

# **Digital literacies in higher education: skills, uses, opportunities and obstacles to digital transformation**

## **Alfabetizaciones digitales en la educación superior: habilidades, usos, oportunidades y obstáculos para la transformación digital**

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### **Resumen**

La digitalización de las instituciones de educación superior (IES), debido a la imposibilidad de clases presenciales y tutoría, causada por COVID-19, puso de manifiesto la necesidad de repensar las oportunidades y los obstáculos para el desarrollo de habilidades de los estudiantes. Basado en el marco de alfabetización digital de Martin y Grudziecki (2006), se desarrolló un estudio con el objetivo de identificar las habilidades digitales de los estudiantes, los usos y efectos de esto en el desarrollo personal y habilidades sociales. La recopilación de datos, utilizando un cuestionario en línea, tuvo lugar al comienzo del cierre de IES en Portugal. Los resultados apuntan a un dominio de las habilidades de búsqueda y edición de datos y a una menor capacidad para crear y desarrollar nuevas soluciones digitales. La mayoría de los estudiantes informaron que las tecnologías digitales se usaron principalmente para la comunicación institucional y entre pares, pero no para el desarrollo de redes y habilidades de aprendizaje permanente. La falta de participación de muchos docentes en el apoyo pedagógico disponible es un obstáculo para una transformación digital adecuada en la educación superior, tanto en tiempos de crisis como en el futuro.

**Palabras clave:** Alfabetización digital, educación superior, habilidades digitales

### **Abstract**

The digitalisation of higher education institutions (HEI), due to the impossibility of face-to-face classes and tutoring, caused by COVID-19, evidenced the need to rethink opportunities and obstacles for the development of digital skills among students. Based on the digital literacy framework by Martin and Grudziecki (2006), a study was developed aiming to identify university students' digital competences, as well as the uses and effects of digital literacy in the development of personal and social skills. Data collection, using an online questionnaire, took place during the initial closing period of HEIs in Portugal. The results point to an almost widespread mastery of search and data editing skills and to a lesser ability to create and develop new digital solutions. Most students reported that digital technologies were used (before the crisis) mainly for institutional communication and between peers, but not for the development of networking and lifelong learning skills. The lack of involvement of many teachers in the available pedagogical support is an obstacle to an adequate digital transformation in higher education, both in times of crisis and in the future.

**Keywords:** digital literacy, higher education, digital skills

## Introduction

In the European Union, digital issues have been the subject of growing interest, particularly due to the recognition that possessing, or not possessing, digital skills will be an important factor in the near future, as evidenced by the European Parliament (2018) resolutions on “Education in the digital era: challenges, opportunities and lessons for EU policy design”. This idea, which had already been circulating in some political and academic discourses (Gil Serra & Roca-Piera, 2015) became visibly present in the current pandemic crisis created by COVID-19. The need to, in such a short period of time, resort to long-distance educational and work processes has drawn attention to teaching and learning mediated by digital technologies at different levels of schooling, and has questioned the attention that has been given to this problem and in the regulation processes of national and international education policies.

The Lisbon Strategy (approved in 2000 and renewed in 2005), through the initiative “i2010 - An information society for growth and jobs” (European Commission, 2005), which was presented with the goal of “promoting an open and competitive digital economy and putting the emphasis on ICT as a factor of inclusion and quality of life” (p. 3), adopted a series of measures and defined the following political priorities: the creation of a single European information space (digital convergence as the main driver of change); to encourage innovation and investment in research; to develop an Inclusive European Information Society, consistent with sustainable development and that prioritises better public services and quality of life. Following these intentions, the Europe 2020 strategy (European Commission, 2010), which replaced the Lisbon strategy, aimed toward smart, sustainable and inclusive growth. To pursue these intentions, the Commission established, as one of its emblematic initiatives, the creation of a digital Agenda for Europe, guided by the goal of accelerating the implementation of high-speed Internet, so that families and businesses could take advantage of a single digital market. Both strategies clearly valued the digital dimension, since technological means are considered a factor in improving quality of life and elements that promote social inclusion, namely because they are drivers of change, innovation and integration in the labour market.

The definition of the 2030 Agenda for Sustainable Development (United Nations, 2015) spurred the debate on Sustainability in the European Union, as outlined in the “White Paper on the Future of Europe” (European Commission, 2017a). With the intention of reaching the goals of sustainable development by 2030, and considering Education, Science, Technology, Research and Innovation as prerequisites, the European leaders agreed to work towards the creation of a European Education Convergence Area, by 2025, with its objective being the widespread access to quality, inclusive education, in all stages of life, from early childhood to higher education, including adult education (European Commission, 2019). Among the priorities for achieving these goals are the improvement of ICT skills and the development of fundamental digital skills, in accordance with the action plan developed by the European Union (European Commission, 2018). According to the European Commission Communication (2018, p. 4), the Digital Education Action Plan “takes further the call of the Reflection Paper on Harnessing Globalisation for society to become increasingly mobile and digital, as well as (...) providing the right blend of soft skills as well as robust digital skills”. Thus, it calls for “education to help strengthen resilience in times of rapid technological change and globalisation” (p. 5), by defining the following action priorities:

