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Digital Competence and Gender: Teachers in Training. A Case Study

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Abstract: The ICTs are simultaneously an important tool and subject in teacher training. It, therefore, follows that digital competence is fundamental and constitutes a significant educational challenge, particularly the digital divide or gap by gender. The aim is to identify and analyze self-perceptions of digital skills, and the possible relationship of these to gender, in first-year university students taking a degree in primary education teacher training at a Spanish faculty of education. This is a descriptive study using ex-post-facto method and collecting data from a questionnaire administered for four consecutive years to the above-mentioned subjects. The results revealed gender differences in the students' reported perceptions. Men were more likely to perceive themselves as competent in the use of ICTs, reporting better information management and online collaboration skills using digital media. Besides, they made more use of computers as their sole device for browsing, downloading, and streaming and felt more confident about solving problems with devices. In contrast, women reported making more use of mobile phones and were more familiar with social media and aspects related to image and text processing and graphic design.

Keywords: higher education; media education; educational technology; gender; university students

1. Introduction

In initial teacher training, ICTs are simultaneously a tool and an important knowledge [1–3] because they promote universal education and meaningful learning and contribute to professional performance and development and the management and organisation of educational resources [4].

Unless teachers possess digital skills, there is little chance that they may help their students to master this core competence. Yet, as future citizens with full rights and duties, it is a skill they need, since ICTs are a key element in social change [5,6]. In this respect, [7] indicated that the benefits of these technologies depend on the use made of them, but they nevertheless have the potential to facilitate communication, reduce the barriers of space and time, improve quality of life, be a valuable resource for learning [8] and provide equitable access to information and communication.

Ultimately, what is meant by digital competence? It can be defined as the ability to use technology effectively to optimise our daily lives [3,9–11].

Numerous studies have been conducted on digital competence in teacher training students [2,3,12–20], showing a strong interest in it. However, one of the most extensive and important studies of digital competence in the context of the Spanish education system was conducted by [21] with a sample of more than 2000 young people aged between 14 and 19 years old. To perform their study, they developed a questionnaire, the COTASEBA (high school students' technological competence questionnaire), which they administered in several autonomous regions. This same instrument has been employed in subsequent studies [13,22–25]. Besides the COTASEBA, other instruments have been developed to assess digital skills, such as the one designed by [2], but the COTASEBA has undoubtedly been one of the most influential in Spain.

Previous studies have reported that students make frequent use of ICTs [25,26], spend more than 15 h a week performing tasks that involve use of these technologies [27], perceive themselves as competent and consider that their ability to search for information on the internet, analyse it, manage it, organise it, criticise it and assess it is very good [28,29] and can apply technology to design materials in learning contexts [30]. However, young people primarily use ICTs for social and communicative purposes and may encounter difficulties when applying them to learning contexts because they do not possess sufficient skills to perform creative or complex tasks such as programming or those related to safety and problem-solving.

Age, gender, and educational level were frequently reported as significant to digital skills [31,32]. Young adults, ages 18–26, were the most connected age group, also, those with higher levels of education [33], but that did not mean their Internet uses were homogeneous. In this sense, most authors do not consider that the youngsters actually have the digital capabilities that they consider they have [34].

The lack or paucity of digital competence, termed the second digital divide or digital gap [20,35], is one of the variables frequently correlated with gender [12,24,28–30,36–42]. Previous studies suggested that the higher level of use of a variety of websites by men increased their knowledge of the web, which in turn caused them to use this new technology more often than women. Therefore, as women expand their use of different types of websites, their knowledge and use of the web should expand [43]).

Women seem to be less competent both in ICTs in general and in access and use of the internet [35]. This also includes female teachers [37]. Nevertheless, not all studies have found these differences in digital competence when analysing the variable of gender [18,20,44], even with teachers in training [45,46]. In this sense, [47] found that men and women do not differ much in their online skills. However, they found that the self-rated ability of women is significantly lower than that of men. Perhaps one of the most serious challenges is the nomophobia, behavioural disorder about digital technologies, usually smartphones; this issue has more women than men affected [48].

