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A Competency Framework for Teaching and Learning Innovation Centers for the 21st Century: Anticipating the Post-COVID-19 Age

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Abstract: During the COVID-19 pandemic, most Higher Education Institutions (HEIs) across the globe moved towards "emergency online education", experiencing a metamorphosis that advanced their capacities and competencies as never before. Teaching and Learning Centers (TLCs), the internal units that promote sustainable transformations, can play a key role in making this metamorphosis last. Existing models for TLCs have defined the competencies that they could help develop, focusing on teachers', students', and managers' development, but have mislead aspects such as leadership, organizational processes, and infrastructures. This paper evaluates the PROF-XXI framework, which offers a holistic perspective on the competencies that TLCs should develop for supporting deep and sustainable transformations of HEIs. The framework was evaluated with 83 participants from four Latin American institutions and used for analyzing the transformation of their teaching and learning practices during the pandemic lockdown. The result of the analysis shows that the PROF-XXI framework was useful for identifying the teaching and learning competencies addressed by the institutions, their deficiencies, and their strategic changes. Specifically, this study shows that most institutions counted with training plans for teachers before this period, mainly in the competencies of digital technologies and pedagogical quality, but that other initiatives were created to reinforce them, including students' support actions.

Keywords: teaching learning center (TLC); competence; pandemic

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1. Introduction

"Transformation" and "metamorphosis" are in essence the same word. "Transformation" is of Latin and "metamorphosis" (μεταμόρφωσις) is of Greek origin. They both have a prefix "trans" or "meta", which means "on the other side" or "beyond". The second part refers to form, "forma" in Latin and "morphe" (μορφή) in Greek. Although etymologically closely related, "metamorphosis" is often used with more abrupt changes, such as the evolution in butterflies from larvae to chrysalis and adult butterflies. "The Metamorphosis" is also the chosen translation for Kafka's book "Die Verwandlung" in languages such as English or Spanish. In this book, the main character, Gregor Samsa, wakes up one morning converted into a huge insect. He struggles with his new condition, where even simple gestures, such as opening a door, become nearly impossible for him.

In mid-March 2020, with the COVID-19 pandemic, professors all over the world must have experienced feelings such as Kafka's character when universities across the globe moved abruptly to the "emergency online education" [1]. For better or worse, this rapid transition forced teachers to transform their teaching practices, students to adapt to new forms of learning, and Higher Education Institutions (HEIs) to advance their organization and infrastructures [2]. For a while, HEIs suffered a metamorphosis that advanced their capacities and competencies as never before.

In Kafka's book, Gregor Samsa dies. However, some authors such as Drüke (2013) [1] believe that the title of the book refers to the transformation of Grete, Gregor's sister, who experiences along the book a transformation to adapt to the new family circumstances. As Drüke, we believe that the metamorphosis experienced by teachers during the pandemic might serve as a catalyst for developing capabilities that last and promote a deep and sustainable transformation of Higher Education Institutions into organizations of the 21st century.

From the 1960s, institutions have invested in the creation of Teacher and Learning Centers (TLCs) as the solution for supporting this transformation. Although the concept of TLC has evolved, the spirit remains in the institutions as internal units with capabilities and positions to promote sustainable transformation of teaching and learning practices or, as Ringer defines, the hubs of educational reforms [3]. In the traditional paradigm, TLCs focus on the improvement of teaching skills and transfer of knowledge about student learning [4]. However, a new paradigm of TLCs emerged in the past years that stresses the importance of involving other stakeholders, such as students or managers, in the center activities [4], and emphasizes the idea of leadership role that they might play for having more pervasive effects [5]. Authors such as Holt et al. (2013) [5] stress the idea that TLCs "need to see their strategic leadership contribution as the designers and sustainers of open teaching and learning networks encompassing powerful forms of learning both across, and up and down the organization".

