Analysis of Teachers'Pedagogical Digital Competence: Identification of Factors PredictingTheir Acquisition

Francisco D.Gui-Hn-Gámez ·M•José Mayorga-Fernández· Javier Bravo-Agapito· David Escribano-Ortiz

Abstract

Toe current technological revoluti.on has reached all social classes and its educative use by teacbers has not gone unnoticed. The introduction of 2.0tools has become a reality in many classrooms. Inorder to evaluate the digital competence ofteachers, d.ifferent dimensions mnst be considered, including knowJedge and educati.ve use. Tbe first objecti.ve of this research is to fin.d out whether there are any d.ifferences between the knowledge and use of teacbing staff of ICT, specifically regarding d.ifferent 2.0tools, as well as d.ifferent modules on the Moodle virtual platform, using the t-Student test. The second objective is to analyse, tbrough a multiple linear regression model, which factors bave an eflect on tbe level of digital competence: gender, age and educational stage. With this aún, a non-experimental, ex postfacto type of research has been carried out with a study populati.on of 81 teacbers from the community of Madrid (Spain). The results have sbown that there are statistically significant d.ifferences between the lmowledge and use of 2.0tools and Moodle Modules. Inaddition, tbe results have found that the variables age and gender bave an effect on the prediction of the level of pedagogical digital competence of the teaching staff, while the educational stage in which they teach has no effect The conclusions derived from this study can belp to develop educational interventions focused on improving the unfavourable digital competence of teachers.

Keywords Pedagogical digital competence · ICT · Moodle · 2.0 tools · Teachers

1 Introduction

The current technological revolution has shaken the foundations of tite contemporary world. Ithas gone from having a limited relationship in time and space to having a perma-nent connection anytime and anywhere (Yin et al. 2011). This evolution has occurred in a short space of time. Therefore, it can be said that the incursion and development of new technologies have brought about a "social mutation" which has affected all areas of society worldwide (Brown and Duguid 2017).

Itis noteworthy that the educational field is one of the most affected areas regarding this evolution, since there is no doubt tltat the professional future of students wi11 be linked to the use of Information and Communication Technologies (ICT). Thus, trained and motivated teachers will be needed in order to use tltese tools efficiently (Siddiq et al. 2016; Gil-Flores et al. 2017; Tondeur et al. 2018). In this regard, Krumsvik (2014) has emphasised the need for teachers to obtain adequate training according to digital competence (DC), and, more specifically, in terms of pedagogical digital competence (PDC). This will enable them to transmit the course contents to their students adequately through s technological resources, which will vastly improve teaching.

Inrecent years, due to the rise ofICT, tite use of Learning Management Systems (LMS) (Jackson 2017) has grown largely among the educational community. However, the level of PDC that teachers have on these LMS is not suffi.cient, since there is a lack of technological and pedagogical training in relation to tltem (Gregory et al. 2015; Guillén-Gámez and Fernández-López 2017). Inaddition, the PDC level of teaching staff can be affected ifdifferent variables are tak.en into account, such as age (Scherer et al. 2015; Gudmundsdottir and Hatlevik 2017) and sex (Aesaert and Van Braak 2015; Tondeur et al. 2016; Casillas et al. 2017).

This has brought about a series of questions. More specifically, what level of knowledge and educational use do teaching staff have of ICT? Does the PDC level of teachers differ among its dimensions (knowledge and educational use)? and What factors affect the leve] of PDC? Inthis sense, the present study has two objectives: (1) to find out and compare whether there are differences between the knowledge and educational use of 2.0 tools and Moodle Modules; (2) to identify the factors that best predict the level of PDC.

2 Theoretfcal Framework

2.1 Approach to the Concept of Pedagogical Digital Competence (PDC)

The European Commission (EC 2018) defines a competence as the ability to have adequate knowledge, skills and attitudes needed by the population for their personal development, employability, social integration and active citizenship. Specifically, the European Commission (EC 2007) determined the DC as one of the 9 main competences that any citizen requires to participate in the society of tite twenty first century.

DC can be understood as a way to use technologies, as well as how to understand the impact of technologies in the digital world by promoting their optimal integration (NMC 2017). Navarro et al. (2016) and Ananiadou and Claro (2009), for example, have described

DC as the integrated and functional use of knowledge, skills and digital attitudes. Similarly, Lakkala et al. (2011) see the term DC as the ability to use a specific digital technology or software. Incontrast, PDC implies a further step; it affects the attitude, lrnowledge and educational use that teachers have towards ICT (From 2017). Specifically, Lázaro-Cantabrana et al. 2019, p. 1) understand this concept as "a set of sk:ills, abilities and attitudes that the teacher must develop to incorporate digital technologies into their practice and professional development". Therefore, this competence must be related to both technological k:nowl- edge and its didactic use (Rivera-Laylle et al. 2017).

