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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

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Abstract: Due to the rise of new technologies, further development of digital competence by professors is necessary. The aim of this paper is to know the pedagogical digital competence of lecturers in Spain, focused on a model called PDC-TER: ICT resources to Teach, to Evaluate and to Research; as well as to predict those variables that affect the level of this competence through different regressions (Multiple Linear Regression, MLR). A study has been carried out in the Spanish territory, with a total of 867 lecturers. For it, an ex post facto non-probabilistic study based on the survey technique has been proposed. The results show that the professors have an average level of digital pedagogical competence, while in the 2.0 tools for teaching and research dimensions, it has a medium high level of competence, as well as a medium level in relation to the use of tools 2.0 for the evaluation. Furthermore, one of the variables predictive of the level of digital competence in the three dimensions of the PDC-TER model, is the number of research and innovation projects in which they have participated. These data highlight the need to improve the digital competence of professors in order to meet the demands of the qualified professions of the future, and therefore, prepare students for it.

Keywords: pedagogical digital competence; technological resources; ITC; professors; higher education; measurement; regression; educational research methods

1. Introduction

In recent years, the great advances that have taken place in Information and Communication Technologies (ICT) have led to the development of a so-called Information and Communication Society [1]. This has led to the emergence of a wide range of studies that aim to understand how ICT is influencing the construction of this new knowledge society [2–4]. In this sense, ICT is crucial for the development of generic competences within academic curricula, as well as elements of cultural interpretation and integration [5]. Therefore, ICT should be considered as a means of articulation between academic and social knowledge, constituting the backbone of pedagogical training. This is essential, given that the mere inclusion of ICT in the classroom does not guarantee improvements in teaching-learning processes [6]. Thus, ICT plays a fundamental role in the profile of professors [7] because their use of such technologies directly affects the use that their students make of them [8].

All these factors imply that teaching staff in general, and university teaching staff more specifically, must have a high level of digital training. Nonetheless, various studies confirm that university teaching

staff continue to integrate ICT into their teaching practice in different ways as a result of vast differences in their levels of pedagogical ICT competence [9–12]. It is necessary, therefore, for professors to be committed to the educational purpose of providing their students with learning opportunities through innovative methodologies strategies where ICT is present in an active way [13]. This implies that university professors have a dual responsibility: on the one hand, they are obliged to improve their level of pedagogical digital competence, and, on the other hand, they must contribute to enhance the development of the pedagogical digital competence of their students [14].

In the scientific literature, different authors have attempted to define the concept of digital competence. Ananiadou and Clarob [15] and Navarro et al. [16] define it as the integrated and functional use of knowledge, skills and digital attitudes. Equally, from [17] conceives digital competence as the ability to apply the necessary knowledge, attitudes and skills to plan, implement, evaluate and constantly review the teaching-learning processes supported by ICT with a solid theoretical basis and research and experimentation to provide students with high-level learning contexts. Therefore, digital competence can be understood as pedagogical digital competence. Considering this definition, it can be stated that pedagogical digital competence has three constituent dimensions: attitudes towards ICT, knowledge and educative use of said technologies [16,18,19].

Regarding studies focused on the use of ICT as a support to education, Marcelo et al. [20] found that only 16.7% of the teaching staff participating in their study integrated ICT as a support to develop their teaching activities. After conducting a review of different research focused on the main 2.0 tools that university professors use for teaching, it was found that the most commonly used tools were e-mail, text processors, search engines, as well as virtual presentations [21–24]. Magen-Nagar and Maskit [25] concluded that familiarity and the domain of ICT tools were the factors that most influenced their use for educational purposes rather than the availability of tools or other variables involved. On the other hand, Cabero and Barroso [26] concluded that professors in their study obtained the lowest scores in aspects related to pedagogical knowledge and content regarding the use of ICT in their classrooms.

On the contrary, Mercader and Sallán [27] found that the tools that most professors use for training purposes are LMS. Maraver-López et al. [28] conducted a study on university teachers' use of LMS platforms. They found that the most used tools were chat, forums and online questionnaires, while those least used in their teaching planning were blogs and Wikis. Different studies agree that the university lecturers' use LMS is primarily as a repository of information or materials [29–32].

