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SUCCESS FACTORS

FOR EDUCATIONAL VIRTUALIZATION IN INITIAL TEACHER TRAINING

FACTORES DE ÉXITO PARA LA VIRTUALIZACIÓN EDUCATIVA EN LA FORMACION INICIAL DOCENTE

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ABSTRACT

The post-pandemic COVID-19 effect reveals the need to strengthen Initial Teacher Education (ITE) in and from virtual environments. The present research is contextualized in a Higher Pedagogical Institute of Northern Lima in Peru. Its objective was to diagnose the current state of ITE and to identify factors that dynamize this training through educational virtualization to establish a proposal for improvement. A mixed methodological approach was deployed, with a concurrent design that allowed the application of a survey to 60 students (teachers in initial training) and 20 trainers of these future teachers; as well as a focus group with key informants: 6 students and 8 trainers. The results show the perception of a high level of ITE (86.7% high in students and 90% high in teachers). The qualitative content analysis revealed the following success factors of educational virtualization for initial teacher training: facilitating access to technology, online training and learning networks, articulation in the pedagogical teaching praxis; generating opportunities to reduce the digital divide; capitalization of learning; massification of digital transformation. Based on this, a model of educational virtualization is proposed, concretized in a practical way in an educational strategy to develop initial teacher training.

Keywords: teacher, initial teacher training; educational virtualization; technology, curriculum planning, digital tools, virtual tutors, feedback

RESUMEN

El efecto pos pandémico COVIT 19 revela la necesidad de fortalecer la formacion inicial docente (FID) en y desde entornos virtuales. La presente investigación se contextualiza en el Instituto Superior Pedagógico de Lima Norte en Perú .Su objetivo fue diagnosticar el estado actual de la (FID) e identificar los factores que dinamizan esta formacion a través de la virtualización educativa para establecer una propuesta de mejora .Se desplego un enfoque metodológico mixto con un diseño concurrente que permitió la aplicación de una encuesta a 60 estudiantes (docentes en formacion inicial y 20 formadores de estos futuros docentes ;asi como un grupo focal con informantes claves :6 estudiantes y 8 formadores. Los resultados muestran la percepción de un alto nivel de FID 86%alto en estudiantes y 90%en profesores el análisis de contenido cualitativo revelo los siguientes factores de éxito de la virtualización educativa para la formacion inicial docente: facilitar el acceso a la tecnología, formacion en línea y redes de aprendizaje, articulación en la praxis pedagógica docente, generar oportunidades para reducir la brecha digital ,capitalización del aprendizaje ,masificación de la transformación digital. Con base en lo anterior se propone un modelo de virtualización educativa, concretado de manera practica en una estrategia educativa para desarrollar la formacion inicial docente.

Palabras clave: Docente, formacion inicial docente, virtualización educativa, tecnologia, planeamiento curricular, herramientas digitales, tutorial virtual, retroalimentación.

INTRODUCTION

This study is framed in the context of continuing education through virtual education with the purpose of analyzing, developing, and proposing methodological strategies in virtual environments for Initial Teacher Education (ITE). The transition from face-to-face to virtual education has revealed the need to provide teachers with digital tools to optimize teaching and learning processes.

At the same time, we start from the reflection of the distance between ITE and the new challenges of a world in constant change, consequently, there is a gap in the methodologies applied by teachers in schools and the use of digital tools. The new role of the teacher should be oriented to the moderation of information management and teach to under-stand the new knowledge.

Critical reflection worldwide suggests that ITE has a deficit in the humanistic vision of the search for freedom of thought, social equality, solid practice, and tolerance as principles of coexistence; finally, there are insufficient contributions in actions to care for the environment under a principle of common welfare and sustainable development for all. It is necessary to take advantage of the opportunity to open the range of options to learn about other realities and put into practice new ways of accessing knowledge to develop large learning communities.

There is still insufficient articulation of ITE with the transversal axes planned in the Sustainable Development Goals (SDGs), in their 2030 agenda, necessary to reinforce the principles of equality, social construction and the trans-formation of human dignity. The thematic fields should appropriate new lifestyles that contribute to social development and environmental care, this will allow developing the quality of life and well-being of people in a world where we can coexist collaboratively before the natural and health disasters that we must face.

From the perspective of the Peruvian educational context, ITE faces great challenges, which are based on the training of future teachers trained to handle technological tools that will allow them to guarantee educational quality with the purpose of developing significant learning in students. It is the task of teacher training institutions to adapt their academic programs to the context of new pedagogical models in virtual environments and to prepare their students in a suitable and competent manner.

In this context, it is necessary for teachers to transform themselves to promote competencies and capabilities in students. In this sense, it is important to consider the importance of re-evaluating teachers to attract students with entrepreneurial and human development profiles to teach. Similarly, the Peruvian Ministry of Education, in its guidelines for the implementation of the non-classroom educational service in public and private institutes of higher education in the current context, points out that it represents a valuable opportunity to strengthen the training of future teachers by using all the potential offered by ICT and the media in their diversity of access at the national level (Minedu, 2020, cited by Atúncar-Prieto, 2023).

The ITE has and will have a great responsibility in preparing teachers capable of working with students with knowledge according to their interests and whose objectives are to develop the necessary competencies to insert them in a society demanding changes and a new exercise of citizenship. Classroom education with its strengths and difficulties prevailed for centuries, but knowing the social changes that were projected, teachers were not prepared for these changes, in short, educational virtualization arrived to replace classroom education and found us unprepared.

The disruptive changes in education resulting from the current situation in recent years have led the ITE to processes of construction and deconstruction of its training models to meet the various educational needs that have been revealed because of a decontextualized education based on the transmission of knowledge. The theoretical construct of the present study has focused on deepening the epistemological bases of ITE with the purpose of assuming a scientific position based on diverse authors that allow the enhancement of ITE models.

In this sense, ITE is conceptualized as the educational system whose purpose is to train professionals for teaching based on academic models to provide future teachers with strategies in the social, cultural, scientific, and artistic dimensions that allow them to develop in the teaching practice. The ITE models are regulated by state policies and regulated by educational regulatory bodies with the objective of preparing teachers who will work in basic education according to each level or modality of study.

