Article

Perceptions of University Students towards Digital Transformation during the Pandemic

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Abstract: The aim of this study is to determine the perceptions of university students toward teaching–learning processes during the COVID-19 pandemic. This research gathers inquiries made worldwide on the perceptions of students in higher education during a state of alarm. The proposed objectives were (a) to analyse the perception of students toward teaching–learning processes in university; (b) to determine the assessment given by students about the changes that took place in university teaching as a result of COVID-19; and (c) to explore resources (hardware and software), professional collaboration, digital pedagogy and student empowerment (motivation) regarding digital education and recent changes in university teaching due to the pandemic. This study used a non-experimental, descriptive design based on opinion polls or surveys. The results show a positive correlation between digital pedagogy, student motivation and digital environments. As a conclusion, we encourage the scientific community to continue delving into the motivation, collaboration and reflective exchange of experiences, self-learning and promotion of initiatives that foster the development of competencies in future teachers. It is also important to continue the research on integrated designs in training processes in university, tutoring and continuous evaluation, as they are key for digital transformation in universities.

Keywords: active pedagogies; digital transformation; digitalisation; empowerment; higher education; teaching competences

1. Introduction

The present study is but one grain of sand in the plethora of existing studies on the perceptions of students during a state of alarm [1]. The pandemic unexpectedly hit higher education, leading to quick decisions made and actions taken, as shown by the results of systematic reviews [1], all of which are focused on the students' perceptions toward the new, urgent and unexpected educational situation. This study is framed within this line of research between face-to-face and virtual teaching, highlighting key aspects of hybrid higher education models [2], with educational technology and virtual environments as central elements [3].

Students who have access to a good Wi-Fi connection and modern computers overcome the barriers of a hybrid model from the point of view of infrastructure. Currently, a new field of educational research is opening up for educators and researchers. Even before the pandemic, we could share the concerns of teachers about Digital Transformation in Education (DTE). Reviews on the incorporation of bimodal higher education underline the importance of digital pedagogy compared with digital resources, which was one of the main topics in pre-pandemic articles [4].

Although DTE has revolutionised traditional forms of teaching, scientific questions revolve around the improvements that it incorporates to traditional teaching and learning processes. In this sense, the research results coincide in the creation of new spaces known as "identity agency and digital spaces" [5].

In our case, the 2030 Agenda guides the way that DT is linked to the Sustainable Development Goals (SDG). It is stated that the rise in Information and Communication Technologies (ICT) involves a considerable potential to accelerate progress; to reduce the digital divide; and to promote the development of inclusive knowledge societies based on human rights, empowerment and the attainment of gender equality. The development of inclusive knowledge societies must be based on four pillars: freedom of speech, freedom of information, universal access to information and knowledge, and quality learning [6].

Initially, this change was associated with the application of digital technologies, which has continued to advance with the so-called "digital pedagogies", digital literacy, the European Framework for the Digital Competence of Educators, the importance of the coordination between the planning and projects that regulate the life of educational centers, and the simultaneous incorporation of their digital project. In agreement with other social organisations, DT is the change associated with the application of digital technologies in all aspects of human society [7,8].

The UNESCO has created the ICT Competence Framework for Teachers (ICT-CFT), which is a tool used to guide the initial and permanent training of educators in the use of ICT in the entire education system. The ICT-CFT has been designed to adapt to national and institutional objectives, thus providing an updated framework for professional development and the creation of policies. ICT-CFT version 3 responds to the recent technological and pedagogical evolution in the field of ICT and education, and it incorporates the inclusive principles of non-discrimination, open and equitable access to information and gender equality by teaching with the help of technologies. This tool also addresses the implications of the recent technological advances in education and learning, such as artificial intelligence (AI), mobile technologies, the Internet of Things and open educational resources, with the aim of supporting the creation of inclusive knowledge societies.