Few studies have analyzed the extent to which university teaching staff use ICT to assess their students. El-Bahsh and Daoud [31] (2016) concluded in their research that professors did not use virtual tools effectively; they were only used on rare occasions to evaluate students [21].

In terms of the extent to which ICT is integrated in the research process of university professors, Buarki [21] found that professors have low levels of knowledge in data analysis with SPSS, blogs, as well as Wikis and Software to cite bibliographical references, and use ICT mainly to search and access research in their field of study. Akpan [33] highlighted that professors with greater digital pedagogical competence also obtain better results in research.

According to different studies analyzed, the level of development of professors' digital pedagogical competence is not influenced by variables such as age, gender, years of teaching or professional category [34–36]. However, other studies claim the opposite, noting a negative relationship between the age of professors and their integration and attitudes towards ICT [11,12,37], or belonging to one genre or another influences their level of digital competence [9,10].

The factors that can best predict the level of digital competence of university teaching staff have also been studied, although to a lesser extent compared to other educational stages [38]. Kunda et al. [39] investigated the factors that influence the attitude of Educational Sciences university teaching staff towards the integration of ICT. They found that the availability of wireless access points, access to computer equipment in classrooms and laboratories, as well as free access to online journals, produced positive effects on the increased use of ICT in the classroom, while the increase in internet bandwidth and availability of LMS platforms had negative effects. In the same context, Jegede et al. [40] used

a regression model to analyse the relationship between professors' level of digital competence and attitudes towards ICT. They determined that affective and behavioral attitudes, in addition to having a positive weight, were significant in the proposed model.

Taking into account the literature, our main contribution is: (1) know the level of pedagogical digital competence of professors; and (2) identify the factors that affect the level of competence of higher education professors, considering that: there are hardly any studies focused on PDC-TER Model (the competence in resources 2.0 to teach, to evaluate and to research). In addition, most studies have focused on predicting this competence through variables such as age, gender or teaching experience, without taking into account other variables such as the number of innovation/research projects in which professors participate, number of research stays carried out, number of Master made, among other variables, this being our contribution as well.

2. Materials and Methods

2.1. Design

This research uses a non-experimental quantitative design employing surveys [41]. Descriptive and inferential analyses have been carried out to identify the variables that best predict the level of pedagogical digital competence of university teaching staff based on different components of the construct.

2.2. Participants

The study population consists of higher education professors in Spain, more specifically a total of 115,366 university professors [42]. To this end, a total of 12,538 lecturers from different Spanish universities spread throughout the country were contacted by email. In total, 1206 lecturers responded. Once the sample collection was carried out, an exploratory analysis was essential prior to the application of the factorial model in order to deduce the database. The final sample consisted of 867 university professors from the Spanish educational system. Our sample describe about 0.8 of the Spanish population professors in the Higher Education. Thus, we think that it more than sufficient, given the purpose of the study and the analysis that we perform. Regarding the confidentiality of the participants' answers, the surveys were filled out anonymously, thus guaranteeing the privacy of the data. Also, all subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee from the university itself.

The professors were selected through an intentionally non-probabilistic sampling process. Regarding the sociodemographic characteristics, the sample consisted of 415 female participants with an age range between 24 to 69 years (M = 46.56 ± 9.55); and 452 male participants with an age range between 24 and 73 years (M = 48.47 ± 10.34).

The distribution of the teaching staff according to knowledge areas is as follows: Social Sciences (N = 414); Experimental Sciences and Technologies (N = 183); Health Sciences (N = 163); and Human Sciences (N = 107).

Of the total number of participants in the study, 86.4% had a PhD, compared to 13.6% who still did not have one. In addition, the percentage of professors who had been accredited at least a six-year term research by a public and official body was slightly higher (51.4%) according to those who have not recognized any part of research (48.6%).