Thus, the research has yielded contradictory results, which underlines the need for new studies that analyse the digital competence of young people, in order to establish differences between their perceptions. Furthermore, in response to the complexity of analysing digital competence, several explanatory models have been proposed. Of these, the DIGCOMP model (European Digital Competence Framework) as applied to citizens' digital competence has been adopted within the European Higher Education Area (EHEA) and formed the basis of the present study [9–11,49]. DIGCOMP breaks digital competence down into multiple competencies that are grouped into five areas or dimensions: information, communication and collaboration, digital content creation, safety and problem-solving. Although we employed this model in our study, it is important to note the existence of other proposals using a diversity of concepts, such as the holistic concept developed by [50].

2. Materials and Methods

2.1. Research Questions

In the light of the general objective of this study and by the review of the literature on the use of technology by young people, we selected a single instrument, the COTAEDU digital competence questionnaire, which we developed based on the COTASEBA questionnaire (high school students questionnaire of technological competence) [21]. Therefore, to determine whether gender influences the self-perceptions of digital skills in first-year university students of primary school teacher training, we investigate students' competencies in five areas or dimensions: information, communication and collaboration, creation of digital content, security and troubleshooting. Our aim is to identify the digital gap inside the DIGCOMP framework.

Our research question was as follows:

- What are the gender differences in self-perception of teachers in training about digital competence in a Spanish education faculty?

2.2. Sample

Our sample was recruited from a study population consisting of 492 first-year students taking a degree in primary education teacher training at a Spanish faculty over four consecutive years (every year with new starter students). The sample consisted of 329 students, of whom 69.9% were women and 30.1% men. The study obtained a level of confidence of 99%, with an error rate of 4.09%. Selection of first year students had been made for avoiding other influences, like subjects taken. Sample rate of women and men are very similar to the study population.

2.3. Research Instrument and Procedure

Given the large size of the sample, we used a single instrument, the COTAEDU digital competence questionnaire, which we developed based on the COTASEBA questionnaire [21]. We conducted comprehensive measurements of the items as regards both their formulation and their content, although many of them already appear in the COTASEBA, which presents excellent reliability and validity [21]. We included 58 items from the latter questionnaire, three of which concern identification while the rest explore digital competencies.

Thus, expanding on the pre-existing questionnaire, we developed the first version of our own instrument containing 125 items. This was validated by a group of experts consisting of five university professionals who assessed each item for clarity, pertinence and relevance, and suggested amendments. Subsequently, in line with the experts' observations, we eliminated all items that had not obtained a score of 3 from at least three of the five experts for clarity, pertinence or relevance. The final digital competence questionnaire consisted of 98 items distributed over the five dimensions of the DIGCOMP framework. Additional items, a total of 40, are mainly about copyright and frequency of use.

Quantitative items can be viewed online, divided into the five dimensions mentioned (see Annex I); also, we included nine qualitative dimensions: (1) Gender; (2) Do you have a computer at home?; (3) Do you have internet at home?; (67) Indicate the social media software you are familiar with; (72) Do you think it is dangerous to upload photos onto social media sites?; (73) What device do you use to access the internet?; (74) What influence does the internet exert on your life?; (75) How much do you think the internet has impacted on today's society?; and (76) Write down what you know about Creative Commons licences. Have you used these licences for your own work? Have you used material protected by these licences?

We obtained good results for the internal consistency reliability of the instrument, with a Cronbach's Alpha coefficient of 0.959 and a split halves result of 0.964 for the first part and 0.872 for the second. The quantitative items were measured using an 11-point scale from 0 to 10 (see Table 1).

As with [21], in our analysis, we considered values between 5 and 10 as positive and values from 0 to 4 as negative. The questionnaire was administered to students via a link to Google Forms, and data were subsequently analysed to obtain descriptive statistics, using SPSS version 24.0.

Descriptive statistics have been used for statistical analysis, test Kolmogorov–Smirnov (normality), Mann–Whitney U (nonparametric) and ANOVA (to deepen the results).

Table 1. Item response options in the COTAEDU.