For all this, all teachers must have an adequate level of PDC, which allows them an adequate integration and use of ICT in classroom. Thus, they are required to possess a series of basic sk:ills that enables them to respond to certain situations, both personally and professionally, as well as pedagogical skills in relation to learning and the teaching profession (Lund et al. 2014). In this sense, it is clear that teaching staff have a double responsibility: they must improve their level of PDC development and contribute to the development of their student's PDC (Instefjord and Munthe 2017).

On the one hand, this concept has been deeply studied in the literature providing a multitude of terms, where it has been quite complicated to fi.nd a single term, such as digi- tal competence, digital literacy, media literacy, digital ability or skills of Internet (Janssen et al. 2013; Hatlevik and Christophersen 2013). But also, the internal structure of the DChas also been analyzed in different approaches. For example, the European Commission (EC 2017) created a project called DigCompEdu which understood DC as the ability of a person to make a safe, critical and creative use of ICT. This same commission createdthe DIGCOM project (EC 2013) which was focused on ti.ve dimensions on self-percep- tion in digital competition: digital technologies for information search, to communicate, for content creation, security and problem solving. In similar lines, the National Institute of Educational Technologies and Teacher Training (INTEF 2017) created a rubric basedon a system of dimensions, indicators and levels of skills development in digital teaching competence.

In relation to the creation of instruments or models to measure the level of technological competence of teachers, different instruments have been developed in recent years. González Martínez et al. (2018) created a self-perception instrument called INCOTIC which mediates the use of ICT. Ruiz et al. (2015) created an instrument called ACUTIC to evaluate the self-perception of attitudes towards ICT, technological knowledge and didactic use of digital technologies. With another approach, Koehler and Mishra (2009) proposed the TPACK model (Technological Pedagogical and Content Knowledge). Inparticular, if the technology (TK) is linked to the content (CK), the technological knowledge dimension of the Content (TCK) is obtained where teachers need to understand how technology can be used to represent their disciplinary areas to use and develop competence discipline (León et al. 2016). However, Cox and Graham (2009) argue that to achieve the full development of the TCK dimension, and subsequently the development of the complete TPACK model, it is necessary for teachers to develop this knowledge in their pedagogical environment, that is, put it into practice and optimal (didactic use).

Taking into account the previous instruments and models, in this work: a proper definition has been made based on the:m, considering that teachers will have a correct digital competence when, in addition to having knowledge in specific technologies and their use in the classroom, they also know how to get the most out of these technologies in the implementation of teaching methodologies that facilitate the acquisition of curriculum content. In other words, it is not enough for teachers to have a high level of knowledge and use of digital technologies in the classroom, but it is essential that they know how to apply

these technologies through new and innovative pedagogical methods in order for students to acquire relevant learning.

2.2 Pedagogical Digital Competence Regarding 2.0 Tools

In the scientific literature, most of the research has focused on finding out the educational use that teachers malee of ICT (Ahmed et al. 2016; Alhassan 2017; Amhag et al. 2018; Faizi 2018). Mercader and Gairin Sallan (2017), for example, have analysed how teachersuse ICT. Using a sample of 527 professors, they discovered that the tools that most teach- ers use are virtual presentations (97%) and LMS, such as Moodle or the Virtual Campus of universities (89.2%). Less than 40% of the teachers indicated that they use blogs, wikis or social networks in their classes. In the same context, Barak (2017) used a sample of 52 science teachers, concluding that almost 40% of them used asynchronous online forums, with other less popular applications in the cloud, such as wikis, blogs and social networks (45 to 25%).

Despite the aforementioned research, there are currently few studies to have been carried out that are based on teachers' knowledge of 2.0 tools. For instance, Sadaf et al. (2016) analysed the proficiency leve] of teachers using 2.0 tools. Their results found that teachers had a greater knowledge of social networks and video and sharing applications. Social bookmarking and online office applications occupied the last positions. Equally, Cabero-Almenara et al. (2019) analysed the ICT knowledge of 4874 teachers. They found that said teachers had a greater knowledge of 2.0 tools when referring to the use of email, forums and blogs, yet a low average according to the knowledge of online questionnaires or design of questions. Mainly, technological knowledge has been studied through the TPACK model. For example, Cabero Almenara et al. (2017) evaluated the TCK (Technological content knowledge) dimension of university students. The results showed medium–high levels in relation to the knowledge of technologies that can be used to understand and develop curricular contents, where the female sex obtained a slightly higher perception than the male sex, although not significantly.