2.3. Description of the Instrument and Variables

In order to measure the pedagogical digital competence of the university teaching staff, an instrument called PDC-TER (knowledge and use in 2.0 tools for teaching, evaluation and research) was elaborated. In this instrument, knowledge of 2.0 tools and their didactic use (knowledge + use) are measured using a Likert scale of five points (in total, ten points per item). The instrument is

composed of 19 items organized in three dimensions. The first dimension is made up of seven items related to 2.0 resources for teaching (maximum score to reach 70 points). The second dimension consists of four items focused on 2.0 tools for student assessment (maximum score to reach 40 points). The third dimension is composed of eight items related to research (maximum score to reach 80 points). The maximum total score in the PDC-TER is 190 points.

The variables included in the present study are: variable Y_0 to Y_3 are dependent variables (DV) and variable X_0 to variable X_7 are independent variables (IV). The description of each variable is: Total pedagogical digital competence of university professors (Y_0), Pedagogical digital competence in resources related to teaching (Y_1), Pedagogical digital competence in resources related to evaluation (Y_2), Pedagogical digital competence in resources related to research (Y_3), age of the participants (Scale, X_0), gender of university professors (Nominal, X_1), number of national and international research stays (Scale, X_2), number of years of university teaching experience (Scale, X_3), number of research projects and teaching innovation (Scale, X_4), number of Masters studied. (Scale, X_5), possess a sexennium of research/not possess it (Nominal, X_6) and have the title of PhD/Not have the title of PhD (Nominal, X_7). Point out that in the Spanish educational system, a six-year investigation (Sexennium) refers to the recognition of a six-year research section.

3. Results

The results section is divided into three sections: the first section is focused on analyzing the reliability and validity of the instrument; the second section describes the digital competence of the teaching staff in each dimension of the PDC-TER model; and the third section presents the results obtained through the regression models.

3.1. Reliability and Validity of the Instrument

The reliability of the instrument was ensured by using Cronbach's α. The instrument's total reliability was $\alpha = 0.94$, which is a very acceptable value. Likewise, the reliability of each of the dimensions was also high: teaching dimension, $\alpha = 0.87$; evaluation dimension, $\alpha = 0.87$; research dimension, $\alpha = 0.91$. On the other hand, an exploratory factor analysis (EFA) was performed through the analysis of the main axis with oblimin rotation. The sample adequacy index (KMO) was 0.850 and Bartlet's sphericity test was significant (sig = 0.001), indicating that the correlation matrix exceeded the conditions for carrying out this analysis. The three factors of the instrument explain 48.10% of the total variance.

3.2. Descriptive Exploratory Analysis of the Instrument's Dimensions

In the successive tables, the dimension items of the instrument are analyzed descriptively, using the premise that each item has measured knowledge and didactic use (maximum score to reach being ten points). In each of them, the mean (M), median (Me), standard deviation (Sd) were included.

Regarding 2.0 resources related to teaching, Table 1 shows that the highest level of professors' competence is in multimedia presentations (M = 9.04 ± 1.36), which are slightly similar to word processors (M = 8.86 ± 1.47). The level in competence on LMS is medium high (M = 7.87 ± 2.16), which is higher than in the 2.0 tools offered by Google+ (M = 6.64 ± 2.44). It is noteworthy that professors do not have an in-depth knowledge or use of the tools focused on conducting online tutorials with students (M = 5.37 ± 2.82), educational forums (M = 5.07 ± 2.72) or educational blogs (M = 4.53 ± 2.47).

Regarding 2.0 resources related to the evaluation of students, Table 1 sets out all the items where the level in competence is medium. The rubrics through LMS is the item with the highest score (M = 6.02 ± 2.83), followed by the use of test-type controls to evaluate students (M = 5.90 ± 2.84). Forums (M = 5.10 ± 2.79) and e-Portfolios (M = 4.52 ± 2.65) are tools not highly valued by the professors with low-average scores.

Table 1. Descriptions of 2.0 resources related to.

