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The Contribution of Digital Portfolios to Higher Education Students' Autonomy and Digital Competence

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Abstract: Education is continuously evolving, even more with rapid technological advances and the needs and possibilities detected from the COVID-19 pandemic experience. In the current social context for higher education students, their need to have skills and competences related to autonomy, is increasingly acknowledged, and they must be capable of conducting better self-regulated learning. Digital competence is another elementary value to tackle with quality education: not only for online and hybrid modalities, also in face-to-face teaching and learning, the use of digital tools is proven to enrich the process and make learning more efficient. Among the resources explored in education, one of the most valuable are e-portfolios or reflexive digital portfolios. Thus, this study intends to give response to the following two questions in the context of students in higher education: is the experience of the use of a digital portfolio related to the promotion of autonomous competence? How is the use of digital portfolios related to digital competence? The sample is gathered within a European project; 355 students from six universities of five countries responded to a questionnaire. The main results confirm that students that have used e-portfolios appear more likely to be autonomous and also show remarkable differences in some items of their digital competence, compared with those that have not used e-portfolios. Not all responses point at significant differences, but at least for given aspects, we affirmatively conclude that e-portfolios may ease the learning process in terms of digital and autonomous competences.

Keywords: digital competence; digital portfolios; higher education; students' autonomy

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1. Introduction

Because of the COVID-19 pandemic, the way of conducting teaching and learning is being reformulated, conditioned by aspects related to cyberlearning such as ubiquity, multimodality, and others. Despite the benefits of computer-mediated learning, we must not lose sight of the fact that constructive, active, customised, and collaborative learning must continue to be promoted, with a special focus on the development of learners' autonomy. This implies fostering higher levels of learners' self-management and metacognition in e-learning and hybrid environments [1,2].

From a competence-based approach, the concept of autonomy can be broadly defined as a process that establishes a dynamic relationship between knowledge and the learner. Regarding this aim, it is essential for learners to develop their awareness of the learning process, as well as to reinforce their critical thinking, cognitive and metacognitive skills, and to stretch interactions with other participants in the process for both teachers and learners [3]. Strengthening the capability to more autonomously conduct the learning process leads to more efficient self-regulation. Self-regulated learning is an active process

in which students set the goals that drive their learning, emphasising autonomy and self-control, as learners apply their own learning strategies and self-assess their progress [4].

Self-regulated learning has been broadly studied and theorised during the last decades. Some authors, such as Bandura, established the foundations of self-regulation in learning with social cognitive theory in the early 1990s [5]. Zimmerman focused as well on the study of self-regulation and motivation [6,7], whilst Winne made important contributions to the field from the social cognitive perspective of self-regulated learning [8,9]. Additionally, Pintrich proposed a reference model differentiating four areas for self-learning: cognition, motivation, behaviour, and context [10]. McCardle and Hadwin identified three critical aspects to measure self-regulated learning: time, context, and diversity. The latter is in relation to the tasks and objectives of each situation [11]. In the same way, Wenden highlights the importance of self-management strategies when learning a foreign language, but she also lists some of the characteristics of good language learners, such as "figure out their special problems and try to do something about them" [12]. In the realm of "learning to learn" Grenfell and Vee lead the learning process towards an approach more focused on knowing the learner and proposing specific didactic responses according to their strategic competence profile, learning style, developmental stage, cognitive style, and other relevant variables such as motivation and self-regulation [13]. Finally, Oxford's model of strategic self-regulation describes different types of strategies relevant to control learning, including the metacognitive ones, but also those that regulate affective dimensions and socio-cultural interactions [14]. In sum, as many authors have confirmed, self-regulated learning is closely related to better learning in terms of reinforcing the process in motivational and contextual dimensions, promoting cognition, metacognition, and, at the end, more autonomy to make education more significant.

In higher education, students' autonomy is viable in digital and hybrid contexts when the digital competence from participants is adequate [15,16]. Digital competence has become increasingly relevant in several dimensions of today's society, to which the emergence of the COVID-19 pandemic has provoked a remarkable contribution [17,18]. This is a highly topical issue, especially when it comes to higher education [19,20], and involves unprecedented challenges such as the importance of teacher training in digital competence [21] along with new possibilities after the emergence of improved technologies like generative artificial intelligence [22].

Some terminological discrepancies related to digital competence and digital literacy are discussed in the literature [20], but the common points are that teachers need to have a good understanding of the current situation and need to integrate those resources in their syllabi in order to guide students' learning in an effective way. An interesting insight from Stockwell and Reinders points out that learners are unlikely to develop autonomy because of technology, "but rather, technology has the potential to provide opportunities for engaging with the target language for learners who possess some degree of autonomy", as cited in [23] (p. 43).