<table>
<tr><th>Items</th><th colspan="11">Response Options</th></tr>
<tr><td rowspan="2">4–57 and 71</td><td colspan="4">0</td><td colspan="3">5</td><td colspan="4">10</td></tr>
<tr><td colspan="4">I am completely ineffective</td><td colspan="3">I am moderately proficient</td><td colspan="4">I am completely proficient</td></tr>
<tr><td rowspan="2">55–66</td><td colspan="4">0</td><td colspan="3">5</td><td colspan="4">10</td></tr>
<tr><td colspan="4">Strongly disagree</td><td colspan="3">I agree in certain very specific situations</td><td colspan="4">Strongly agree</td></tr>
<tr><td rowspan="2">68–70</td><td colspan="4">0</td><td colspan="3">5</td><td colspan="4">10</td></tr>
<tr><td colspan="4">I don't use them</td><td colspan="3">I am sufficiently competent</td><td colspan="4">I use them every day</td></tr>
<tr><td rowspan="2">77–98</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>I've never heard of them</td><td>Never, but I've heard of then</td><td>Once or twice</td><td>Once every few months</td><td>Once a month</td><td>Two or three times a month</td><td>Once a week</td><td>Two or three times a week</td><td>Almost every day of the week</td><td>Every day</td><td>A couple of times a day</td></tr>
</table>

3. Results

As noted earlier, the questionnaire contained both qualitative and quantitative items; consequently, we performed different tests depending on the type of variable. We used contingency tables to analyse qualitative items, taking correlation coefficients as a reference to determine the significance of the relationship between variables.

For quantitative items, it was important to determine whether to use parametric or non-parametric tests in order to identify differences related to gender. We performed a Kolmogorov–Smirnov test to assess goodness of fit, i.e., if the sample presented a normal distribution. We found that all items presented a non-normal distribution, indicating the need to use non-parametric tests. Even so, the non-normal distribution did not present a severe problem for the ANOVA test, which is fairly robust in the event of non-normal distribution.

Nonetheless, we initially attempted to identify differences using non-parametric tests such as the Mann–Whitney U test. Besides, to further investigate our data we performed an ANOVA to conduct a more in-depth analysis (using Scheffe's test).

Items which obtained a significance level lower than 0.005 in the ANOVA and non-parametric test were highlighted; those which did not meet the two conditions were considered less statistically robust. Thus, we only considered those results that performed satisfactorily in both statistical tests. For qualitative variables, we only found a relationship between gender and the devices used to access the internet (0.023 significance).

Our results showed that women made greater use than men of mobile devices, in computer and mobile device use (78.7% vs. 64.6%) (see Table 2). In contrast, 32.3% of men reported only using a computer, compared with 18.7% of women.

Table 2. Gender and devices.

Contingency Table Item 1 Gender/Item 73 What Device Do You Use to Access the Internet?		(73) What Device Do You Use to Access the Internet?			Total
		Computer	Mobile Device (e.g., Smartphone, Tablet)	Computer and Mobile Device	
Women	Number	43	6	181	230
	% in (1) Gender	18.7%	2.6%	78.7%	100.0%
	% in (73) What device do you use to access the internet?	57.3%	66.7%	73.9%	69.9%
	% of total	13.1%	1.8%	55.0%	69.9%
Men	Number	32	3	64	99
	% in (1) Gender	32.3%	3.0%	64.6%	100.0%
	% in (73) What device do you use to access the internet?	42.7%	33.3%	26.1%	30.1%
	% of total	9.7%	0.9%	19.5%	30.1%
Total	Number	75	9	245	329
	% in (1) Gender	22.8%	2.7%	74.5%	100.0%
	% in (73) What device do you use to access the internet?	100.0%	100.0%	100.0%	100.0%
	% of total	22.8%	2.7%	74.5%	100.0%

Concerning scale variables, 38 of the 89 COTAEDU items distributed across the dimensions correlated with the variable of gender, excluding three items (28, 31 and 90) that it should be considered questionable since they were significant according to the non-parametric but not the ANOVA test (see Table 3).

Table 3. Items related to the variable of gender.

