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Original Research Article

Teacher professional development in the age of virtualization: needs and challenges in Higher Education

Superación docente en tiempos de virtualización: necesidades y desafíos en la Educación Superior

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ABSTRACT

Introduction: Teachers professional development in Higher Education must face new challenges due to the virtualization of the teaching - learning process, which requires updating and restructuring traditional educational models, transforming both pedagogical practice and institutional frameworks.

Objective: To identify the needs and challenges of teacher professional development in Higher Education in the face of virtualization of the teaching-learning process.

Methods: Theoretical methods were used: historical-logical, analytical- synthetic, and inductive-deductive, along with a systematic review using PRISMA of 15 studies from 2023 to the present, which allowed for the organization, filtering and synthesis of evidence on teacher professional development and curricular adaptation in virtual environment with rigor and transparency.

Results: The challenges emerged: limited technological access, which conditions participation in virtual processes and inequalities in educational quality; the need for teachers' professional development in digital competences; and curricular restructuring aimed at integrating digital resources and active methodologies into teaching. The importance of an integrative approach linking teacher training with educational virtualization was highlighted.

Conclusions: A comprehensive approach is vital to a university system aligned with the digital future, where the articulation between teacher professional development and virtualization sustains a resilient, inclusive, sustainable Higher Education.

Keywords: digital competence; educational technology; higher education; training

RESUMEN

Introducción: El desarrollo profesional docente en Educación Superior debe enfrentar nuevos retos debido a la virtualización del proceso de enseñanza-aprendizaje, lo que exige actualizar y reestructurar los modelos educativos tradicionales, transformando tanto la práctica pedagógica como los marcos institucionales.

Objetivo: Identificar las necesidades y desafíos del desarrollo profesional de los docentes en la Educación Superior frente a la virtualización del proceso de enseñanza aprendizaje.

Métodos: Se emplearon métodos teóricos: histórico-lógico, analítico-sintético e inductivo-deductivo, y una revisión sistemática con PRISMA de 15 estudios desde 2023 hasta la actualidad, lo que permitió organizar, filtrar y sintetizar la evidencia sobre superación docente y adaptación curricular en entornos virtuales con rigor y transparencia.

Resultados: Se manifestaron tres desafíos: acceso tecnológico limitado, que condiciona la participación en procesos virtuales y desigualdades en la calidad educativa; necesidad de superación docente en competencias digitales; reestructuración curricular, orientada a integrar recursos digitales y metodologías activas en la enseñanza. Se destacó la importancia de un enfoque integrador que vincule la formación docente con la virtualización educativa.

Conclusiones: Un abordaje integral es clave para un sistema universitario acorde al futuro digital, donde la articulación entre superación docente y virtualización sostiene una Educación Superior resiliente, inclusiva y sostenible.

Palabras clave: competencia digital; enseñanza superior; formación; tecnología educacional

Introduction

The accelerated advancement of digital technology and its cross-cutting impact on all spheres of society reaffirm it as a driving force behind transcendental transformations.

In UNESCO reports (2023), corroborated that the COVID-19 pandemic, in addition to forcing educators to rethink their teaching modalities and adopt digital tools to continue their processes, constituted the catalyst for the adoption of the virtual modality in education.

Currently, almost three years later, its use is confirmed as a potential entity for the total transition from face-to-face to virtual education.

The educational technology industry is evolving rapidly and unstoppably in the distribution of digital tools and interactive platforms with innovative approaches.

aimed at closing gaps and making education more accessible, personalized, and efficient. These elements generate as many opportunities as challenges in educational institutions, for teachers and students.

In this environment, Higher Education (HE) stands out with high rates of adoption of digital technology and, in order to fulfill its mission in the training of new professionals and their continuing development, it faces the challenge of adapting to this scenario where virtualization grows rapidly and online management platforms, mobile applications, artificial intelligence, among others, expand the range of opportunities for informal learning.