1. Making better use of digital technology for teaching and learning
2. Developing relevant skills and competences for digital transformation
3. Improving education systems through a better data analysis and foresight

In higher education, already in 2017, the designated “Renewed EU Agenda for Higher Education” (European Commission, 2017b, p. 7) mentioned, among others, the intention of “develop and roll out a digital readiness model to help higher education institutions, their staff and students implement digital learning strategies and exploit the potential of state-of-the-art technologies, including learning analytics. This will be accompanied by guidance on open education initiatives”.

Based on the need to digitalize the university context (Milenkova & Manov, 2019; Koumachi, 2019; Bergdahl et al., 2020), and in light of national and international guidelines regarding both the intention to modernize education and guarantee that students have conditions to access digital technologies, as well as the capacity for critical use and civic participation in online environments, this article provides a report on a study aiming to: identify perceptions of higher education students regarding the digital skills they possess, in addition to the uses and possible effects that students attribute to digital literacy, in the development of personal, social and lifelong learning skills. These objectives were guided by the following research questions:

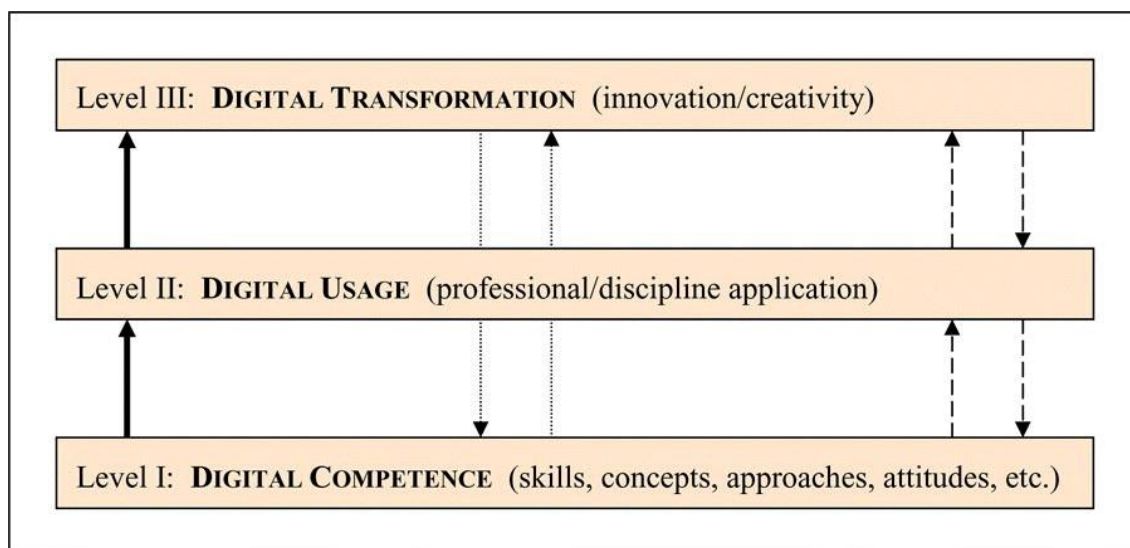
- What is the relationship between students’ characteristics (sex, age, academic year) and their perceived digital skills? What opportunities and obstacles do they believe they face in order to develop these skills within a university context?
- What uses do students of Education and Psychology courses make of digital technologies within a university context?
- To what extent does the use of digital technologies, by higher education institutions, contribute to digital transformation and the development of lifelong learning skills?

The study is based on DIGICOMP 2.0, “a framework for developing and understanding digital competence in Europe” (Ferrari, 2013), but, at the same time, brings an added value to digital literacies in higher education conceptual framework. According to several authors (e.g. Bawden, 2008; Martin & Grudziecki, 2006), it is very important to take into account student attitudes and perspectives to deepen knowledge about the level of digital literacy, not only the digital competence, that could, for instance, be verified by tests and practice observation.

The presentation of the empirical study, methodological procedures and results, is preceded by a theoretical framework on digital literacies in higher education, and proceeded by some reflections made from the dialogue between theory, our professional teaching experience and the perceptions collected by inquiry, using the questionnaire applied to students. The conclusions are supported by a framework that triangulates data obtained from literature, questionnaire and open-ended questions answered by higher education students.