On the other hand, many authors have investigated what factors affect the PDC level of teaching staff (Egan et al. 2018; Cristobal and Gimbert 2018; Kunda et al. 2018). Regarding gender, sorne studies have found males to have a greater preference for ICT than females (Incantalupo et al. 2014; Balta and Duran 2015; Ilkan et al. 2017). In contrast, some authors have discovered that females have better digital skills than males (Aesaert and Van Braak 2015; Krumsvik et al. 2016). However, there are other studies that have found no statistically significant differences in terms of gender (He and Zhu 2017; Stosic and Fadiya 2017; Dauda et al. 2018). As for age, severa! authors affirm that there is a significant, negative correlation (Napal Fraile et al. 2018). Nonetheless, there are other investigations that confirm the opposite (Guo et al. 2008) or even state that there is no correlation (Guillén-Gámez et al. 2018; Benali et al. 2018).

2.3 Pedagogical Digital Competence Regarding Moodle Modules

Many authors have researched the use of Moodle by teachers rather than their knowledge (Rodrigues et al. 2018; Badia et al. 2018). Costa et al. (2012), for example, analysed the use of Moodle modules at the University of Aveno in Portugal with a sample of 278 participants. The results showed that, a1though Moodle has great potential, it is mainly used as a repository for materials. Lilrewise, El-Bahsh and Daoud (2016) showed that participants mainly used

Moodle to download course Iectures and slides. Regarding the modules on the Moodle platform, participants pointed out that chats, wikis, foroms, questionnaires and surveys were not commonly used.

Maraver-López et al. (2016) analysed the use of Moodle modules by 30 professors from the University of Huelva (Spain). The results det.ermined that the most commonly used tools were chat, forums and quizzes, while blogs and wikis were the least likely to be used. These results were supported by Badia et al. (2018) who found in their study that quizzes, forums and lessons were the activities used most by teachers. Th.ey argued that these resources can provide new educational scenarios in educative leaming. Kalayci and Humiston (2015) investigated the use of collaborative modules used on Moodle. Using a sample of 28 participants, their results determined that the t.eache.rs' preferences regarding collaboration tools ranked from highest to lowest were wikis, forums, glossaries and control type tests.

Despite the advantages described by numerous authors (Erakovit and Lazovit 2017; Saw et al. 2018), the scientific worlcs detailed in the previous paragraphs reveal the fact that in practice, the didactic potential of this platform is being underused and that its use its limited in many cases to a simple digital repository (Marozas and Dumbrava 2010; Sánchez-Santamaría et al. 2012; Rodrigues et al 2018).

Therefore, it is important to ask whether this limited use is due to the fact that teachers do not carry out activities with these tools because they lack technological training or as a result of other external factors such as age or gender (Hrto:l .ová et al. 2015; García-Gil and Andreu 2017; Kuo et al. 2018). Por instance, Ghavifekr and Mahmood (2017) determined intheir research that there were significant differences between the use of an LMS and gender, although they did not find significant differences in age. Conversely, Saleem et al (2016) and Guillén-Gámez et al. (2019) did not find differences in gender in the use of Moodle in their teaching practice. However, they found a negative effect with respect to age.

Reflecting on the above research. itcan be seen that most studies have focused on analysing teachers' didactic use of ICT,rather than finding out their levelof technological knowledge or whether any differences exist between knowledge and educational use in the classroom. On the other hand, it is apparent that no research has been found that identifies the PDC level of the teaching staff on Moodle in terms of the different educational stages at which they tea.ch. This is because most research has tended to focus on the age andgender oft.eache.rs.

Therefore, the first objective of this research is to analyse and compare t.eachers' level of knowledge and educational use on 2.0tools and Moodle Modules. The second objective is to identify the variables that best predict the PDC level of the teaching staff.

Por this, the following hypotheses have been proposed.

1. There are no differences in the level of PDC of the teachers with respect to knowledge and educational use inthe 2.0 tools and Moodle Modules.
2. None of the independent variables being analysed are significantly related to the PDC level of the teaching staff.

3 Method

3.1 Design

A non-experimental ex post facto design has been used through the creation of an instrument to measure the technological knowledge and educational use of teachers on 2.0 tools

and Moodle Modules (Kerlinger et al. 2002). To collect the data, a survey on the instrument created was carried out and applied to the population under study. The two research questions were: (1) Are there significant differences between the knowledge dimension and the educational use dimension in the PDC of the teaching staff? and (2) Does the age, gender and educational stage affect the PDC level of the teaching staff? A descriptive analysis followed by an inferential analysis has been carried out.