Likewise, ITE is oriented in a process of academic development in the training of future teachers, contextualizing the curricula to the educational needs and the design of pedagogical strategies that improve the teaching-learning processes. This profile implies that the training processes must respond to a specialized training to prepare teachers in various virtual or face-to-face educational fields that allow them to manage various ecological, intercultural, communicative, and technological strategies.

Along the same lines, ITE aims to develop the necessary competencies of the teacher to integrate him/her to the social, technological, and cultural educational needs, on

which technological strategies should be incorporated (Rodríguez-García et al., 2019). The training models have a holistic pedagogical vision with the aim of preparing teachers in the various fields of education-al action, as an input to this process also adds the personal skills and creativity of each teacher to improve their digital and socioemotional competencies.

In turn, the main purpose of ITE is to link the contents with the integral formation of the student and for this purpose it is necessary to carry out applied educational research to glimpse new methodologies based on digital competencies that lead to innovation in the educational processes (Almenara et al., 2019). In this sense, ITE is the priority educational system for training teachers who respond to the new educational needs and who have innovative and technological tools with the purpose of making substantial and impactful changes in the educational field.

From the point of view of the educational policies of the ITE, it is considered that the training processes of future teachers respond to the demand of educational needs and the curriculum proposed by state agencies, considering the ITE as the initial professionalization centers where the teacher appropriates pedagogical methods and strategies to stimulate learning processes in schools (Beng Huat et al., 2020).

In relation to professionalization processes, ITE approaches research and pedagogical praxis as a culture of professional development in a cross-cutting manner (Brito, 2020, cited by Atúncar-Prieto, 2023). The educational practice allows the systematization of the various experiences evidenced in the classroom and should be accompanied by a teacher who facilitates the necessary mechanisms for continuous reflection of their praxis.

To deepen the study of the category, from the literature review, the following subcategories are identified: Curricular planning contextualized to the new needs of the teacher profile, digital tools to improve the didactic strategies of the teacher in training, processes of construction of new knowledge in the various learning modalities and learning feed-back to promote virtual teacher tutors.

Curricular planning contextualized to the new needs of the teacher's profile.

Curriculum planning in ITE transcends in an emphatic way in the teacher profile and in this sense, it is important to build a contextual process that meets the new educational challenges in the framework of the current situation. Theoretical scopes plan a constant revision and adaptation that allow the dynamization of a curriculum from a reflexive critical approach with the purpose of transcending in teacher training and can generate transformational changes in the educational system.

In this line, it is argued that an added value of teacher training is to provide teachers with organizational, reflective, projective, and adaptive skills for planning learning activities to build a solid social vision in the teaching profession (Lin et al., 2020). Similarly, decision-making becomes a fundamental factor in the curricular contextualization as a predominant factor in their training, in the sense of enriching the pedagogical planning to be applied in educational institutions.

The construction of the teacher profile is a vital process to promote substantial changes in education and a continuous renewal from the point of view of the hidden curriculum. Under this premise, contextualized curricular planning requires teaching competencies that provide a breadth in their pedagogical visions and in this way a suitable organization can be made according to the current needs to generate an impact in relation to the interests of the students.

At the same level, it is vital to articulate sectoral educational needs with state policies, and in this way, it is possible to envision improvements in educational systems based on curricular planning for the benefit of students and teachers (Thorburn et al., 2020). The curricular objectives are focused on different approaches, but allied to the development of competencies that allow students to exercise full citizenship, co-communicative skills, and an ecological vision of changes in lifestyles.

In relation to the approach to the subcategory of curricular planning contextualized to the new needs of the teaching profile, the conceptualizations lead to a reflection of the ITE processes in the aspects of state policies, dynamization, capacities and technological resources that every student in training must strengthen and potentiate to exercise teaching from an approach of attention to the needs of each community. The goal is to develop the necessary mechanisms to establish a teaching profile that can transform education from a contextualized, constructionist, innovative and critically reflective planning with emphasis on the adaptation to the new modalities of virtual work.

Within a turning point in the conceptualizations, we find that in a changing society, curriculum planning must evolve and with greater necessity in virtual education (Nin et al., 2020, cited by Atúncar-Prieto, 2023). It is necessary to technify planning through a construct of collaborative work networks and exchange of pedagogical experiences. The approach reveals the need to establish a teaching profile with technological mastery to promote collaborative work of learning networks in virtuality.

Digital tools to improve the didactic strategies of the trainee teacher

Teaching strategies allow to dynamize learning in students and are necessary in different educational spaces. In the current situation, digital tools emerge to enhance the teaching work, in this sense, within the virtual mode it is of vital importance to provide such resources to teachers who are being trained and are projected as the future digital teachers of this new era.

Among the possibilities presented by digital tools, the potential of these tools in the management of social networks and interactive resources for active learning stands out (Greenhow & Chapman, 2020). They also allow the management and promotion of communicative networks to encourage proactive participation as a manager of new knowledge.

The networks for the exchange of pedagogical experiences are a factor to develop within the ITE, so digital tools are ideally articulated to such training processes with the pedagogical intentionality of providing didactic strategies, which allow them to exercise their profession in the new learning modalities and can mark a differentiation from the point of view of the innovative teacher of the XXI century.

At the same time, it is emphasized that digital tools provide technological support to teachers through the analysis and editing of videos, digital readings, hybrid collaborative work and the systematization of all types of information, allowing them to open a range of possibilities for interaction with students. In this context, it is necessary that the teacher training process develops transversal training modules in the management of digital resources, which can be validated in the teaching practice. From a projectist point of view, it is argued that the future of teacher training is framed in new learning scenarios that will break the traditional models to migrate to technological classrooms on virtual platforms, where there is a pre-dominance of digital tools as a pedagogical resource for learning (Hrastinski et al., 2021; Marcelo et al., 2020, cited by Atúncar-Prieto, 2023)

In summary, digital tools become the main pedagogical resource to improve and innovate in the pedagogical processes that lead to technify education from an avant-garde look, where teachers become researchers and learn to use these resources actively with a view to continuous change, product of technological advances and the rise of the virtual modality.