## Digital Literacies in Higher Education

Although the existence of different definitions and concepts of digital literacy (Hall et al., 2013; Bawden, 2008; Lankshear & Knobel, 2008), it is possible to identify two main trends, according to Bawden (2008): on the one hand, those who defend the mastery of ideas, which presupposes a careful and contextualised process of evaluation, analysis and synthesis of information; and on the other hand, those who understand digital literacy as a list of specific skills and techniques that are necessary for the efficient use of digital technologies. From the point of view of this author, digital literacy involves “mastering ideas, not keystrokes”. The concept of digital literacies, which guided the study to which this article refers, includes the three levels mentioned by Martin and Grudziecki (2006): digital competence, professional/discipline application, and innovation/creativity (Figure 1).



*Figure 1: Levels of digital literacy*

According to these authors, and as demonstrated in Figure 1, level 1, “digital competence” is a prerequisite for digital literacy and involves everything from simple skills, such as using a keyboard, to more critical, evaluative and conceptual approaches, including attitudes and awareness about their own learning, about themselves as learners, and about their relationship with peers, as well as about the role of the digital in order to live in society. Level 2, “digital use”, pertains to the application of digital skills in a professional context or in a specific knowledge domain. Level 3, “digital transformation”, is achieved when the use that is made of digital technologies provides innovation and creativity and stimulates significant changes in the professional field or in a conceptual domain.

Similar to Martin and Grudziecki (2006), Bawden (2008), Lankshear and Knobel (2008) and Aires (2015), we chose to use the term digital literacies, in the plural form, since this concept includes many literacies, such as: computational literacy; information literacy; visual literacy; media literacy; among others. In this same line of reasoning, Lankshear and Knobel (2008) defend the use of the term literacies: to give visibility to different

discourses on digital literacy, as well as the political and practical implications which emerge from them; to adopt a more comprehensive and sociocultural perspective of literacies and recognize the benefits that may emerge from this comprehensive view, as well as the effects on different domains of learning. UNESCO (2011, p. 18) combined the concepts of Media and Information Literacy (MIL) to show “a unified notion that embodies elements of both media literacy and information literacy and conveys the aims and objectives of MIL”, aiming to “construct a programme to train teachers who are media and information literate” (p. 19).

According to the Kempster Group (2008, p. 5), digital literacies encompass the following elements:

- Access: knowing about and knowing how to collect and/or retrieve information;
- Manage: Applying an existing organisational or classification scheme;
- Integrate: Interpreting and representing information - summarising, comparing, and contrasting.
- Evaluate: making judgments about the quality, relevance, usefulness, or efficiency of information;
- Create: generating information by adapting, applying, designing, inventing, or authoring information;
- Communicate: communicating information persuasively to meet needs of various audiences through use of an appropriate medium.

On the other hand, Bawden (2008) states that the concept of digital literacy includes the following elements and respective skills: 1) underpinnings - the ability to read, write and use technological devices; (2) background knowledge - understanding of the digital creation pathways, sources and resources; (3) central competencies - the ability to assemble knowledge from multiple sources; and (4) attitudes and perspectives - the ability to learn independently, as well as to exhibit good behaviour in a digital environment. We believe that both perspectives are complementary, since access is essential for fundamental knowledge, and management, integration and evaluation are components of contextual knowledge, with creation and communication being practical applications of core skills, including attitudes. Given the scope of the concept, digital literacies are especially relevant within the framework of demands of the global market and of the political orientations and transnational crises that demonstrate the need to prepare students for a future that is uncertain, where information abounds and communication is increasingly mediated by digital technologies.

From teachers' specific point of view, to be digitally competent, at all levels of education, according to the European Framework for the Digital Competence of Educator (DigCompEdu 2.0; Redcker & Punie, 2017) comprises professional competences, pedagogic competences and learner's competences. The DigCompEdu framework Figure 2) distinguishes six different areas in which educators' Digital Competence is expressed with a total of 22 competences.