In this regard, Torres and González (2005) point out that teacher development refers to:

> (…) the set of training processes that enable (…) the acquisition, expansion, and continuous improvement of the basic and specialized knowledge and skills required for a better performance of their work responsibilities and functions, as well as for their comprehensive cultural development, which allows raising the effectiveness and quality of their work. (as cited in Lupolo Lombe, 2018, p. 2)

In accordance with what was previously stated, Hernández de la Cruz et al. (2023) propose that teachers must be in constant training to achieve adaptation to changes and the use of innovative strategies that favor motivation and learning in students, turning them into protagonists of their own learning. These elements are observable in the Cuban context, where the integration of technologies into the teaching-learning process presents limitations.

It is a reality today that teachers have the need to manage digital platforms, the knowledge and application of tools to the curriculum of each subject for adaptation to the virtual environment; this entails an increase in professional development with a continuous training approach, in addition to the total mastery of their specialties and the development of capacities and skills to integrate technology into the teaching-learning process (TLP).

Therefore, it can be stated that teacher development becomes a vital necessity to guarantee the quality of education and ensure that it responds to the demands of

the current moment.

Cuban Higher Education, in order to fulfill its mission in the training of broad-profile professionals, reaffirms teacher development (TD) as a cardinal priority within the priorities of the Ministry of Higher Education (MHE) from the perspective of continuous training (Saborido Lordi, 2022), which facilitates the updating and permanent adaptation of teachers to the changes that shape the teaching-learning process (TLP). In particular, the need for TD for the virtualization of the teaching-learning process (VTLP) is recognized.

Cuban Higher Education, in order to fulfill its mission in the training of professionals with a broad profile. Thus, TD in the effective use of technologies is fundamental to guarantee the design and implementation of virtual teaching-learning environments, which translate into quality education.

Through a systematic literature review, needs, challenges, and demands arising from the digitalization of society are identified, in order to synthesize the available evidence and provide a critical framework for the effectiveness of the TLP in university contexts. Therefore, this article aims to: Identify the needs and challenges of the professional development of teachers in Higher Education in the face of the virtualization of the teaching-learning process.

Theoretical framework or conceptual references

UNESCO (1998), in the tenets of the World Declaration on Higher Education for the Twenty-first Century: Vision and Action, states the need for:

> (…) higher education institutions must create a vigorous staff training policy. (…). Clear guidelines should be established regarding teacher development in Higher Education. (…), ensure professional conditions (…) appropriate for teachers in order to guarantee excellence in research and teaching, (…). (pp. 9-11)

Later, in the conference it is stated that it is necessary to:

> (…). Guarantee equitable access to technologies at all levels of education systems (…). Fully harness information and communication technologies for educational purposes (…). Their use (…), is important (…) to modernize the workplace in (…) real (…) virtual entities. (pp. 2-13)

However, the United Nations (2018) states that it must: (…) ensure equal access for all men and women to quality technical, professional, and higher education, including university teaching (…). Create (…) vocational training (…) and increase (…) qualified teachers, (…) in teacher training. (pp. 15-16)

The challenges related to technological integration in HE demand a constant updating of teachers' technical and pedagogical capacities. Different approaches are being developed globally.

In Europe and Asia, teacher professionalization programs are being developed with the use of active methodologies for online teaching. Universities in China and Japan also stand out for their work in preparing professors for the use of artificial intelligence. In North America, training programs focused on hybrid teaching are being implemented, while in Latin America, work is being done on the development of digital competencies (European Union, 2023).

These trends exhibit the correlation between approaches and technological development in the regions, as well as the work being done to adapt teaching work through professional development.

However, TD for the VTLP transcends the elementary management of technological tools. It extends to a harmonious transformation in the teacher's pedagogical and methodological skills for curriculum redesign and its implementation. According to Martínez-Sum (2019), curricular development in virtual environments requires a holistic vision that integrates technological innovation and performativity in distance teaching, in such a way that it fosters student motivation and well-being.

In particular, teachers are required to develop skills in adapting content to digital formats and in designing teaching strategies in virtual contexts. This also implies managing time and assessments, in order to teach with innovative didactics based on the available digital resources. In this context, educator development is redefined as a

process that combines pedagogy and technology.

Methodology

A qualitative approach was adopted based on a systematic literature review on TD in HE within the VTLP, using the theoretical methods: historical-logical, analytical-synthetic, and inductive-deductive. Qualitative and quantitative studies were explored, derived from the search for relevant research in the academic databases Web of Science, Scopus, Dialnet, EBSCO, and Redalyc. These platforms provide access to updated, high-quality bibliography with a global scope.

