICT, in addition to being significant, were moderate, with negative emotions less favourable for the female teachers. In addition, in Dimensions 5 (quality of ICT resources) and 7 (integration), significant differences were also found in this age group in favour of males, according to the results of Tondeur et al. [56]. The effect sizes in these two dimensions were small, so the differences regarding the perception of the quality of digital resources in research, as well as the real integration of ICT in research work between both genders were very small, although you have to keep them in mind as they were significant. On the other hand, in Dimension 2 (digital ethics) and Dimension 6 (intention to use) no significant differences were found according to gender in any of the two age ranges analysed, results contrary to those obtained by Smith and Pino [46], Chee et al. [47], Alleyne and Persaud [48], and Harðardóttir et al. [49] where women were found to have a greater ethical awareness than men. These results also differ to those obtained by Baydas and Goktas [53], Teo and Milutinovic [54] and Sánchez-Mena et al. [55], whose studies identified no significant differences in the intention to use.

In general, if the global digital competence is taken into account in this age range (over 40 years), the differences between both genders of the teaching staff were significant, with an effect size which ranged between small and moderate. That is, this effect size indicates that there are still differences in the importance of ICT in research work, with slightly higher perceptions in male teachers.

6. Conclusions

This study has discussed the fact that ICT continues to be an important area of training in higher education [8], enabling university teachers to continue to build their knowledge [11]. This is important since the work of teachers is not only focused on teaching-learning processes; they must also be continuously researching and disseminating the results of their research [12] to achieve social progress. In this sense, higher education institutions should continue to focus on providing sufficient training in digital competence for their teachers.

The aim of this research was to gain a broad understanding of the level of development of university teaching staff's digital competence in carrying out research tasks, based on gender. A large number of key dimensions of the broader research task have been addressed to gain in-depth knowledge of this digital competence. The results have shown that there are still significant gender differences in five of the seven dimensions analysed, meaning that gender can still be considered a limitation in the use of ICT for research work [16]. For this reason, it is necessary to commit to greater digital empowerment in higher education [6]. The results found showed that the effect sizes in the dimensions that were significant had small sizes. In other words, the differences between the two genders are significant, but small. Perhaps the main justification for finding very small significant differences between both genders is due to two reasons: on the one hand, as a reflection of the democratization process on equal opportunities regarding access to infrastructure and technological devices in this new century [65], and, on the other hand, easy access to digital content [66].

Based on the findings of this study, it would be interesting to further explore the following lines of research. First, it would be useful to identify the lower levels of digital competence, both for each gender, taking into account different age ranges, and for the different areas of knowledge to which the participants in this study belong, to enable the development of specific training frameworks for those who most need them. Second, in addition to the gender variable, there may be other variables that affect the acquisition and development of digital competence for research work, for example, the age of the participants, the number of research projects they have participated in, or the number of research stays carried out in other prestigious institutions. For this reason, it would be useful to further analyse the possible factors and variables that may be influencing their acquisition. Third, it would be interesting to carry out a comparative analysis between teachers from different geographical contexts at an international level, in order to discover how they integrate technology into their education and research tasks.

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References

1. Flores-Lueg, C.; Roig Vila, R. Diseño y validación de una escala de autoevaluación de competencias digitales para estudiantes de pedagogía. *Pixel Bit Rev. Medios Educ.* **2016**, *12*, 209–224. [CrossRef]
2. Ocaña-Fernández, Y.; Valenzuela-Fernández, L.; Morillo-Flores, J. La competencia digital en el docente universitario. *Propósitos Represent.* **2020**, *8*, 455. [CrossRef]