Construction of new knowledge in the different learning modalities

The various theories established as educational paradigms have always followed a pedagogical line with the objective of generating learning in students, regardless of the debates surrounding their positions, the essentiality of establishing an educational purpose is rescued. The transfer of knowledge in the interaction between the teacher and the student has always had the purpose of constructing learning through formative or contextual content, for which it is necessary the interactive construction of knowledge that encompasses the collection of previous knowledge, the creative transfer, and the manifestation of learning.

In this sense, the construction of knowledge is a process of constant innovation that should be encouraged from the ITE so that they can contribute reflexive actions in their pedagogical conceptions as educational actors who have the responsibility to contextualize learning (Sáez Núñez et al., 2019).

It is of vital importance that ITE promotes socio-critical thinking in the process of constructing new knowledge, to train teachers with innovative roles in education and to maximize their abilities to generate learning processes that capture the interest of their students.

In the context of pedagogical practice, the construction of knowledge in the different learning modalities is centered on the new requirements of education based on the practicality of learning and innovation processes where the contents respond to the needs of these processes (Marcelo et al., 2019, cited by Atúncar-Prieto, 2023). The teacher in training should have an approach to these new learning models through pedagogical praxis and educational research.

In a differentiation of conceptualizations, a posture of leaving traditional methodologies to generate knowledge and migrate to innovation methodologies where the construction of new knowledge is generated, consequently, the teacher becomes a moderator of learning, and the student becomes the manager of his own learning.

Learning feedback to promote virtual tutor teachers

Feedback is a fundamental part of the learning process because it allows clarifying and improving the process. In this area, the role of the teacher is vital for the achievement of an accompaniment that rescues the lessons learned and establishes improvement strategies. However, the accompaniment requires socioemotional strategies that are integrated to the academic, therefore, the role of the ITE should influence the need to promote teacher tutors with the necessary skills to address various scenes of feedback in the face-to-face or virtual to be a model guide for their students.

In this sense, a vital resource for feedback based on the social learning approach is presented, where strategies such as collaborative creation for the construction of learning and adaptive management are proposed to integrate feedback with what has been learned in the construction process, to make joint iterative decisions to improve what has been learned (Tanis, 2020).

This establishes an adequate innovation process that all teachers in training should understand, appropriate, and validate through their pedagogical praxis, so that they can have the necessary skills to develop an adaptive feedback process and can have assessment strategies. At the same time, it is necessary for teachers and students to make the best decisions to promote learning within a projective and reflective perspective. From a technological point of view, learning feedback is a constant communicative process that requires optimization and analysis algorithms that allow sequential decisions to be made (Li & Wu, 2019).

For this purpose, computer applications are proposed that systematize the data collected by the teacher and allow him to record the relevant aspects of the feed-back process to establish solutions according to the levels of progress or difficulties of each student. The use of educa-tional technology makes it possible to develop online registration systems in a private or collaborative way, allowing the teacher to have a support for consultation and updating of information. In this line, feedback is essential in the learning processes, and it is necessary to rely on technological resources to show an accompaniment that enhances the progress of each student.

In turn, learning feedback in ITE is an added value for teachers, which should be strengthened in their training and serve as a filter to know in a personalized way the progress of their students (Pérez et al., 2019, cited by Atúncar-Prieto, 2023). In this sense, he/she needs professional competences and criteria to develop an adequate tutoring of meaningful accompaniment, therefore, feedback of personal production that clarifies learning; feedback of praise where his/her progress is valued; and projective feedback of con-stant improvement is proposed.

ITE should focus on different feedback strategies that turn the teacher into a learning companion, with emphasis on virtual education, where it is necessary to focus on socioemotional accompaniment due to the context of social isolation, we are living in. Virtuality requires continuous feedback processes for self-learning, which is positioning itself as a new way of learning.

MATERIALS AND METHODS

The methodological development of the present study is based on the methodological route of epistemic mapping (Deroncele Acosta et al., 2021). These aspects adopt the socio-critical paradigm, centered on a mixed approach, being the type of research of an applied educational nature to collect theories that contribute to educational innovation with the aim of transforming educational practice. The study is of a transversal type, which is characterized by being developed in a defined space of time to analyze the problematic in a present or current context and proceed to describe them; and of transformative scope with the purpose of trans-forming the object, from the categorial conception with emphasis on the scientific novelty and the theoretical relational movements from the dialectic unity of the subject-object, which are embodied from a holistic vision of scientific. The research method is located under the mixed model, being its application concurrently.

The technique and instrument used in the study is the questionnaire with the survey methodology using the quantitative treatment for the closed questions, to determine a quantitative diagnosis of the target category. For the qualitative procedure, the focus group technique is proposed to obtain significant data from a systematization of the data with the Atlas.ti software (version 8.0), for the analysis of the emerging categories.

As for the theoretical methods, the inductive-deductive method is assumed for the collection and analysis of the in-formation and the holistic-dialectical method for the construction of scientific knowledge. In the present study, the population are the teachers and students at a Higher Pedagogical Institute, constituted by a sample of 20 teachers and 60 students of this institution. From the axiological approach, the study focuses on an assessment of the epistemological bases of ITE.

The categories involved in the study are educational virtualization (tool category) with the subcategories of potentialization of technologies in the development of learning activities, formative model for the reduction of digital gaps and modular articulation, holistic approach to technological trends and an ethical culture, and digital competencies for self-learning from a visual interpretation of education; and the ITE (target category) with the subcategories of curricular planning contextualized to the new needs of the teaching profile, digital tools to improve the didactic strategies of the teacher in training, processes of construction of new knowledge in the various learning modalities, and feedback of learning to promote virtual teacher-tutors.

RESULTS AND DISCUSSION

The results of the diagnosis of the ITE target category at the level of teachers, trainers and students are presented, structured in a descriptive analysis made up of frequency tables; processed in the SPSS 25 program. Finally, the emerging categories of the focus group are presented in relation to the dynamics of educational virtualization in the ITE, processed in the Atlas.ti 8 program.