3.2 Partlclpants

The sample is of a non-probabilistic nature where the subjects were selected according to their accessibility. Por this, a snowball sampling was used in which the researchers asked the first subject to identify another potential subject who also met the research criteria. Therefore, the results of the research cannot be used in generalisations regarding the whole population, but simply in comparison to other similar samples. The sample was made up of a total of 99 teachers from the Community of Madrid, Spain. The teaching staff taught in the Early Childhood (3-6 years), Primary Education (6-12 years) and Secondary Education (12-16 years). Once the sample collection was collected, a preliminary exploratory analysis was carried out in order to refine the database and eliminate all examples of lost or atypical cases, which could cause a disproportionate effect on the results. The final sample was composed of 81 teachers. The description of the participants can be seen in Table 1.

Regarding the sociodemographic characteristics, 48.15% of the participants were female, with an average age of 43.62, while 51.85% were male, with an average age of 38.17. Finally, from the point of view of the professional profile, 53.10% of the sample worked in the Infant and Primary Education stage, while 46.9% worked in the Secondary Education stage.

3.3 Description of the Instrument and its Variables

Inorder to measure the PDC of the teaching staff, a self-developed instrument was applied. This instrument is made up of two dimensions: 2.0 Tools and Moodle Modules. In addition, each dimension is composed of two subdimensions: knowledge and didactic use. A Likert scale of 5 points was used to measure knowledge and use, where value 1 was related to "absence of knowledge/use", and value 5 was related to '1ots of knowledge/use"(knowledge +use;;;;; 10 points). The instrument consists of a total of 11 items organised into the two dimensions analysed.

The dimension called 2.0 Tools was composed of four items (educational blogs, educational social networks, YouTube, Google+). The maximum score to be reached ineach subdimension (knowledge/use) was 20 points. The dimension related to Moodle

Table 1 Description of the participants. *Sourr:e:* Owncreation

Type of education	Female		Male		Total	
	N	Age	N	Age	N	Age
Infant and primary	19	35.58±5.59	24	43.16±7.00	43	38.93±7.25
Secondary	20	36.94±7.22	18	44.05±6.80	38	40.68±7.78
Total	39	43.62±6.82	42	38.17±6.29	81	39.75±7.51

Modules was composed of seven items (Mailboxes, Tests, Forums, Wikis, Qualifier, Glossaries and Lessons). The score to reach in each subdimension was 35 points. The total maximum score of the instrument (sum of the seores of the four sub-dimensions) was 110 points.

Table 2 shows the variables included in the present study. Toe variable Y_O to Y_2 show dependent variables which result from the sum of each ítem of the dimension, while the variable X_1 to X_3 are independent variables. Toe gender variable is of a nominal type with two categories (male/female); the age variable is of a scale type; and the educational stage variable is of a nominal type with two categories (Infant and Primary Education/Secondary School).

3.4 Data ColledionProceclure

For the study, a survey was designed through Google Orive. The link was provided to a series of teachers who, through the WhatsApp application, continued to disseminate the survey to different teachers (snowball sampling). In the heading of the questionnaire, the participation of the teachers was requested, guaranteeing anonymity in the treatment of the data.

3.5 Procedure and DataAnalysis

Toe analysis of data included several procedures which are detailed below:

- First, the reliability and validity of the instrument was analyzed in order to know the psychometric properties of the test.
- Second, a descriptive analysis of each item of the dimension was carried out, focused on its subdimensions (knowledge and use). Subsequently, whether any significant differences existed between both subdimensions was analysed.
- Finally, three models of multiple linear regression were created. This procedure was used to find out the effect of the independent variables on the PDC level of the teachingstaff according to each dimension. A multiple regression model was estimated using the Ordinary Least Squares method, following a stepwise approach. In addition, the non-violation of assumptions that allow this type of analysis was considered.

Table2 Definiti.on of variables. *Source:* Own creation

Name	Description	Type
PDCtotal	Total PDC of the tcaching staff	Y_0
PDC tools 2.0	PDC in tools 2.0: knowledge + educational use	Y_1
PDCMoodle	PDC in Moodl.e modules: knowledge+ educational use	Y_2
Gendcr	Teachcr's gendcr	X_1
Age	Teacher's age	X_2
Stage	Educational stage in which the teacher teaches	X_3

4 Results

The results section is divided into three sections: the first section is focused on analysing the reliability and validity of the instrument; the second section is focused on comparing knowledge and use in the 2.0 tools and Moodle Modules dimensions. Toe third section presents the results obtained through the regression models.

4.1 Reliability and Validity of the Instrument

The reliability of the instrument was ensured by using Cronbach's a. Toe instrument's total reliability was a=0.72, which is an acceptable value. Likewise, the rcliability of each of the dimensions was also appropriate: 2.0 tools dimension, a =0.71; Moodle modules dimension, a=0.76.