The European Commission identifies digital skills as some of the fundamental domains for the pursuit of lifelong learning [24]. They also describe that:

> Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking. [25] (p. 9)

The European Commission itself has developed the European Digital Competence Framework for Citizens, which presents an updated list of twenty-one competences and is divided into five dimensions (see Table 1): information and data literacy, communication and collaboration, digital content creation, security, and problem solving [26,27].

Table 1. Dimensions and competences of the Digital Competence Framework for Citizens.

Fields of Expertise	Description
1. Information and data literacy	1.1 Browsing, searching, filtering data, information and digital content. 1.2 Evaluating data, information and digital content. 1.3 Managing data, information and digital content.
2. Communication and collaboration	2.1 Interacting through digital technologies. 2.2 Sharing through digital technologies. 2.3 Engaging in citizenship through digital technologies. 2.4 Collaborating through digital technologies. 2.5 Netiquette. 2.6 Managing digital identity.
3. Digital content creation	3.1 Developing digital content. 3.2 Integrating and re-elaborating digital content. 3.3 Copyright and licences. 3.4 Programming.
4. Safety	4.1 Protecting devices. 4.2 Protecting personal data and privacy. 4.3 Protecting health and well-being. 4.4 Protecting the environment.
5. Problem solving	5.1 Solving technical problems. 5.2 Identifying needs and technological responses. 5.3 Creatively using digital technologies. 5.4 Identifying digital competence gaps

Note. Adapted from [26] (p. 21).

Additionally, learners become more autonomous in a digital context if they take better advantage of virtual learning environments; when they are able to select valid, reliable, and secure information from different digital resources; and when they adapt and interact with flexibility through digital devices [28]. The key ideas of this path intend to deepen the transformative role change of learners and teachers and the kind of strategies both should use to approach a context in which self-regulation is prioritised through enhanced feedback in a digital context.

In this context, digital reflective portfolios appears to be one of the most relevant educational tools used for the planning of university teaching, easing teachers' ability to send qualitative feedback and facilitating long-term collection of samples of the development of students' autonomy. Digital portfolios or e-portfolios are a virtual version of the previous concept of print or analogue portfolios. Digital portfolios can be defined as a space or dossier where students reflect and compile their learning journeys by using multimodal artefacts [29]. Such tools are proven to provide positive impacts on multiple focuses of the learning paradigm: permitting teachers to enhance students' experiences in learning and assessment [30], offering opportunities to access hard-to-measure constructs like collaboration, deep metacognitive reflections on the learning journey [31], and helping students' self-regulation in different aspects, such as speaking tasks [32], among others.

Apart from the previous benefits of using digital portfolios in higher education, special attention must be given to their potentialities in the development of digital competence. We can find several precedents remarking the importance of digital portfolios to deal with digital competence. For instance, the use of these tools is identified as one of the benefits for pedagogy of applying crosscutting digital technologies when considering the digital competence of students [33], and it seems clear that the use of a virtual platform allows students to develop digital competencies like documentary or instrumental competences in a proper way [34]. In fact, we can infer from the project that is going to be presented below that the process of setting up a reflective digital portfolio allows students to improve some of the dimensions of their digital and autonomous competence. More specifically, within this project students had the chance to develop some of the scopes presented in Table 1: they produced and shared among their class members a series of digital contents

(developing their capacities for managing information and data literacy). In the same way, in producing content they had to fulfil some requirements related to adequate browsability, a clear layout, or combining both multimodal and hypertextual items, as well as multimedia and other types of audio–visual materials. In doing so, students could also develop the digital micro-competencies indicated in Section 2 of Table 1, namely those referring to netiquette and digital identity management. In addition to the aforementioned issues, we should note that most students have explored the potential of using technologies from a creative perspective, overcoming all kinds of challenges. But the impact is not always that clear, perhaps because students are used to employing different digital tools like portfolios and their impact can be difficult to measure [35].

Although the self-regulation and autonomy of students, the digital competence of teachers and students, and the use of digital learning tools like digital portfolios represent three conceptualisations already dealt with in several previous studies, the fact is that in higher education, and specially in universities with one-to-one traditional teaching models, these constructs are not yet conclusive.

This paper was planned with the aim of providing further evidence from different countries as a new contribution to the debate related to making higher education evolve. This study delves into concrete aspects of BLEARN AUTONOMY (https://blearn-autonomy.eu, accessed on 10 August 2023), an Erasmus+ Strategic Partnership carried out between November 2020 and February 2023. The project experimented with digital, innovative strategies that improve teachers' feedback to higher education students, foster collaborative teaching across institutions, and develop consistent institutional policies of blended learning. The Autonomous University of Barcelona (UAB) led a network of partners that brought expertise and new sources of creativity to the project. The team of participants included universities based in Spain, Portugal, Norway, Poland, and France. The list of collaborating partners included the University of Vic- University of Central Catalonia (UVic- UCC), the University of Minho (UM), the University of Stavanger (US), the University of Warsaw (UW) and the Catholic University of Lyon (UCLy).