Status of the Initial Teacher Education (ITE) category in students and teacher educators of a Higher Pedagogical Institute

The subcategories with their respective items of the initial teacher education category and the correction scales are presented for a better analysis of the trends. At the same time, Cronbach's Alpha reliability tests for the ITE category and its subcategories at the level of teachers and students are sketched with reliability values > ,700, which represents good reliability.

Student survey

The socio-demographic profile of the sample is made up of 60 students from a Higher Pedagogical Institute in northern Lima, who are between the first and ninth cycles of their teaching careers and range in age from 17 to 38 years old.

The current state of ITE, as reported by the students (Table 1), shows that in the dimension of contextualized curricular planning, 96.67% of the students at a Higher Pedagogical Institute perceive a high level of contextualized curricular planning, while 3.33% of them report a medium level in this dimension. In relation to the dimension digital tools as a didactic strategy, it is observed that 91.67% of the students refer to a high level in the use of digital tools as a didactic strategy, while 8.33% of them refer to a medium level in this dimension.

Table 1. Frequency of the dimensions of Initial Teacher Education (ITE)

	Contextualized curriculum planning		Digital tools as a teaching strategy		Construction of new knowledge		Learning feedback	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
High	19	95,0	18	90,0	20	100,0	19	95,0
Medium	1	5,0	2	10,0	0	0,0	1	5,0
Total	20	100,0	20	100,0	20	100,0	60	100,0

Source: own elaboration

In turn, in the dimension construction of new knowledge, it is observed that 90.00% of the students at a Higher Pedagogical Institute refer to a high level in the construction of new knowledge, while 10.00% of them refer to a medium level. Regarding the learning feedback dimension, it is observed that 90.00% of the students refer to a high level, while 10.00% of them refer to a medium level in this dimension.

Survey of teacher trainers

In relation to the socio-demographic profile of the sample of 20 teachers from a Higher Pedagogical Institute, the teachers have between 3 and 30 years of experience in ITE, the youngest being 31 years old and the oldest 72 years old, who work in the specialties of Early Childhood Education and Primary Education.

The current state of ITE, as reported by the teacher educators (Table 2), shows that in the dimension of contextualized curriculum planning, 95.00% of the teacher educators of a Higher Pedagogical Institute report a high level of con-textualized curriculum planning, while 5% of them report a medium level. In relation to the dimension of digital tools as a didactic strategy, it is observed that 90.0% of the teacher-trainers refer to a high level in the use of digital tools as a didactic strategy, while 10.0% of them refer to a medium level in this dimension.

Table 2. Frequency of the dimensions of Initial Teacher Education (ITE)

	Contextualized curriculum planning		Digital tools as a teaching strategy		Construction of new knowledge		Learning feedback	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
High	58	96,7	55	91,7	54	90,0	54	90,0
Medium	2	3,3	5	8,3	6	10,0	6	10,0
Total	60	100,0	60	100,0	60	100,0	60	100,0

Source: own elaboration

In turn, in the dimension of construction of new knowledge, it is observed that 100.00% of the teacher-trainers of a Higher Pedagogical Institute refer to a high level in the construction of new knowledge. In relation to the learning feedback dimension, it is observed that 95.00% of the teacher-trainers refer to a high level, while 5.00% of them refer to a medium level in this dimension.

Emerging categories of educational virtualization strategies in ITE.

The following are the emerging categories from the systematic coding of the data collected in the focus group of ITE students to identify strategies that dynamize educational virtualization. The development of the focus group had as a starting point the posing of the open question in relation to the mentioned topic, where from their perceptions emerged the superior categories of generating opportunities for the reduction of the digital gap, the capitalization of learning in the new educational scenarios, and the massification of the digital transformation as shown in Figure 1.

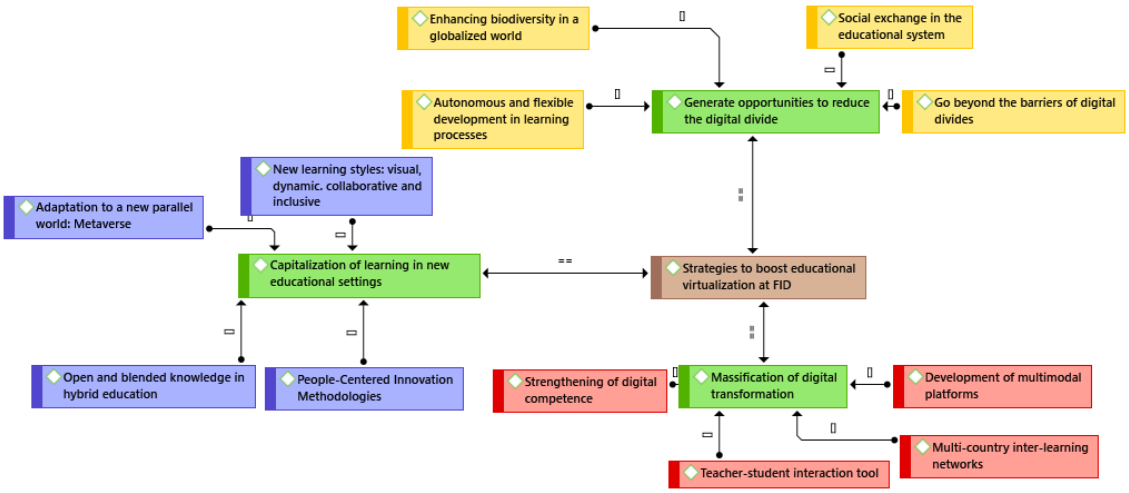

Figure 1. Emerging categories of educational virtualization strategies in ITE according to students.

Source: own elaboration

In relation to the higher category of generating opportunities for the reduction of the digital divide, second order categories emerge such as autonomous and flexible development to reconfigure learning processes; in turn, the need to promote biodiversity in a globalized world and in a constant process of adaptive change; the importance of being promoters in the social exchange of the various components of the educational system, in order to transcend the barriers of the digital divide for a balance of access to quality education.