The process of DT requires technology, digital culture and leadership in order to be fully accepted in the educational environments. One of the digital enablers is the hybridisation between the physical and digital worlds; in our case, this situation is reflected in the multimodal models of face-to-face and distance learning. We need certain leadership profiles that are undoubtedly essential for an efficient management focused on the well-being of people. That is, we need positive leaders [9] to work on the change and development of educational organisation; this has been successfully achieved by many management teams in their educational centres, and now, they must advance in these aspects with confidence. All of the studies found in the literature about the organisations that have overcome situations of maximum stress and internal de-structuring stated that promoting positive emotions improves the motivation and well-being of professionals, which in turn increases their creativity, commitment and capacity to adapt to new situations. Successful managers who lead these resilience processes have focused on "what works", "the critical factors of success" of the new organisation and "the positive aspects" of each collaborator as starting points of improvement. The factors that are studied nowadays [10–12] have identified the following factors as descriptors that define a positive leadership model: involvement, innovation, influence, resilience and coaching.

DT is directly involved in new types of innovation and creativity in HE. Similarly, traditional teaching methods have been improved and supported. In present time, during the COVID-19 pandemic, digitalisation has allowed for developing efficient academic actions when the situation did not allow for attending face-to-face lectures. The aim is not to follow a fashion technological trend but much more, since DT brings accessibility to vulnerable groups and improves the efficacy of educational methodologies, which provides the educational quality for which we have searched for so long. Fundamentally, DT is the reinvention of educational organisations.

1.1. Rethinking Higher Education

We are not in crisis, but we have advanced to a new age. We are in the Age of Innovation. To understand the nature of this new age, one must only check the literature about the impact of change [13]. We have to reinvent education and the concept of organisation, since DT modifies educational scenarios as we know them. What is needed for this transformation? The DT of an organisation requires incorporating technologies, creating or modifying processes, and employing people with adequate capacities and skills for such processes and technologies.

In these working keys, there are studies aimed at identifying the degree of integration of technology in the organisational structures of educational centres [14]. The following resistances have been found among teachers: fear of technology, fear of the change involved in the incorporation of technologies and active methodologies, a change in the teacher's role and the detection of a positive leadership that amplifies the DT processes. Regarding the barriers, these are related to resources, such as the lack of available devices for teachers and students mentioned in the abovementioned study. With respect to organisational structure, the path is marked by closed hierarchical innovation; innovation is collective intelligence. This situation is revisable with the forced incorporation of digitalisation in educational centres.

Therefore, the attitude of teachers is a key element for e-organisation, as it is also for future teachers. Studies conducted in other countries show that pedagogy and emerging technologies must be incorporated in future teacher training plans [15]. Other studies have designed an explanatory theoretical model [16] with four teacher profiles in terms of the use of technologies in the classroom: "reluctant", "learner", "manager" and "e-innovator". These studies state that, in order to develop these attitudes, we seek future teachers, and it is essential to promote self-confidence and the collaboration of the educational community.

1.2. Digital Active Pedagogies

As an analytical framework to determining how we learn and what contexts we need, rethinking the curriculum and learning ecologies is a relevant strategy for learning [17,18]. Future teachers under training face an unprecedented and unknown situation. On the bright side, they have the chance to experiment and "live" virtual teaching in all of its dimensions. Similarly, they are given the opportunity to observe, design and evaluate innovating projects in their professional practice. The acceleration of training in all educational levels has been considerable. We cannot disregard the relevance of the development of Personal Learning Environments (PLEs). PLEs have become essential experiences during the pandemic. Studies focused on recognising that the different types of learning that can be acquired by our future teachers are aimed at unravelling and delving into the possibilities of Learning Ecologies (LE) in the institutional, business and working reality of their social environment in a pandemic such as the one caused by COVID-19. Other studies aimed at critically analysing the new learning environments as dynamic and informal environments as well as at developing the capacity of future teachers to be autonomous in the execution of tasks that require the application of theory and practice.

1.3. The Empowerment of Future Teachers

Other studies related to LE show that technological resources can provide great help in learning and professional development processes. The increasing impact of LE is a framework useful for interpreting and exploring the multiple opportunities of digital learning [17]. Previous investigations have demonstrated the importance of PLEs in HE and in the professional development of future educators [19].

