

Analysis of the Digital Competence in the Teaching Staff of Universidad de Las Palmas de Gran Canaria

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ABSTRACT

Digital competence of academics has been progressively gaining relevance during the last decade in the context of an exponential growth of digital devices, tools and applications that are available for education enhancement. Frameworks such as DigCompEdu intend to establish a common ground for institutions to evaluate and foster their academics' digital competence performance. Through a stratified sample of 106 participants, this study intends to extract a preliminary descriptive analysis of the digital competence level of academics at *Universidad de Las Palmas de Gran Canaria* (ULPGC). Results show a mean B2 digital competence level, although self-perception seems to be slightly lower with B1 as the most common answer. Overall, academics at ULPGC show a homogeneous distribution of digital competence performance across its different demographic stratus, and fairly aligned with national indicators.

Keywords: DigCompEdu Framework, Educational Technology, Teachers' Digital Competence.

1. INTRODUCTION

In the pursuit of a standardized evaluation of the digital competence among educators, the European Framework for the Digital Competence of Educators (DigCompEdu)¹ provides a common area for institutions to evaluate and foster such competences among their academics'. By detailing a set of 22 digital competences for education, organized in six areas, it proposes six proficiency levels (A1, A2, B1, B2, C1, C2) with cumulative progression, similarly to the Common European Framework of Reference for Languages (CEFR).

DigCompEdu implies that educators' general digital competences should be a prerequisite, as well as their subject-specific, pedagogical, and transversal competences. After this, teacher-specific digital competences could be developed within the frame of DigCompEdu. Several aspects are common to the Technological Pedagogical Content Knowledge (TPACK) model²⁻⁴, which appeals to the effective integration of three knowledge areas for educators' successful performance in the current teaching environments: technological, pedagogical, and content knowledge. DigCompEdu, however, strengthens mechanisms for such connections to be properly established by describing how technological competence and subject-specific teaching competences can be integrated by teachers. These strategies take over the widespread positive perception of ICT integration in classroom, to enhance the proper didactic use of technologies such as videos or robotics⁵⁻⁷.

For the case of Spain, since July 2020 there is official consensus that DigCompEdu framework should be the reference for academic institutions to evaluate and foster their educators' digital competence proficiency⁸. Additionally, besides that preliminary agreement, a Reference Framework for Educators' Digital Competence is being developed by national authorities, aiming to adapt DigCompEdu to serve as guide for its direct implementation in educative centers. Aligned with these efforts, a joint initiative coordinated by the European Commission and the CRUE (*Conferencia de Rectores de las Universidades Españolas*) has evaluated the general digital competence of academics in Spain as per DigCompEdu⁹.

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The *Universidad de Las Palmas de Gran Canaria* (ULPGC) has been one of the universities participating in that study. During the last years, it has been a particularly sensitized organization towards digital competence development within its teaching staff, as shown by the creation of specific postgraduate training plans under DigCompEdu ULPGC project¹⁰, including a University Expert/Specialist degree (30 ECTS) and in the near future a Master's degree (60 ECTS) which is currently under development.

This paper intends to generate a preliminary assessment of ULPGC teaching staff digital competence performance under DigCompEdu framework, as well as comparing such information with the abovementioned national results. Such evaluation might serve as an initial guide for future studies to generate a complete and detailed mapping of ULPGC academics' relation with technology and digital tools as part of their teaching activity.

2. METHODOLOGY

This study at ULPGC has been carried out in parallel to other 50 Spanish universities, coordinated under the national evaluation managed by the European Commission and the CRUE⁹. In this paper, only results for ULPGC are exploited.

2.1 Data collection

The questionnaire-based instrument used for data collection is a validated tool called "DigCompEdu Check-In Self-reflection Tool"⁹. It has been designed by the Joint Research Center (JRC) based on the DigCompEdu framework¹. Data was collected between May 3rd and May 31st, 2021.

This instrument is structured into three blocks. Initially, as its first block, it provides an assessment of digital competence, including proficiency levels as per the DigCompEdu Model: A1 (Newcomer); A2 (Explorer); B1 (Integrator); B2 (Expert); C1 (Leader) and C2 (Pioneer). The second block is the questionnaire itself, and it includes a set of 25 questions structured in the following seven evaluating factors for the digital competence: 1. Professional engagement; 2. Digital resources; 3. Teaching and learning; 4. Assessment and feedback; 5. Empowering learners; 6. Facilitating learners' digital competence; 7. Open education. Each question is quantified based on seven competence levels, from 0 (lowest) to 6 (highest). For evaluation, the score results are converted into a range scale based on an approximation from previous experiences^{9,11}. Finally, block three includes a final appraisal to measure potential changes on the perception of the proficiency level after the awareness created by second block.