3. Mimirinis, M. Qualitative differences in academics' conceptions of e-assessment. *Assess. Eval. High. Educ.* **2018**, *44*, 233–248. [CrossRef]
4. Picatoste, J.; Pérez-Ortiz, L.; Ruesga-Benito, S.M. A new educational pattern in response to new technologies and sustainable development. Enlightening ICT skills for youth employability in the European Union. *Telemat. Inform.* **2018**, *35*, 1031–1038. [CrossRef]
5. Area-Moreira, M.; Hernández-Rivero, V.; Sosa-Alonso, J.-J. Models of educational integration of ICTs in the classroom. *Comunicar* **2016**, *24*, 79–87. [CrossRef]
6. Ocaña-Fernández, Y.; Valenzuela-Fernández, L.A.; Garro-Aburto, L.L. Inteligencia artificial y sus implicaciones en la educación superior. *Propósitos Represent.* **2018**, *7*, 536–568. [CrossRef]
7. Del Prete, A.; Almenara, J.C. El uso del Ambiente Virtual de Aprendizaje entre el profesorado de educación superior: Un análisis de género. *Rev. Educ. Distancia* **2020**, *20*, 65–78. [CrossRef]
8. Instefjord, E.J.; Munthe, E. Educating digitally competent teachers: A study of integration of professional digital competence in teacher education. *Teach. Teach. Educ.* **2017**, *67*, 37–45. [CrossRef]
9. Afdal, H.W.; Spernes, K. Designing and redesigning research-based teacher education. *Teach. Teach. Educ.* **2018**, *74*, 215–228. [CrossRef]
10. Correa Bautista, J.E. Measurement of the investigative competences of physiology teachers: An empirical approach. *Rev. Fac. Med.* **2009**, *57*, 205–217.
11. Guillén-Gámez, F.D.; Ruiz-Palmero, J.; Sánchez-Rivas, E.; Colomo-Magaña, E. ICT resources for research: An ANOVA analysis on the digital research skills of higher education teachers comparing the areas of knowledge within each gender. *Educ. Inf. Technol.* **2020**, *25*, 4575–4589. [CrossRef]
12. Marrero, O.S.; Mohamed, R.A.; Xifra, J.T. Tratamiento de la información y la competencia digital de los estudiantes para la producción de géneros discursivos en la Universidad Ecotec (Ecuador). *Rev. Espac.* **2019**, *40*, 14–25.
13. Banevičiūtė, B.; Kudinovienė, J. Development of arts teacher research competence in master studies. *Pedagogika* **2017**, *125*, 57–67. [CrossRef]
14. Barrera, R.R.E. The Research Competences of The University Teacher. *Rev. Univ. Soc.* **2018**, *10*, 75–84.
15. Brown, M.; McCormack, M.; Reeves, J.; Brook, D.C.; Grajek, S.; Alexander, B.; Weber, N. *2020 Educause Horizon Report Teaching and Learning Edition*; EDUCAUSE: Louisville, CO, USA, 2020; pp. 2–58.
16. Guillén-Gámez, F.D.; Mayorga-Fernández, M.J. Prediction of Factors That Affect the Knowledge and Use Higher Education Professors from Spain Make of ICT Resources to Teach, Evaluate and Research: A Study with Research Methods in Educational Technology. *Educ. Sci.* **2020**, *10*, 276. [CrossRef]
17. Muñoz, O.R.; Penalba, F.A.; Sánchez, J.F.; Santos, O.C. Reducing techno-anxiety in high school teachers by improving their ICT problem-solving skills. *Behav. Inf. Technol.* **2017**, *36*, 255–268. [CrossRef]
18. Walder, A.M. Pedagogical Innovation in Canadian higher education: Professors' perspectives on its effects on teaching and learning. *Stud. Educ. Eval.* **2017**, *54*, 71–82. [CrossRef]
19. Lawrence, J.E.; Tar, U.A. Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educ. Media Int.* **2018**, *55*, 79–105. [CrossRef]
20. Liu, F.; Ritzhaupt, A.D.; Dawson, K.; Barron, A.E. Explaining technology integration in K-12 classrooms: A multilevel path analysis model. *Educ. Technol. Res. Dev.* **2016**, *65*, 795–813. [CrossRef]
21. Saade, R.; Kira, D. The emotional state of technology acceptance. *Issues Inf. Sci. Inf. Technol.* **2006**, *3*, 1–11.
22. Celik, V.; Yesilyurt, E. Attitudes to technology, perceived computer self-efficacy and computer anxiety as predictors of computer supported education. *Comput. Educ.* **2013**, *60*, 148–158. [CrossRef]
23. Rogers, R.K.; Wallace, J.D. Predictors of technology integration in education: A study of anxiety and innovativeness in teacher preparation. *J. Lit. Technol.* **2011**, *12*, 28–60.
24. Prabhakaran, A.; Mishr, H.K. Technological change in libraries: The evolution of techno stress. *Res. World* **2012**, *3*, 131.
25. Sareen, P. Techno Stress Creators—An Exploratory Research on Teaching and Non Teaching Staff Working in Colleges. *Int. J. Manag. Humanit.* **2019**, *3*, 1–7.
26. Awofala, A.O.; Akinoso, S.O.; Fatade, A.O. Attitudes towards Computer and Computer Self-Efficacy as Predictors of Preservice Mathematics Teachers' Computer Anxiety. *Acta Didact. Napoc.* **2017**, *10*, 91–108. [CrossRef]
27. Çakir, T. The Attitudes of Preschool Teachers and Principals towards Computer Using. *Anthropologist* **2014**, *18*, 735–744. [CrossRef]
28. Deniz, L. Prospective class teachers' computer experiences and computer attitudes. *Int. J. Soc. Sci.* **2007**, *2*, 116–122.
29. Halder, S.; Chaudhuri, S. Computer self-efficacy and computer anxiety of trainee teachers: Issue of concern. *Proc. Epistem.* **2011**, *4*, 1–7.
30. Semerci, A.; Aydin, K.M. Examining High School Teachers' Attitudes towards ICT Use in Education. *Int. J. Progress. Educ.* **2018**, *14*, 93–105. [CrossRef]
31. Agbatogun, A. Self-concept, computer anxiety, gender and attitude towards interactive computer technologies: A predictive study among Nigerian teachers. *Int. J. Educ. Dev. Using ICT* **2010**, *6*, 55–268.
32. Csikszentmihalyi, M. *Beyond Boredom and Anxiety: The Experience of Play in Work and Games*; Jossey-Bass: San Francisco, CA, USA, 1975.
33. Hoffman, D.L.; Novak, T.P. Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations. *J. Mark.* **1996**, *60*, 50–68. [CrossRef]