Social projection used to be carried out in a world characterised by promptness and immediacy, where working environments were in constant development and alert for the quickly changing demands. What happened to us now? Why has it been of utmost importance to face confinement and to bring the school to our homes? The coronavirus, which has changed the customs of most of humanity drastically and very quickly, has taken

the management of the new economic and social paradigm focused on the development of competences to the extreme. After this experience, we will have learned to work, study and socialise in a different way. We miss human contact, which is so important for learning and communication. To date, many of our teaching–learning procedures are based on time shifts, and through lockdown experiences, we can help transform such system toward tasks. In this sense, studies on the COVID-19 pandemic have emphasised psychological pressure, anxiety and the importance of data privacy [20].

Social projection is found in new challenges of working environments that are in constant crisis management (health, economic and social crises), which must therefore be very sensitive to the demands of developmental agendas, such as those included in the abovementioned 2030 Agenda (green energy, telecommunications and digitalisation). It seems that, long time ago, when researchers wrote about knowledge generation, learning was considered ubiquitous [21], invisible [22], connected [23,24] and rhizomatic [25], as new formats were created, and times and spaces were expanded and modified. Future teachers will have to respond to a set of emerging skills and competences. This requires leadership in their own working life, responsibility in their own development, and self-management of their intentional learning projects inside and outside of formal institutional environments.

Anyone who wants to carry out a project of intentional learning would generally ask themselves: what do I want to achieve and how can I do this? What are the human and material resources that are available in the course of the project? Which are the most suitable and efficient instruments to carry out the activities and support my project? What is the expected result, and how can I know that the objectives have been met? This idea is key to the change in institutional culture that must be sought in higher education.

The creation of challenging situations for students in terms of self-management in a formal institutional framework is wide. Two example of this are learner control as an expression of self-management and learner control from the perspective of instructional control. The student must make independent decisions on what and how to learn [26], although not by themselves; there must be a balance between learner control and the facilitator role played by the educator. This new professional role must be characterised by negotiation and the exchange of perspectives, ensuring the necessary resources and validating the results of training in digital competences, emerging technologies, digital learning (gamification), digital evaluation and empowerment for the participation of students in LE. All of these scopes constitute a relevant part of university training in all fields of knowledge.

The existence of a team that provides help and support to face technical difficulties is important. Through e-learning as the centre of teaching interest, a methodology based on problems, projects and working contracts has been introduced. The new learning model is based on continuous learning, and it results in the combination of different learning contexts, which include formal, non-formal and informal learning. These emerging circumstances have been analysed in studies on ubiquitous learning, continuous learning and expanded education contexts. The creation of "learning ecologies for continuous learning" provides an integrated conceptualisation of learning as a complex phenomenon that unites formal, non-formal and informal learning experiences. This creation offers a framework to understand how individuals select, experiment, navigate and participate in learning experiences that comprise multiple contexts [27].

We have revised and verified the impact of learning styles on future leadership models. The attitudes toward computer technology as well as the design and creation of materials are key. It is important to take into account the relationship between interests and skills in order to choose the most adequate education and to evaluate its strategies. One of the implications that we detected is related to the motivation that students experienced and expressed in the design of their materials. These smart classroom studies show that intelligent technology aids in the development of inquiry, collaborative, group, mobile and ubiquitous learning [28]. The smart classroom can adapt in a personalised manner for individual

learning of each student. It enriches learning by supporting it with interactive resources provided by emerging technologies, such as Augmented Reality (AR) [29–31]. In a smart classroom environment, it is easier to stimulate the motivation of students for learning, to promote their active learning and to achieve an adequate learning performance [32]. Thus, proposed the development and promotion of an active learning environment in smart schools of Malaysia [33]. In this process, multimedia technology and Web 2.0 tool, specifically MyPortfolio, were integrated to allow students to learn on their own and to record their evolution and experiences within this cooperative learning environment.

The obtained results show the valuation of the following aspects: motivation, collaboration and reflective exchange of experiences, self-learning, promotion of initiatives and decision making. The tasks they promote facilitate the development of competences associated with the search for information, planning, reflection, coordination, cooperation, professional development and leadership.