The resulting total score (which covers from 0 to 150) maps the six proficiency levels through the seven defined factors for digital competence. Score ranges are as follows per each proficiency level: A1 [0, 22]; A2 [23, 38]; B1 [39, 56]; B2 [57, 74]; C1 [75, 91]; C2 [92, 150].

2.2 Participants

The sample for this study consisted of a total number of 106 academics from ULPGC, randomly selected through the composite stratified sampling method. This procedure consists of a set of five steps to guarantee a representative sample for the whole considered population. The first step was to obtain a complete list of academics from the organization, with information on academic area, professional category, and gender. The final sample to achieve should be proportionally divided as per the weight represented by each stratum. Then, a random sample was selected within each stratum to meet the required sample, and the questionnaire was only sent to that selection. In case the selected academics were not able to participate, another person from the same stratum was randomly chosen as substitute.

2.3 Data analysis

Initially, a descriptive analysis has been performed for collected information about ULPGC academics performance on digital competence. Additionally, some statistical tests have been performed for deeper understanding of the interrelations among variables. After confirmation of non-normal distribution of data, through a normality Shapiro-Wilk test, non-parametric Mann-Whitney *U* tests have been used for comparisons among factors. The statistical analyses included in this study have been performed using Jamovi¹². A confidence level of 95% has been considered in all cases.

2.4 Confidentiality

This study has been carried out under a strict confidentiality compromise. All participants remained anonymous and gave informed consent for the scientific use of the data gathered.

3. RESULTS

This section presents the main results of this study. With an exploratory perspective, Table 1 shows the distribution on participants as per their professional status, their dedication and their academic area, as well as gender and age. As stated in Methodology section, the stratification of the sample intends to represent the global distribution of the organization. Therefore, almost 70% of participants are permanent academics, and a similar amount is considered for academics with full time dedication. Additionally, the academic areas with more representation are Social and Legal Sciences, Engineering and Architecture and Health Sciences. Participants who decided not to specify their gender, age or academic area were a minority (with each accounting for less than 4% of the responses) and, therefore, not included in Table 1.

Table 1. Number of participants per gender, age, professional status, dedication and academic area.

	Gender		Age				Prof. status		Dedication		Academic area				
	Men	Women	30 to 39 y/o	40 to 49 y/o	50 to 59 y/o	More than 60	Permanent academic	Non-permanent academic	Full time	Part time	Arts and Humanities	Sciences	Social and Legal Sciences	Health Sciences	Engineering and Architecture
N*	54	48	9	26	47	21	72	34	74	32	16	11	34	20	22
f (%)	50.9	45.3	8.5	24.5	44.3	19.8	67.9	32.1	69.9	30.2	15.1	10.4	32.1	18.9	20.7

*Not showing “Not specified” for gender, age or academic area.

The instrument used is based on the “DigCompEdu Check-In Self-reflection Tool”, consisting of 25 questions rated from 0 to 6, and covering a global score range from 0 to 150 intended to measure the aggregated digital competence of academics. Figure 1 shows each participant score, organized from lowest to highest. The mean and median scores achieved by participants are respectively 68.8 and 65.0, which are framed within B2 competence level. Abovementioned 25 questions are organized in 7 different digital competence factors described in Methodology section, aiming to evaluate different descriptors. Table 2 offers detailed information of the mean values for each factor, as well as the maximum achievable score for them, which aggregate to the total 150 maximum score of the complete questionnaire.

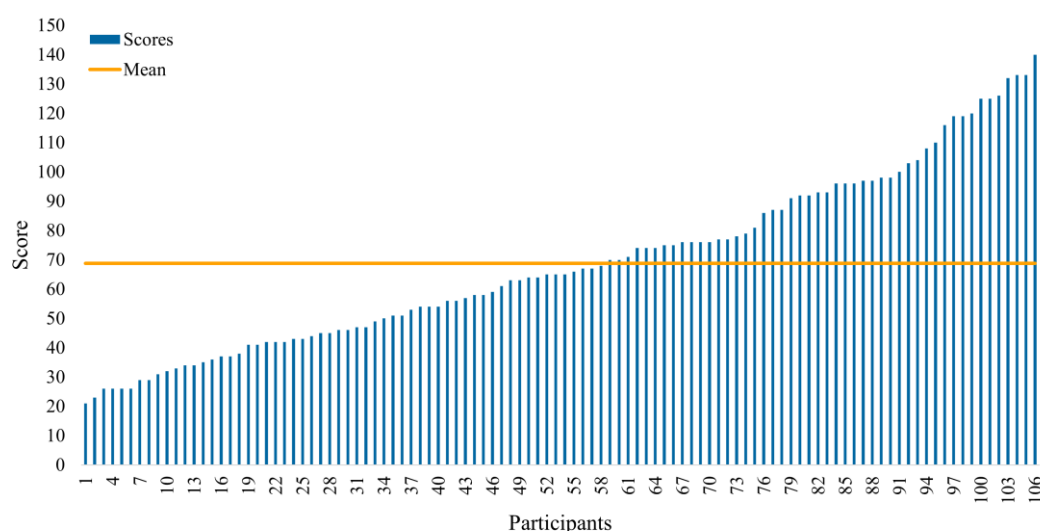


Figure 1. Digital competence scores of participants and mean value.