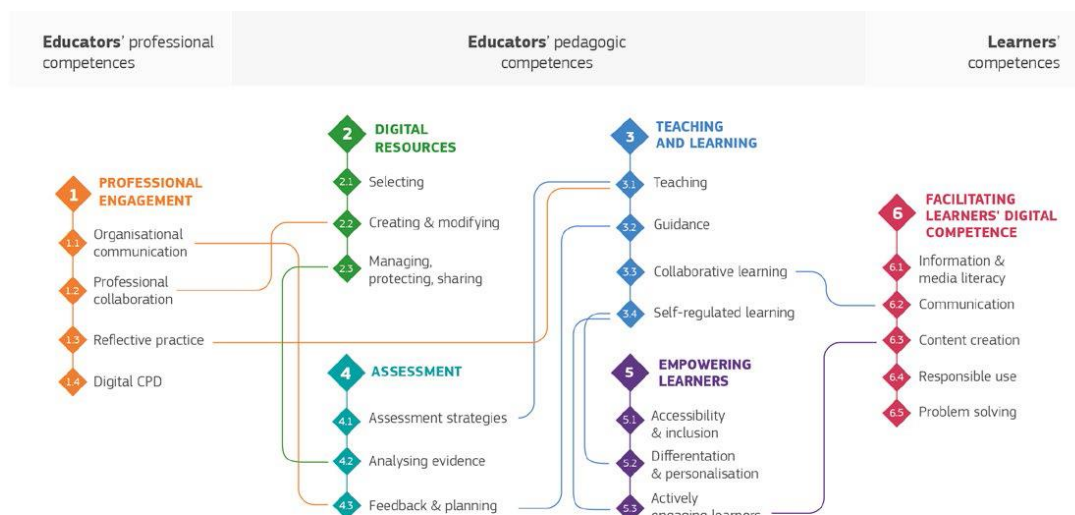


Figure 2: DigCompEdu framework (Redcker & Punie, 2017, p. 16)

According to this framework (Redcker & Punie, 2017, p. 17), the six DigCompEdu areas focus on different aspects of educators' professional activities:

**Area 1: Professional Engagement**

Using digital technologies for communication, collaboration and professional development.

**Area 2: Digital Resources**

Sourcing, creating and sharing digital resources.

**Area 3: Teaching and Learning**

Managing and orchestrating the use of digital technologies in teaching and learning.

**Area 4: Assessment**

Using digital technologies and strategies to enhance assessment.

**Area 5: Empowering Learners**

Using digital technologies to enhance inclusion, personalisation and learners' active engagement.

**Area 6: Facilitating Learners' Digital Competence**

Enabling learners to creatively and responsibly use digital technologies for information, communication, content creation, wellbeing and problem-solving.

These six areas are interrelated and complement each other, composing educators' digital pedagogic competence, that according to Redcker and Punie (2017, p. 16) "need to foster efficient, inclusive and innovative teaching and learning strategies".

Regarding digital literacy skills, UNESCO (2018) proposes a global framework describing competence areas and competences to add to what is currently covered in DigComp 2.0.: devices and software operations; information and data literacy; communication and collaboration; digital content creation; safety; problem-solving; career-related competences.

More recently, the Broadband Commission for Sustainable Development Working Group on School Connectivity (2020), co-chaired by the ITU, UNESCO and UNICEF, presented an analysis on how the COVID-19 pandemic forced the digital transformation of education. According to the working group,

The crisis brought a deeper understanding of the many dimensions of the digital divide, equity gaps, and issues around children's safety online. It showed governments the need to work closer with development partners to remove technological barriers and lower connectivity costs, as well as the need to invest in digital infrastructure and digital literacy, especially for marginalized populations. (p. 4)

In this sense, to respond the crisis, UNESCO (2020) defines a plan and implementation of distance learning programmes in three phases: Phase 1 is the rapid response; phase 2 is comprised of the daily routine of distance learning practices; and phase 3 is the new normal of school education after the crisis. Hulges et al. (2020) refer that the temporary shift of instructional delivery mode, due to the crisis, represents

emergency remote teaching (ERT), that involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated. (p. 8)

In higher education, within the framework of the commitments of the Bologna process, as mentioned by Leite (2019), it has been emphasised that teaching based on teaching should give way to teaching based on learning, which means teachers would need to continuously learn to be a teacher, that is, learn to take on mediation roles which allow students to be involved in processes that help them build their learning. This learning includes, according to Masetto (2003, p. 27), the domain of the teaching-learning process: "the teacher as creator and manager of the curriculum, the understanding of the teacher-student and student-student relationship in this process, as well as the theory and practice of educational technology". Tang and Chaw (2016) also mention that, in order to make an effective use of technologies in the teaching-learning process, it is necessary that teachers and students have a certain level of digital literacy which, in accordance with other authors (Bawden, 2008; Kempster Group, 2008; Hall et al., 2013), involves the domain of digital skills: managing information, possessing critical thinking skills and adopting ethical behaviours appropriate to the context.

Dorfsman (2015) sustains that the emergence of new technological learning environments can enrich and deepen the higher education teaching process. However, in the document "Horizon Report" (Johnson et al., 2016) it is reported that digital skills continue to be a challenge for Higher Education: in line with this position, a consensual aspect in literature is that university teachers use digital technologies for personal research and networking purposes, but do not mobilize these skills as often within the classroom (Bergdahl et al., 2020; Guri-Rosenblit, 2018; Alexander et al., 2017; Wineburg et al., 2016).

On the other hand, some authors report that students, especially younger students, feel comfortable with the technologies they use daily and usually know how to access and organize information, but may not know how to apply this knowledge towards learning (Bergdahl et al., 2020; Johnson et al., 2016; Tang & Chaw, 2016). In this line of reasoning, English (2016) argues that daily interaction with digital technologies does not always translate into the development of understanding, critical thinking and problem-solving skills, which are essential for digital transformation (Parrish, 2016). Regarding

digital transformation, Mahlow and Hediger (2019, p. 1) sustain that “The central task for higher education institutions is to model the complex networks of digital skills (critical thinking, media literacy, cross-cultural competence, etc.) as a foundation for creating contextualized learning scenarios in the disciplines”.