Likewise, in the superior category of capitalization of learning in the new educational scenarios, categories emerge that point out the new learning styles related to the visual interpretative, the dynamism of the teaching-learning process, and the importance of working collaboratively to include the diverse abilities in a whole that minimizes exclusion; Likewise,

the adaptation to a parallel and imaginative world in constant change called metaverse, in this way open and combined knowledge is generated in a hybrid scenario that promotes innovation methodologies that have human development as their center of interest.

Finally, in the superior category of the massification of digital transformation, the second order categories emerge related to the strengthening of digital competencies in ITE; the use of digital tools to promote synchronic/asynchronous interaction between student and teacher; the development of multi-modal platforms for autonomous learning with timely feedback; and the importance of promoting multi-country interlearning networks for the exchange of innovative experiences in education.

Similarly, the categories emerging from the systematic coding of the data collected in the focus group of teacher trainers are presented to identify strategies that dynamize educational virtualization in Initial Teacher Education (ITE) as shown in Figure 2.

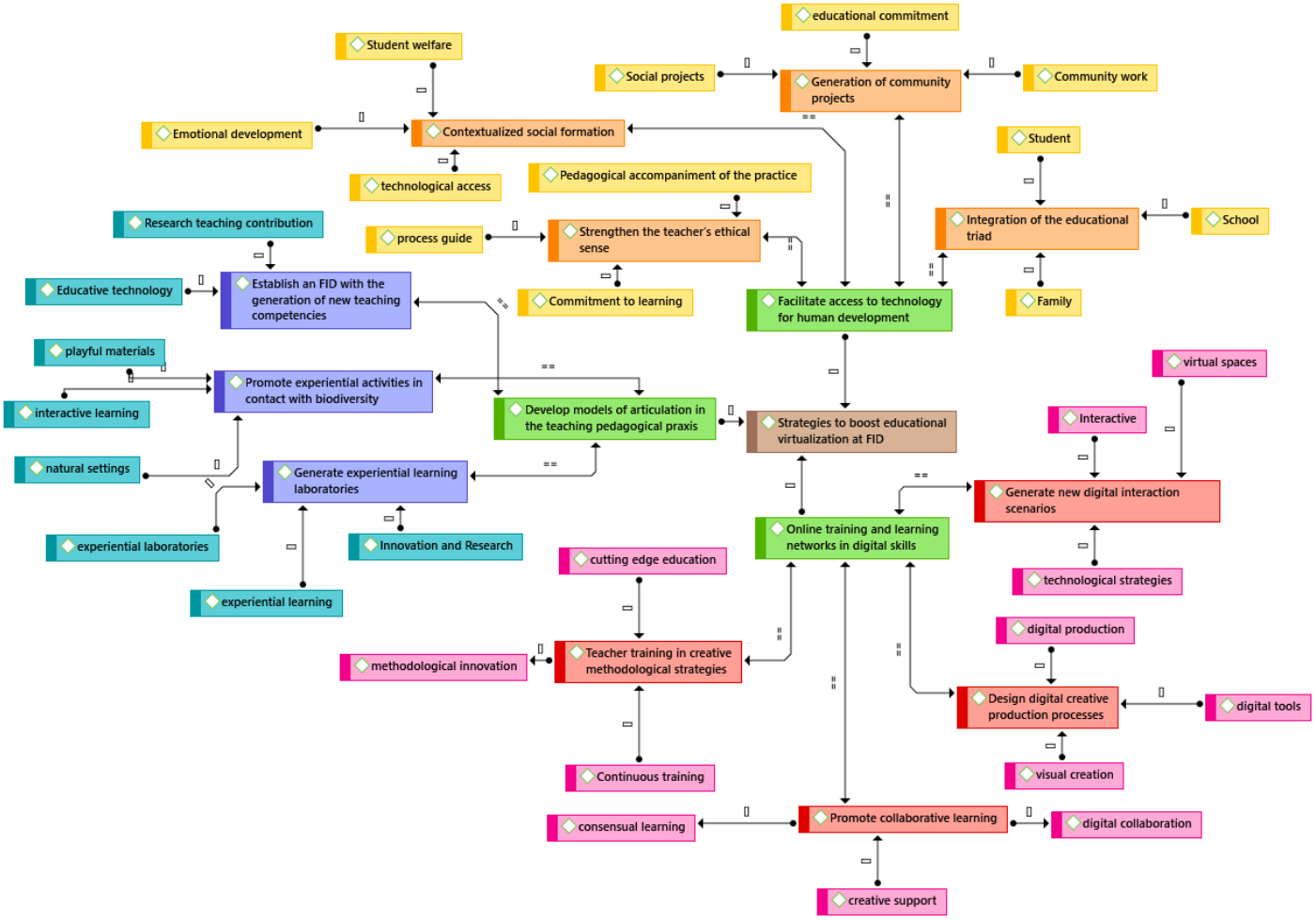

Figure 2. Emerging categories of educational virtualization strategies in ITE according to teacher-trainers.

Source: own elaboration

In this focus group, an open question was posed with the purpose of collecting the experiences of the teacher educators related to the strategies they are using in the new learning scenarios such as virtuality. In this way, the research is deepened through the collegial dialogue of professionals in education, and they transmit essential contributions that were systematized through coding to identify emerging categories that contributed to the objectives of this study.

As a result of the systematic coding of the data collected in the focus group of teacher trainers, the emerging categories of the strategies that energize educational virtualization in Initial Teacher Education (ITE) are established. In this sense, three superior categories emerge related to facilitating access to technology for human development, online training and learning networks in digital competencies, and developing models of articulation in the pedagogical teaching praxis.

In relation to the higher category of facilitating access to technology for human development, the categories linked to the management of community projects emerge, which affects the educational commitment to promote community work through social projects; the integration of the educational triad that links the actions of the school, the student and the family in the search for the common good; the strengthening of the teachers' ethical sense that allows the foundations of a citizen to be laid according to the current needs from the teachers' commitment with the accompaniment in the learning process; and a contextualized social formation that promotes access to technology and emotional development that contribute to the students' well-being.