		M	Me	Sd
to teaching	Multimedia presentations	9.04	10.00	1.36
	Text processors	8.86	10.00	1.47
	Learning management system (LMS)	7.87	8.00	2.16
	Google + (Docs, Drive, Sites)	6.64	7.00	2.44
	Online tutorials (Hangout, Blackboard, AdobeConnect)	5.37	5.00	2.82
	Educational forums to configure activities	5.07	5.00	2.72
	Content platforms (Blogger, WordPress)	4.53	4.00	2.47
	Total Dimension	47.39	47.00	10.62
to evaluate	Rubrics through LMS	6.02	6.00	2.83
	Test type controls through Moodle	5.90	6.00	2.84
	Forums configured to evaluate activities	5.10	5.00	2.79
	E-porfolio	4.52	4.00	2.65
	Total Dimension	21.54	21.00	8.75
to research	Searchers to consult bibliography (Google Scholar)	8.09	8.00	1.95
	Database searchers (WoS, Dialnet, Theseus, Eric)	7.55	8.00	2.15
	Journals websites JCR and SJR.	6.83	7.00	2.36
	Quantitative software (SPSS, Minitab, Mplus, R, Excel)	6.35	6.00	2.57
	Social networks (Researchgate, Academy)	6.17	6.00	2.49
	Researcher profile (Researcher ID, ORCID)	6.12	6.00	2.36
	Bibliographic citations (Mendeley, Refworks, EasyBIB)	6.00	6.00	2.60
	Qualitative software (ATLAS.ti, NVivo, MAXQDA)	3.71	3.00	2.24
	Total Dimension	50.82	50.00	13.89
	Total PDC-TER	119.75	118.00	28.11

Source: own elaboration.

Regarding 2.0 resources related to research, it can be observed at a general level that there is a great difference between items. Web searches to consult scientific literature (M = 8.09 ± 1.95) or databases (M = 7.55 ± 2.15) are the web resources of which the lecturers have the best command. Professors also have a good level of knowledge on impact journal websites (M = 6.83 ± 2.36), but their level in social networks (M0 = 6.17 ± 2.49) and research profiles (M = 6.12 ± 2.36) to communicate and share their scientific publications with others are resources little used. Regarding the domain and use of software for the treatment of data, it can be observed that the 2.0 tools focused on quantitative methodologies are the most used (M = 6.35 ± 2.57) compared to qualitative software (M = 3.71 ± 2.24).

According to the total level of pedagogical digital competence of professors for each dimension, as well as the total level of the instrument, the professors obtained a medium-high level in the dimension to teach (M = 47.39 ± 10.62) and in the dimension to investigate (M = 50.82 ± 13.89), while in the dimension to evaluate the professors had a medium level (M = 21.54 ± 8.75). In terms of the level of total competence, it should be noted that it is medium (M = 119.75 ± 28.11) compared to the 190 maximum points attainable.

3.3. Identification of Factors That Affect the Proficiency Level of Professors

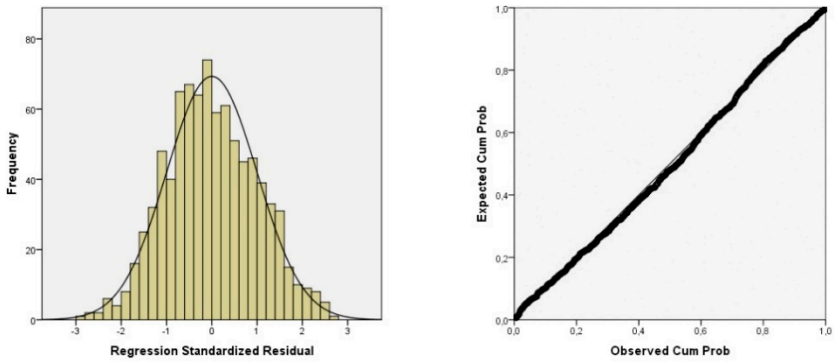
In order to identify the variables that affect the pedagogical digital competence of professors, three multiple linear regressions (MLR) have been carried out: the first regression is focused on the total level of competence which includes the sum of all the items of the three dimensions of the instrument (PDC-TER Model); the following regressions are focused on the specific competence of each dimension of the instrument, where each dimension includes the sum of their respective items. It was estimated using the ordinary least squares method, following a forward approach in which only the significant regression coefficients were considered.

