

## Article

# Implementation of Hybrid Education in Peruvian Public Universities: The Challenges

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**Abstract:** Digital competencies and hybrid education have become fundamental tools to promote new learning styles in the context of higher education. The objective of the research was to evaluate the challenges that hybrid education creates with respect to the digital competencies of Peruvian university teachers in times of uncertainty. The approach used was mixed in order to collect both numerical and qualitative data. The population and sample were composed of 189 teachers from three national universities. The techniques used were a survey for quantitative data and an interview for qualitative data. The instruments used were a questionnaire and an interview protocol. The results show that the challenges that universities in Peru must face are the recognition of their own potential, technical–technological capacity, interpretation of the felt needs, the formative development of human talent, and reflecting themselves as a dynamic node that responds to the changes in society. It was concluded that Peruvian universities must proactively address the challenges presented by hybrid education and the development of digital competencies to ensure a high quality education that prepares students for the world of today and the world of tomorrow.

**Keywords:** blended learning; learning methods; digital skills; higher education institutions



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## 1. Introduction

The secondary effects of COVID-19 encouraged the development of digital competencies in each of the fields of action in which people communicate face-to-face [1], including, of course, the diverse and distinct educational settings of the corresponding communities around the world [2]. This resulted in prolonged closures of schools and universities worldwide [3], creating challenges for teachers, students, and parents [4] to integrate into a totally virtual educational system, which stands in contrast to the current system [5], called hybrid education.

In this sense, hybrid education is the term used to refer to synchronous online and face-to-face teaching; the applicability of which has increased since the global health crisis to convert face-to-face classes to a virtual modality [6]. In spite of this, its applicability was rushed, since the same methods, resources, and curricula used in the face-to-face modality were used [2], without considering a hybrid education model of its own. Therefore, university education worldwide has made incredible efforts to move its academic, administrative, and research activities online [7,8].

However, the health crisis severely affected the educational trajectory of students in all modalities [9]. The greatest challenge observed in the Latin American context was the lack of digital competency among educational actors. In this region, the adaptation of teaching methodologies to virtual environments was not sufficient [10]. The tool known as a study guide was the main teaching resource that had the possibility of being accessed online, since it could be easily shared through the WhatsApp messaging application, without dictating to the class [11]. Although teachers have adapted their teaching strategies and methodologies to digital formats, there has been no initiative to implement a hybrid education model that adapts to the contextual needs of the university. This generates uncertainty for both teachers and students, and trial and error thus predominate in the teaching praxis [12].

In Peru, significant gaps in digital competencies were revealed in teachers, students, and parents; this highlights the demand for training. After the beginning of virtual learning due to the health crisis, it has been important to accelerate the development of these competencies in all educational actors involved in the process. This requires continuous training processes that contribute to the development of digital competencies suitable for the promotion of contextualized, collaborative, and reflective learning, generating new ways of learning to learn [13]. Therefore, it is considered key to have pedagogical strategies relevant to the digital domain, such as the use of interactive digital platforms and interactive games that improve technical skills for learning purposes. As a result, the health crisis has opened up more opportunities for flexibility and innovation for teachers, allowing them to adapt their activities to the demands of their students [14].

Within this reality, the present research aimed to evaluate the challenges that hybrid education demands with respect to the digital competencies of Peruvian university teachers in times of uncertainty. For this purpose, the following general problem was formulated: What are the challenges that hybrid education demands with respect to the digital competencies of Peruvian university teachers in times of uncertainty? Likewise, the following specific problems were formulated: What are the digital competencies of Peruvian university teachers in times of uncertainty? What are the institutional conceptions of the hybrid education model in relation to the strategies, structure, and support used by the National Universities of Peru in times of uncertainty? What are the hybrid education experiences implemented in the National Universities of Peru in times of uncertainty? What are the challenges regarding the level of development of digital competencies of Peruvian university teachers with respect to the demands of hybrid education? The present study, being descriptive in nature with a mixed approach, established the following central hypothesis: the identification of the challenges of hybrid education in Peru in times of uncertainty, with respect to the digital competencies of university teachers.