Item	Mann-Whitney U Test	ANOVA
7. Problems with configuration and maintenance	0.010	0.000
9. Install and uninstall	0.044	0.025
10. Change formats	0.037	0.023
12. Intermediate text processing	0.007	0.003
14. Search engine queries	0.029	0.018
21. Scientific calculators	0.001	0.010
22. Images and graphics	0.040	0.040
23. Audio clips	0.014	0.011
26. Graphic design	0.011	0.012
28. Browsing; use of links	0.047	0.058
30. Web design: links	0.035	0.018
31. Download from the internet	0.401	0.075
32. Collaborative software	0.000	0.000
33. Coordinate activity	0.007	0.003
37. FTP (File Transfer Protocol)	0.023	0.023
42. Organise work using databases or spreadsheets	0.026	0.042
43. Graphic organisers	0.030	0.043
44. Online help manuals	0.001	0.001
45. Share information online	0.000	0.000
46. Share resources online	0.001	0.000
47. Automate processes	0.002	0.001
50. Information on computers	0.001	0.000
51. Hardware and software	0.000	0.000
52. Assess multimedia	0.022	0.011
53. Emails with viruses, trash or spam	0.000	0.000
56. Manage and communicate information	0.250	0.019
59. Intellectual property: music	0.009	0.007
60. Non-compliance with intellectual property: films	0.006	0.008
61. Copies	0.000	0.000
62. Non-compliance with intellectual property: graphic novels	0.000	0.000
63. Non-compliance with intellectual property: streaming videos	0.000	0.000
65. Non-compliance with intellectual property: video games	0.000	0.000
66. Non-compliance with intellectual property: software	0.000	0.000
68. Familiarity with social media sites	0.070	0.029
70. Familiarity with cloud storage	0.006	0.002
77. Frequency of use: image editors	0.014	0.018
78. Frequency of use: sound recording/editing	0.005	0.005
82. Frequency of use: collaborative tools	0.011	0.008
88. Frequency of use: virtual worlds	0.000	0.000
90. Frequency of use: wikis	0.015	1.220
98. Frequency of use: discussion forums	0.000	0.000

For significant items, we conducted a comparison of means obtained from the ANOVA for the variable of gender to obtain measures of central tendency (means and standard deviations) (see Table 4) and found that men usually scored higher than women.

Table 4. Comparison of means by gender.

Item		Mean	Standard Deviation	Difference between Means (Absolute Value)	Difference between Std. Dev. (Absolute Value)
(7) I know how to solve computer or internet problems such as email configuration, antivirus configuration or hard drive defragmentation.	Women	5.21	2.388	1.00	0.12
	Men	6.21	2.269		
	Total	5.51	2.394		
(9) I know how to install and uninstall software on a computer.	Women	7.05	2.244	0.59	0.28
	Men	7.64	1.961		
	Total	7.23	2.177		
(10) I know how to change file formats (convert a file from one format to another).	Women	5.90	2.428	0.66	0.18
	Men	6.56	2.246		
	Total	6.10	2.390		
(12) I know how to write a document with a word processor (e.g., MS Word, Open Office Writer), using advanced techniques to create a header, change letter size and font, use bold, underline, etc.	Women	8.15	1.691	0.64	0.38
	Men	7.51	2.072		
	Total	7.95	1.835		
(14) I know how to search for databases developed by others.	Women	4.19	2.427	0.68	0.15
	Men	4.87	2.280		
	Total	4.39	2.401		
(21) I know how to use scientific calculators which include operating systems to solve numerical problems.	Women	4.34	2.478	1.01	0.36
	Men	5.35	2.837		
	Total	4.65	2.628		
(22) I know how to create images and graphics using software.	Women	4.47	2.507	0.62	0.06
	Men	5.09	2.568		
	Total	4.65	2.538		
(23) I know how to create audio clips using software.	Women	4.32	2.657	0.82	0.06
	Men	5.14	2.718		
	Total	4.57	2.698		
(26) I know how to edit images using graphic design software (e.g., CorelDraw, Photoshop, Gimp).	Women	5.80	2.571	0.78	0.06
	Men	5.02	2.511		
	Total	5.56	2.574		
(30) I know how to design web pages using software, including links within the document itself or to others.	Women	2.84	2.450	0.73	0.29
	Men	3.57	2.737		
	Total	3.06	2.558		