On the other hand, in the higher category of online training and learning networks in digital competencies, the categories linked to teacher training in creative methodological strategies that contemplate continuous training in techno-logical innovation that promotes cutting-edge education emerge; enhancing collaborative learning through strategies that facilitate creative support for consensual learning and digital collaboration; and the design of digital creative pro-duction processes to manage digital creation and production through the use of technological tools.

Finally, in the category of developing models of articulation in the pedagogical teaching praxis, the categories linked to establishing an ITE with the generation of new teaching competencies from educational technology and the contribution of research in innovation and didactics emerge; promoting experiential activities in contact with biodiversity in natural settings where interactive learning is applied through the use of playful materials; and generating virtual learning laboratories through research and educational innovation that allow transforming learning processes in a continuous and contextualized manner.

In the training process of professional teachers in education, the potentiation of digital, epistemic, socioemotional and innovation competencies is transcendental. In this line, the National Basic Curriculum Design of ITE (DCBN) reaffirms the importance of developing in ITE the indispensable competencies to practice teaching with emphasis on reflection, collegial ethical dialogue, and a multicultural technological vision in pedagogical practices. From this point of view, it is necessary to reconfigure educational strategies in ITE to improve learning processes from the social contexts where educational virtualization is involved as a cutting-edge competence for students' global human development. In this sense, educational virtualization should transcend in the necessary transformations of ITE, from the various training scenarios to guide a curriculum that embodies a reflective, proactive, and innovative teaching professional in the construction of quality education (Atúncar-Prieto-Prieto, C.; Deroncele-Acosta, 2021).

At the same time, the importance of responding to emerging situations resulting from disruptive changes in education is emphasized, which involves ITE in the development of innovation methodologies that contextualize and dynamize the teaching practice. In this context, educational virtualization is projected as an educational system that responds to global challenges and, therefore, it is vital for ITE to guide education professionals in technological pedagogical innovation to respond to the challenges of humanity (Gutiérrez et al., 2015; Cornejo Núñez, 2021, cited by Atúncar-Prieto, 2023).

The process of the present research supports the need and feasibility of establishing new educational strategies in ITE through educational virtualization. The educational tendencies refer that the educational virtualization started a process of incidence in the learning processes because of the consequences of the post pandemic. In this context, the limitations of teachers' digital and epistemic competencies were revealed.

Consequently, the contributions of this study contribute to a reconfiguration of ITE based on curricular contextualization, the use of digital tools, the construction and feedback of learning, using educational virtualization as a trans-forming tool. The results of the research developed can be replicated and adapted in different educational contexts.

In relation to the current state of ITE, according to the questionnaire applied to teachers, 90% of them refer that ITE is at a high level and only 10% consider that it is at a medium level (Table 2), because of continuous training in the areas of innovation, technology, human development, and research. However, some new teachers are adapting to the training processes. In this sense, the continuous training of the teacher-trainer promoted by the institutions in current and con-textualized topics generates the conditions for the construction of innovative teaching teams; however, in this process there is a starting point of induction and accompaniment of the teacher to adapt to the

educational proposal through the reconfiguration of the connection between training and learning in collaborative scenarios (Delgado et al., 2021, cited by Atúncar-Prieto, 2023).

In relation to ITE students, 86.67% refer that the ITE is at a high level and only 13.33% consider that it is at a medium level (Table 1); product of the perception of the educational service provided in their ITE. It is observed that a greater number of students agree with the training received and identify with the institutional proposal; however, there is a significant percentage of students who identify pedagogical strategies that need to be improved. In this sense, it is affirmed that when pedagogical experiences are significant, they contribute to educational quality and in this way, students build a good perception of the educational service; otherwise, when the experience generates uneasiness in the student, a scenario that is not very favorable for their professional development is established, where the implementation of technological resources becomes essential to enhance learning (Tur et al., 2022)

Similarly, as a result of the focus group, applied to the group of teacher educators who actively participated in the open question, it was possible to obtain the emerging categories of first order related to facilitating access to technology for human development, online training and learning networks in digital skills, and developing models of articulation in the pedagogical praxis; which constitute strategies to boost educational virtualization in the ITE. In this line, the strategies of teachers in educational virtualization have an impact on quality training and expertise of the professional in the field of the various learning scenarios where technology assumes a leading role. Similarly, educational virtualization strategies are rooted in the need to integrate courses for the integration and optimization of work teams in the various ITE modalities (Idárraga et al., 2022).

In this same line, as a result of the focus group, applied to the group of students who actively participated in the open question, it was possible to obtain the emerging categories of first order related to facilitating access to technology for human development, online training and learning networks in digital competitions, and developing models of articulation in the teaching pedagogical praxis; which constitute strategies to boost educational virtualization in ITE. In this sense, the educational virtualization strategies developed in the learning processes contribute to the training of teachers to improve the mechanisms of social interaction, the management of learning networks, and technology is positioned as an agent of change to reduce digital divides. In turn, it is pointed out that ITE approaches should have as a premise the potentiation of educational virtuality to promote learning networks and project a transformation of physical environments with technological means that allow the teacher trainer to use innovative strategies that can be replicated by students when exercising their career (Duart et al., 2020; Rojas Quesada et al., 2020, cited by Atúncar-Prieto, 2023)

Formative model of the dynamics of educational virtualization in Initial Teacher Training

Taking into account the transformative scope of our study based on the need to transcend the diagnosis and offer an improvement proposal for initial teacher training, we present the formative model of the dynamics of educational virtualization and based on it an educational strategy to enhance initial teacher training; for the development of the model we used the method of theoretical construction which deploys its system of procedures from 4 phases: conceptual phase, projective phase, transformative phase and phase of epistemic transcendence (Deroncele-Acosta, 2022).