### *1.1. Literature Review*

#### *1.1.1. Digital Competence*

Digital competence was first defined in 2006, and was subsequently updated by the European Commission, and is defined in the European Digital Competence Framework (DIGCOMP), as the: “confident, critical and responsible use of and engagement with digital technologies for learning, at work and participation in society” [15] (p. 3). The concept is multidimensional, as it extends beyond the use of information and communication technology (ICT) [5], focusing also on presenting the critical position of the use of ICT in different aspects of life [16], being a concept that must be renewed and adapted as ICT changes [17].

In this view, the term “digital competence” is recent and refers to technology-related skills. A recent review [18] explains that the terms “computer literacy” and “ICT literacy” are frequently used in the literature in a variety of contexts to refer to this variable, and also have variations such as “IT literacy” or “technology literacy”.

Therefore, digital competence is a concept that is widely discussed and understood in different ways in different contexts and theoretical frameworks that emphasize the combination of technical, cognitive, emotional, and social skills needed to function effectively in

digital environments [19]. On the other hand, recent authors have adopted the definition proposed by the European Union (EU), which describes digital competence as the confident and critical use of Information Society Technologies (IST) for work, leisure, and communication [20]. This definition emphasizes the importance of basic ICT skills, including retrieval, assessment, storage, production, presentation, and exchange of information, as well as participation in collaborative networks through the Internet.

The European Framework refers to the digital competencies of educators, pointing out six dissimilar areas [21] that encompass the digital competency of an education professional, which were taken as the dimensions used in this study [22].

The dimension of professional commitment is the ability of educators to manage digital technology in order to improve the teaching process, their personal and professional development, and the interactions that take place in the educational community between the teaching professional, parents, and other professionals. This dimension describes the appropriate and efficient use of technologies for communication between colleagues, students, parents, and different agents that are part of the educational community [23].

Digital content: the educator must have the ability to manage a variety of digital content to evaluate and select the most relevant digital resources for teaching and learning. Also called digital resources, it is considered as the most complex dimension, with few studies on the development of educational content [24].

Teaching and learning: The teaching competency that the teacher must acquire is related to the design, programming, and implementation of the use of digital technologies throughout the learning process [25,26]. Providing guidance and support to learning, collaborative learning, and self-regulated learning through digital technology seeks that the center of the entire teaching and learning process be the student and that they should access these types of learning through their interactions with others, the promotion of collaboration between peers, and their ability to reflect on their learning. Also called digital pedagogy, it is the dimension that integrates digital resources and methods into the learning process, which is mainly based on the planning, design, and use of digital technologies during the teacher's teaching [23].

Assessment and feedback: This is the ability to improve the existing assessment strategy through the use of digital tools, facilitating the achievement of feedback that contributes to the teaching and learning process. This area includes assessment strategies, the analysis of evidence and trials, and feedback and planning [21,23].

Empowering students: Through the use of technological tools, pedagogical strategies should be developed to promote active student participation during the learning process, considering the competencies and needs of each student. Specific competencies include accessibility and inclusion, personalization, and active student participation [21,23].

Facilitating the digital competence of students corresponds to the ability to develop digital competencies within students, which has a transversal axis within learning. This area includes information and media literacy, digital communication and collaboration, digital content creation, responsible use and welfare, and digital problem solving [21,23,26]. This dimension seeks the active participation of students in the field of citizenship through the integration of their activities into the problem-solving process [23].

### 1.1.2. Hybrid Education

Hybrid education is a teaching model that combines synchronous online and face-to-face teaching, maximizing the advantages of face-to-face and virtual education. Although the proposal dates back to the late 1990s, it was recently adopted by several countries at all educational levels, with a greater emphasis on higher education [27], promoting the integration of various forms of communication and information, allowing participants to be in the same physical location or in different locations [28].

This educational alternative combines several learning styles [29], including traditional methods, audiovisual media, computer-assisted learning, and autonomous learning. These have evolved with the popularity of the Internet, the development of e-learning, and from

the experience of the pandemic, demonstrating that it offers a flexible learning environment, supported by the autonomy of students, and contributing to the development of thinking and communication skills for use in both the physical and virtual environments [30].