The role of the Higher Education institutions is to develop practical knowledge to be transferred to their students to prepare skilled workforce adapted to the continuously changing market needs [6]. According to a recent study by Dondi et al. (2021) [7], today, digital skills are one of the four categories that will help students to thrive in the future of work. So, HEIs need to expose students to a variety of learning methods (online, face to face blended, theoretical, and practical) to assure job-readiness [1]. They need to assure a sustainable digital transformation, since the transformation taking place in HEIS around the globe may become the blueprint for innovation and creativity in the next decade [8]. TLCs are the units that should guide institutional transformations from the core to this end.

To support the continuous development of TLCs, prior work proposes different models defining the competencies that these centers should develop, mainly focusing on teachers' and students' development of digital and pedagogical practices. Although these models have shown to be very effective for defining the plans for teachers' professional development, they are still anchored in the traditional paradigm of TLCs and mislead key aspects needed for making these centers evolve. Within these aspects, current literature highlights the need for supporting leadership and cultural change at the institution [5], the technologi-

cal infrastructure for education [9], or the concept of supporting evidence-based practices to promote scholarly teaching practices [10]. There is a need for new models able to provide a more holistic perspective on the competencies of the new TLCs, more focused on providing guidelines and support for defining strategic plans for facing the challenges to come.

To advance on this challenge, this paper presents the PROF-XXI framework. This framework is one of the results of the large-scale European project PROF-XXI (http://profxxi.org/ (accessed on 21 December 2021)), which aims to build capacity for the development of TLCs adapted to the 21st century in Latin American Higher Education Institutions. The PROF-XXI framework describes the competencies that TLCs should consider for defining the strategies and actions allowing for support of teaching and learning innovation. The goal of this paper is to present and evaluate the framework with four Latin American institutions. Specifically, this paper shows how this framework can be used for analyzing the current level of competencies of an institution in terms of innovation and education from the perspective of different stakeholders. Using mixed methods, we cross-analyze quantitative and qualitative data of a workshop with 83 participants and analyzed the initiatives conducted by four TLC leaders to answer two research questions: (RQ1) How does the PROF-XXI framework helps with analyzing the competence level of the teaching and learning centers at an institution from the managers, teaching and administrative staff perspectives? (RQ2) How does the PROF-XXI framework help with identifying the competencies of the TLC developed before and during the COVID-19 pandemic lockdown? The result of this analysis aims at serving as a validation of the framework as well as a showcase for other institutions to apply it.

2. Teaching and Learning Centers: History and Models

At the end of the 1950s, international concern for teaching and learning at the higher education level was raised [11–15], which manifested itself in many ways: generation of taxonomies for assessment, support units for teaching and learning, vocational guidance and curriculum design, among other initiatives. However, the Anglo-Saxon universities began to configure in the 1960s [4] the Teaching and Learning Centers (TLCs) as we know them today. From the 1970s onwards, open universities have contributed to the further consolidation of the concept, by developing advanced models of teacher support and especially learner support, embedding those activities in their core organizational service structure [15,16].

In recent years, the globalization of higher education combined with the dissemination of digital technologies generated a strong political and social pressure for universities to continuously innovate their teaching and learning practices. A growing need to identify, build and develop strategic actions and contributions of support units for teachers and students has become a means for higher education institutions to guarantee quality and competitiveness [16–18].

Consequently, the need for frameworks to guide these practices and types of experiences has been emerging. Some of them focused on benchmarking performance [17,18], others on good practices and institutional policies [17,19]; some centered on the development and accompaniment of teachers [11,19–21], the systematization and maturation of learning about practice as significant referential elements for teacher development [11,20,22–24], or from a vision of co-creation of added value and relevance for institutions and internal collaboration [4,25]. In Table A1 in Appendix A, we present several alternative models that represent these different approaches indicating the stakeholders they focus on (teachers, students, or managers).