In the search process, descriptors in Spanish and English were used, combining them with logical operators such as "Y", "AND", "O", "OR", and "NOT", see Table 1. The keywords that define the studied variables were organized through the following equations.

Table 1

Equations used in the search process

Languages	**Descriptors or keywords and logical operators**
Spanish	"Superación docente" AND "Educación Superior" AND "virtualización"
	"Metodologías de enseñanza" OR "estrategias pedagógicas" AND "aprendizaje en línea"
	"Competencias digitales de los profesores" OR "formación continua para docentes en la era digital" ("educación virtual" AND "docentes") NOT "Educación primaria"
	"Tecnología educativa" AND ("Educación Superior" OR "Universidad")
	"Desafíos de la educación virtual" AND "Transformación pedagógica en la virtualización"
English	"Teacher development" AND "higher education" AND "virtualization"
	"Teaching methodologies" OR "pedagogical strategies" AND "online learning"
	"Teacher training in digital environments" AND "Virtualization of the teaching-learning process"
	"Teachers' digital competencies" OR "Continuous training for teachers

in the digital age" ("Virtual education" AND "Teachers") NOT "Primary education"

"Educational technology" AND ("Higher education" OR "University")

"Challenges of virtual education" AND "Pedagogical transformation in virtualization"

The following were defined as inclusion criteria: scientific articles published in peer-reviewed journals, accessible in Spanish or English, published from 2023 to the present. Research that did not meet these criteria was excluded, as well as systematic reviews and duplicate articles.

To organize and structure the search in an orderly manner, the PRISMA method was applied, including the four stages explained by Espinoza-Freire (2025), which facilitated the planning process; they are: identification, screening, eligibility, and inclusion (pp. 626-627).

Next, the way in which the information flowed during the selection process is shown statistically (see Figure 1), from the initial identification of 68 records to the final inclusion of 15 articles for the study.