Several studies show that learning articulated towards digital media promotes the production of digital content, such as videos, which can lead to better academic performances and greater cognitive processing as it requires deeper levels of understanding and cognitive processing to create and evaluate the content [31]. The effectiveness of technology in supporting learning depends on how it is used in the design and development of teaching and learning activities [28].

The incorporation of a virtual component into education requires attention to be paid to the security, scalability, and humanization of the teaching system. And, although it still demands a certain flexibility, this type of education requires a well-organized learning management system in order to bring satisfactory results [28,32,33].

Incorporating online learning into education has been beneficial in terms of cost savings, accessibility, and security; however, it has also presented challenges such as increased stress, miscommunication, and even technological problems, highlighting the need for fundamental innovations in the learning methods and psychological skills used by the learner [34].

Hybrid education requires curricular plans to be redesigned to have a positive impact and achieve teaching and learning outcomes [35]. The simple substitution of teaching tools may not effectively facilitate student learning and participation, so the hybrid approach may have results only in small groups. It is necessary to propose a redesign of online hybrid alternatives to traditional face-to-face teaching [27].

In this sense, hybrid education implies the use of a new pedagogy, integrating innovative approaches with traditional knowledge in order to improve teaching and learning experiences [33]. Therefore, tutoring initiatives and additional guidance for students are required, as well as continuous assistance and periodic measurements to monitor the student's process [36].

Therefore, three dimensions have been considered for the implementation of B-Learning (blended learning): Strategy, which allows aspects related to the global design of B-Learning to be solved, such as definition, promotion, degree of implementation, purpose, and policies to orient its use; structure, which refers to issues related to the technological, pedagogical, and administrative frameworks, making the B-Learning environment possible; and finally support, which solves aspects related to the implementation and maintenance of the programs, through technical and pedagogical support, and encouragement for teachers who use B-Learning [37].

## 2. Materials and Methods

This study adopted a mixed approach, which merges two perspectives in an integrated manner, i.e., it combines quantitative and qualitative data [38]. Thus, the variables used to assess digital competency and hybrid education were examined from both a quantitative and interpretative point of view. The research, of a basic nature, focused on delving deeper into the phenomenon to understand attitudes towards digital competency and hybrid education of teachers at national universities. The design of the study was flexible, dynamic, and evolutionary, developing in sequential interrelated stages [39].

The study population refers to the set of individuals who are the object of research [40]. In this case, three academic institutions in Peru were selected: the Universidad Nacional Federico Villarreal (UNFV), the Universidad Nacional del Santa (UNS), and the Universidad Nacional de Educación Enrique Guzmán y Valle (UNEGyV), as they are public higher education institutions with a long history in the country. The sample consisted of 189 teachers who were teaching in virtual mode. Surveys were used to collect quantitative data and semi-structured interviews were used to collect qualitative data.

The instrument used was the European Digital Competences Framework questionnaire, adapted by Cabero-Almenara and Palacios-Rodríguez [23], and an interview protocol

of their own authorship, with two thematic units. The first one was about the experiences with the hybrid education protocols implemented in National Universities, with their respective categories (hybrid education, implementation of hybrid education, and teacher competencies related to hybrid education). The second one was about challenges regarding the level of development of digital competencies and related categories (challenges regarding the development of competencies). These interviews were conducted with six teachers who have taught in the hybrid education modality for higher education. Two teachers were from UNEGyV, two from Universidad San Ignacio de Loyola, and two from Universidad Nacional Mayor de San Marcos, which served as an integral process to understand the phenomenon under study.

It should be noted that the research began with an exploratory stage, in which the phenomenon was contextualized and the theoretical basis supporting the study was developed. Subsequently, a descriptive stage was carried out, establishing the design of the study and the research questions that guided the researchers. Instruments were chosen for data collection, which were then processed using the Statistical Package for the Social Sciences (SPSS) version 26 and Excel (Microsoft® Excel® 2021 MSO, version 2403 build 16.0.17425.20124). Finally, conclusions were reached through an inductive process.