Table 2. Mean scores per factor, standard deviation and maximum achievable score.

Factors	F1	F2	F3	F4	F5	F6	F7	Global
Mean	13.50	10.00	11.70	7.60	8.06	13.00	4.93	68.80
Standard deviation	4.69	3.76	5.97	3.99	4.50	7.44	4.40	29.60
Maximum achievable	24.00	18.00	24.00	18.00	18.00	30.00	18.00	150.00

When considering potential interdependences among factors and participants' characteristics, we have checked whether digital competence in each factor might be variable depending academic area of teachers or age.

As initial hypothesis, potentially academics whose professional activity is developed within Engineering and Architecture, or Sciences, might have better digital competence performance than professionals in the fields of Arts and Humanities, or Social and Legal Sciences. However, this hypothesis is not supported by Mann-Whitney *U* tests, not finding any significant difference in digital competence by factors among the different academic areas.

However, referring to age there are some differences between the age ranges considered, as shown in Table 3. Academics in their thirties and forties could be considered as having similar digital competence performance in each descriptor, as no significant difference has been found between them. However, when comparing academics in their thirties with 60-year-old teachers, or older, significant difference ($p < 0.05$) is found for "Facilitating learners' digital competence" factor. Additionally, academics in their forties show significant differences with 60-year-old academics, or older, in "Professional engagement" and "Digital resources". No significant differences have been found with other age ranges.

Table 3. Comparison among factors considering age as split variable

Factors	<i>p</i> value*		
	30-39 vs 40-49 y/o	30-39 vs >60 y/o	40-49 vs >60 y/o
F1. Professional engagement	0.373	0.785	0.019
F2. Digital resources	0.910	0.101	0.023
F3. Teaching and learning	0.496	0.802	0.279
F4. Assessment and feedback	1.000	0.351	0.187
F5. Empowering learners	0.909	0.509	0.366
F6. Facilitating learners' digital competence	0.326	0.035	0.473
F7. Open education	0.393	1.000	0.097

*Mann-Whitney *U* test. Bold values: $p < 0.05$.

Additionally, no significant differences are found in any of the digital competences factors when splitting by gender.

As mentioned in Methodology, a third block has been included in this study aiming to evaluate the digital competence performance self-perception in academics, and whether this parameter is subject to changes after the awareness generated by the test itself. Figure 2 shows the results of this block, aggregating in a bar plot all the counts for each performance level. It can be observed how B1 and B2 levels suffered from a decrement in digital competence performance self-perception after the test was completed. This loss of participants acknowledging both levels is translated into a small increase in C1 level (1 academic) and a more noticeable increase in A2 level (7 academics). Differences between pre-test and post-test scores are not statistically significant, but it can be appreciated how awareness of digital competence implications, gained by completing the administered test, results in a general tendency of reduction in self-perception of digital competence performance. As per post-test values, a 28% of participants declares to have a B1 performance level in digital competencies, while a 22.6% declares a B2 performance level.