The professional development of faculty members is a key factor to guaranteeing a good higher education [34,35]. The concept of PLE has been interpreted in different ways [36]. The main benefit of PLEs is related to the opportunities offered to students to control their environment, expanding beyond the physical space of educational institutions [37]. As was pointed out by [38], learning is becoming increasingly self-directed and informal thanks to technology, hence the need is to explore what resources are used by teachers to promote their professional development from the integrating perspective provided by LEs. This way of learning is a revolution in permanent teacher training, since teachers lead and control their own learning and they are able to identify their needs, interests and potentialities. These aspects are very significant indicators of teacher professional development [39,40].

Digital citizenship, i.e., the competences and ethical values required to participate in on-line society, is an increasingly essential element in the 21st century. Critical thinking [41]; citizenry [42]; and the inclusion of systems such as interactive groups, collaborative learning and peer tutoring have proved to be efficient strategies that help all students reach their maximum potential based on their learning capacities, while they also promote social inclusion and the coexistence of the entire classroom and community [43].

2. Materials and Methods

Method: This was a non-experimental, descriptive study based on surveys [44]. The aim of this study was to explore the perceptions of university students toward the digital transformation in university teaching that took place as a consequence of the COVID-19 pandemic. The specific aims were (a) to analyse the perceptions of university students toward digital transformation in university teaching; (b) to determine the valuation given by university students about the digital transformation that occurred in university teaching as a result of COVID-19; and (c) to explore the resources (hardware and software), professional collaboration, digital pedagogy and student empowerment (motivation) with respect to digital education and the recent changes in university teaching due to the pandemic.

The participants were recruited by non-probabilistic sampling, using their accessibility as the main selection criterion.

The sample constituted 486 students from Osuna University School, which is ascribed to the University of Seville (Spain). The students were registered in Social and Health Science degrees between their first year of a bachelor's degree and a master's degree (44% of the students were in their first year, 30.2% were in their second year, 11.7% were in their third year, 13.4% were in their fourth year and 0.6% were studying for their master's degree), of which 82% were women and 18% were men. In general, they showed similar sociodemographic characteristics, and their ages were mainly between 18 and 25 years (mean = 20.7 years).

Instrument: The questionnaire on digital transformation in university teaching that took place due to COVID-19 was developed from an adaptation of the studies conducted by [45,46]. It was inspired by the scale designed by [41] for the analysis of digital trans-

formation and The Motivated Strategies for Learning Questionnaire of [42] to evaluate the motivational component. This instrument consisted of 37 items (5 identification items and 32 items about digital transformation), grouped into 5 categories: student profile, resources (hardware and software), professional collaboration, digital pedagogy and student empowerment (motivation). The Cronbach's Alpha obtained was 0.73.

Regarding the student profile, five questions were included to gather information about the main characteristics: (1) sex, (2) age, (3) degree year, (4) group and (5) degree. The students answered the rest of the questions in a Likert-scale from 1 (strongly disagree/little) to 5 (strongly agree/much). The new items were recoded before conducting the analyses (items 9, 21, 22 and 28).

The categories and the rest of the items of the questionnaire are the following:

(6) Resources (hardware and software): the hardware requirements of the subjects may vary, and for some subjects, the will of the students to use their own device appeared already in face-to-face education. However, the inaccessibility of institutional devices can be a serious problem for students without hardware (resources).

6. If I had had the opportunity to use the computers of the faculty/school instead of my own computer, I would have taken that opportunity.
7. My own devices-tools help me to better learn the subjects compared to the ones provided by the faculty/school.
8. My devices-tools met the requirements of the platform.
9. How difficult is it to learn to use the digital environment of the platform?
10. In the future, I would rather use my own resources (devices-tools) than the ones provided by the faculty/school.

(7) Professional collaboration: relationships with the students are an important part of higher education, since these can help to develop social skills and to improve behaviour in future workplaces. On-line education can have a negative effect on human relationships and hinders opportunities for face-to-face interactions.