In the development of the field work, all interested parties were adequately informed and consent was obtained from all participants. The data obtained were only used for the purposes proposed in this study. In addition, the protocols were reviewed and approved by the Ethics Committee of the Universidad Nacional Experimental Francisco de Miranda.

### 3. Results

This section presents the information gathered from the application of the instrument to the study sample, in addition to the interviews conducted with teachers who are experts in hybrid education. It is worth mentioning that the research assumed a mixed approach, so it contains both quantitative and qualitative results. Each of the results is presented below.

#### 3.1. Results of Quantitative Analysis

To measure the level of digital competencies and implementation of hybrid education, the questionnaire was applied as an instrument to a sample of 189 university teachers, using the online form. The results are presented below (Table 1).

**Table 1.** Description of teachers' digital competency levels.

| Levels   | Novice |   | Explorer |    | Integrator |    | Expert |    | Leader |    | Pioneer |   | Total |     |
|--|--------|---|----------|----|------------|----|--------|----|--------|----|---------|---|-------|-----|
|  | f      | % | f        | %  | f          | %  | F      | %  | f      | %  | F       | % | f     | %   |
| Digital competence in teaching                           | 4      | 2 | 40       | 21 | 106        | 56 | 33     | 18 | 6      | 3  | 0       | 0 | 189   | 100 |
| Dimension 1: Professional commitment                     | 0      | 0 | 74       | 39 | 59         | 31 | 52     | 28 | 4      | 2  | 0       | 0 | 189   | 100 |
| Dimension 2: Digital content                             | 0      | 0 | 23       | 12 | 47         | 25 | 68     | 36 | 45     | 24 | 6       | 3 | 189   | 100 |
| Dimension 3: Teaching and learning                       | 4      | 2 | 40       | 21 | 122        | 65 | 17     | 9  | 6      | 3  | 0       | 0 | 189   | 100 |
| Dimension 4: Assessment and feedback                     | 4      | 2 | 72       | 38 | 96         | 51 | 15     | 8  | 2      | 1  | 0       | 0 | 189   | 100 |
| Dimension 5: Student empowerment                         | 6      | 3 | 81       | 43 | 93         | 49 | 9      | 5  | 0      | 0  | 0       | 0 | 189   | 100 |
| Dimension 6: Development of students' digital competence | 0      | 0 | 49       | 26 | 91         | 48 | 47     | 25 | 2      | 1  | 0       | 0 | 189   | 100 |

The level of digital competency presented by the university teachers is integrative, according to Table 1. That is to say that the teachers appear to make increasing but occasional use of this competence, represented by 56% of the sample, followed by 21% being in the explorer level, 18% in the expert level, and only 3% in the novice level; as for the leader and pioneer levels, these were not reached by any of the teachers in the sample. In reference to the dimensions, it was identified that teaching and learning, assessment and feedback, student empowerment, and the development of students' digital competence reached the integrative level, while the professional commitment dimension only achieved the explorer level; finally, the digital content dimension was the one that presented the greatest development by reaching the expert level.

The results presented in Table 2 show that, from the faculty's perspective, the level of implementation of hybrid education in universities is just being explored, i.e., it remains in the initial process of an institutional awareness of this educational model being formed. The results for the three dimensions studied, referring to strategies, structure, and support, show that the total or majority of the teachers thought that these were at an exploratory or initial level within the implementation of hybrid education. Only the support dimension presented a low percentage (12%) at a higher stage, possibly due to the fact that the universities provided technical and pedagogical support to ensure the success of the virtual activities carried out within the framework of virtual education.