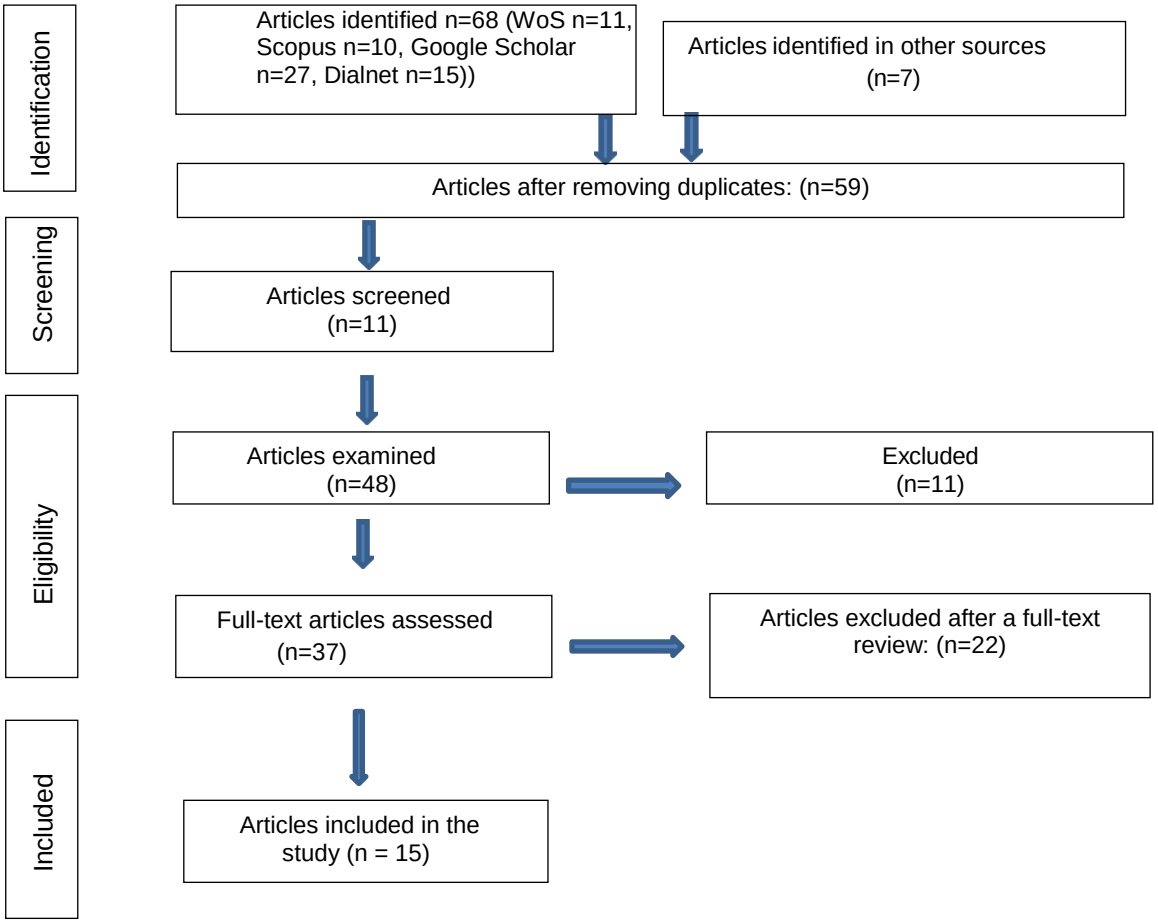


Figure 1

Studies identified under the PRISMA method

Note: This figure took into account the Flow diagram explained by Espinoza-Freire (2025, p. 640), but prepared by the authors of this article, with data specific to this research.

After the selection of the articles, the analysis of the abstracts and full texts was carried out. Matrices were prepared that included key indicators such as authors, year of publication, country, and the main objectives of each research study. Subsequently, a meticulous analysis of each article was carried out, taking into account the selection of sources, the classification of the articles, the content analysis, the validation of the findings, and the representation of the data carried out by the authors in each case.

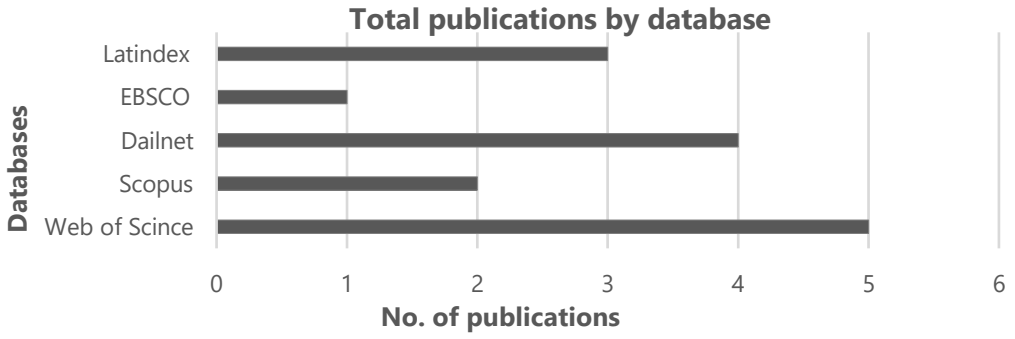
A qualitative methodology was used, Bardin (2002), based on content analysis. Work was done on identifying the dimensions related to the variables addressed in the studies, the main results and common patterns in each category, as well as the gaps detected in the studies.

Results

As a result of the systematic review carried out, a total of 15 articles were examined that addressed, indistinctly, TD in HE in relation to the VTLP. According to the year of publication, 4 works corresponding to 2025, 5 to 2024, and 6 to 2023 were recorded, evidencing the validity of the topic in accordance with the unstoppable technological evolution and in relation to its availability in the academic databases (Figure 2).

Figure 2

Total number of publications according to the databases



The analysis of the graph shows that more than 50% of the articles included in the review are indexed in high-impact databases such as Web of Science, Scopus, and other academic ones such as EBSCO, among others, which reflects a preference for academic sources recognized at the international level. The remaining articles, belonging to Dialnet and Latindex, evidence the value of open-access and regionally focused platforms to complement the global perspective with relevant research in the Ibero-American context.