An Exploratory Factor Analysis is carried out by extracting the main components and seeing if there was correspondence betwecn items and factors. Construct validity is ensured, in the first instance, based on the value obtained in the Kaiser-Meyer-01kin index (KM0=0.738) and Bartlett' s test of sphericity which has a Chi Square for 87.044 (p = 0.004), indicating that the factor analysis is appropriate. The Varimax rotation revealed the existence of two factors explaining 42.33% of variance: Factor 1 (Moodle Modules) 27.66%; Factor 2 (2.0 Tools) 14.67%. Subsequently, with the help of the AMOS 22.0 software, the goodness of fit of the proposed model was determined, through a Confirmatory Factor Analysis following the criteria set by Byrne (2010) and Kline (2010): Chi Square as a test of hypothesis contrast (CMIN/DF, 1.060) considering that values below 3 indicate a good fit; comparative adjustment index (CFI, 0.923) and incremental adjustment index (IF1, 0.935) considering values greater than 0.900 indicates a good fit; and the mean square root of the approach error (RMSEA, 0.027) where values below 0.05 indicate a good model fit. The proposed model is found in "Appendix" section.

4.2 Descriptive and Comparative Analysis Between the Subdimensions of Each Dimension

Table 3 shows the average perceived by the teachers in the 2.0 tools dimension for each subdimension (knowledge and educational use). It can be observed that the values in the knowledge subdimension are slightly superior to those of the educational use subdimension for each ítem. Regarding the total section (sum of the seores obtained among all the 2.0 tools), it can be seen that teachers perceive a higher level of technological knowledge (M= 11.82; ±2.20) than the integration of these 2.0 tools in the classroom (M= 1O.90;±3.16). Inaddition, these values determine that the level of PDC of teachers is average when taking into consideration the 20 maximum points to be reached.

To analyse whether there were any significant differences between the knowledge and the use of these 2.0 tools, the total score of each subdimension was employed. The Kolmogorov-Smirnov test determined that the data followed a normal distribution in the knowledge dimension (KS=0.097; df =81; p >0.05), as well as in the educational use dimension (KS=0.093; df =81; p >0.05). In addition, the observation of the normal Q-Qand Q-Q charts without trend verifies that the distributions approach normality. Toe t-Stu- dent test for related samples determined that there were statistically significant differences between both dimensions (t =2.245, df =80, p <0.05), with a small effect size (d=0.336) (Borenstein 2009).

Table 3 Descriptive and comparative analysis between the subdimensions of the 2.0 tool8. *Source:* Own creation

		Mean	Typical deviation	Asymmetry	Kurtosis	Kolmogorov-Smimov		
						KS	df	Sig.
Blogs	Knowlcdgc	3.07	1.02	-0.15	-0.29	0.212	81	0.001
	Educational use	2.74	1.01	0.10	-0.14	0.231	81	0.001
RRSS	Knowlcdgc	2.24	0.86	0.26	-0.51	0.250	81	0.001
	Educational use	1.88	0.81	0.81	*1.15*	0.230	81	0.001
Youtube	Knowlcdgc	3.33	1.17	-0.40	-0.44	0.191	81	0.001
	Educational use	3.33	*0.95*	0.28	-0.51	0.276	81	0.001
G. drive	Knowledge	3.18	*1.15*	-0.26	-0.41	0.217	81	0.001
	Educational use	2.96	1.22	0.20	-0.69	0.216	81	0.001
Total *(20p)*	Knowledge	11.82	2.20	-0.21	0.01	0.097	81	0.058
	Educational use	10.90	3.16	0.42	-0.17	0.093	81	0.083

Regarding the Moodle Modules dimension, Table 4 shows the descriptive values of the items of each of its subdimensions. In general, it can be observed in the total section that the score in the knowledge subdimension (M =21.40;±2.83) is higher than in the subdimension of educational use (M= lS.73;± 2.99). In addition, these values determine thatthe level of PDC of teachers is average when taking into consideration the 35 maximum points to be reached.

The Kolmogorov-Smirnov test determined that the data followed a normal distribution in the knowledge dimension (KS=0.094, df =81, *p>0.05),* as well as in the educational use dimension (KS=0.090; df =81; p>0.05). In addition, the observation of the normal Q-Q and Q-Q charts without trend verifies that the distributions approach normality. The t-Student test for related samples determined that there were statistically significant differences between both dimensions (t= 6.216, df =80, p< D.05), with a large effect size (d=0.917).

4.3 Identification of Variables Explaining the PDC Level of the Teaching Staff

In order to ídentify the variables that best predíct the PDC level of the teaching staff, three mnltiple linear regressions (MLR) have been carried out: the first model fucused on the 2.0 Tools dimension; the second model focused on digital competence in the Moodle modules; and the third model focused on the total competence of teachers taking into account both dimensions.

Each model is considered according to a series of independent variables described in Table 1 and based on the fact the gender variable and the educational stage variable have been codified in dummy variables. For the gender variable, the value 1has been granted for males, and the value O for females. For the educational stage variable, the value O has been assigned to the Infant and Primary Education stage; and the value 1for the Secondary Education stage. To calculate the prediction, an MLR model has been used according to the following steps.