34. Yang, J.C.; Quadir, B. Individual differences in an English learning achievement system: Gaming flow experience, gender differences and learning motivation. *Technol. Pedagog. Educ.* **2018**, *27*, 351–366. [CrossRef]
35. Hsu, T.-C. Effects of gender and different augmented reality learning systems on English vocabulary learning of elementary school students. *Univers. Access Inf. Soc.* **2017**, *18*, 315–325. [CrossRef]
36. Bressler, D.; Bodzin, A. A mixed methods assessment of students' flow experiences during a mobile augmented reality science game. *J. Comput. Assist. Learn.* **2013**, *29*, 505–517. [CrossRef]
37. García, N.M.; Perú, U.N.D.A.P.; Paca, N.K.; Arista, S.M.; Valdez, B.B.; Gómez, I.I. Investigación formativa en el desarrollo de habilidades comunicativas e investigativas. *Rev. Investig. Altoandinas J. High Andean Res.* **2018**, *20*, 128–136. [CrossRef]
38. El Hassani, A. The Role of Information Literacy in Higher Education: An Initiative at Al Akhawayn University in Morocco. *Nord. J. Inf. Lit. High. Educ.* **2015**, *7*, 32–37. [CrossRef]
39. Alazam, A.-O.; Bakar, A.R.; Hamzah, R.; Asmiran, S. Teachers' ICT Skills and ICT Integration in the Classroom: The Case of Vocational and Technical Teachers in Malaysia. *Creat. Educ.* **2012**, *3*, 70–76. [CrossRef]
40. Saripudin, S.; Sumarto, J.E.; Ade Gaffar Abdullah, A.A. Integration of ICT skill among vocational school teachers: A case in west Java, Indonesia. *Int. J. Innov. Technol. Explor. Eng.* **2020**, *9*, 251–260. [CrossRef]
41. Sivakumaren, K.S.; Jeyapragash, B.; Arputharaj, J.I. Awareness, Perceptions and Purposes of Academic Social Networking Sites (ASNS) among the Research Scholars in State Universities of Tamil Nadu, India: A Study. *Libr. Philos. Pract.* **2019**, 1–11.
42. Avani, P.; Haneefa, K.M. Use of Social Media by Library and Information Science Students in Universities in Kerala. *J. Knowl. Commun. Manag.* **2019**, *9*, 94–105. [CrossRef]
43. Luke, A. Digital Ethics Now. *Lang. Lit.* **2018**, *20*, 185–198. [CrossRef]
44. Sanjuanelo, S.L.; Caballero-Uribe, C.V.; Lewis, V.; Mazuera, S.; Salamanca, J.F.; Daza, W.; Fourzali, A. Consideraciones éticas en la publicación de investigaciones científicas. *Salud Uninorte* **2007**, *23*, 64–78.
45. Stahl, B.C.; Eden, G.; Jirotka, M.; Coeckelbergh, M. From computer ethics to responsible research and innovation in ICT. *Inf. Manag.* **2014**, *51*, 810–818. [CrossRef]
46. Smith, W.L.; Pino, N.W. College Students, The Academic Ethic. *Va. Soc. Sci. J.* **2005**, *40*, 52–67.
47. Chee, K.H.; Pino, N.W.; Smith, W.L. Gender differences in the academic ethic and academic achievement. *Coll. Stud. J.* **2005**, *39*, 604–619.
48. Alleyne, P.; Persaud, N. Exploring undergraduate students' ethical perceptions in Barbados: Differences by gender, academic major and religiosity. *J. Int. Educ. Bus.* **2012**, *5*, 5–21. [CrossRef]
49. Harðardóttir, A.K.; Guðjónsson, S.; Minelgaite, I.; Kristinsson, K. Ethics as usual? *Manag. J. Contemp. Manag. Issues* **2019**, *24*, 11–21. [CrossRef]
50. Anderson, S.E.; Maninger, R.M. Preservice Teachers' Abilities, Beliefs, and Intentions regarding Technology Integration. *J. Educ. Comput. Res.* **2007**, *37*, 151–172. [CrossRef]