The different independent variables are described in Section 2.3, taking into account that the following variables have been recoded into dummy variables: gender (male 0, female 1), possess a research sexennium (not 0; if 1), have the PhD degree (not 0, yes 1). To calculate the predictive line,

an MLR has been used in steps. In addition, the non-violation of the assumptions that allow this type of analysis in each proposed model was taken into consideration.

3.3.1. Regression in Y_0 (Total Pedagogical Digital Competence of Professor's Higher Education)

The Y_0 model takes into account the total level of competence. Regarding the assumptions of normality, independence and multicollinearity of the residuals, Figure 1 shows the histogram and the P-P plot of normal probability of the typified residuals. This figure supports the assumption of normality of waste. On the other hand, independence was tested with Durbin–Watson statistics, in this case D.W. = 1.90 indicating independence, since the statistic is close to the value 2 [43].



(**a**) (**b**)

Figure 1. Multiple linear regression (MLR) assumptions. (**a**) Regression Standarized Residual; (**b**) Observed Cum Prob.

The multicollinearity was checked through the tolerance values and the variance inflation factor (VIF). In the Table 2, the tolerance values are greater than 0.6, and the VIF values are below values of 10, indicating non-collinearity [44,45]. The Y_0 model was significant, F (4, 862) = 15.099, $p < 0.05$, adjusted $R^2 = 0.061$, where only the masters variable ($t = 4.686$, $p < 0.05$), projects ($t = 4.228$, $p < 0.05$), stays ($t = -2.927$, $p < 0.05$), and experience ($t = -2.335$, $p < 0.05$), were significant variables, the last one of them having a negative weight. The equation of the regression model can be seen as the following:

$$Y_0 = 113.725 + 0.158\ \text{Masters} + 0.142\ \text{Projects} + 0.099\ \text{Stays} - 0.079\ \text{Experience} \quad (1)$$

Table 2. Model coefficients.

Variables	Coefficients β	t	Sig.	Tolerance	VIF
Constant	113.725	45.143	0.001		
No. Masters	0.158	4.686	0.001	0.960	1.042
No. Projects	0.142	4.228	0.001	0.961	1.041
No. stays	0.099	2.927	0.004	0.951	1.051
Experience	−0.079	−2.335	0.020	0.944	1.059
Gender	−0.005	−0.138	0.890	0.985	1.015
Sexennium	0.029	0.786	0.432	0.777	1.287
PhD	−0.012	−0.328	0.743	0.878	1.139
Age	−0.032	−0.539	0.590	0.302	3.306

Source: own elaboration.

3.3.2. Regression in Y_1 (Pedagogical Digital Competence in Resources Related to Teaching)

The Y_1 model was focused on knowing the competence of the professors in relation to the 2.0 resources dimension to teach. The histogram and the P-P plot of normal probability of the typified residuals support the assumption of normality of it. Furthermore, Durbin–Watson statistics showed

independence (D.W. = 1.94), and the VIF values are below values of 10, indicating non-collinearity (Table 3). The Y_1 model was significant, F (4, 862) = 11.154, $p < 0.05$, adjusted $R^2 = 0.045$, where only the masters variable ($t = 4.290$, $p < 0.05$), projects ($t = 2.748$, $p < 0.05$), stays ($t = 2.101$, $p < 0.05$), and age ($t = -2.519$, $p < 0.05$), were significant variables. The equation of the regression model can be seen as the following:

$$Y_1 = 48.855 + 0.149 \text{ Masters} + 0.093 \text{ Projects} + 0.072 \text{ Stays} - 0.089 \text{ Age} \quad (2)$$

Table 3. Model coefficients.