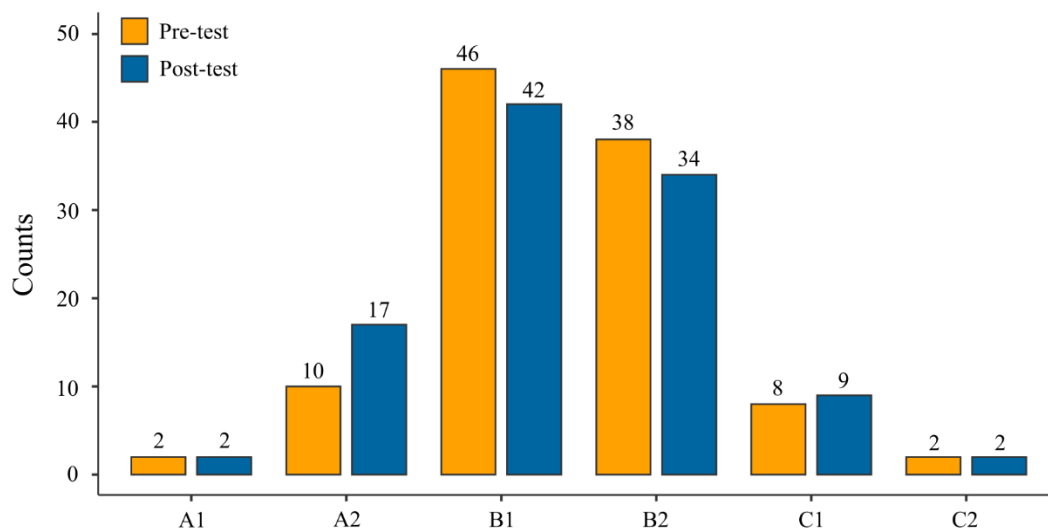


Figure 2. Pretest and posttest digital competence self-appraisal.

4. DISCUSSION AND FUTURE WORKS

The main objective of this study is to develop a preliminary descriptive approximation to the digital competence of academics in ULPGC, under DigCompEdu framework¹. The information compiled from ULPGC is framed in the joint effort for the evaluation of digital competence of academics in Spain⁹, so this will be our main reference to not only provide descriptive elements, but also to evaluate whether our organization is aligned with the national situation.

The first result highlightable is the estimated level of academics' digital competence at ULPGC as per the questionnaire ratings, which is in B2 "Expert" level (with respective mean and median scores of 68.8 and 65.0). This is slightly higher than the national average, which is also framed in B2 level but with a median score of 63 points⁹. It is interesting to compare such actual results from the questionnaire with pre-test and post-test self-perceived competence, where our results are aligned with the national evaluation. In both cases the most frequent self-perceived level has been B1 "Integrator". However, ULPGC academics answered more frequently B1 and B2 levels, covering a total 71.7% of the answers in post-test self-appraisal versus the 49.1% from national study.

Regarding the variables of analysis included in the questionnaire, it is worth mentioning that there is no significant difference in self-perceived digital competence by gender, professional status, dedication or academic area. These variables were also not determinant in national study⁹ excepting academic area, where there were significant differences between three blocks, ordered as follows from highest to lowest level: 1. Social Sciences and Arts and Humanities; 2. Engineering and Architecture; 3. Sciences and Health Sciences. As a hypothetical explanation of the fact that ULPGC teaching staff has not shown these differences among academic areas, it is relevant to highlight that the organization has been providing all its academics with various postgraduate training programs in digital competence¹⁰, as mentioned at Introduction. This offering, regardless their academic area, might have acted as a homogenizer tool for the organizations' training staff self-perception of digital competence. However, further assessments might be needed to deeply understand the specific impact of those training programs.

From all variables, Age is found to be the most determinant for digital competence level. It has been detected that 60-year-old academics, and older, have significantly lower level than younger academics. Particularly, comparing with academics between 30 and 39 years old, differences have been measured for Factor 6: "Facilitating learners' digital competence". On the other hand, when comparing with academics between 40 and 49 years old, the significant differences appeared for Factor 1: "Professional engagement" and Factor 2: "Digital resources". This is also in consonance with the national evaluation for digital competence⁹, where lowest scores were achieved by 60-year-old academics and older. A difference between both samples in this regard appears with academics in the range of 50 and 59 years old, which in our case show a similar score range than younger academics.

However, beyond this initial descriptive study, there is still more information worth analyzing in terms of finding deeper correlations within factors, as well as potential specific correlations between relevant items of the questionnaire. These aspects would be helpful to have a wider picture of the digital competence level at ULPGC, as well as to detect potential action targets to further improve it. Additionally, this research line also opens the opportunity to study ULPGC students' perception on their digital competence, as well as on their teachers'. Correlation analyses might unveil interesting differences in perception that provide a more complete picture of ULPGC digital competence, as well as its impact in teaching and learning processes. Future studies will address these aspects, as well as the specific role of the postgraduate programs created and offered at ULPGC¹⁰ to enhance the digital competence of its academics under DigCompEdu framework¹.

5. CONCLUSIONS

Digital competence is a growing need for educators to be able to successfully integrate technology and digital tools in their teaching activity. Besides subject-specific teaching competence, the availability and incorporation of such digital resources in the classroom turns digital competence evaluation and training into a mandatory aspect to consider for academic organizations and government educational institutions.

In such scenario, this evaluation of ULPGC academics' digital competence shows an overall mean and median B2 "Expert" proficiency. Variables such as gender, professional status, dedication, or academic area have not proved to be determinant for the digital competence performance of ULPGC teaching staff, showing a homogeneous distribution of digital competence across its different demographic stratus. Age, however, is the most determinant demographic variable to consider, being educators with 60 years old, or older, those with lower performance. Results for this study are aligned with the national evaluation in Spain⁹.

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