**Table 2.** Description of the levels of implementation of hybrid education according to teachers.

| Levels           | Awareness/<br>Exploration |     | Early<br>Adoption/Implementation |    | Implementation/Mature<br>Growth |   | Total |     |
|------------------|---------------------------|-----|----------------------------------|----|---------------------------------|---|-------|-----|
|                  | f                         | %   | f                                | %  | f                               | % | f     | %   |
| Hybrid education | 189                       | 100 | 0                                | 0  | 0                               | 0 | 189   | 100 |
| D1: Strategies   | 189                       | 100 | 0                                | 0  | 0                               | 0 | 189   | 100 |
| D2: Structure    | 189                       | 100 | 0                                | 0  | 0                               | 0 | 189   | 100 |
| D3: Support      | 166                       | 88  | 23                               | 12 | 0                               | 0 | 189   | 100 |

### 3.2. Results of the Qualitative Analysis

For the qualitative analysis, six (6) interviews were conducted with university teachers with experience in the development of hybrid education. They were conducted during the months of June and July 2023. The semi-structured interviews were based on the interview script referred to the topic of study and were conducted through Google Meet, as an instrument that accurately recorded the information provided by the key informants. Once the information was obtained, it was transcribed verbatim for the information analysis process, which included a microanalysis or content analysis of each information protocol line by line, word by word. At the same time as the microanalysis or content analysis, the method of constant comparison between each of the dimensions and properties was carried out, and consistency was achieved with this method. Furthermore, the qualitative results are presented in two natural thematic units: one, the experiences of hybrid education implemented in national universities (Table 3) and two, challenges regarding the level of development of digital competencies (Table 4). The results of each of the natural thematic units are presented below.

**Table 3.** Hybrid education and its implementation.

| Natural Thematic Unit: Hybrid Education Experiences Implemented in National Universities |  |   |  |
|--|--|---|--|
| Categories   | Comments   | Interpretation  | Closing Interpretation   |
| Hybrid Education   | <p>Teacher 1: "Hybrid education allows combining two educational models, both synchronous and asynchronous, where the autonomous learning of the participants becomes a fundamental tool for the successful development of the course".</p> <p>Teacher 2: "Hybrid education approaches are not new, but rather its conception dates back to the 1980s, and it is understood as the combination of two models, i.e., online learning accompanied by synchronous activities".</p> <p>Teacher 3: "From my perspective, it refers to working, teaching, with virtual and face-to-face learning groups".</p> <p>Teacher 4: "Hybrid education today can be understood as an educational form of combining the teaching-learning process, that is, combining the face-to-face model with online education".</p> <p>Teacher 5: "Classroom and retransmission using technological resources. It is attended both in person and virtually at the same time"</p> <p>Teacher 6: "Hybrid education refers to two different approaches. To two different natural processes that, nevertheless, through technology are combined to generate learning processes. It is also known as Blended Learning. In this way, they can generate learning with the use of information and communication technology, even beyond the geographical or face-to-face spaces".</p>   | <p>Hybrid education involves combined virtual–presential processes that require interactive, autonomous and meaningful educational activities.</p>  | <p>Hybrid education therefore represents the combination of two virtual–presential pedagogical models to generate new changes to the learning styles of students and even teachers. It involves adaptability processes, teaching strategies, and educational materials centered on a technological platform that optimizes this process. This requires teachers to be committed to this teaching modality, and to make use of technologies and technical support to generate new ways of learning.</p> |
| Implementation of hybrid education   | <p>Teacher 1: "With the COVID-19 pandemic, it became relevant, and universities had to adapt quickly. For its implementation, a technological platform that optimizes the entire educational process must be considered. At the same time, it is necessary to have expert teachers in the area, the design of educational materials and a good internet connection".</p> <p>Teacher 2: "Due to the pandemic, universities in the country assumed the implementation of hybrid education, with strengths or weaknesses, but they started with an educational process to maintain the quality of education. The first thing they considered was the technological platform, the educational model focused on strategies".</p> <p>Teacher 3: "For this purpose, we have technical support, implement the platform, the virtual learning classroom, and at the classroom level, make a presentation of the class with smart boards".</p> <p>Teacher 4: "the university took measures to be able to carry out the teaching-learning process; at the beginning, there was a lot of uncertainty because many of the teachers did not have the necessary training".</p> <p>Teacher 5: "Not all teachers handle technological tools well. Prior to the pandemic, training was provided to teachers in the use of digital applications such as Moodle, which has been implemented little by little in the university after the pandemic".</p> <p>Teacher 6: "The University where I work has been implementing since years before the pandemic a very ambitious technological infrastructure, with state-of-the-art technology. So, the process of implementation and adaptation is also an interesting process, a learning process, so these spaces."</p> | <p>Its instruction and implementation must be planned, from a pedagogical model focused on hybrid education to the technological process that guarantees its implementation, having the continuous training of teachers in different educational processes as a central axis.</p> |  |