Variables	Coefficients β	t	Sig.	Tolerance	VIF
Constant	48.855	25.281	0.001		
No. Masters	0.149	4.290	0.001	0.914	1.095
No. Project	0.093	2.748	0.006	0.960	1.042
No. stays	0.072	2.101	0.036	0.941	1.063
Experience	0.078	1.336	0.182	0.322	3.110
Gender	−0.005	−0.143	0.886	0.986	1.014
Sexennium	−0.066	−1.731	0.084	0.747	1.339
PhD	−0.056	−1.549	0.122	0.847	1.181
Age	−0.089	−2.519	0.012	0.888	1.126

Source: own elaboration.

3.3.3. Regression in Y_2 (Pedagogical Digital Competence in Resources Related to Evaluation)

The Y_2 model was focused on the ICT resources dimension to evaluate. The assumption of normality was supported. Durbin-Watson statistics showed independence (D.W. = 1.79), and the VIF indicated non-collinearity (Table 4). The Y_2 model was significant, F (1, 865) = 29.914, $p < 0.05$, adjusted $R^2 = 0.032$, where only the master's variable ($t = 4.290$, $p < 0.05$) was significant variables. The equation of the regression model can be seen as the following:

$$Y_2 = 20.125 + 0.183 \text{ Masters} \quad (3)$$

Table 4. Model coefficients.

Variables	Coefficients β	t	Sig.	Tolerance	VIF
Constant	20.125	51.579	0.001		
No. Masters	0.183	5.469	0.010	1.000	1.000
No. Project	0.056	1.663	0.097	0.998	1.002
No. stays	0.052	1.555	0.120	1.000	1.000
Experience	−0.016	−0.465	0.642	0.961	1.040
Gender	0.001	0.024	0.981	0.997	1.003
Sexennium	0.002	0.059	0.953	0.908	1.101
PhD	−0.050	−1.461	0.144	0.971	1.030
Age	−0.030	−0.873	0.383	0.916	1.091

Source: own elaboration.

3.3.4. Regression in Y_3 (Pedagogical Digital Competence in Resources Related to Research)

The Y_3 model was focused on the ICT resources dimension to investigate. The assumption of normality was supported. Durbin-Watson statistics showed independence (D.W. = 2.00), and the VIF indicated non-collinearity (Table 5). The Y_3 model was significant, F (5, 861) = 16.238, $p < 0.05$, adjusted $R^2 = 0.081$, where only the masters variable ($t = 3.192$, $p < 0.05$), projects ($t = 5.094$, $p < 0.05$),

stays ($t = 3.109$, $p < 0.05$), experience ($t = -4.213$, $p < 0.05$), and Sexennium ($t = 3.518$, $p < 0.05$) were significant variables. The equation of the regression model can be seen as the following:

$$Y_3 = 47.857 + 0.110\ \text{Masters} + 0.171\ \text{Projetcs} + 0.105\ \text{Stays} + 0.130\ \text{Sexennium} - 0.148\ \text{Experience} \quad (4)$$

Table 5. Model coefficients.

Variables	Coefficients β	t	Sig.	Tolerance	VIF
Constant	47.857	38.087	0.001		
No. Masters	0.110	3.192	0.001	0.895	1.117
No. Project	0.171	5.094	0.001	0.942	1.062
No. stays	0.105	3.109	0.002	0.931	1.075
Experience	−0.148	−4.213	0.001	0.861	1.161
Gender	−0.004	−0.112	0.911	0.984	1.016
Sexennium	0.130	3.518	0.001	0.777	1.287
PhD	0.054	1.536	0.125	0.849	1.178
Age	0.055	0.914	0.361	0.291	3.440

Source: own elaboration.

4. Discussion

In this study, the level of digital pedagogical competence of professors in Higher Education of Spain has been analysed in depth about ICT resources which professors can use in the teaching-learning process with their students, in the process of assess their students, and for research. In addition, the predictor variables of the level of digital pedagogical competence of said professors have been identified.

Despite the fact that the teaching staff has an overall medium-high level of self-perception regarding their level of competence, this level is still insufficient to meet current educational demands. They still possess a level of competence that is more technical and communicative than pedagogical, as the educational potential of ICT is not exploited for its effective incorporation in teaching-learning processes (teaching and evaluation) as well as in relation to research. This is corroborated by previous research which has found that university teaching staff have tended to develop their digital pedagogical competence in different ways [9–12,46].