- Regression in Y_0(Total PDC of the teaching staff)

Table 4 Descriptive and comparative analysis between the subdimensions of Moodle modules. *Source:* Owncreation

		Mean	Typical deviation	Asymmetry	Kurtosis	Kolmogorov-Smimov		
						KS	df	Sig.
Mailboxes	Knowlcdgc	3.38	0.91	0.06	-0.34	0.242	81	0.001
	Educational use	3.23	0.97	-1.18	0.79	0.305	81	0.001
Tests	Knowlcdgc	2.98	1.08	-0.01	-0.68	0.163	81	0.001
	Educational use	2.83	0.86	0.35	0.17	0.235	81	0.001
Forums	Knowlcdgc	3.49	1.09	-0.32	-0.64	0.209	81	0.001
	Educational use	3.19	0.76	0.20	-0.28	0.275	81	0.001
Wikis	Knowledge	3.42	0.95	-0.22	-0.98	0.273	81	0.001
	Educational use	2.60	0.89	0.11	-0.27	0.215	81	0.001
Qualifier	Knowledge	2.51	1.10	0.39	-0.42	0.196	81	0.001
	Educational use	1.69	1.14	1.84	2.61	0.346	81	0.001
Glossarics	Knowledge	3.47	0.92	-0.40	-0.41	0.273	81	0.001
	Educational use	2.79	0.90	-0.09	-0.47	0.221	81	0.001
Lessons	Knowledge	2.15	0.79	0.35	-0.20	0.278	81	0.001
	Educational use	1.40	0.72	0.20	-0.27	0.425	81	0.001
Total (35*p)*	Knowledge	21.40	2.83	0.09	0.73	0.094	81	0.073
	Educational use	18.73	2.99	0.03	0.24	0.090	81	0.158

Toe Y_0 model takes into account the total PDC level of the teaching staff. Regarding the assumptions of normality, independence and multicollinearity of the residuals, Fig. 1 shows the histogram and the P–P plot of normal probability of the typed residuals. This figure supports the assumption of normality of residuals. Nonnality was also assumed through Kolmogorov-Smirnov (KS=0.079, df=81, p>0.05) and the Durbin-Watson statistic showed independence of the residuals (DW=1.71), since the st.atistic is elose to the value 2 (Chen 2016).

Toe multicollinearity was checked through the tolerance values and the variance inftation factor (VIF). As observed in Table 5, tolerance values are greater than 0.6, and VIF values are below 10, indicating non-collinearity (Chan 2004; Ghani and Ahmad 2010).

Toe MLR model was significant., $F(2, 78)=38.613; p<0.05$, adjusted $R^2=0.48$, where only two of the three independent variables were significant predictors of the independent variable, one of which had a negative weight. The equation of the regression model can be seen as the following by considering the standardised coefficients in the same unit:

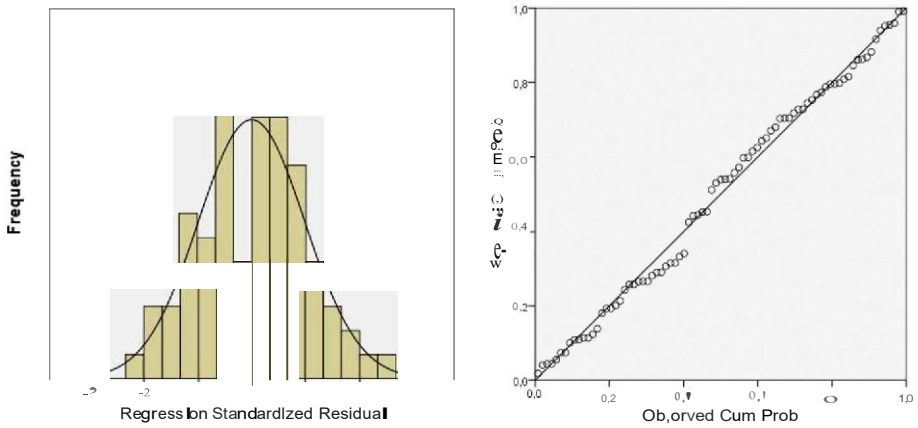
$$Y_0 = 72.623 - 0.400\ \text{Age} + 0.415\ \text{Gender}$$

Thus, when it comes to males, the predicted score will be:

$$Y_0 = 72.623 - 0.400\ \text{Age} + 0.415 \times 1$$

And for females:

$$Y_0 = 72.623 - 0.400\ \text{Age} + 0.415 \times 0$$



Flg, 1 Histogram (left side) and P-P graph of standardi.sed residuals (right side). *Sou-rce:* Own creati.on