Table 4. *Cont.*

Item		Mean	Standard Deviation	Difference between Means (Absolute Value)	Difference between Std. Dev. (Absolute Value)
(32) I know how to use collaborative software.	Women	3.61	2.383	1.16	0.12
	Men	4.77	2.502		
	Total	3.96	2.473		
(33) I know how to coordinate an online group activity such as an online forum.	Women	3.51	2.306	0.84	0.18
	Men	4.35	2.488		
	Total	3.76	2.390		
(37) I know how to send files from one computer to another over the internet via FTP (File Transfer Protocol).	Women	3.21	2.798	0.78	0.08
	Men	3.99	2.880		
	Total	3.45	2.841		
(42) I know how to organise information using tools such as databases, spreadsheets and similar programs.	Women	4.75	2.271	0.54	0.19
	Men	5.29	2.081		
	Total	4.91	2.227		
(43) I know how to use graphic organisers such as mind maps, diagrams or schematics to depict relationships between ideas or concepts.	Women	4.25	2.577	0.60	0.41
	Men	4.85	2.164		
	Total	4.43	2.472		
(44) I know how to use online help manuals.	Women	4.48	2.511	0.98	0.10
	Men	5.46	2.409		
	Total	4.78	2.518		
(45) I know how to use software to share information online with my peers.	Women	4.92	2.679	1.37	0.45
	Men	6.29	2.233		
	Total	5.33	2.627		
(46) I know how to use operating system tools to share resources online or in the classroom (e.g., folders, drives, peripherals).	Women	5.02	2.377	0.98	0.22
	Men	6.00	2.157		
	Total	5.31	2.353		
(47) I know when it would be useful to develop groups of instructions and automate frequently employed processes by using macros, control procedures and formulas, etc.	Women	2.90	2.303	0.93	0.08
	Men	3.83	2.382		
	Total	3.18	2.362		
(50) I know how to explain the advantages and limitations of computers as regards storing, organising, retrieving and selecting information.	Women	4.45	2.244	0.98	0.06
	Men	5.43	2.309		
	Total	4.75	2.305		

Table 4. *Cont.*

Item		Mean	Standard Deviation	Difference between Means (Absolute Value)	Difference between Std. Dev. (Absolute Value)
(51) I understand the compatibility problems encountered between hardware and software.	Women	3.73	2.415	1.45	0.04
	Men	5.18	2.451		
	Total	4.16	2.513		
(52) I consider myself competent to make and assess contributions aimed at improving multimedia productions made by my peers.	Women	4.25	2.280	0.68	0.18
	Men	4.93	2.096		
	Total	4.45	2.245		
(53) I consider myself competent, in most cases, to detect email with viruses, trash or spam.	Women	5.34	2.530	1.14	0.31
	Men	6.48	2.224		
	Total	5.68	2.495		
(56) I know how to use technology tools and resources to manage and communicate personal and/or professional information.	Women	5.39	2.025	0.57	0.05
	Men	5.96	1.974		
	Total	5.56	2.023		
(59) I comply with intellectual property rights for the music.	Women	4.63	2.841	0.91	0.13
	Men	3.72	2.711		
	Total	4.35	2.829		
(60) I download films without checking if it is legal.	Women	5.91	3.183	1.00	0.19
	Men	6.91	2.993		
	Total	6.21	3.156		
(61) I make copies for my friends of music, films, video games, etc.	Women	4.66	3.405	1.52	0.14
	Men	6.18	3.265		
	Total	5.12	3.431		
(62) I download graphic novels illegally.	Women	.80	1.977	1.87	1.44
	Men	2.67	3.414		
	Total	1.36	2.635		
(63) I use pirate streaming services to watch films or football matches.	Women	3.78	3.552	3.32	0.49
	Men	7.10	3.059		
	Total	4.78	3.732		
(65) I download video games illegally.	Women	1.82	2.964	2.78	0.76
	Men	4.60	3.728		
	Total	2.66	3.451		

Table 4. *Cont.*

Item		Mean	Standard Deviation	Difference between Means (Absolute Value)	Difference between Std. Dev. (Absolute Value)
(66) I download software illegally.	Women	4.24	3.333	1.93	0.04
	Men	6.17	3.378		
	Total	4.82	3.457		
(68) Indicate (0–10) how familiar you are with these tools (social media sites).	Women	8.38	2.011	0.53	0.05
	Men	7.85	2.062		
	Total	8.22	2.038		
(70) Indicate how familiar you are with cloud storage (e.g., Dropbox, Megaupload).	Women	4.42	2.842	1.02	0.19
	Men	5.44	2.654		
	Total	4.73	2.822		
(77) Do you use an image editor (e.g., Photoshop)?	Women	4.14	2.280	0.66	0.03
	Men	3.485	2.246		
	Total	3.939	2.286		
(78) Do you use a sound recorder/editor (e.g., Audacity)?	Women	2.25	2.029	0.71	0.28
	Men	2.96	2.308		
	Total	2.46	2.138		
(82) Collaborative tools (e.g., Google Drive).	Women	2.67	2.238	0.74	0.29
	Men	3.41	2.527		
	Total	2.89	2.350		
(88) Do you participate in virtual worlds (e.g., Second Life, World of Warcraft)?	Women	1.40	1.907	1.20	0.76
	Men	2.60	2.668		
	Total	1.76	2.230		
(98) Do you participate in discussion forums (RSS feed)?	Women	2.15	2.256	1.10	0.41
	Men	3.25	2.666		
	Total	2.48	2.436		