The project tried out innovative digital strategies in a collaborative and cross-curricular manner in higher education. Some of the main goals of the project aimed to improve feedback from teachers to students, to foster collaborative teaching between institutions, and to develop coherent institutional blended learning policies [28]. Two guiding handbooks resulted from this work: the *Handbook for leaders in higher education: Developing and designing institutional policies for digitally enhanced (hybrid/blended) teaching and learning* [36] and the *Manual for higher education teachers* [28]. A third intellectual output consisted of the development of a digital platform for collaborative teaching across higher education institutions, mainly used by the project participants.

From the extended research, in this paper the emphasis of the data analysis is placed on the following questions:

- Is the experience of the use of a digital portfolio related to the promotion of the autonomous competence of higher education students?
- How is the use of digital portfolios related to the digital competence of higher education students?

The following sections are devoted to explaining the instrument used to gather data and the research method, including the factor analysis of the questionnaire. Afterwards, results are presented focusing on each research question, and, finally, there is a section to present the main conclusions along with a discussion of results.

2. Materials and Methods

2.1. Instrument

A questionnaire was developed and used within the project, explained in detail by Cea et al. [28]. The database from BLEARN AUTONOMY questionnaire [37] is retrieved and scratched here to obtain insights regarding the posed research questions.

The original instrument is composed of four parts:

- 1st part—Socio-biographic data;
- 2nd part—Experience of students in methodologies for the development of autonomy;
- 3rd part (I)—Experience with teachers' feedback;
- 3rd part (II)—Reflective portfolios;
- 4th part—Digital competence.

In this paper, though, only specific items were selected according to the aims of this research: four items from the 2nd part (autonomy of students in higher education), one from each section of the 3rd part (the use of digital portfolios), and all items from the 4th part (students' self-perceived digital competence). These items of interest are described in Section 2.1.1. The reason to select specific questions instead of performing a greater analysis is because each part of the questionnaire was somehow independent, studying several topics of interest within the project. Here, the scope was narrowed just to the needed data in order to respond to the research questions.

Most of the questions of the instrument were to be responded to in a 5-point Likert scale of agreement (1—Totally disagree, 2—Disagree, 3—Neither agree nor disagree, 4—Agree, 5—Totally agree). In the full version, there are also a few questions to be answered Yes/No, and some multiple-choice questions.

2.1.1. Topics of Interest

From a set of nine items in the 2nd part of the questionnaire, there were four relevant agreement questions in light of students' autonomy. These questions had to be answered according to their experience as students by thinking on subjects where they had participated:

- Q2-02 [Decision-making was shared between teacher/students].
- Q2-03 [Students were invited to increase awareness of the learning process. For example, reflecting on how to learn more effectively or what the stages of the learning process might be].
- Q2-04 [Learning strategies were implicitly taken into account: identification of difficulties in learning, identification of learning needs, learning planning, identification of learning resources, implementation of reflection tools (e.g., learning journals)].
- Q2-05 [Learning strategies were explicitly mentioned. For example, certain strategies were presented and practised in a controlled way].

The following part of the questionnaire (3rd part) was named "Experience with teachers' feedback" and finished up with the dichotomous question "Have you written learning journals or reflective portfolios?" (Q3-16). If answered yes, the student was conducted to a set of extra questions to better-understand its possible impact (3rd part, section II), whereas if the response was negative, this supplementary section was skipped. In this study, the filtering question Q3-16 was considered as an independent variable when exploring results related to the development of autonomous competence in two groups of students: the ones who have made use of digital portfolios and those who have no experience in writing assignments with digital tools used as portfolios. In this study, we were often guided by this distinction.

Additionally, from the second section of the 3rd part, a complementary question was especially remarkable: "In my experience as a student, the completion of learning journals or reflective portfolios was a productive experience and it had a positive impact on my learning" (Q3-50).

To measure the digital competence of the participants, the questionnaire offered a last part (4th part) composed of 31 questions of agreement. Items were grouped into several sections. Five sections were adapted from the domains and expertise of the European Digital Competence Framework [26]: information and data literacy (questions Q4-01 to Q4-03), communication and collaboration (Q4-04 to Q4-09), digital content creation (Q4-10 to Q4-13), safety (Q4-14 to Q4-17), and solving problems (Q4-18 to Q4-21). In addition, there was a question about critical attitude (Q4-22), a set of questions about the development of digital competence and its contribution to different capabilities (Q4-23 to Q4-30), and a final

question about self-perception measuring the relevance of promoting digital competence (Q4-31) (for more details of the questions, see Table 4 with results).