Recognising the possible benefits of integrating technologies in higher education (English, 2016; Johnson et al., 2016; Milenkova & Manov, 2019), it becomes important that teachers understand and take into account the diversity and different levels of digital literacy of students (Tang & Chaw, 2016), and this topic remains poorly debated, in addition to needing further research (Guri-Rosenblit, 2018). The study presented below was conducted having this remark as a reference.

## Methodology

The study was conducted, as mentioned above, with the aim of identifying the perceptions of students attending the 1st cycle (graduate degree) of higher education, regarding the digital skills they possess and the possible effects they attribute to digital literacy in the development of personal and social skills.

The instrument used was a questionnaire, submitted online, from 3/20/2020 to 4/22/2020. The questionnaire included 3 closed-ended questions and 3 open-ended questions. The closed-ended questions provided information about digital skills, the purposes and frequency of use, as well as the effects that students recognize in the integration of digital technologies. Students' perceptions were expressed through a 4-item Likert scale. Open-ended questions focused on opportunities, obstacles and other uses or functions of digital technologies in university education.

The Higher Education Institution (HEI) where the study was developed has 148 undergraduate students from 2 departments (Education Sciences and Psychology). At the beginning of the interruption of classes, due to COVID-19, only 30 % of the HEI courses (123) had an online component, in Moodle, provided by the University to which it belongs. In the curricular plan of the Education Sciences Degree (3 years), there is one mandatory course related to Multimedia and Education, in the first semester of the first year. In addition, in the second semester of the third year, there is an optional course related to Games and Education. There is no specific course related to digital literacy in the Psychology Course (3 years).

The University to which this HEI belongs established a unit of Educational technologies, 20 years ago, so as to offer technical and pedagogical support to the academic community. However, according to Correia et al. (2018, p. 8) “there is a lot of work still to be done in the promotion of LLL e/b-learning courses, taking advantage of the scientific quality of our teachers and researchers and the experience of the staff”. The University provides access, support and training to use the Moodle platform which, according to the authors, was chosen for being open source and fully customizable, as well as for a large support community. At the moment, Moodle has 3845 courses, from 15 organic units.

Ninety students answered the online questionnaire. These students present the following characteristics: 82% are female; they belong to courses in the area of Education (55.6%) and Psychology (44.4%); they are aged between 18-20 (35.6%), 21-23 (23.3%), 24-26 (7.8%), 27-30 (5.6%) and over 30 years old (27.8%); 41.4% attend the 1st year, 29.9% attend the second year and 28.7% attend the 3rd year.



What distinguishes these students and provides the innovator aspect on this analysis is that most teachers from both courses privilege teaching practices that can impact the development of the students personal and social skills such as: assessment for learning instead of only learning assessment (Gibbs & Simpson, 2004; Crisp, 2007), so that assessment can become a vehicle to promote learning; interrelation between teaching-learning and research (Leite, 2019), so teaching has to be closely related to research, that is, with the production of new and relevant knowledge; pedagogical practices focused on the development of autonomy and the practical application of knowledge (problem-based learning, project based learning, workshops, case studies, simulations, ...).

Quantitative data was analysed using SPSS 26, while qualitative data was analysed through content analysis (Bardin, 1977; Maxwell & Miller, 2008; Miles & Huberman, 1984), that is, a process that consists of reducing information and making inferences. This analysis, conducted with the support of the NVivo12 software, had the following steps: pre-analysis (floating reading); exploration of the content (coding and categorisation), with the units of analysis being the excerpts of the speeches with emerging categories; treatment and interpretation of results according to the objectives of the study. The categories concern the opportunities, obstacles, uses and functions that students attribute to digital technologies in higher education.

From an ethical point of view, we ensured the participants' anonymity, as well as their knowledge and adherence to free and voluntary participation, without any financial compensation, and with the possibility to withdraw at any moment, without harm or personal identification.

## **Presentation and discussion of results**

The analysis of the data allowed the establishment of relationships between the perceptions of these university students and the levels of digital literacy to which Martin and Grudziecki (2006) refer, namely: digital skills, use of digital technologies and digital transformation.

### **Level 1 – Digital Competence**

In general, most students reported that they have mastered or completely mastered digital skills related to information search, selection, data protection, use and personal expression. There was a smaller number of students who claimed to understand programming languages and know how to develop applications, as shown in Table 1 (Likert scale in which 1 = I do not master and 4 = I completely master).