From a regional perspective, the articles analyzed cover diverse geographic areas. The main region of this review is Latin America, to which 11 of the 15 publications

belong, highlighting the variety and volume of academic production in the region. Asia and Europe have a more limited but equally significant representation. In this approach, Cuban academic production stands out in the context of the review, emphasizing its key role within the global analysis.

As part of the carried out analysis, a summary matrix (Table 2) was generated that synthesizes the key information from the selected articles. It details the total number of articles included, the authors, and the years of publication, the titles, and the objectives of the studies. In this way, the main aspects of the analyzed literature were structurally visualized, facilitating the understanding and comparison of the articles.

Table 2

Matriz resumen de artículos seleccionados

No	Author	Year	Title	Country	Objectives
1	Acosta Guanoquiza, C. O., Mejía Alban, G. M., Ramírez Gutiérrez, C. V., & Reigosa Lara, A.	2024	Digital tools to strengthen teachers' teaching methodology	Ecuador	Analyze and promote the integration of digital tools in the daily practice of teachers in basic areas as a methodological strategy that allows enriching the educational process.
2	Butar, Mulyadi, H.,&Ramdhany, M. A	2024	The Mediating Role of Work Motivation in the Impact of Training on Teachers'	Indonesia	Determine the mediating role of work motivation in the relationship between teacher training and digital literacy.
3	Valderrama, D. A., & Valderrama Barragán, G. A.	2024	Impact of continuous teacher training on educational quality in Higher Education	Ecuador	Investigate the impact of continuous teacher training on educational quality in Higher Education institutions.

4	Hernández-Sellés, N., Muñoz-Carril, P.-C., & González-Sanmamed, M.	2023	Roles of the university teacher in collaborative learning processes in virtual environments	Spain	Identify the tasks and roles performed by the university professor in CSCL.
	Picado García, E.	2025	Virtualization of the curricular component Information Systems and Knowledge Search, in the Information Management program at UNAN-Managua	Nicaragua	Virtualization of the curricular component Information Systems and Knowledge Search through the Moodle virtual environment to strengthen the teaching and learning process of first-year students in the Information Management program at UNAN-Managua.
6	Porvént-Rovirosa, L., Calderón-Menéndez, A., & Pérez-Suárez, R.	2023	Virtual environments: a challenge for Higher Education teachers	Cuba	Design a system of workshops aimed at the professional development of teachers at the Municipal University Branch of Majagua (FUM), in order to equip them with the necessary skills to interact with their students in virtual environments and in the Interactive Learning Platforms (ILP) created for work

					in higher education.
7	Ramírez Casate, A. P., Guerra González, C., & Antúnez Sánchez, A. G.	2025	Impact of teacher training in master's programs in instructional design	Cuba	Evaluate the results of instructional design training for teachers in master's programs at the University of Granma, Cuba.
8	Ruiz, R., Sarango F. y Chumbay, J.	2024	Teacher empowerment in Virtual Education: advances and challenges of lifelong learning	Ecuador	Detailed analysis that seeks to understand and evaluate the contribution of the VLE to the continuous training process of teachers at the National University of Education (UNAE).
9	Vivero Quintero, C E., Piza Burgos, N. D., & Arana Cadena, R. M.	2023	Pedagogy and psychology in virtual university education, references for practice at the Technical University of Babahoyo	Peru	Characterize the educational virtualization process from the perception of teachers and students, the documentary and content analysis of virtual tools.
10	Choez Pilay, J. G., & Herrera Guanoquiza, Yajaira Marianela	2024	Continuous training program to strengthen the teaching methodology of mathematics teachers.	Ecuador	Design a continuous training program to strengthen the teaching methodology of mathematics teachers, specifically in the use of the Moodle digital tool.