To summarise, in the present study we used four representative questions to analyse autonomy, two questions about the use of digital portfolios (one as a filtering question and the other one due to special relevance), and the whole part related to digital competence. The latter was dealt as a complete questionnaire by itself and, for this reason, an exploratory factor analysis has been performed.

2.1.2. Factor Analysis and Reliability

An exploratory factor analysis of the questionnaire about digital competence (4th part) was conducted. The structure of this part of the questionnaire appeared to be consistent. If divided into six factors, its constructs were correlative with the original presentation responded to by participants: factor 1 (F1)—questions Q4-23 to Q4-31, F2—Q4-04 to Q4-09, F3—Q4-14 to Q4-17, F4—Q4-18 to Q4-21, F5—Q4-01 to Q4-03, and F6—Q4-10 to Q4-11. From this factor analysis, questions Q4-12, Q4-13, and Q4-22 were not correlated variables and appeared to be out of the factors.

Although being consistently divided into six factors, a distribution into four factors was considered more appropriate (Table 2). The previous factors 1 and 2 merged into a variable (new F1 = Q4-01 to Q4-09), another one remained equal (new F2 = Q4-23 to Q4-31), factors 6 and 8 merged into a variable (new F3 = Q4-10 to Q4-11 and Q4-18 to Q4-21), and factor 3 maintained composition (new F4 = Q4-14 to Q4-17).

Table 2. Exploratory factor analysis. Factor loadings.

	Factor 1	Factor 2	Factor 3	Factor 4	Uniqueness
Q4-04	0.982				0.272
Q4-05	0.935				0.273
Q4-07	0.897				0.299
Q4-01	0.750				0.450
Q4-02	0.660				0.423
Q4-08	0.644				0.622
Q4-03	0.626				0.431
Q4-09	0.601				0.467
Q4-06	0.578				0.547
Q4-27		0.785			0.429
Q4-26		0.784			0.402
Q4-29		0.759			0.451
Q4-28		0.747			0.423
Q4-23		0.723			0.497
Q4-30		0.707			0.453
Q4-25		0.679			0.530
Q4-24		0.632			0.547
Q4-31		0.539			0.680
Q4-19			0.916		0.291
Q4-20			0.880		0.310
Q4-21			0.779		0.441
Q4-18			0.766		0.480
Q4-11			0.520		0.495
Q4-10			0.441		0.587
Q4-15				0.869	0.270
Q4-16				0.803	0.373
Q4-14				0.803	0.272
Q4-17				0.747	0.424
Q4-12					0.610
Q4-13					0.714
Q4-22					0.753

Note. Applied rotation method is promax.

To ensure statistical reliability, Cronbach's α was calculated and 0.943 was reported. This value confirms the reliability of the instrument (BLEARN AUTONOMY questionnaire 4th part, 31 items).

2.2. Sample

The used dataset counts had a total amount of 415 responses. From these, 60 consisted of students that were invited to participate twice: at the beginning of the course (pretest) and at the end (post-test). Therefore, the main analysis was conducted with a dataset of 355 unique participants, where those having participated twice were studied only from their post-test.

This sample responds to the following profile: 252 female (71%), 99 male (28%), and 4 people that did not identify themselves within these options.

The precedence of respondents was diverse: 59 students (16.6%) from Universitat Autònoma de Barcelona (UAB) in Catalonia, 68 (19%) from Universidade do Minho (UM) in Portugal, 20 (5.6%) from Universitetet i Stavanger (UiS) in Norway, 35 (almost 10%) from Uniwersytet Warszawski (UW) in Poland, 58 (over 16%) from Université Catholique de Lyon (UCLy) in France, 38 (10.7%) from Universitat de Vic—Universitat Central de Catalunya (UVic- UCC) in Catalonia, and 77 (21.7%) from UVic- UCC in an interuniversity programme with the Universitat Oberta de Catalunya (UOC).

When asked about their highest level of completed studies, 115 respondents (i.e., 32.4%) stated that they just had secondary studies and 44 (12.4%) confirmed having short-cycle tertiary education; in both cases, this response means that they were completing their first bachelor's degree in a university. Furthermore, 158 students (44.5%) confirmed having finished a bachelor's degree, which means that they were mostly completing their first masters' degree. But, responses also arrived from second- and third-cycle studies: 37 students (10.4%) informed having completed previously a masters' degree and one participant had even already finished a doctorate. As seen, the sample was very heterogeneous in terms of educational level within universities and their highest level of completed studies.

Focusing on their specialities, as the questionnaire was spread several ways among different studies, the responses were also diverse. However, we can identify clear trends: several participants were completing language studies (Masters' in Translation and Interpretation, MA in Literacy Studies, Applied Linguistics), but also other studies like Sociology, Computer Science, and studies in the field of Education Sciences.