<b>Descriptive Statistics</b>				
	N	Minimum	Maximum	Mean
Find data information and content through a simple search in digital environments	90	2	4	<b>3,58</b>
Apply filters to obtain data, information and content	90	1	4	<b>2,49</b>
Select digital technologies to interact and identify appropriate simple communication means for a given context	90	1	4	<b>3,11</b>
Use a variety of digital technologies in order to interact with other people	89	2	4	<b>3,37</b>
Identify simple ways to protect personal devices and digital content	90	2	4	<b>3,36</b>
Create and edit simple content in simple formats	90	1	4	<b>3,20</b>
Choose the best way of expression through the creation of simple digital means	90	1	4	<b>2,87</b>
Know at least one Programming language	90	1	4	<b>1,41</b>
Design digital applications to solve specific problems	90	1	3	<b>1,21</b>

*Table 1: Perceptions of digital skills*

In order to establish possible relationships between students' characteristics (sex, age, academic year) and their perceived digital competence, considering the characteristics of the sample and in light of its imbalance, we proceeded with a simple statistical analysis, through the use of non-parametric tests. The analysis, obtained through the Kruskal-Wallis test, allowed us to conclude that there are no significant differences regarding age ( $p = .655$ ) and the academic year ( $p = .320$ ). However, regarding the variable sex, although the differences are not statistically significant, the significance value, obtained through the Mann-Whitney test, is quite reliable for a 95% confidence interval ( $p = 0.051$ ), as presented in Table 2.

**Test Statistics<sup>a</sup>**

Mann-Whitney U
Wilcoxon W
Z
Asymp. Sig. (2-tailed)

a. Grouping Variable: sex

The results obtained are in line with the study by Hall and colleagues (2013) on the digital literacy skills of higher education students, which did not find differences in perceptions according to age and academic year. The authors also suggest that, contrary to what would be expected, several studies have failed to establish a direct relationship between age and the level of sophistication of students' technological skills, providing examples from studies by authors such as Helsper and Eynon (2010) and Bullen et al. (2011). The authors also argue that, even if younger students are comfortable with the technology they use on a daily basis, these students may not understand its use in academic and professional circles or may not know how to use digital tools to support their own learning.

Students' perceptions of the opportunities and obstacles they believe they face to development digital skills, in the university context, was obtained through content analysis of the responses to the open-ended questions. The opportunities identified by the

respondents are related to: the need to perform academic tasks and assignments (30 references); existence of specific curricular units that contribute to the development of digital skills (15 references); the recent long-distance learning (10 references); developing training and extracurricular training activities (8 references); the need to use digital technologies for administrative purposes related to the course (2 references). There were 12 students who stated that, during their university education, there were little to no opportunities for the development of digital skills (which ends up being an obstacle, thus this subcategory was allocated to the category “obstacles”). The current pandemic crisis was mentioned by a student as an opportunity for this development: “Now with long-distance learning, we have this opportunity by force” (student id 37, male).

The obstacles the students mentioned mostly pertained to the little to no opportunities to develop digital skills in a university context (29 references). This perception was justified by the following reasons:

- Absence or reduced presence of technologies in the classroom. Students stated:

“Reduced number of classes and other types of opportunities to help develop these skills” (student id 5, female)

“Technologies are not implemented in classes - we are still in classrooms from the 19th century” (student id 37, male)

“The fact that they don’t put these pedagogical methods into practice is, in my view, an obstacle” (student id 16, female)

- Lack of incentive, expressed in the following statements:

“Excessive face-to-face classes and no incentives for digital interaction” (student id 55, male)

“Little incentive to develop these skills” (student id 18, female)

- Characteristics of the course. It was stated that:

“My course has nothing to do with digital skills” (student id 52, female)

“It is not taught in the course (since it is not necessary for the career)” (student id 89, female)

- Lack of digital literacy among teachers, reported in the following statement:

“Poor levels of digital literacy among most teachers” (student id 49, female)

Several authors corroborate the idea that, despite evidence on the inevitability and importance of the development and mobilisation of different digital literacies in an educational context, their integration into a formal context is still poor or non-existent (English, 2016; Guri-Rosenblit, 2018), which is in accordance with the perceptions expressed by the students. Students’ perceptions that the characteristics of the course are not related to digital literacy was mentioned by Hall et al. (2013). These authors argued that some students may not value digital skills in higher education, because they are focused on the specific content of their courses. On the other hand, the perceptions expressed by students, presented in this article, are in contrast with those of Andrew et al. (2018) and Edmunds et al. (2012), who argue that, although students admit the use of technology is useful in the classroom, most believe that technology can be more useful in the workplace. However, in the perspective of Hall and colleagues (2013), there are

students who fail to establish connections between different areas of their life and digital literacy.