11. How does on-line education affect your interaction with your classmates? (extremely bad—extremely well).
12. How frequently do you ask your classmates for help during on-line teaching?
13. How much help do you seek from other students only for academic purposes?
14. How frequently did your on-line student meetings were focused on academic purposes?
15. How much do you miss being face-to-face (without masks) with your classmates?
16. How important is it for you that the teacher uses the webcam during the lectures?
17. In my opinion, I learn better in face-to-face lectures than in on-line lectures.
18. How important is it for you to interact with the teacher verbally every week?
19. How much does the teacher help you to understand the topics of the subject if you can ask questions during the on-line lecture?
20. Do you prefer on-line lectures in the future?

(8) Digital pedagogy: emotion and learning are strongly connected and such relationship affects academic performance (marks). Emotions influence our attention, memories and rational thinking. However, traditional face-to-face lectures can improve the mental health of students. Measuring the amount of emotional support that students require during virtual lectures is a challenge.

21. How difficult is it to adapt to the situation of on-line theory lectures?
22. How difficult is it to adapt to on-line practical work/activities/assignments?
23. How much did you participate during the on-line lectures?
24. Do you think that on-line education is useful?
25. How much are you enjoying on-line education?

(9) Student empowerment (motivation): the students' degree of involvement in their studies. The following statements refer to their motivation and attitudes about online lectures.

26. In an on-line lecture, I prefer the material of the subject that really challenges me to learn new things.

27. I think that on-line teaching significantly improves the quality of university teaching.
28. On-line lectures are more boring than face-to-face lectures.
29. If I study adequately, I can learn the material of this subject.
30. I believe that I can use what I learn in this subject for other things.
31. I believe that I will get an excellent mark in this subject.
32. Obtaining a good mark in this subject is the most satisfactory thing for me right now.
33. It is important for me to learn the topics of this subject.
34. When I take exams, I think about the consequences of failing.
35. I am very interested in the contents that I am learning in this subject.
36. I am sure that I can do a great job in the assignments and exams of this subject.
37. I think that the material of this subject is useful to learn.

Data analysis: the data were subjected to descriptive (mean and standard deviation), correlational and inferential analyses, using the statistical software SPSS v.26.

3. Results

Once the questionnaires were collected, the mean scores obtained in each of the items were analysed (Table 1). Regarding the item "If I had had the opportunity to use the computers of the faculty/school instead of my own computer, I would have taken that opportunity" ($\bar{\alpha} = 3.43$; $\sigma = 1.37$), the participants would have taken the opportunity to use the computers of the faculty/school. However, they considered that their own devices help them learn the subjects better than the ones provided by the faculty/school ($\bar{\alpha} = 3.54$; $\sigma = 1.17$). This is due to the fact that they also considered the fact that "their devices met the requirements of the platform" ($\bar{\alpha} = 4.29$; $\sigma = 1.01$). Therefore, students prefer to use their own resources (devices) rather than the ones provided by the faculty/school ($\bar{\alpha} = 3.56$; $\sigma = 1.19$).

Table 1. Descriptive data.