51. Venkatesh, V.; Morris, M.G. Davis User Acceptance of Information Technology: Toward a Unified View. *MIS Q.* **2003**, *27*, 425. [CrossRef]
52. Olugbara, C.T.; Letseka, M. Factors Predicting Integration of E-Learning by Preservice Science Teachers: Structural Model Development and Testing. *Electron. J. e-Learn.* **2020**, *18*, 421–435. [CrossRef]
53. Baydas, O.; Goktas, Y. Influential factors on preservice teachers' intentions to use ICT in future lessons. *Comput. Hum. Behav.* **2016**, *56*, 170–178. [CrossRef]
54. Teo, T.; Milutinovic, V. Modelling the intention to use technology for teaching mathematics among pre-service teachers in Serbia. *Australas. J. Educ. Technol.* **2015**, *31*, 363–380. [CrossRef]
55. Sánchez-Mena, A.; Martí-Parreño, J.; Aldás-Manzano, J. Teachers' intention to use educational video games: The moderating role of gender and age. *Innov. Educ. Teach. Int.* **2018**, *56*, 318–329. [CrossRef]
56. Tondeur, J.; Valcke, M.; Van Braak, J. A multidimensional approach to determinants of computer use in primary education: Teacher and school characteristics. *J. Comput. Assist. Learn.* **2008**, *24*, 494–506. [CrossRef]
57. Arkorful, V.; Barfi, K.A.; Aboagye, I.K. Integration of information and communication technology in teaching: Initial perspectives of senior high school teachers in Ghana. *Educ. Inf. Technol.* **2021**, 1–17. [CrossRef]
58. Perrotta, C. Do school-level factors influence the educational benefits of digital technology? A critical analysis of teachers' perceptions. *Br. J. Educ. Technol.* **2012**, *44*, 314–327. [CrossRef]
59. Hinojo-Lucena, F.-J.; Aznar-Diaz, I.; Caceres-Reche, M.-P.; Trujillo-Torres, J.-M.; Romero-Rodriguez, J.-M. Factors Influencing the Development of Digital Competence in Teachers: Analysis of the Teaching Staff of Permanent Education Centres. *IEEE Access* **2019**, *7*, 178744–178752. [CrossRef]
60. Lucas, M.; Bem-Haja, P.; Siddiq, F.; Moreira, A.; Redecker, C. The relation between in-service teachers' digital competence and personal and contextual factors: What matters most? *Comput. Educ.* **2021**, *160*, 104052. [CrossRef]
61. Guillén-Gámez, F.D.; Mayorga-Fernández, M.J.; Contreras-Rosado, J.A. Validación de un instrumento sobre la competencia digital docente en Educación Superior en labores investigadoras [Validation of an instrument about the digital competence teaching in higher education in research work]. *Send.* **2021**.
62. Gil-Flores, J.; Rodríguez-Santero, J.; Torres-Gordillo, J.-J. Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure. *Comput. Hum. Behav.* **2017**, *68*, 441–449. [CrossRef]
63. Bagozzi, R.P.; Yi, Y. On the evaluation of structural equation models. *J. Acad. Mark. Sci.* **1988**, *16*, 74–94. [CrossRef]

64. Hu, L.T.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model. Multidiscip. J.* **1999**, *6*, 1–55. [CrossRef]
65. Albirini, A. Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. *Comput. Educ.* **2006**, *47*, 373–398. [CrossRef]
66. Aljawarneh, S.A. Reviewing and exploring innovative ubiquitous learning tools in higher education. *J. Comput. High. Educ.* **2019**, *32*, 57–73. [CrossRef]