Despite all these experiences, the gap of not having an articulated frame of reference to guide leadership and decision-making has become evident and necessary in recent times [4,18,22,26,27]. In fact, as literature shows, teaching and learning innovation can only be successfully embedded in higher education organizational culture and practices if supported by strategically driven systemic change [28]. The need to use a holistic approach for such purpose was particularly evident in the context of the pandemic as

higher education institutions across the world realized they should move from randomly selected emergency remote teaching practices to more sustainable, evidence-based digital transformation processes involving strategically their entire operations, infrastructure, and staff. Recent studies analyzing the changes conducted by HE institutions during the COVID-19 pandemic also align with this idea. For example, the work by Alan and Parvin (2021) [28] proposes a policy framework for managing higher education during emergency periods based on the idea that "only a substantial policy framework will enable online technology to play a constructive role". That is, the metamorphosis of an organization can only be complete if it involves the entire body in a process of change.

This was the background which led to the development of the PROF-XXI framework, described in detail in the following section. At the core of its design, two basic references were used, which represent the holistic and organic nature of the PROF-XXI TLC model: the European Framework for Digitally Competent Educational Organization (DigCompOrg: https://ec.europa.eu/jrc/en/digcomporg (accessed on 21 December 2021)) and the European Digital Competence Framework for Educators (DigCompEdu: https://publications.jrc.ec.europa.eu/repository/handle/JRC107466 (accessed on 21 December 2021)). In fact, the PROF-XXI framework was designed having in mind the critical interdependence that should be established between the institutional vision, strategy, and policies; infrastructure, processes, and organization; faculty, educational practices, teacher, and learner support; and, finally, quality and evaluation. These four basic pillars of higher education institution operation informed the five dimensions of the PROF-XXI TLC competencies framework (first published in [29]).

3. The PROF-XXI Framework

The change of teaching and learning practices as the metamorphosis metaphor suggests a dynamic process with different stages that could have different paces. A TLC should not only be able to address each of the different changes and paces but also be organized as a complex, multilayered, and multipurpose unit. Therefore, the PROF-XXI competencies have been structured according to five levels, each representing a TLC type of activity and stage of development. Specifically, the PROF-XXI framework proposes a set of competencies that institutions can take as a reference to develop the actions and strategies of their TLCs into these five levels and five dimensions that interrelate to define a total of 50 competencies (see Figure 1). Levels are from 1 to 5, where 1 means the lowest level of competence and 5 means the highest. See a complete definition of each level and dimensions in Appendix B.

While Level 1 "Development" defines the basic competencies that any TLC should have to start its innovation in teaching and learning, Level 5 "Public Accountability of Impacts for Continuous Improvement" refers to those competencies needed to monitor the actions carried by the TLCs to assess their impact and assure transparency. In the middle, there are Level 2 "Innovation", Level 3 "Value Generation", and Level 4 "New Challenges and Opportunities". The "Innovation" level refers to those competencies able to generate and promote educational innovation at the institution. The "Value Generation" level makes explicit those competencies that will enable the institution to add value to its teaching and learning practices, generating changes that affect its culture. The "New Challenges and Opportunities" level refers to those competencies that institutions need to identify new horizons on teaching practice and quality learning scenarios, enabling the identification of indicators and metrics for evaluating these innovations.