The perception that, overall, university teachers do not possess a sufficient level of digital literacy, and that this fact can influence student participation, especially in digital environments, is corroborated by Guri-Rosenblit (2018), Alexander et al. (2017) and Wineburg et al. (2016). In the case of the University which the Faculty where the study was conducted belongs to, despite the existence of a content management platform and other digital resources, as well as applications for the performance of specific tasks (e.g., Panopto, Turnitin), adherence to the use of more advanced technologies is poor. The offer of teacher training has not been achieving widespread attendance, over the years, and the little use of technologies, in an integrated and complementary way, within the teaching-learning process, is visible in the reduced number of curricular units placed in the Moodle platform. Therefore, this situation, which had to be changed due to the transition to ERT, was done, at first, mainly by sharing files via an institutional repository, exchanging e-mails and synchronous videoconferencing sessions.

Other obstacles reported by the students were associated with: lack of time (8 references); lack of knowledge and/or experience with digital technologies (7 references); lack of accessible training in this area (4 references); impossibility of face-to-face classes due to COVID-19 (4 references); technical problems (4 references); financial difficulties and lack of resources (3 references); lack of personal interest (2 references). There were 9 students who reported no obstacles (thus, they were allocated to the opportunity category).

It is interesting to highlight that ERT, due to the COVID-19 pandemic, appears both as an obstacle and as an opportunity for the development of digital skills and that, in most cases, students refer to extrinsic reasons as challenges to the development of skills, even though, overall, they present a positive perception about the level of skills they possess. The students who mentioned distance learning as an opportunity justify it by the knowledge of various learning management platforms and by conducting videoconferences. On the other hand, students who consider distance learning an obstacle state that: the impossibility of face-to-face classes; group discussions are more difficult; lack of guidance, as well as lack of organisation and management of online classes. An example of this last opinion: “The online classes (if we can call them that) that we are obliged to attend at the moment ... are without goals, out of context” (student id 25, male).

## **Level 2- Digital technology uses in higher education**

The students were asked about the purpose and frequency of digital technology use in a university context. Table 3 shows the means of the responses that were obtained using a Likert scale, where 1 = rarely/almost never and 4 = always.

<b>Descriptive Statistics</b>				
	N	Minimum	Maximum	Mean
Files sharing between teachers and students	90	1	4	<b>3,29</b>
Communications between students	88	1	4	<b>3,27</b>
General information	89	1	4	<b>3,16</b>
Files sharing between students	90	1	4	<b>3,07</b>
Events sharing	90	1	4	<b>3,01</b>
Communications between students and teachers	90	1	4	<b>2,98</b>
LMS access	88	1	4	<b>2,91</b>
General announcements	87	1	4	<b>2,74</b>
Multimedia presentation	85	1	4	<b>2,67</b>
Search and access to information	86	1	4	<b>2,51</b>
Academic information	86	1	4	<b>2,49</b>
Collaborative study	85	1	4	<b>2,35</b>
Watch videos	83	1	4	<b>2,20</b>
Access to repositories	88	1	4	<b>2,19</b>
Access to data bases	80	1	4	<b>2,13</b>
Participation on learning communities/discussion groups	73	1	4	<b>1,79</b>
Teachers' pedagogical differentiation	59	1	4	<b>1,76</b>
Search websites	75	1	4	<b>1,76</b>
Quizzes and online exercises	70	1	4	<b>1,64</b>
Video creation	78	1	4	<b>1,63</b>
Use game in classroom	60	1	4	<b>1,55</b>
Use games outside classroom	55	1	4	<b>1,53</b>
Website creation	52	1	4	<b>1,40</b>
Games development	49	1	4	<b>1,31</b>

*Table 3: Purposes of digital technology use*

The analysis of the information presented in table 3 indicates that digital technologies are used more frequently by students, especially for communication and sharing of files and information, with results that assume values above the mean (2). The use of digital technologies for network interaction (online searches, communication, interactive activities), for differentiation and for creating multimedia content in class (videos, games, websites) are the items with the lowest response rate and a lower mean value for frequency. These values are in accordance with the skills that students claim to have. This result also coincides with the conclusions of several authors (Bergdahl et al., 2020; Johnson et al., 2016; Tang & Chaw, 2016), when they argue that the process of integrating technologies in higher education is slow and still restricted, and sometimes it is related to the digital skills of teachers, as previously mentioned.

## Digital transformation

The students were asked about the possible effects of digital technologies in higher education. Table 4 shows the means of responses, on a scale of 1 = strongly disagree to 4 = completely agree.

Descriptive Statistics				
	N	Minimum	Maximum	Mean
Networking skills	84	2	4	<b>3,46</b>
LLL skills	82	2	4	<b>3,44</b>
Study and search autonomy	86	1	4	<b>3,07</b>
Study/search efficiency	85	1	4	<b>3,06</b>
Sense of belonging to the institution	80	1	4	<b>2,95</b>
Broaden the relationship between teachers and students	84	1	4	<b>2,94</b>
Sense of belonging to the group/class	82	1	4	<b>2,84</b>
Broaden the relationship between students	83	1	4	<b>2,76</b>

Table 4: Perceptions about the effects of integrating digital technologies

As can be seen from the data in table 4, most students express the perception that digital technologies can contribute to the development of networking skills and the development of lifelong learning skills. Although they still have values above the mean, there was a lower level of agreement with the contribution of technologies to the expansion of peer relationships.