Conceptual phase

The conceptual foundation is established from a critical-reflexive review of general theories, where the holistic configurational theory is assumed (Fuentes et al., 2007) and from the constructivism approach that promotes various reflective questionings in the educational field. Within this plane, it is complemented by the connectivism theory, from the premises of blended learning in challenging teaching and learning contexts, and its impact on the development of informational competence for future teachers (Divaharan and Chia, 2022; Gómez-García et al., 2022, cited by Atúncar-Prieto, 2023)

In relation to the substantive theories, the established concepts associated with the object are redefined, where the potentiation of technologies involves addressing the impact of technologies on learning. Similarly, pedagogical, and social interaction focuses on learning experiences that strengthen educational systems, linking with sociocultural environments. In turn, the new virtual educational scenarios emerge from social contexts, product of communication barriers in relation to social distancing that limit face-to-face interactions, hence the importance of social factors and technological support in the use of the virtual learning environment among teachers, as well as the role of learning analytics in these environments (Alsubaie, 2022; Figueroa-Céspedes, 2020; Ahmad et al., 2023; Akazaki et al., 2023, cited by Atúncar-Prieto, 2023).

In the proposed scenario, digital competencies are defined as configurations that allow the integration of ICT in the classroom in a critical, creative, and safe way, being

a dynamic element of innovation in virtual classrooms. Similarly, the multimodal training model emerges as the construction of new learning modalities that allow guaranteeing the continuity of education, in the same way assuming a digital culture that allows a sustainable digital transformation (Deroncele-Acosta et al., 2023).

From the construction and reconfiguration of learning, pedagogical interactions are addressed where the construction of knowledge is linked to the use of technologies and the emancipatory and holistic paradigm is promoted from a discourse of understanding knowledge in experiential and real contexts that allow emancipating the individual to make decisions based on critical reflection.

Along the same lines, sociocultural scientificity in virtual environments is understood as the process where teachers manage and integrate their technological, pedagogical, and disciplinary knowledge (Aleman-Saravia & Deroncele-Acosta, 2021). In this context, to bet on collaborative educational work that promotes autonomy, empowerment, creative self-efficacy and motivation for learning from the personal role to contribute to a process of building online learning communities.

From other aspects, innovation laboratories are spaces that encourage reflective and collaborative work (Hernández-Gil & Jaramillo-Gaitán, 2020). In turn, the reduction of digital divides is a fact that is evident in the massification of the use of digital tools globally and with greater emphasis on social networks and platforms (Escoda et al., 2020, cited by Atúncar-Prieto, 2023) and finally, visual interpretation is generated in technological scenarios with emphasis on visual elements that contribute to didactic processes (Huilcapi-Collantes et al., 2021) that are strengthened through teacher accompaniment as a powerful mechanism to improve classroom teaching performance and educational quality (Arellano et al., 2022)

Projective phase

The formative model of the dynamics of educational virtualization in IDF was obtained through the holistic dialectical method of the holistic configurational theory, deploying its first three procedures: 1.- identification of configurations, 2.- argumentation of the relationships between configurations, culminating with the 3.- identification of dimensions (Fuentes et al., 2007).

Transformational phase

The training models transfer a set of knowledge for professionalization through the dialectical unit of professional training expressed in the dimensions: Formative, Educational and Developmental.

As a result, the configurations of the model are presented in relation to the potentialization of technologies in pedagogical interaction (formative unit), which is defined as the process of implementing educational systems with tech-nological means that make pedagogical interactions more dynamic; through the development of a digital culture in innovation laboratories (educational unit), which is defined as the fundamental axis to promote teaching innovation from a digital culture education that responds to the construction of collaborative and autonomous learning (develop-mental unit), which is defined as the teaching-learning process that is built from collaborative networks and the effectiveness of autonomy to generate new knowledge. Consequently, the formative-educational-developing didactic unit is revealed as an expression of the technological contextual dimension of the formative process where the use of technologies in socio-cultural contexts responds to new pedagogical trends.

At the same time, a qualitatively higher order category emerges, related to the management of an ethical culture of inclusion in the new educational scenarios (formative unit), which is defined as the ability to promote the ethical sense that respects the socio-cultural and emancipatory scientific development (educative unit), which is defined as the approach to human development from the scientificity of the social sciences that allows to evolve in a concept of liberation of their thoughts and allows the reduction of digital gaps in social interconnection (developmental unit, which is de-fined as the measures of action for access to education for all with the right to information that transcends their contexts and allows them to have a global vision of the world. Consequently, the formative-educational-developmental didactic unit is revealed as an expression of the sociocultural axiological dimension of the formative process that focuses on inclusion through pedagogical methods that respond to the virtualization of education.

Similarly, a second qualitatively higher order category emerges, related to social management with a holistic vision (formative unit), which is defined as the process of social integration from a pedagogical formation that promotes multimodal planning in the reconfiguration of learning (educational unit), which is defined as a formative organization process for scenarios where different educational modalities are combined with the purpose of adapting the teaching-learning processes to visual interpretation in the educational intervention (developmental unit), which is defined as the visual strategies to capture the student's attention and exercise an interpretative process of knowledge. Consequently, the formative-educational-developmental didactic unit is revealed as an expression

of the pedagogical praxiological dimension where the reconfiguration of the teaching practice prevails in the learning processes.

Epistemic transcendence phase

The epistemic transcendence phase allows revealing the essential relationships, regularity, and novelty of the model, in this sense, the following are essential relationships:

- The potentialization of technologies in the interaction of a digital culture, energized by collaborative learning.

- The emancipatory inclusion in the new educational scenarios from the reduction of digital divides.

- The holistic vision in educational intervention, energized in the reconfiguration of learning from a developmental process of accompaniment and continuous improvement.

Likewise, the generation of a knowledge of reflexive questioning on the current needs of establishing a formative model of educational virtualization in a praxiological line of the articulation of theory and practice, an intercultural knowledge that responds to the needs of human development and cultural valuation as an axiological and ontological assumption are revealed as regularities.

The scientific novelty is sustained from the systematization of a formative model of the dynamics of educational virtualization in initial teacher training, which is expressed in the dialectical relationship between the technological training of the teaching professional, a socio-cultural education with a holistic vision and from the developmental dialectic of the pedagogical praxis for the revaluation of the teaching professional. In turn, the model is energized by the relationships of the configurations, through which the following dimensions are defined:

- Technological contextual dimension: where technology prevails as a resource for innovation from teaching collaboration.