Table 3. Cont.

| Natural Thematic Unit: Hybrid Education Experiences Implemented in National Universities |  |  |                        |
|--|--|--|------------------------|
| Categories   | Comments   | Interpretation   | Closing Interpretation |
| Teachers' competencies in hybrid education   | <p>Teacher 1: "First, the teacher must be innovative and adapted to change, must manage uncertainty, must be creative, must handle the technical part and must be a researcher".</p> <p>Teacher 2: "A fundamental competence is technological; the teacher must understand that ICTs are part of the educational process. Another competence is human development, even when working remotely, human values must be fostered in students and the teacher must be an innovator and researcher.</p> <p>Teacher 3: "He/she has to handle technological resources, there are situations in which the teacher must have mastery and overcome teaching situations".</p> <p>Teacher 4: "in the case of hybrid education, I think that there must be continuous training, a permanent updating on the part of the teacher, because the subject of hybrid education is related to technology, and this aspect is constantly evolving. There are constant proposals regarding new findings or new ideas".</p> <p>Teacher 5: "The teacher must integrate knowledge through connectivism, not only be a transmitter of knowledge, but also encourage participation in virtual spaces".</p> <p>Teacher 6: "I believe that one of the competencies in this context of hybridization is the importance of the teacher's handling of new information and communication technologies. Likewise, the management of agile and innovative strategies to ensure the achievement of competencies".</p> | <p>The teacher must be an agent of change and must acknowledge the adaptability of the educational process according to current needs, therefore, he/she must be an innovative and creative teacher who is willing to do their own research.</p> |                        |

Note. Results of the interview with teachers on hybrid education and its implementation.

**Table 4.** Challenges in the development of digital competencies.

| Natural Thematic Unit: Challenges in Terms of the Level of Development of Digital Competences |   |   |  |
|---|---|---|--|
| Categories  | Commentaries  | Interpretation  | Closing Interpretation   |
| Challenges in terms of competency development   | <p>Teacher 1: "According to the current times, teachers face different challenges. The first is adaptation to change, the second is continuous training, the third is teaching strategies adapted to current demands, the fourth is the use of technologies, and the last is that they must transcend the teachability of the content. The challenges are many and may vary according to each need, among them the teacher must be a researcher of his educational praxis, this entails being constantly updated. He must understand the needs of his students and of his course itself. They must assume technological competence as a transversal element in their teaching practice. And he must work on uncertainty as a process of change".</p> <p>Teacher 2: "Due to the current changes in which we live, one of the great challenges for teachers must be the adaptability of change, under a flexible thinking, which allows them to learn to unlearn and learn from new realities. This implies that he/she must assume technologies as transversal processes in his/her pedagogical practice."</p> <p>Teacher 3: "Innovate, technology is not static, a new resource is always appearing or there is another one that improves it, that is to say, to update is the biggest challenge. Learning and unlearning, hybrid teaching opens up possibilities to stimulate mental processes with virtual resources, and if we do not see it this way, we may continue to look at the resources as something insignificant or meaningless".</p> <p>Teacher 4: "the main challenge for the teacher is continuous training and continuous updating in digital competencies, this is very important, as this should be part of their daily work and experience as a teacher".</p> <p>Teacher 5: "The challenges considered are collaborative work, ICT management, developing critical and reflective knowledge, permanent updating and management of face-to-face and virtual teaching strategies".</p> <p>Teacher 6: "The challenge today is to accept and develop in the teacher this diversity of complex approaches associated with the discipline and tools that provide the support to ensure efficient learning. Among the challenges: Constant updating. Proficiency in technological tools. Design and adaptation of materials. Effective online communication. Management of online interaction. Efficient management of time and workload."</p> | <p>Among the teacher's challenges is to cultivate curiosity through research, in order to be at the forefront of the existing changes within the socio-educational environment.</p> <p>In addition, the teacher must be a motivating agent that establishes active listening in order to understand the different and ever-changing educational scenarios, in addition to accepting the use of technology as a transversal process in teaching.</p> | <p>It is asserted that technological and research competencies must be internalized in the teacher, appropriating their entire epistemic foundation to generate transcendental changes in their students and in the teacher him/herself.</p> |

Note: Results of the interview with teachers concerning challenges.