2.3. Ethical Statements and Data Collection

This study required the participation of humans. For this reason, it was reviewed and approved by the Research Ethics Committee of the Universitat Autònoma de Barcelona, Ethics Committee on Animal and Human Experimentation (CEEAH). To accomplish the requirements, each participant signed an informed consent to proceed with the questionnaire, and we guaranteed the anonymity of the treated data.

Data collection using this questionnaire was conducted between May 2021 and June 2022.

3. Results

Six universities participated in this study, and participants came from different studies. This means that the use of portfolios varied among them: in some subjects, they used portfolios; in others, they did not. In the ones using digital portfolios, the students made them with tools like Mahara, whereas others used collaborative tools in the cloud like blogs or other services (Webnode, Wix, Sapo, etc.). In this study, the interest was not in detailing the characterisation of how to use digital portfolios, but in analysing an overall view of the relationship between the use of digital portfolios and the development of digital and autonomous competence in higher education students.

In the following subsections, key relationships are explained. In some cases, responses are compared contrasting students that used digital portfolios (n = 151, 42.5%) and ones that did not (n = 204, 57.5%).

3.1. Self-Perception of Autonomy According to Effective Use of Digital Portfolios

To compare two independent groups (Q3-16), one using digital portfolios and the other one not using them, a Mann–Whitney U test was conducted.

Results show $p < 0.001$ for two questions related to students' autonomy (Q3-02 and Q3-03), and $p < 0.05$ for the other two (Q3-04 and Q3-05). Participants responded according to their experience as students.

3.2. Relationship between Digital Competence and the Use of Digital Portfolios

In general terms, the use of digital portfolios was reported as a good experience. In this line, the responses to question Q3-50 from part 3 stated "In my experience as a student, the completion of learning journals or reflective portfolios was a productive experience, and it had a positive impact on my learning." Most of the respondents agreed or totally agreed with such statement (almost 42% agreed and 24% totally agreed, followed by 22.6% that neither agreed nor disagreed) (Table 3).

Table 3. Frequencies for question Q3-50.

	Frequency	Percent	Valid Percent
Totally disagree	7	1.687	3.955
Disagree	13	3.133	7.345
Neither agree nor disagree	40	9.639	22.599
Agree	74	17.831	41.808
Totally agree	43	10.361	24.294
Missing	238	57.349	
Total	415	100.000	

Note. The large number of missing values is due to the fact that only participants with experience in digital portfolios answered this question.

To compare two independent groups (Q3-16), one using digital portfolios and the other one not using them, a Mann–Whitney U test was conducted. Results show $p < 0.001$ for two questions (Q4-24 and Q4-25) and $p < 0.05$ for five more items (Q4-09, Q4-11, Q4-23, Q4-26, and Q4-27). This result indicates statistical significance, mainly in the factor related to the application of technologies to education. In other words, the development of digital competence is self-perceived by higher education students as contributing to managing feedback, improving communication with other students, and others (Table 4).

Therefore, it is seen that the use of digital portfolios makes a difference in the given responses and demonstrates some positive impacts (at least in terms of self-perception). Nevertheless, it is also clear that the results do not show significant differences in a major part of the items.

In an additional analysis, a calculation was performed to compare results according the digital competence at two levels. Twelve responses that did not complete all items in the fourth part of the questionnaire were excluded, and it resulted in the sum of the 31 items (Q4-01 to Q4-31) for each participant ranging from 59 to 155. Making two groups from these scores (from 59 to 124 representing low digital competence, n = 200, and from 125 to 155 representing high digital competence, n = 203), we obtained a significant difference in Q3-50: a Mann–Whitney U test showed $p = 0.001$, indicating that students with a higher digital competence were more likely to affirm that the completion of digital portfolios was a productive experience with a positive impact on their learning. On the contrary, the results were not conclusive, with contrasts between students who had used digital portfolios and those that had not in relation to their scored digital competence for two groups (high and low). In this case, the Mann–Whitney U test reported $p = 0.241$. This classification into two

groups of digital competence is indicative, and does not respond to distribution density or any other specific principle other than grouping lower and higher scores.

Table 4. Mann–Whitney U test in the dimension of digital competence distinguishing use of e-portfolio and no-use.