- Sociocultural axiological dimension: where the ethical sense and social commitment of the teacher prevails.

- Pedagogical praxeological dimension: where the reconfiguration of the teaching practice prevails in the learning processes.

Finally, the dimensions configure the movement of the developmental teaching practice in educational virtualization.

Educational strategy for initial teacher training

Based on the previous model, the educational strategy for initial teacher training is established as a practical instrument of educational transformation, considering criteria of relevance and impact. In this line, it is referred that the practical contribution guarantees the COVAC criterion: Coherence, Organization, Feasibility, Applicability and Clarity (Deroncele-Acosta, 2022). In turn, the practical contribution aims to transform the educational environment in which scientific re-search is developed. In this sense, the educational strategy for initial teacher training aims to contribute to the transformation of the formative processes of students who are preparing to practice teaching, the future teachers in their initial training. This educational strategy is constituted by the procedures used to promote learning and is based on the epistemological construction of initial teacher training, which is oriented in a process of academic development in the training of future teachers, having as dimensions: contextualized curricular planning, digital tools as a didactic strategy, processes of construction of new knowledge and learning feedback; and the category educational virtualization tool that is conceptualized as an educational system that meets the needs of the current context using digital tools having as dimensions: potentialization of technologies, training model for the reduction of digital gaps, holistic approach to technological trends, and digital competencies for self-learning (Colunga Santos, 2022; Vargas.Murillo, 2020, Pereira Medina, 2020, cited by Atúncar-Prieto, 2023)

Similarly, the background of the study refers that the use of ICTs has increased in all teaching activities and that technological innovation is decisively related to Initial Teacher Education (Deroncele-Acosta et al., 2023) At this level, the educational strategy is based on the model of the dynamics of educational virtualization (Atúncar-Prieto-Prieto & Deroncele-Acosta, 2021). The proposed strategy is summarized below (see Table 3).

Table 3. Strategy to enhance initial teacher training.

Phase	Objective	Actions	Thematic component	Dynamic component	Resources
Phase 1. Contextual tech-nological	To promote technology as a resource for innovation through teaching collaboration.	Planning of a contextualized curriculum according to the new needs of the teaching profile.	Planning process focused on learning. Local, regional, and global educational reality. Social, political, and cultural demands. Techniques and instruments for curriculum planning. Models of articulation in the teaching pedagogical praxis.	Debate with a critical position on current social trends. Digital design of pedagogical management documents.	Didactic learning guide. Virtual classroom: Zoom. Collaborative tolos. Office applications.
		Training in the use of digital tools to improve the didactic strategies of teachers in training.	Access to technology for human development. Massification of digital transformation. Online training and learning networks in digital competencies. Capitalization of learning in new educational scenarios.	Design of training modules in digital competences. Workshop on the application of digital resources as a didactic strategy in learning processes.	Training modules. Application workshop guide Virtual platform Innovation classroom Computer room Collaborative drive
Phase 2. Sociocultural axiological	Strengthen teachers' sense of ethics and social commitment.	Dynamization of the construction of new knowledge in the various learning modalities	Challenges of globalized and changing learning education. Multicultural diversity and its learning needs, Construction of a new globalized social identity. Competency-based approach and its contributions to education. Opportunities for bridging the digital divide	Hermeneutic mapping of relevant contents for the teacher training process. Seminar for the exchange of teaching practice experiences.	Hybrid Classrooms Videoconferencing platforms Collaborative tools Curricular designs Digital repositories
Phase 3. Pedagogical Praxiologic	Promote metareflection and feedback of the teaching practice in the processes	Development of timely learning feedback processes to train virtual teacher-tutors.	Critical reflective socio-critical approach. Formative evaluation and feedback. Resolution, evaluation, and decision making in problematic situations. Instruments for recording lessons learned and prospective interest.	Dialogue tables for self-evaluation and co-evaluation processes. Focus groups for the exchange of experiences with experts in educational topics.	Self-assessment and co-assessment tools Field notebooks Virtual classrooms Recording applications Applications for systematization of information.

Source: own elaboration

CONCLUSIONS

The process developed in this study allowed a diagnosis of the current state of ITE, where current theoretical trends indicate the need for a transformation of the formative aspects in relation to curriculum planning, the use of digital tools to build new knowledge and develop timely learning feedback; all this energized by technological strategies where educational virtualization is prevailing.

The relevance of the study is focused on pointing out that ITE teachers and students refer that the training level of their profession is good, due to the innovation processes developed in the institution; however, a smaller percentage of the study sample indicated that some aspects need to be improved, which will be considered for improvement strategies.

Regarding the qualitative analysis of the focus groups, referred to collect the contributions based on their experiences and to the students based on their formative perceptions; in both cases directed to the educational virtualization tool category, it was possible to establish main emerging categories, second and third order categories.

The teacher focus group established as main emerging categories those of facilitating access to technology for hu-man development, online training and learning networks in digital competencies, and developing articulation models in the teaching pedagogical praxis. As for the students, facilitating access to technology for human development, online training and learning networks in digital competencies, and developing models of articulation in the teaching pedagogical praxis; in both focus groups, they constituted strategies to dynamize educational virtualization in the ITE, which are substantial contributions of the present study.

Finally, a formative model of the dynamics of educational virtualization is established as a proposal for improvement, expressed in three dimensions as a synthesis of the relationship between the various configurations established, these dimensions are: technological contextual dimension, sociocultural axiological dimension, pedagogical praxiological dimension; based on this model an educational strategy is established for initial teacher training (as a practical instrument of educational transformation), which was aligned to these dimensions, therefore, Phase 1 is established. Technological contextual, with the objective of empowering technology as a resource for innovation from teacher collab-oration, Phase 2. Axiological sociocultural, with the objective of strengthening the teacher's sense of ethics and social commitment, and Phase 3. Pedagogical Praxiological, with the objective of promoting meta-reflection and feedback of the teaching practice in the processes; in this way a concrete proposal is established that consolidates the transformative scope of the study and its execution is scheduled for future cycles.

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