#### 4. Discussion

Due to the constant changes generated by global uncertainty, the dynamism of the environment, and the complexity related to the SARS-CoV-2 virus, many university organizations across the world faced uncertain scenarios and volatile changes that led to a rethinking of their strategic vision. In this sense, as a result of the COVID-19 pandemic, disastrous social, economic, psychological, financial, educational, civic, political, and other scenarios have arisen, considerably affecting human life.

One of the changes that has arisen since COVID-19 is the adoption of virtual, remote, and/or hybrid education at all educational levels as a technological platform that allows for the promotion of learning in a participatory, dynamic, and meaningful way [29].

However, the new scenario marked by the SARS-CoV-2 virus meant that, at the educational level and specifically in universities, different atmospheres of uncertainties were externalized both for the teaching staff and for their students [7,8,17]. Therefore, our research aimed to evaluate the challenges that hybrid education creates with respect to the digital competencies of Peruvian university teachers in times of uncertainty.

In analyzing the results, the aim was to describe the digital competencies of Peruvian university teachers in times of uncertainty. It is asserted that the university teachers under study are within the integrative level, meaning that these teachers make growing and occasional use of this competence and that, throughout the different scenarios of uncertainty we have faced in recent years, the teacher sought ways of self-training in order to keep pace with the changes required at the educational level [25]. This process led to self-taught learning in the teachers, and through trial and error they acquired the skills and abilities for the development of competencies. The same scenario of uncertainty led university teachers to recognize their weaknesses, but also to explore strengths that might not have been present at the time [14]. This aspect generated a digital autonomy in these teachers, since their learning was based on the need to develop virtual classes [29].

The results show that the national universities in Peru had similar experiences, since in some of them there was indecision as to which technological platform to use for virtual education, leaving the professors in the void of perplexity, reflecting their lack of knowledge regarding the use of technologies within education, these results are consistent with [22]. This reality demanded that teachers assume digital autonomy and, through self-taught learning, generate new ways of learning, both for teachers and students.

Likewise, when analyzing the institutional conceptions of the hybrid education model in reference to the strategies, structure, and support used by and given to the national universities of Peru in times of uncertainty. It can be asserted that the majority of teachers who were part of the study sample are at the level of awareness/exploration, from the perspectives of the dimensions of strategies, structure, and support. This is interpreted as a need felt by university teachers [19], since the knowledge acquired by hybrid education for its own development has been generated from the need for teachers to learn more every day. However, there has not been a university governance policy that has led to the new approaches being reviewed, which is required by current education system. Therefore, there is a lack of revision of the curricula and of the processes of creating strategies, structure, and support for the development and implementation of hybrid education. Consequently, increased stress, inadequate organizational communication, and technological difficulties emerged as challenges [34].

Within this perspective, this scenario led us to understand the experiences of teachers with the hybrid education implemented in Peruvian national universities in times of uncertainty. Although teachers recognize that technology becomes an effective tool when it is controlled and is part of the educational praxis, university teachers have adopted the concept of hybrid education based on their experiences and not from an epistemic decision by the universities to assume the hybrid mode of education [14]. The implicit theories from the teachers about the definition of this model, its characteristics, and the elements within it, is varied and inaccurate, since they come from their own experiences. This implies that it has not been possible to execute the methodology required for a successful implementation

of hybrid education since most teachers do not know what is necessary for it. The haste in implementing the model led to maintaining the methods, resources, and curricula of the face-to-face format [2]. In addition, teachers reflect on their own pedagogical practices, disregarding theory and prioritizing experience. However, from this point of view, it seems that university teachers have adopted the need for self-learning into their cognitive processes, and this has been perfected through praxis, involving errors and trial and error.