The most used 2.0 tools for teaching continue to be the most familiar tools for professor in Higher Education [25], despite the continuous advances that occur in this field and which can have a positive impact on issues related to teaching, such as methodologies and innovations. The overvaluing of university teaching staff with regard to the incorporation of ICT in teaching may be the result of a restricted view in terms of the use of methodological teaching strategies and programmes, as they claim to use emails, multimedia presentations and text processors to a greater extent for this purpose. This is also in accordance with the studies carried out by Sánchez-Santamaría et al. [29], García-Valcárcel et al. [30], El-Bahsh and Daoud [31] and Rodrigues et al. [32]. This means that these professors do not have true literacy in relation to digital pedagogical competence.

The potential of ICT is reduced when analysing the extent to which these Spanish professors use it to evaluate their teaching. First, there are few studies that focus on this issue, but even more significantly, those studies that do exist have found the teaching staff do not use very powerful online evaluation resources, such as e-portfolios or evaluation forums, to a large extent. Instead, they focus mainly on the use of rubrics. This is despite the fact that they consider themselves to have an average level of digital pedagogical competence. According to Buarki [21], this leads to the assumption that professors rarely use these tools to evaluate their students.

Research is the main way to promote the work of professors in Higher Education. Therefore, it is unsurprising that this dimension is highly valued, with professors having a medium-high self-perception. Despite this fact, according to Buarki [21], their main use of ICT is focused on access to

scientific knowledge. However, they do not typically use ICT to communicate and share their scientific publications through social networks and research profiles.

After analysing the predictive variables of the level of total digital pedagogical competence, it can be observed that the number of postgraduate degrees, projects and international stays correlate positively, while teaching experience correlates negatively. Therefore, it can be noted that the teaching experience affects negatively to the total level of digital pedagogical competence, that is, the greater the teaching experience, the less the development of total digital pedagogical competence, which are results contrary to those obtained by Ashrafzadeh and Sayadian [34], Scherer, Siddiq and Teo [35] and Nwankwor [36], since according to these authors, experience does not influence the level of digital competence. Although it should be noted that this variable does not affect the rest of the established models. This suggests that activities related to research are more likely to encourage professors to further train in pedagogical digital competence.

When carrying out an analysis according to the dimensions of the instrument, it can be observed that participating in research projects correlates positively with the three dimensions. In both the 2.0 tools dimension for teaching and in the 2.0 tools dimension for research, the number of postgraduate degrees, the stays in other centres and the possession of one or more research periods all have a positive influence. This indicates that part of these tasks give professors a more open mind to the use of ICT in their daily work. Teaching experience was the only influential variable in the 2.0 tools dimension for research. This result corroborates the above, as university teaching staff's research ability increases as their teaching experience increases as well as their attitude towards educational technology [47].

5. Conclusions

After carrying out the study, it can be seen that, despite the fact that the teaching staff has an overall medium-high level of self-perception regarding their level of digital pedagogical competence, this level is still insufficient to meet current educational demands. They still possess a level of competence that is more technical and communicative than pedagogical, as the educational potential of ICT is not exploited for its effective incorporation in teaching-learning processes (teaching and evaluation) as well as in relation to research.

After carrying out the study, one possible recommendation is for the university policy to include and propose a digital pedagogical training programme for university teaching staff. Another suggestion may be to encourage professors to use ICT tools both in their teaching, as well as in the evaluation of their students and in research, since such use favours high-quality teaching, as well as success in the professional field.

As future research lines of research, it would be interesting to find out the opinion of students on their professors' level of pedagogical competence, in addition to the self-perception of professors. Furthermore, it would also be very positive to complete a study by analysing the close environment of professors, their department and, faculty to a greater extent. By gaining access to their immediate learning zone, it may be possible to determine to what extent these elements influence or impair their pedagogical digital training.

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