LEVEL OF COMPETENCE	OBJECTIVE	DIMENSIONS (A–E) AND COMPETENCES (1–5)				
		A. Teacher support	**B. Student support**	**C. Leadership, Culture and Transformation**	**D. Technology for Learning**	**E. Evidence-based practices**
1	**Development**	A1. Identify innovative good practices with high impact considering the institutional educational project and local, national, and international trends and good practices. A2. Design a model and/or actions for teacher training and counselling based on good practices and the characteristics of the disciplines. A3. Initially implement actions designed considering different scenarios and contexts.	B1. Diagnose student characteristics and needs to enhance teaching and learning processes. B2. Develop actions to support students considering the diagnosis, the educational project, and the characteristics of the disciplines. B3. Implement actions or initiatives, considering emerging situations, and adjustments for continuous improvement.	C1. Identify stakeholders, considering characteristics, socio-cultural scenarios, leadership, and cultural particularities within the institution. C2. Analyse previous experiences within the institution, linked to organizational cultural changes, identifying strengths, weaknesses, and challenges. C3. Conceive a plan for the TLC adapted to the University's strategy, considering international reference models and good practices.	D1. Systematise prior learning in digital education and TEL, implemented within the institution. D2. Design a pedagogical model for quality digital education and TEL, D3. Implement digital education and TEL actions, in an initial way, considering the contexts and available resources.	E1. Identify available evidence and good practice in relation to teaching and learning at higher education level and disseminate these findings within the education community. E2. Collect initial results and effects on the actions taken, considering feedback from stakeholders and external non-participating peers.
2	**Innovation**	A4. Set up benchmarking and innovative experiences. A5. Promote innovation processes among teachers that have an impact on learning. A6. Encourage the coverage of teachers who implement innovations.	B4. Promote meaningful practices and tools for learning among students in the various disciplines. B5. Foster the articulation of teaching innovation with the effective learning experience of students.	C4. Promote groups of innovative teachers and support their transformational dynamics. C5. Generate collaboration and work networks among the various members of the university community.	D4. To train the various actors of the university community for the development of innovative practices with the use of digital technology. D5. To observe new TEL trends at international level.	E3. Use available evidence on teaching and learning. E4. Promote peer exchange related to innovative practices in teaching and learning.
3	**Value Generation**	A7. Disseminate innovative internal models and experiences of excellence for teaching practices. A8. Generate changes in teaching practices and their effects on the student experience.	B6. Contribute to increasing the quality of learning. B7. To bring about positive effects on the student experience	C6. Actively participate in the generation of an institutional culture of sustainable transformation and quality. C7. Position the unit as relevant within the educational process.	D6. Encourage the increased implementation of TEL in everyday learning. D7. Model TEL best practices among the educational community.	E5. Generate evidence on results, outcomes, and impacts. E6. Share the evidence collected among the different levels and actors of the organization.
4	**New Challenges and Opportunities**	A9. To visualize new horizons on teaching practice, capable of fostering transformative pedagogical practices.	B8. Visualize new challenges and scenarios in student learning as lifelong practice. B9. Ensure the overall increase of student learning outcomes.	C8. Define metrics and indicators to evaluate the impact of pedagogical innovation. C9. Contribute to the process of transforming the University into a learning and innovative organization,	D8. Sustainable involvement of the teaching staff in TEL pedagogical practices	E7. Systematise the new challenges arising from the work, the available evidence, and the good practices in actions for the institutional strategy.
5	**Public accountability of impacts for continuous improvement**	A10. Ensure tools to monitor and report on the quality of innovative teaching practices. A11. Support institutional decision-making based on challenges and good practices.	B10. Implement evaluation surveys on the university and student learning experience. B11. Support institutional decision-making based on the student experience.	C10. Evaluate the transformative impact of innovative teaching practices. C11. Generate spaces for dialogue and meetings that foster co-responsibility for results, effects and impacts among the different actors in the educational community.	D9. Implement public reports that account for the effects of TEL on educational practice.	E8. Communicate scientifically in different formats and external academic communities, the processes implemented within the unit.

Figure 1. PROF-XXI Framework organizing the competencies of a TLC into five levels of competency and five dimensions. Extracted from [30].

The PROF-XXI framework also organizes the competencies into five dimensions that refer to the institutional aspects that are affected by the different competencies developed by the TLC. The "Teacher Support" (Dimension A) refers to the competencies related to the support of teachers, while the "Student Support" (Dimension B) refers to those related to students' support. The dimension "Leadership, Culture and Transformation" (Dimension C) is one of the most innovative added by this framework. It refers to the competencies needed for leading and promoting cultural transformations at the institution through the definition of new policies and actions that affect its current processes. The dimension "Technology for Learning" (Dimension D) refers to those competencies that an institution should have to manage educational initiatives supported by technology, including the definition of technological processes and infrastructures. Finally, the dimension "Evidence-based Practice" (Dimension E) refers to the competencies needed to be able to collect data and information for understanding the effect of the transformation conducted by the institution.