11	Hernández de la Cruz, J. M., Peñate-Villasante, A. G.&, Hernández-Manso, T.	2024	Teacher preparation for heritage interpretation training: virtualization and active methodologies	Cuba	To socialize the experience that shows the adaptability of integrative teaching tasks to active methodologies, facilitating their use from face-to-face settings to virtual learning environments, in the course.
12	Alfaro Rodríguez, A. P., López López, H. L., Espinoza Bibriesca, G., & Casillas Navarro, J. J.	2023	Use of virtual platforms in teaching-learning processes in Higher Education	Mexico	Analyze how the use of various technological platforms directly impacts the academic performance of Higher Education students in a fully virtual modality.
13	Fernández-Morante, C., Cebreiro López, B., Casal-Otero, L., & Mareque León, F.	2023	Teachers' Digital Competence. The Case of the University System of Galicia. Journal of new approaches in educational research	Spain	The purpose of this study is to find out the level of digital competence of Galician university professors, as well as to identify whether there are significant variable-based differences
14	Berríos-Barra, L.,y Calderón-López, M.	2025	Analysis of didactic-digital competence in trainers of future teachers: practices and perceptions	Chile	Explore the beliefs of university teachers to analyze their impact on the use of technologies in

					initial teacher training (ITT).
15	Jianyang Zhang & Yanran Wu	2025	Impact of university teachers' digital teaching skills on teaching quality in higher education	China	The study analyzes how the digital skills of university professors impact the quality of teaching in Higher Education.

The selected articles were organized into two categories: descriptive studies and intervention studies. Within the descriptive category, 9 articles were classified; these indistinctly explore the students, administrators, and teachers perception through questionnaires and observation guides on the current situation of the VTLP in HE, and assess the implication of TD. The remaining 6 are intervention studies and present training proposals designed to develop teachers, with the respective validation of results in each case.

As a result of the analysis, it was identified that, in the period from 2023 to the present, teachers face dissimilar challenges in the context of the VTLP. According to the questionnaires applied, students perceived in their teachers a limited technological competence that, consequently, affects the proper development of virtual classes. Administrators emphasized that, despite increased levels of access to technologies and identified advances in relation to teachers' commitment to working with them, training still needs to be accompanied by adequate planning to achieve the effective use of tools.

From the teachers' point of view, the findings concentrate on the positive perception regarding technologies for raising the quality of the TLP and the need for self-preparation, although this is considered a work overload.

Discussion

Analysis of the Current Situation

Almost three to six years after the forced virtualization resulting from the pandemic, TD in HE is experiencing qualitatively and quantitatively superior results. Alfaro Rodríguez et al. (2023), referred to "(…) the relevance of analyzing how the

use of various technological platforms directly impacts the academic performance of Higher Education students in a fully virtual modality" (p. 180).

In this sense and from the student perspective, these authors applied the virtual modality questionnaire, where 25% recognize better preparation of their teachers, reflected in the quality they perceive in the courses taught by them (Alfaro Rodríguez et al., 2023).

For her part, Picado García (2024) shows that, according to the students: "Teacher training (…) is efficient, (…) in the management of the Moodle Platform and Web 2.0 tools" (p. 185).

The administrators' approach coincides with the manifest progress of TD in HE, especially in the commitment to take advantage of virtualization in all the substantive processes of the university (Vivero Quintero et al., 2023).

From this perspective, the results are encouraging, but from a more critical standpoint, although students and administrators coincide in a positive perception of teacher development, it is necessary to question whether these advances are sufficient for the quality of the VTLP. The advances in the use of Moodle and Web 2.0 tools, although important, could be only an initial step. Acosta Guanoquiza et al. (2024) point to a growing interest in training and updating in the use of digital tools, highlighting a decrease in levels of reluctance, which now stand at 13%.

In this regard, according to the results presented by Ruiz Quizhpe et al. (2024), teachers recognize that TD for the VTLP should be regular, accessible, and kept up to date. They also suggest carrying out joint work to achieve the creation of interactive and diverse content, and to design virtual classrooms in all subjects.

Berríos-Barra and Calderón-López (2025), after an analysis carried out with teachers from public and private universities, observed consensus on the criteria for improvement. However, their results reveal that 38% of teachers still maintain a teaching-centered approach, instead of prioritizing learning.

Although the results presented by Acosta Guanoquiza et al. (2024), Ruiz Quizhpe et al. (2024), and Berríos-Barra and Calderón-López (2025) provide a positive panorama regarding interest in professional development in digital tools and content

creation, it is appropriate to bear in mind that, despite the evident decrease in levels of reluctance, a gap still persists in the transition toward learning-centered pedagogical approaches, since it is a fact that teachers retain a teaching-focused stance and give rise to controversies about current professional development strategies and whether they really promote the changes required in teaching practice.