Thus, when revealing the challenges related to the level of development of the digital competencies of Peruvian university teachers with respect to the demands of hybrid education, it is asserted that, from the uncertain scenarios experienced over the past few years, universities have been forced to innovate cyclical, systemic, and holistic processes, leading them to be at the forefront of the postmodern world. From this point of view, organizations within the university environment must assume innovation as a form of appropriation opportunities for change, while incubating and producing their own knowledge and learning, based on the demands imposed by the emerging reality. The need for the university to manage the educational curriculum alongside an educational model should be a matter of importance of course, as is familiarizing and training the teaching staff using these documents. Only in this way will universities be able to guarantee a high-quality education, leaving aside unpremeditated and anarchic curricular management.

If the universities aim to foster the successful and socio-productive development of the nation, they have to innovate, manage their own knowledge and learning, and in this way gradually start to change. Otherwise, if they do not make use of new paradigms within and approaches to scientific and human knowledge, they will not be able to undertake the search for new forms and models of organizational knowledge management, nor will they be able to generate the transformations necessary to understand the demands of the present time. Adaptation at the organizational level is more effective than that which is carried out individually if the institution's guidelines are not clear; therefore, it is necessary to not only implement hybrid education, but also to tailor each university's particular appropriation of the hybrid education model to its context [12,27] for a true acknowledgement of the demands and needs of each university.

## 5. Conclusions

Regarding the general objective of evaluating the challenges that hybrid education created with respect to the digital competencies of Peruvian university teachers in times of uncertainty, it is asserted that universities must adopt uncertainty, continuous training, and the recognition of their potential as the core axes that dynamize educational action, assuming hybrid education as a process of change within an increasingly technological society. Within this vision, university teachers should be empowered to effectively master various digital competencies, in order to promote learning styles within students, fostering autonomous, self-taught, and meaningful learning within a multipurpose society. Among the challenges that must be faced by the universities in Peru are the recognition of their own potential, their technical–technological capacity, the interpretation of their felt needs, and the formative development of human talent. The universities must promote themselves as a dynamic node that responds to the changes demanded by society.

As for the digital skills of university teachers in Peru, they are at the integrative level. Teachers apply this level as a growing and occasional factor based on previous knowledge, but they have no intentions to empower themselves to master digital skills. This may be due to their simplified thinking of approaching teaching from the classroom and traditional models that have governed education.

In relation to the institutional conceptions of the hybrid education model, in terms of the strategies, structure, and support provided to the national universities of Peru in times of uncertainty, it is concluded that the teachers who made up the study sample are at the level of awareness/exploration, according to the dimensions of strategies, structure, and support. This is due to the fact that no clear institutional policy has been established to integrate hybrid education as a process to generate new ways of learning. On the contrary,

the learning acquired by teachers has been based on their own needs and the different difficulties they have had in the process, leading to continuous trial and error. This aspect is considered to be negative, since quality education should be promoted, but institutional policies should be established for all human talents.

The implementation of hybrid education in the national universities of Peru was promoted in an accelerated manner and with many uncertainties after the COVID-19 pandemic. As a result, teachers experienced different traumatic episodes in the development of their educational activities. Furthermore, teachers have recognized the effective use of technology in different educational spaces. However, teachers' learning about hybrid education has been a product of their own desire to learn. Thus, at the institutional level, there have been no initiatives to implement a hybrid education model contextualized to the reality of university education in Peru.

And finally, by revealing the challenges associated with the level of development of the digital competencies of university teachers in Peru with respect to the demands of hybrid education, it is asserted that universities, as the epicenter of professional, humanistic, and technical training, must adopt uncertainty as a process of continuous learning. This leads societies to learn about and develop all of their human talents, leading them to be at the avant-garde of the postmodern world.

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## Abbreviations

The following abbreviations are used in this manuscript:

|            |   |
|------------|---|
| ICT        | Information and Communication Technology    |
| B-Learning | Blended learning                            |
| SPSS       | Statistical Package for the Social Sciences |

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