	W	*p*
In terms of information and data literacy, I'm capable of...		
Q4-01 [Browsing, searching, filtering data, information and digital content]	22,006.000	0.087
Q4-02 [Evaluating data, information and digital content]	21,833.500	0.132
Q4-03 [Managing data, information and digital content]	20,510.000	0.738
In terms of communication and collaboration, I'm capable of:		
Q4-04 [Interacting through digital technologies]	21,381.000	0.263
Q4-05 [Sharing through digital technologies]	21,001.000	0.406
Q4-06 [Engaging in citizenship through digital technologies]	18,604.000	0.209
Q4-07 [Collaborating through digital technologies]	20,218.000	0.984
Q4-08 [Using codes of conduct and courtesy adequately (Netiquette)]	21,751.000	0.202
Q4-09 [Managing digital identity]	16,986.000	0.009
In terms of digital content creation, I'm capable of:		
Q4-10 [Developing digital content]	18,670.500	0.314
Q4-11 [Integrating and re-elaborating digital content]	17,113.500	0.008
Q4-12 [Identifying copyright and licences]	19,745.500	0.793
Q4-13 [Quoting sources appropriately]	20,158.000	0.826
In terms of safety, I'm capable of:		
Q4-14 [Protecting devices]	21,450.500	0.327
Q4-15 [Protecting personal data and privacy]	20,429.000	0.884
Q4-16 [Protecting health and well-being]	21,482.000	0.268
Q4-17 [Protecting the environment]	19,116.500	0.331
In terms of solving problems, I'm capable of:		
Q4-18 [Solving technical problems]	22,266.000	0.201
Q4-19 [Identifying digital competence gaps]	20,153.000	0.412
Q4-20 [Identifying needs and technological responses]	20,216.000	0.567
Q4-21 [Using creatively digital technologies]	19,312.500	0.176
Additional question		
Q4-22 In general, I have a critical attitude towards technologies, being able to assess their strengths and weaknesses.	19,826.500	0.306
Application of technologies to education: the development of digital competence contributes to:		
Q4-23 [Developing creativity in learning]	17,705.000	0.006
Q4-24 [Managing feedback]	16,487.500	<0.001
Q4-25 [Improving communication with other students]	17,063.000	<0.001
Q4-26 [Improving collaborative learning]	17,883.500	0.010
Q4-27 [Monitoring learning]	17,341.500	0.002
Q4-28 [Organising learning]	18,659.000	0.066
Q4-29 [Constructing knowledge from different sources (multimodality)]	18,989.000	0.084
Q4-30 [Reading and understanding dynamic resources and not just sequential learning materials (multimodality)]	18,800.500	0.103
Final question		
Q4-31 In my experience as a student I think that **promoting the development of digital competence** is relevant.	19,772.000	0.289

Note. Bold italics highlight groupings of questions.

4. Discussion and Conclusions

Is the experience of the use of a digital portfolio related to the promotion of the autonomous competence of higher education students? Results from this study clearly demonstrate that having experience in the development of digital portfolios is seen not as an isolated activity, but rather a strengthened relationship between students and teachers to help in decision making. Teachers contribute directly to the development of students' autonomy with the use of e-portfolios [31]. A main strategy to do so is teachers boosting students' awareness of their learning process [30].

To a lesser extent, but still significant from the presented research, the use of digital portfolios (or not) determines self-perception differences in terms of considering that teachers acknowledge the learning strategies. In other words, students with experience in the use of digital portfolios are prone to report awareness of their learning strategies, whereas students not using them are not. Consequently, the results confirm that digital portfolios are an efficient tool to develop and maintain higher education students' autonomy, reinforcing other studies in the same line [29–32]. In fact, their intensive use can lead to an acquisition of more significant learning, greater self-regulation of students' learning, and greater reflection capacity [35].

How is the use of digital portfolios related to the digital competence of higher education students? Results confirm that students that have used e-portfolios have better digital competence, just in a few aspects, compared with students that have not used e-portfolios. However, this difference does exist and must be highlighted with special regard to the application of technologies to education, as the development of digital competence contributes to managing feedback, improving communication with other students, and others. Again, it is confirmed that e-portfolios can help in education, and in no case are they proven to harm. Therefore, training students in the use of e-portfolios will make more digitally competent future professionals, although the real impact is not yet clear for the different dimensions of the Digital Competence Framework [26].

Other assumptions have been confirmed: students with a higher digital competence are more likely to report better management of digital portfolios.

The results obtained in this experimentally based study confirm, on the one hand, the existing gap between theoretical foundations and practical application in higher education classes. More specifically, we can state that although there are countless theoretical–practical studies that have been identifying for decades the need to promote learner autonomy based on tools for reflection and increased awareness of learning, in fact only a part of the students have experienced this type of practice in constructivist methodologies. On the other hand, it can be concluded that working with reflective portfolios has a positive impact on students' capacity for self-regulation. Finally, the results of this study also show that technologies offer learning opportunities for students to develop metacognitive strategies and that the development of digital competence should be an integral part of the curriculum.

Despite the positive results remarked, it is clear that most of the results in this research are not conclusive and just respond partially to our research questions. Such lack of a relationship between the use of digital portfolios by higher education students and their digital competence was also observed in previous studies [35]. It can be understood as the influence of other variables when asking for self-perception. In this study, we tried to solve this problem using a quantitative approach, but self-perception is still drawn as a main limitation. We found the proposed BLEARN AUTONOMY Questionnaire valid and reliable, but further efforts should be made to gain insight and different research designs using it to conclude whether it is general or not.