Impact on teachers' development

Over the course of this period, several proposals stand out regarding TD. Significant advances are demonstrated, but evidence of the challenges to be overcome also stands out.

Hernández de la Cruz et al. (2023) implemented a course aimed at "(…) the design, planning, and organization of integrative teaching tasks through active methodologies in virtual TLP scenarios (…)" (p. 11). In this proposal, the analysis phase of the instructional design was carried out using the Moodle platform, which contributed to the improvement of teaching-methodological work and the strengthening of the TLP.

Choez Pilay and Herrera Guanoquiza (2024) applied a professional development program based on the use of the Moodle platform, which confirmed the positive impact of this platform on the educational process. The results showed significant advances in teaching methodology through the Moodle platform, aligned with a contemporary technological progress.

However, the course of time and the technological evolution have made it evident that teachers not only need to adapt to technologies, but also to integrate them efficiently into their pedagogical practice.

Ramírez Casate et al. (2025) demonstrated, through the application of a professional development proposal in Instructional Design, that unfamiliarity with the term is still a limitation: 80% of teachers had never been trained in this regard, limiting themselves to the use of teaching guides.

However, the proposal by Ramírez Casate et al. (2025) evidenced "(…) an improvement in the quality of teaching and learning which is reflected in the greater protagonism of the teaching staff (…) to develop higher-quality virtual academic

activities" (p. 25).

In each of the aforementioned cases, the proposals have marked notable progress, but important challenges remain. On the one hand, TD in HE for the VTLP does not reach a uniform level; the influence of contexts leaves many teachers at a disadvantage in the face of virtualization. On the other hand, the integration of traditional methodologies into virtual environments demands permanent attention. In summary, the pedagogical evolution toward the VTLP must go beyond the use of platforms such as Moodle, with the strengthening of a comprehensive pedagogical vision.

Relevance and applicability of the proposals

Although the validated proposals present satisfactory results, the possibility of their implementation on a larger scale could be limited by the necessary adaptations to the environments.

Among the analyzed studies, the proposal by Porvént-Rovirosa et al. (2023) stands out as a solid and effective initiative for TD in HE. Based on a prior diagnosis, these authors designed, implemented, and validated a system of workshops aimed at developing the skills necessary for the virtualization of the Teaching-Learning Process (VTLP) at a Cuban university branch. The workshops, conceived as practical and collaborative spaces, provided teachers with knowledge of key digital tools for the virtualization of their classes.

Through practical examples adapted to their professional context, a notable increase in the use of these tools in teaching activities was achieved. Furthermore, the results showed that independent training regardless of the participants' age and specialty is possible, demonstrating the versatility and scope of this methodology.

The workshop-based approach presents great adaptability, which makes the above-mentioned proposal viable for TD regardless of context. This methodology fosters practical and interactive learning that, focused on TD for the VTLP, can contribute to the development of a continuous professional development model that facilitates technological integration in pedagogical practice, regardless of the specific realities of each educational environment.

Furthermore, the fact of starting from a prior diagnosis for the preparation of its

proposal provides, in coincidence with Fernández-Morante et al. (2023), a crucial perspective by pointing out that professional development programs aimed at working on digital competence must start from a solid pedagogical base and strategic planning so that, thanks to personalized and updated itineraries, the intended objective is achieved.

It is also worth mentioning the contributions of Butar Butar et al. (2024), who aptly highlight the fundamental role of motivation as a key element in teacher development processes. The assertion that well-designed professional development strengthens, in addition to digital skills, work motivation and, consequently, digital literacy, highlights the intrinsic relationship between the emotional aspect and professional development.

Similarly, what is stated by Castro Valderrama and Valderrama Barragán (2024) highlights another positive and encouraging aspect within the HE educational community: teachers' commitment to their professional development and their taking advantage of learning opportunities. Their results demonstrate the positive perception of continuous professional development as a tool for improving both pedagogical skills and disciplinary knowledge on the part of teachers.

Both approaches are particularly relevant, since they focus not only on the tangible results of professional development, but also on the indirect effects that impact teaching performance in the long term.