With regard to networking, there is a contrast between the perception of the potential effects identified and the uses that the students reported in the previous item (cf. Table 3), where networking obtained a score below average. It remains a prominent factor that students give a slightly lower score to the effects in terms of social proximity, when this aspect was one of the highest scored in the question about the use they make of technologies, namely in the item communication between students (cf. Table 3). This apparent contradiction can be justified by Hall and colleagues (2013), who argue that students separate digital technologies and skills, which they mobilize in their daily lives for personal and social purposes, from those they use in academic and professional contexts.

Despite the high level of agreement of students with the potential effects of technologies in higher education, in terms of lifelong learning, as well as the transformational effect they can have in these domains, Bergdahl et al. (2020) question whether the digitalisation of HEIs has been conducted without taking into account how students react to the time constantly spent in front of a screen. Therefore, they state that there must be a balance regarding pedagogical proposals, in order to avoid monotonous learning routines structured from repetitive student-screen interactions.

For the use of digital technologies to contribute to the production of knowledge and the consequent digital transformation, it is necessary that students have the capacity for self-direction (Tang & Chaw, 2016), problem solving (English, 2016), as well as creativity and innovation (Chan et al., 2017). These skills are related to the “lifelong profile of the student” (Monteiro et al., 2019), which, according to the authors, requires the following

skills: understanding and applying knowledge; judgment and decision making; ability to select relevant information with ethical concerns; proper organisation and communication of relevant information; and higher-level cognitive and interpersonal skills, such as critical and creative thinking. All these abilities are included in the elements that comprise digital literacies Bawden (2008) and are usually worked in face-to-face classes, but were not maintained, according to the students, in the period of ERT.

## Final considerations

This study, in temporal terms, was conducted during the initial closing of higher education institutions (HEIs) in Portugal, due to the pandemic crisis of COVID-19, and involved students of the Psychology and Educational Sciences courses, from a Public Portuguese University. Not intending to generalize the results, but rather represent a case study, the study intended to answer, as already mentioned, the following questions:

- What is the relationship between students' characteristics (sex, age, academic year) and their perceived digital competence? What opportunities and obstacles do they believe they face in order to develop these skills within a university context?
- What uses do students of Education and Psychology courses make of digital technologies within a university context?
- To what extent does the use of digital technologies, by the higher education institution, contribute to digital transformation and the development of lifelong learning skills?

Based on the assumption that these students have different characteristics, from a socioeconomic point of view, as well as distinct backgrounds and different previous experiences of socialisation with technologies, with regard to perceived digital skills, the study showed that there are no significant differences in the perceptions of these students in relation to the academic year they attend or the age group in which they are inserted. There are, however, some differences between the responses of male students and those given by female students. On average, the students reported that they have skills mostly in terms of searching, communication and information exchange, whereas creation skills, associated with innovation and creativity, which are fundamental components of digital literacies (Kempster Group, 2008), had less expression.

As opportunities for the development of digital skills, students mentioned being stimulated through activities they perform autonomously, often at the request of teachers and as an element of formative evaluation of curricular units. This finding indicates that attending higher education, in this particular context, requires a series of tasks, activities and socialisations that mobilise digital skills, which are sometimes developed autonomously, not during classroom, through interaction between peers or participation in training actions. The elements that students mentioned being obstacles to the development of digital skills in higher education are related to the absence from activities developed during contact time and the possible reflection of the level of implementation of technologies in learning, by teachers and HEIs. The ERT situation is perceived, by some students, as an opportunity, while for others it represents an obstacle for digital literacies.

Regarding the uses of digital technologies within this university context, they are in accordance with the skills that students claim to have. Once again, the emphasis is placed on information and communication, and less relevance is given to creation, innovation and work within the classroom.

Finally, with regard to digital transformation and the development of lifelong learning skills, there is an apparent contradiction as to the perception of the possible effects of digital technologies in higher education. On the one hand, students attribute effects that are in line with the students' lifelong profile. However, on the other hand, this perception is not reflected in the use they currently make of these media within this university context. Knowing that digital transformation is directly associated with innovation, creativity and the production of significant change, the use of digital technologies in higher education, especially for the transmission of information, in an uncritical and unidirectional way, can represent an obstacle for the digital transformation process.

In light of the above, it is possible to conclude that the abrupt digitalisation of HEI, locus of this study, has reached a stage where both the institution and teachers, overall, were not prepared for this change. With starting conditions for students and institutional support and training for teachers, it is believed that, in the near future, the pedagogical mediation of this University may have effects on the creation of opportunities for lifelong learning, by all agents who, collaboratively, solve problems, rethink the curriculum, redesign practices, reflect on results and develop new skills, facing the digital transformation challenges.

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