	Mean	Standard Deviation
Resources (hardware and software)	3.63	0.53
If I had had the opportunity to use the computers of the faculty/school instead of my own computer, I would have taken that opportunity.	3.43	1.37
My own devices-tools help me to better learn the subjects compared to the ones provided by the faculty/school.	3.54	1.17
My devices-tools met the requirements of the platform.	4.29	1.01
How difficult is it to learn to use the digital environment of the platform?	3.56	1.19
In the future, I would rather use my own resources (devices-tools) than the ones provided by the faculty/school.	3.30	1.18
Professional collaboration	3.65	0.36
How does on-line education affect your interaction with your classmates? (extremely bad—extremely well).	2.15	1.09
How frequently do you ask your classmates for help during on-line teaching?	3.36	1.06
How much help do you seek from other students only for academic purposes?	3.26	0.92
How frequently were your on-line student meetings focused on academic purposes?	3.87	1.12
How much do you miss being face-to-face (without masks) with your classmates?	4.75	0.70
How important is it for you that the teacher uses the webcam during the lectures?	4.29	1.08
In my opinion, I learn better in face-to-face lectures than in on-line lectures.	4.40	1.07
How important is it for you to interact with the teacher verbally every week?	4.47	0.80
How much does the teacher help you to understand the topics of the subject if you can ask questions during the on-line lecture?	4.06	1.02
Do you prefer on-line lectures in the future?	1.93	1.34
Digital pedagogy	2.62	0.82
How difficult is it to adapt to the situation of on-line theory lectures?	2.50	1.16
How difficult is it to adapt to on-line practical work/activities/assignments?	2.29	1.14
How much did you participate during the on-line lectures?	3.06	1.15
Do you think that on-line education is useful?	2.85	1.20
How much are you enjoying on-line education?	2.39	1.10
Student empowerment (motivation)	3.69	0.48
In an on-line lecture, I prefer the material of the subject that really challenges me to learn new things.	3.71	0.91
I think that on-line teaching significantly improves the quality of university teaching.	2.07	1.15
On-line lectures are more boring than face-to-face lectures.	1.91	1.26
If I study adequately, I can learn the material of this subject.	4.09	0.92
I believe that I can use what I learn in this subject for other things.	3.85	0.96
I believe that I will get an excellent mark in this subject.	3.36	0.87
Obtaining a good mark in this subject is the most satisfactory thing for me right now.	4.17	0.95
It is important for me to learn the topics of this subject.	4.34	0.81
When I take exams, I think about the consequences of failing.	4.38	0.94
I am very interested in the contents that I am learning in this subject.	4.30	0.76
I am sure that I can do a great job in the assignments and exams of this subject.	4.00	0.87
I think that the material of this subject is useful to learn.	4.08	0.83
Total	13.58	1.48

The participants did not find it difficult to learn how to use the digital environment of the platform ($\bar{\alpha}$ = 3.30; σ = 1.18).

Regarding the item "How does on-line education affect your interaction with your classmates? (extremely bad—extremely well)" ($\bar{\alpha}$ = 2.15; σ = 1.09), they considered that on-line learning affects them negatively; in this sense, they asked their classmates for help during on-line education ($\bar{\alpha}$ = 3.36; σ = 1.06).

The extent to which these students sought help from other students only for academic purposes was high ($\bar{\alpha}$ = 3.26; σ =0.92), in line with the following item: "how frequently did your on-line student meetings were focused on academic purposes?" ($\bar{\alpha}$ = 3.87; σ = 1.12).

When asked "how much they missed being face-to-face (without masks) with their classmates" ($\bar{\alpha}$ = 4.75; σ = 0.70), they showed an extremely high scores in their answers.

In this on-line situation, they considered it very important that the teacher uses a webcam during lectures ($\bar{\alpha}$ = 4.29; σ = 1.08), since "in their opinion, they learn better in face-to-face lectures than in on-line lectures" ($\bar{\alpha}$ = 4.40; σ = 1.07). That is, they prefer face-to-face lectures, and during on-line education, they think that the teacher must use a webcam and maintain verbal contact (item 18) ($\bar{\alpha}$ = 4.47; σ = 0.80).

The participants considered, with a high score, that asking questions during on-line lectures helps them understand the topics of the subject ($\bar{\alpha}$ = 4.06; σ = 1.02), although they do not prefer on-line lectures for the future ($\bar{\alpha}$ = 1.93; σ = 1.34).

Regarding the items "how difficult is it to adapt to the situation of on-line theory lectures" ($\bar{\alpha}$ = 2.50; σ = 1.16) and "how difficult is it to adapt to on-line practical work/activities/assignments? ($\bar{\alpha}$ = 3.71; σ = 1.14), they showed that it was very difficult for them to adapt to both the theory and practical lectures, with a medium level of participation in on-line lectures ($\bar{\alpha}$ = 3.06; σ = 1.15).

The participants did not find on-line education useful ($\bar{\alpha}$ = 2.85; σ = 1.20), obtaining a low degree of enjoyment ($\bar{\alpha}$ = 2.39; σ = 1.10).