Future perspectives and alignment with the theoretical framework

In the analysis of the research studied, efforts aimed at TD in HE for the use of digital tools for the VTLP prevail. However, a critical area that remains weakly explored is how these tools can be implemented in the design and development of the virtualization of subjects. This gap represents an opportunity for future lines of research that address not only access and teacher training in terms of skills for mastering technologies, but also the specific processes of methodological integration in the virtual classroom.

In the results obtained, the studies evidence significant progress toward the transformation of educational systems in HE, aligned with the principles established by UNESCO (1998) and the United Nations (2018), which, in making declarations

on HE, emphasize the need to adopt innovative approaches that guarantee quality education, in addition to highlighting the implementation of virtualization as a fundamental tool for achieving the Sustainable Development Goals (SDGs).

However, the results also highlight important challenges, such as the technological diversity of contexts and, fundamentally, the need for TD to adapt to new methodologies. In this sense, and based on what is proposed by UNESCO (1998) and the United Nations (2018), HE makes projections toward the future in order to have the VTLP and ensure the viability of the path to address current demands in the training of future professionals.

Undoubtedly, the influence of the context in which the teacher works plays an essential role in the conception of their professional development. Although the contexts of America, Asia, and Europe evidenced in the studies by Ruiz Quizhpe et al. (2024), Zhang & Wu (2025), and Fernández-Morante et al. (2023), respectively, present evident differences in terms of technological development, the TD needs of HE reveal an extraordinary similarity. In America, unequal access to educational technologies shows the socioeconomic disparities that limit progress in some areas. Nevertheless, teachers seek to improve their competencies to adapt to the constant advances in virtualization.

In developed countries such as Japan, educational technology is widely integrated. And in Europe, technological development is more consolidated, but teacher development needs also occupy a central place.

In this sense, regardless of the differences in technological development, HE teachers in the three regions contributing to the studied articles share the need for continuous professional development for the VTLP, an effort aimed at adapting to technological changes and strengthening their role in the face of the educational transformation of HE.

There is also prevailing agreement with Hernández de la Cruz et al. (2023) approaches of regarding the importance of establishing TD as continuous training, crucial for achieving adaptation to changes and for it to have an impact on the effectiveness of the TLP. Meanwhile, the VTLP in the Cuban context presents as many opportunities as challenges. Although the efforts are appreciable, the results

reveal significant limitations in terms of access, professional development, and the availability of resources. These elements further highlight the need for adequate and constant TD, not only to adapt to digital transformations, but also to design and apply pedagogical strategies that are visible up to the virtualization of the class, the moment where the TLP takes shape.

Also noteworthy among the results of the review are points of contact with Martínez-Sum (2019) regarding the need to develop the curriculum in virtual environments from a holistic vision, findings that highlight that the VTLP should not be limited only to adapting content to digital format, but rather requires a comprehensive approach among the pedagogical, technological, and contextual components of the TLP. This links directly to the idea that TD should not only be the means, but should become the catalyst for comprehensively transforming the TLP. However, these findings pose important challenges for TD, for example, strengthening digital pedagogy.

Conclusion

The carried out analysis made it possible to identify three teacher development needs in Higher Education in the face of virtualization: limited technological access, training in digital competencies, and curricular restructuring for virtual environments. Likewise, challenges were detected such as the persistence of a gap in the transition towards learning-centered pedagogical approaches, the perception of work overload associated with self-preparation, and the lack of uniformity in professional development levels due to contextual differences.

The evidence reviewed shows that, although there is a positive perception regarding the usefulness of technologies, limitations still manifest in teachers' technological competence that affect the development of virtual classes. It is confirmed that professional development programs based on practical workshops and instructional design prove effective in addressing the identified needs, although their scalability depends on contextual adaptations. Therefore, teacher development for virtualization requires, according to the findings, not only the management of digital tools, but also the strengthening of specific pedagogical-methodological skills for the design of virtual teaching-learning environments.

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Conflicts of interests

The authors do not declare conflicts of interests.

Authors Contribution

Nisel Polo de la Torre: Conceptualization, data curation, formal analysis, research, Methodology and writing –original draft.

Rachel de la Caridad Revolta Montero: Acquisition of funding, project management, resources, software.

María Isabel Bardina Torres: Supervision, validation, visualization, writing – review and editing.

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