Tables Model coefficients. *Sourr:e:* Owncreation

	Standardized coef-ficientsp		Sig.	Tolerance	VIF
Constnnt	72.623	22.831	0.001		
Age	-0.400	-4.322	0.001	0.751	1.331
Gender	0.415	4.478	0.001	0.751	1.230
Educational stage	-0.028	-0.350	0.727	1.015	0.746

- Regression in Y_1 (PDC in tools 2.0: knowledge+educational use)

Toe Y_1 model is focused on the PDC level of teachers in the 2.0 Tools dimension by taking into consideration that it is composed of knowledge and educational use. The histogram and P–P graph of standardised residuals justified the assumption of normality of the residues. In addition, the normality of the distribution was assumed (KS=0.974, df = 81, $p > 0.05$) and the Durbin-Watson statistic indicated residue independence (D.W. = 1.74). In addition, the VIF and tolerance values indicate the non-<:ollinearity of the independent variables (Table 6).

Toe MLR model was significant, F (2, 78)= 13,872; $p < O.OS$, adjusted R^2 =0.24, where only the age variable with a negative weight (t=-2.581,p < 0.05), and the gender variable (t= 2.694, $p < O.OS$) were significant. Toe regression line was the following:

$$Y_1 = 27.620 - 0.290\ \text{Age} + 0.302\ \text{Gender}$$

Thus, when it comes to males, the predicted score will be:

$$Y_1 = 27.620 - 0.290\ \text{Age} + 0.302 \times 1$$

And for females:

$$Y_1 = 27.620 - 0.290\ \text{Age} + 0.302 \times 0$$

Table6 Model ooefficients. *Source:* own creation

	Standardiud coef-ficientsp		Sig.	Tolerance	VIF
Constant	27.6'2JJ	10.330	0.001		
Age	-0.290	-2.581	0.012	0.751	1.331
Gender	0.302	2.694	0.009	0.751	1.331
Educatiooal stage	0.027	0.269	0.788	0.985	1.015

Table 7 Model coeflicients. *Source:* Owncreation

	Standardiud coef-ficientsp		Sig.	Tolerance	VIF
Constant	45.003				
Age	-0.265	-2.291	0.025	0.751	1.331
Gender	0.272	2.356	0.021	0.751	1.331
Educational stage	0.062	-0.615	0.540	0.985	1.015

- Regression in Y_2 (PDC in Moodle Modules: knowledge +educational use)

Toe Y_2 model is focused on the teacher's PDC level in the Moodle Modules dimension. Toe P–P graph of standardised residuals justified the assumption of normality of the residues; the Durbin–Watson statistic indicated residue independence (D.W.=1.65); the VIF and tolerance values indicated the non-collinearity of the variables (Table 7); and the normality test of the data was accepted ($KS=0.070$, $df=81$, $p>0.05$).

Toe MLR model was significant, $F(2, 78)=10.77$; $p<0.05$, adjusted $R^2=0.20$, where only the age variable with a negative weight ($t=-2.581$, $p<0.05$), and the variable gender ($t=2.694$, $p<0.05$) were significant. Toe regression line was the following:

$$Y_2 = 45.003 - 0.265 \text{ Age} + 0.272 \text{ Gender}$$

Thus, when it comes to males, the predicted score will be:

$$Y_2 = 45.003 - 0.265 \text{ Age} + 0.272 \times 1$$

And for females:

$$Y_2 = 45.003 - 0.265 \text{ Age} + 0.272 \times 0$$

5 Discussion

PDC has been measured by many authors (Maraver-López et al. 2016; El-Bahsh and Daoud 2016). In the present work, two of the dimensions into which Rivera-Laylle et al. (2017) divide PDC have been tak.en into account (knowledge and educative use). In addition, the factors that best predict the level of PDC inteachers has been identified.

The results show that the teaching staff has a medium level of PDC, with a greater knowledge than use of the different ICT tools and Moodle Modules. This leads to the assumption that teachers do not use the right tools in their day-to-day in the classroom. After analysing the data, it has become apparent that the first hypothesis can be rejected, since there are significant differences regarding the knowledge and use dimension. The teachers have a greater knowledge than use of these tools. It can be affirmed, therefore, that these data are partially contrasted with those obtained by the TCK model since in that model teachers have a high self-assessment in relation to their technological Knowledge (Cabero Almenara et al. 2017).

Toe most used tools are video channels. These results are corroborated by Kalayci and Humiston (2015), Mercader and Gairin Sallan (2017), Barak. (2017) and Badia et al.(2018). Regarding Moodle, the research shows that the teaching staff has a higher educative use of glossary modules, wikis and file mailbo.xes, compared to the creation of surveys and questionnaires, which are not often used much. This confirms the results found by Kalayci and Humiston (2015) and El-Bahsh and Daoud (2016). It can be affirmed, therefore, that the PDC of the teaching staff is not integrated transversally into their educational practice.