Motivation is fundamental in on-line lectures. In this sense, they "prefer the material of the subject that really challenges them to learn new things" ($\bar{\alpha}$ = 3.71; σ = 0.91). Moreover, they do not think that on-line education significantly improves the quality of university teaching ($\bar{\alpha}$ = 2.07; σ = 1.15).

The participants considered, with a high score, that "on-line lectures are more boring than face-to-face lectures" ($\bar{\alpha}$ = 1.91; σ = 1.26), although they also believed that "if they studied adequately, they could learn the material of that subject" ($\bar{\alpha}$ = 4.09; σ = 0.92;). Likewise, "they believed that they could use what they learn in that subject for other things" ($\bar{\alpha}$ = 3.85; σ = 0.96). They were very motivated, as they "thought that they would get an excellent mark in that subject" ($\bar{\alpha}$ = 3.36; σ = 0.87; σ^2 = 0.76); they even considered that "obtaining a good mark in that subject was the most satisfactory thing for them at that time" ($\bar{\alpha}$ = 4.17; σ = 0.95).

Furthermore, the participants responded with high scores to the following items: "it is important for me to learn the topics of this subject" ($\bar{\alpha}$ = 4.34; σ = 0.81); "when I take exams, I think about the consequences of failing" ($\bar{\alpha}$ = 4.38; σ = 0.94); "I am very interested in the contents that I am learning in this subject" ($\bar{\alpha}$ = 4.30; σ = 0.76); "I am sure that I can do a great job in the assignments and exams of this subject" ($\bar{\alpha}$ = 4.00; σ = 0.87); and "I think that the material of this subject is useful to learn" ($\bar{\alpha}$ = 4.08; σ = 0.83).

Regarding the correlational tests, it was observed that, in most cases, there are low to moderate correlations ($0.18 < r < 0.53$), although they are significant (Table 2). A positive two-sided correlation was detected between resources (hardware and software) and digital pedagogy ($r = 0.18$), with a significance level of $0.000 < 0.01$. That is, at high values in the items related to resources (hardware and software), the values of digital pedagogy were also high.

Table 2. Correlations.

		Resources (Hardware and Software)	Professional Collaboration	Digital Pedagogy	Student Empowerment (Motivation)
Resources (hardware and software)	Pearson's Correlation Sig. (bilateral)	1			
Professional collaboration	Pearson's Correlation Sig. (bilateral)	0.05 0.27	1		
Digital pedagogy	Pearson's Correlation Sig. (bilateral)	0.18 ** 0.000	0.14 ** 0.002	1	
Student empowerment (motivation)	Pearson's Correlation Sig. (bilateral)	0.185** 0.000	0.26 ** 0.000	0.53 ** 0.000	1

Note: **. The correlation is significant at the 0.01 level (bilateral).

There was also a positive two-sided correlation between resources (hardware and software) and student empowerment (motivation) (r = 0.18), with a significance level of 0.000 < 0.01. That is, if resources increase (hardware and software), student empowerment (motivation) also increases, and vice versa.

Similarly, there was a positive two-sided correlation between professional collaboration and digital pedagogy (r = 0.14), with a significance level of 0.002 < 0.05, i.e., the greater the professional collaboration, the greater the values in the items about digital pedagogy.

Another positive two-sided correlation was identified between professional collaboration and student empowerment (motivation) (r = 0.26), with a significance level of 0.000 < 0.01. That is, at high values of professional collaboration, the values of student empowerment (motivation were also high).

Lastly, there was also a positive two-sided correlation between digital pedagogy and student empowerment (motivation) (r = 0.53), with a significance level of 0.000 < 0.01. That is, the greater the values in digital pedagogy, the greater the values in student empowerment (motivation), and vice versa.

4. Discussion

According to the results of a large number of investigations, the perceptions of university students show the need to reflect on the change in training models [1]. The highlight is that the on-line learning that took place in the first semester of 2020 based on distance education models [7] arrived with the new institutional culture of HE.