In line with this study, it would be necessary to research further the quality of the feedback that teachers send to students and whether it enhances students' autonomous and self-regulatory competence. To what extent this type of feedback can be improved by different instruments such as reflective portfolios or others is also under research, but deeper work is necessary.

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References

1. Cope, B.; Kalantzis, M. E-Learning Ecologies. In *Principles for New Learning and Assessment*; Routledge Publisher: Milton, UK, 2016.
2. Sharples, M. *Practical Pedagogy: 40 New Ways to Teach and Learn*; Routledge: Milton, UK, 2019.
3. Jiménez Raya, M.; Vieira, F. Enhancing Autonomy in Language Education. In *A Casebased Approach to Teacher and Learner Development*; Walter de Gruyter: Berlin, Germany, 2015.
4. Cabero, J. El Aprendizaje Autorregulado Como Marco Teórico Para La Aplicación Educativa de Las Comunidades Virtuales y Los Entornos Personales de Aprendizaje. *Educ. Knowl. Soc. (EKS)* **2013**, *14*, 133–156. [CrossRef]
5. Bandura, A. Social Cognitive Theory of Self-Regulation. *Organ. Behav. Hum. Decis. Process* **1991**, *50*, 248–287. [CrossRef]
6. Zimmerman, B.J. A Social Cognitive View of Self-Regulated Academic Learning. *J. Educ. Psychol.* **1989**, *81*, 329–339. [CrossRef]
7. Zimmerman, B.J. Investigating Self-Regulation and Motivation: Historical Background, Methodological Developments, and Future Prospects. *Am. Educ. Res. J.* **2008**, *45*, 166–183. [CrossRef]
8. Winne, P.H. A Perspective on State-of-the-Art Research on Self-Regulated Learning. *Instr. Sci.* **2005**, *33*, 559–565. [CrossRef]
9. Butler, D.L.; Winne, P.H. Feedback and Self-Regulated Learning: A Theoretical Synthesis. *Rev. Educ. Res.* **1995**, *65*, 245–281. [CrossRef]
10. Pintrich, P.R. A Conceptual Framework for Assessing Motivation and Self-Regulated Learning in College Students. *Educ. Psychol. Rev.* **2004**, *16*, 385–407. [CrossRef]
11. McCardle, L.; Hadwin, A.F. Using Multiple, Contextualized Data Sources to Measure Learners' Perceptions of Their Self-Regulated Learning. *Metacogn. Learn* **2015**, *10*, 43–75. [CrossRef]
12. Wenden, A. *Learner Strategies for Learner Autonomy: Planning and Implementing Learner Training for Language Learners*; Prentice-Hall International Ltd.: Hoboken, NJ, USA, 1991.
13. Grenfell, M.; Vee, H. *Modern Languages and Learning Strategies in Theory and Practice*; Routledge: Milton, UK, 1999.
14. Oxford, R.L. *Teaching and Researching Language Learning Strategies*; Routledge: Milton, UK, 2011.
15. Palau, R.; Mogas, J. *La Competència Digital Docent al Màster de Formació Del Professorat de Les Universitats de Catalunya*; Octaedro: Barcelona, Catalonia, 2022; ISBN 978-84-19506-92-4. [CrossRef]
16. Palau, R.; Mogas, J. *Activitats per al Desenvolupament de La Competència Digital Docent al Màster de Formació Del Professorat*; Octaedro: Barcelona, Catalonia, 2022; ISBN 978-84-19506-93-1. [CrossRef]
17. Schleicher, A. The Impact of Covid-19 on Education. In *Insights from Education at a Glance 2020*; OECD: Paris, France, 2020.
18. Nóvoa, A.; Alvim, Y. Nothing Is New, but Everything Has Changed: A Viewpoint on the Future School. *Prospects* **2020**, *49*, 35–41. [CrossRef] [PubMed]
19. Boumadan, M.; Soto-Varela, R.; Matosas-López, L.; Gutiérrez, Á. Estado de La Investigación En Torno a La Competencia Digital Docente En España. In *La Tecnología Educativa Como eje Vertebrador de la Innovación*; Sánchez-Rivas, E., Colomo-Magaña, E., Ruiz-Palmero, J., Gómez-García, M., Eds.; Octaedro: Quito, Ecuador, 2022; pp. 317–326.
20. Zhao, Y.; Pinto Llorente, A.M.; Sánchez Gómez, M.C. Digital Competence in Higher Education Research: A Systematic Literature Review. *Comput. Educ.* **2021**, *168*, 104212. [CrossRef] [PubMed]
21. Ruiz-Cabezas, A.; Medina, M.C.; Pérez, E.; Medina, A.M. University Teachers' Training: The Digital Competence. *Píxel-BIT Rev. De Medios Y Educ.* **2020**, *58*, 181–215. [CrossRef]
22. Rudolph, J.; Tan, S.; Tan, S. ChatGPT: Bullshit Spewer or the End of Traditional Assessments in Higher Education? *J. Appl. Learn. Teach.* **2023**, *6*, 342–363. [CrossRef]
23. Gruber, A.; Matt, E.; Leier, V. Transforming Foreign Language Education: Exploring Educators' Practices and Perspectives in the (Post-)Pandemic Era. *Educ. Sci.* **2023**, *13*, 601. [CrossRef]
24. European Commission. *Recommendation of the European Parliament and of the Council of 18 December 2006 on Key Competences for Lifelong Learning*; Official Journal of the European Union: Brussels, Belgium, 2006; 394.
25. European Commission. Proposal for a Council Recommendation on Key Competences for Lifelong Learning. Council of the European Union: Brussels, 18 January 2018 (OR. en) 5464/18. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)&from=LT (accessed on 15 July 2023).