Following the order established in the various steps of the regression models, the second hypothesis can be rejected, since two of the three variables employed (gender and age) atfect the level of PDC. However, the educational stage at which teachers do their job does not contribute to predict their PDC level. Specifically, the results have concluded that age predicts this level in each of the regressions carried out, as it has a negative weight in each of them. These results are similar to those found by Saleem et al. (2016) and Guillén-Gámez et al. (2019). Regarding gender, the results indicated that this variable moderately atfects the POC level of the teaching staff, tending to have a negative effect specifically on females have. These findings are consistent with the results found by Balta and Duran (2015), Ilkan et al. (2017) and opposed to the findings of Cabero Almenara et al. (2017), which did not find that this variable was significant in their study with the TPACK model.

Toe results of this work must be considered with caution, since one of the limitations is the design of the sample. Por this design, intencional sampling was chosen, which indicates that the sample is not random and, therefore, the results obtained cannot be extrapolated to the general population of Primary and Secondary Education. Another limitation of this study is the selection of 2.0 tools and Moodle tools. These tools were chosen because they are the best known in this field, but there may be other 2.0 tools that could change the conclusions obtained.

6 Conclusions and Further Works

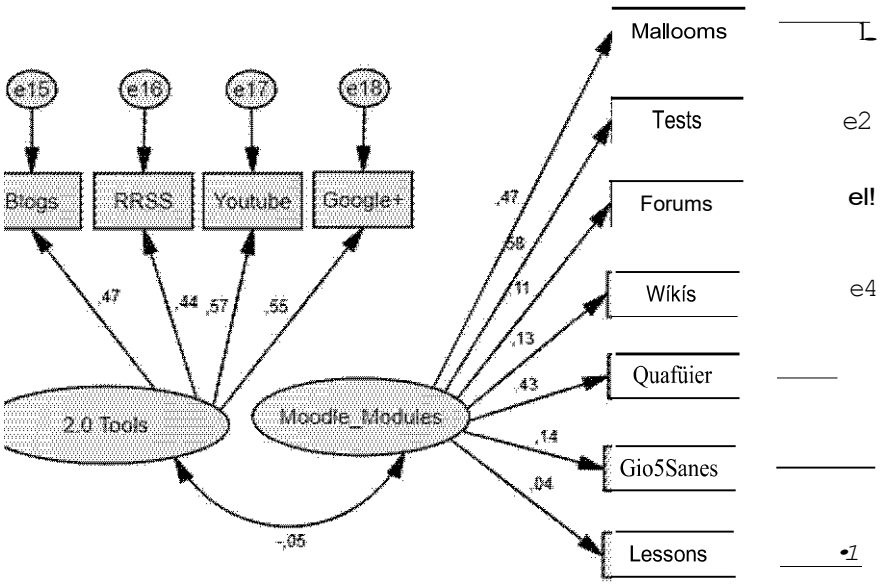
Having carried out this study, it has become clear that more pedagogical digital training must be introduced for teachers from a policy perspective. This competence is in continuous development and is influenced to a great extent by technological advances that exist nowadays. Therefore, regular training must be put in place to ensure sufficient levels of use and knowledge. Inthis sense, Higher Education institutions must include in the inicial training of teachers strategies where the knowledge and use of technologies are not treated as an independent content, but as a content at the service of the implementation of innovative, creative and dynamic strategies that enhance the professional development of these teachers, so that in this

way, these technologies become part of the theoretical foundation, methodological process design and their implementation in the teaching-learning processes.

The results have shown that the teachers currently have a medium leve! of PDC, although they have a higher leve! in the knowledge subdimension with respect to the educativo use subdimension. This leads to the assumption that although we live in a knowledge and information society, our teachers still do not have solid ICT trsining, which directly affects their teaching. This may be doe to shortcomings in training as well as in lifelong learning, since ICT is still not inserted transversally into the teaching-learning processes. Additionally, it may be doe to the fact that teachers still do not have the necessary resources to be used in the classroom, since they still use traditional tools.

Intbis wod<, the PDC of the teaching staff has been measured acconling to two subdimensions (cognitivo and procedural). Therefore, a futuro line of work could also include the attitudinal subdimension. Similarly, it is necessary to continuo broadening understanding of the topic and expand the sarnple to a greater number of participants. This would make it possible to generalise the data obtained to a greater extent in terms of other academic variables (private and public institutions, other educational stages, educational leve! attained). In addition, it would be interesting to find out how the motivation of teachers in their teaching practico can inlluence their leve! of PDC in the classroom.

Appendix



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