In relation to the research carried out on students' perceptions toward the shift to on-line teaching and learning, not all students were taken into account, with a notable lack of consideration for vulnerable populations, such as international students and SEND, as part of the general student body found in all studies; therefore, we point out one of the limitations. Likewise, we will continue to analyse the perceptions and opinions of the teaching staff [4]. Contrasting the line of findings around the use of educational technologies by faculty is of vital importance to make hybrid learning models work.

Most research implications that match the results [47] correspond to the need to develop digital skills, to share good practices, to recognise teaching merits and to develop coherent institutional strategies where technology continues to be incorporated [3,4]. Similarly, we will also continue to investigate in this line in order to identify the problems of student participation and the effects of the hybrid model [48].

After the analysis of the questions related to resources (software and hardware), we can assert that most students, with adequate competence in the use of computer equipment, do not find it difficult to adapt to distance teaching. Likewise, in view of the obtained

results, we can infer that there is no digital divide among the students of the analysed sample, since they find their devices to be sufficiently suitable and, thus, they do not require those provided by their educational centres, which is in line with the findings of other studies carried out during the COVID-19 pandemic [49].

In general, the participants of this study consider that they obtain good results with on-line teaching and are highly motivated with their studies. However, some of them find it difficult to adapt, feel discouraged (they do not like it) and reject this way of learning for the future. Moreover, they highly value interacting with their classmates and teacher in the classroom as well as physically being in the classroom, which is in agreement with the results of other studies performed all over the world [50].

In this sense, new and interesting research lines emerged. We do not know whether such a rejection to remoteness among the protagonists of teaching and learning processes is due to the novelty of this situation; imposed lockdowns to fight the pandemic; or the change experienced in the months of confinement, which coincided with the beginning of this model of virtual teaching. Studies shed light on these issues, coinciding with psychological pressure; anxiety; and as pointed out in this study, alternative evaluation [20].

We should not forget the importance of knowing the interest of students in DT in certain educational scopes. They may not like the idea of distance learning, globally, but that does not imply that they reject all types of virtual learning (courses, assignments, specific contents, etc.). This requires the conceptual and philosophical re-evaluation of teaching and learning as well as of the roles of teachers, students and didactic materials and the connections between them [51].

Therefore, there could be a direct relationship between DT and new types of innovation and creativity in higher education. Similarly, traditional teaching methods have improved and are supported. The aim is not to follow a technological trend but to achieve much more, since DT brings accessibility to vulnerable groups and improves the efficacy of educational methodologies, which provides the educational quality for which we have been searching for so long. Fundamentally, DT is the reinvention of educational organisations.

5. Conclusions

This study falls into the category of studies conducted in the first ten months of the COVID-19 pandemic, in the year 2020. The results are in line with those of other studies, such as those regarding the characteristics of this field of research, which is emerging intensely and rapidly [1,47,48]. The results show that, in the resources category, the problem for access to teaching–learning processes increases, which is a classic issue in the literature on ICT. The findings on this aspect can be compared with those of studies carried out in the University of Olderburg, where the students used their laptop at home, as in our study, and their results are inspiring with respect to the use that students made of technology, which is rather in the logistic line of using resources, such as uploading or downloading documents to pass the subject, than in the line of using technology as a means for the transformation of active learning, where students create contents or collaborative activities [1,48]. In our study, related to the use of collaborative environments, our results are in line with those of [28], who found that the students did not have teamwork skills; therefore, collaborative and communication skills were not developed.

The most common types of tools were messaging, Blackboard Collaborate and discussion forums, which were used daily by 84% of the students. In general, students want more opportunities to develop their formative processes. It is clear that the students used the Blackboard Virtual Teaching platform mainly as a tool to organise their lectures (e.g., to verify registration and to upload materials). In this regard, our findings are in line with those of [9].

We must also highlight the urgency with which decisions were made and the divides that appeared between the students that had access to technological resources and those who did not [47]. One of the objectives of this study was to identify the perceptions of students toward the educational models used during the pandemic. With the evidence

obtained, we can assert that on-line learning requires the development of digital competencies by faculty and students, as is also shown in the literature. Moreover, the use of active methodologies by the faculty as well as a formative monitoring of the learning acquired by the students, are the research lines that we will continue working on in the future [3].

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