26. Carretero, S.; Vuorikari, R.; Punie, Y. *DigComp 2.1: The Digital Competence Framework for Citizens with Eight Proficiency Levels and Examples of Use*; Publications Office of the European Union: Luxembourg, 2017. [CrossRef]
27. INTEF. *Marco Común de Competencia Digital Docente*; 2017. Available online: http://educalab.es/documents/10180/12809/MarcoComunCompeDigiDoceV2.pdf/e8766a69-d9ba-43f2-afe9-f526f0b34859 (accessed on 10 August 2023).
28. Cea Álvarez, A.M.; Dono López, P.; Lerma Sanchis, M.D.; Mogas Recalde, J.; Pazos-Justo, C.; Rambla, X. *Potenciar La Autonomía Mediante La Retroalimentación: Propuestas Para El Aprendizaje Híbrido En La Educación Superior*; Edições Húmus: Braga, Portugal, 2023; ISBN 978-989-755-863-4.
29. Lam, R. E-Portfolios: What We Know, What We Don't, and What We Need to Know. *RELC J.* **2023**, *54*, 208–215. [CrossRef]
30. Boholano, H.B.; Sanchez, J.M.P.; Balo, V.T.M.; Navarro, T.M.M. Utilization of E-Portfolios in Teacher Education Institutions of Higher Education in Central Visayas, Philippines. *Int. J. Inf. Educ. Technol.* **2022**, *12*, 912–920. [CrossRef]
31. Walland, E.; Shaw, S. E-Portfolios in Teaching, Learning and Assessment: Tensions in Theory and Praxis. *Technol. Pedagog. Educ.* **2022**, *31*, 363–379. [CrossRef]
32. Al-Hawamleh, M.S.; Alazemi, A.F.; Al-Jamal, D.A.H. Digital Portfolio and Self-Regulation in Speaking Tasks. *Asian-Pac. J. Second. Foreign Lang. Educ.* **2022**, *7*, 14. [CrossRef]
33. Valeeva, Y.S.; Valeeva, S.N.; Shakurova, M.F. Digital Competence of Students, Postgraduates by Means of Cross-Cutting Digital Technologies in the Educational Process of Universities. In Proceedings of the 2022 6th International Conference on Information Technologies in Engineering Education, Inforino 2022-Proceedings, Moscow, Russia, 12–15 April 2022; Institute of Electrical and Electronics Engineers Inc.: Piscataway, NJ, USA, 2022.
34. Cornejo-Sánchez, J.F.; Limaymanta, C.H.; Mezarina-Castañeda, R.D.; Gálvez-Nores, B.M. Digital Portfolio in The Development of Documentary Competence in University Students [El Portafolio Digital En El Desarrollo de La Competencia Documental En Estudiantes Universitarios]. *EDUSER* **2020**, *7*, 95–108. [CrossRef]
35. Domene-Martos, S.; Rodríguez-Gallego, M.; Caldevilla-Domínguez, D.; Barrientos-Báez, A. The Use of Digital Portfolio in Higher Education before and during the COVID-19 Pandemic. *Int. J. Environ. Res. Public. Health* **2021**, *18*, 10904. [CrossRef] [PubMed]
36. Dikilitas, K.; Rambla, X. *Handbook for Leaders in Higher Education: Developing and Designing Institutional Policies for Digitally Enhanced (Hybrid/Blended) Teaching and Learning*; University of Stavanger: Stavanger, Norway, 2022; ISBN 9788284391427.
37. Rambla, X.; Mogas, J. Fostering Higher Education Students' Autonomy through Blended Learning. *CORA. Repositori de Dades de Recerca* 2023. [CrossRef]