In general, men scored higher than women except for items 12, 26, 59, 68 and 77 (advanced use of word processors, image editing, compliance with intellectual property rights for music, familiarity with social media sites, frequency of use of image editors), where women scored higher.

Of note, among the items for which men scored higher were streaming (item 63), downloading video games (item 65), downloading software (item 66) and downloading graphic novels (item 62); they also made copies for their friends (item 61).

Meanwhile, women obtained higher mean values for compliance with intellectual property rights for music (item 59), competence in graphic design (item 26), frequent use of image editors (item 77), competence in presentation and formatting using word processors (item 12) and familiarity with social media sites (item 68).

An analysis of item scores by dimension and subdimension indicated that men obtained much higher scores than women for seven of the 25 items in the information dimension, whereas women did not obtain higher scores than men for any of the items in this dimension. For the second dimension, communication, men again obtained higher scores for six of the 18 items, while women obtained a higher score for familiarity with social media sites. Within the dimension content creation, men scored higher than women for ten of the 32 items, six of which were related to licences and rights, whereas women only scored higher in three items, one related to music and the other two to creating and editing content. Of particular note is the finding that men downloaded various file formats regardless of intellectual property rights, whereas women tended to comply more with such rights in the case of music. In the fourth dimension, safety, it is striking that men scored higher than women for three of the four items in this dimension, whereas women obtained a higher score for one item related to data and digital identity protection. Regarding the fifth and last dimension, problem-solving, men scored higher than women for six of the ten items.

Thus, their responses indicated that men had better information management and online collaboration skills using digital media; employed downloading and streaming sites more frequently and felt more competent solving problems with devices. In contrast, women reported being more familiar with social media and aspects related to image and text processing and graphic design.

4. Discussion and Conclusions

The aim of the present study was to analyse gender differences in teacher trainees' self-perceptions of digital competence. The subject of gender and digital competence has been examined in several studies, but without reaching consensus [12,24,28–30,36–38,40–42,44,45].

Nevertheless, most studies have found significant differences in digital competence between men and women, for example, women seem to be less competent [35], but some researchers do not find differences [20,44–47].

According to the results obtained, the variable of gender affects many of the items in the COTAEDU, divided into the five DIGCOMP dimensions (information, communication, content creation, safety and problem-solving). Our results show that men reported having better information management and online collaboration skills using digital media. In addition, they made more use of computers as their sole device for browsing, downloading and streaming and felt more confident about solving problems with devices. In contrast, women reported making more use of mobile phones and were more familiar with social media and aspects related to image and text processing and graphic design. These findings suggest that women use technologies for social purposes while men use them more for technical or training purposes.

Gender differences also emerged as regards interest in digital content, such as video games. Various authors have highlighted the potential utility of these to promote digital literacy and have reported that they are primarily used by men [51–55]. This could be related to the differences in digital competence observed between men and women.

Concerning the limitations of the present study, this was conducted in a single faculty using a single instrument, which hinders generalisation of the results; however, this limitation is offset by the large size of the sample analysed. Another limitation is that the object of analysis is self-perception about own skills; real unobserved digital competence does not have to be equal to own self-perception [33,43,47].

This and other analyses of digital competence and the second digital divide in society, especially about future teachers, provide an important point of departure for meeting the challenges of initial teacher training and serve as a foundation to promote significant changes in teacher training as a key pillar of education, giving an answer to the difficulties that they have to face during this stage of their professional development, including some material-technological issues [56].

Some ideas about how to solve these differences on digital competence of future teachers are trying to measure real digital competence, and providing initial ICT courses (before university), more subjects focused on educational technology and increasing relevance of ICT in their initial formation and therefore.

To sum up, digital competence of teachers (and teachers in training) is key for ICT implementation in the classrooms, and gender seems to be related (at least with self-perception).

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