The PROF-XXI framework was defined to be used in three different ways, depending on the objective of the institution: (1) as a self-assessment tool to help institutions understand their overall competence level, (2) as a reference for strategic planning definition to identify the strategic aspects to develop, or (3) as an accreditation framework to certify the innovation competence level of their TLC. This paper will focus on evaluating how the PROF-XXI framework can be used as a self-assessment method.

4. Methods

4.1. Research Objective and Design

The main aim of this paper is to evaluate the PROF-XXI framework as a self-evaluation tool to help HEIs understand the competencies of their teaching and learning centers and identify the institutional changes regarding their teaching and learning innovation policies conducted during the COVID-19 pandemic. Two research questions guided the data collection process and analysis: (RQ1) How does the PROF-XXI framework help with analyzing the competence level of the teaching and learning centers at an institution from the managers, teaching and administrative staff perspectives? (RQ2) How does the PROF-XXI framework help with identifying the competencies of the TLC developed before and during the COVID-19 pandemic lockdown?

To address these research questions, we adopted a mixed method research approach. Mixed methods are used in research that involves collecting, analyzing, and interpreting both qualitative and quantitative data from a single study to understand a phenomenon in its context. This research approach has become popular since the 1960s in disciplines such as education [30], in which a unique paradigm of research (qualitative or quantitative) is not enough to understand a complex phenomenon. For our study, we chose a fully mixed sequential method approach with a dominance of the qualitative dimension [31] to complement quantitative and qualitative data collected from a large sample of participants with qualitative information from a small sample.

We organized the research design into two phases (see Figure 2). The first phase consisted of a two-hour workshop with participants from four Latin American universities. During the workshop, the organizers introduced the PROF-XXI framework and conducted two practical activities with the participants. In the first activity, the participants were asked to answer a questionnaire to evaluate the competencies of their institution regarding the different dimensions of the PROF-XXI framework. In the second activity, they were grouped in teams of five to eight people of the same institution to compare their perceptions of the different competencies, identify activities and/or initiatives existing at their institutions and classify them into the different dimensions of the framework.

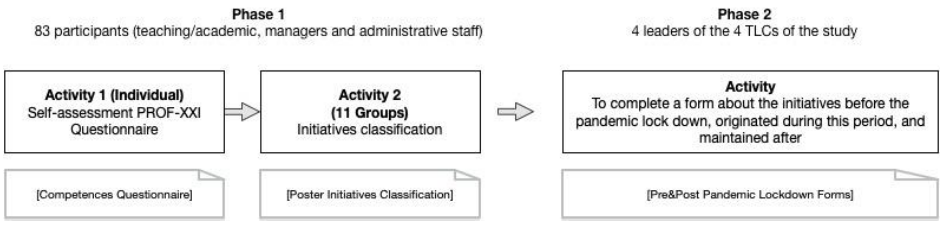

Figure 2. Phases of the different activities conducted for gathering all the data for the study.

The second phase occurred 2 months after the workshop and after three researchers analyzed the data from Phase 1 to extract general conclusions of the collected data so far. The researchers prepared a document to be completed by the main leaders of the Teaching and Learning Centers of each institution. In this document they had to indicate what kind of initiatives related to education and innovation existed at their institution before the pandemic and which of them were created specifically during the pandemic and maintained nowadays.

Further details about the data gathering techniques, instruments and original data can be found in the following sections and are accessible in the Supplementary Material.

4.2. Participants and Sample

Four universities participated in this study: two universities in Guatemala (U1 and U2) and two in Colombia (U3 and U4). These universities differ in size, type of administration (public or private) and year of foundation, which represent contrasting higher education systems (see Table A7 in Appendix F for more information about the universities). They all have TLCs in charge of supporting teachers' professional development. Eighty-three people from these four universities participated in the first phase of the evaluation. Table 1 shows the role of the different participants in each university. Only the leader of the TLC in each institution participated in the second phase of the evaluation (four people in total).

Table 1. Participants from the different universities in the different phases.

University	1st Phase of the Analysis				2nd Phase of the Analysis
	Administrative	**Manager**	**Teaching/Academics**	**Total**	**Teaching and Learning Center Leader**
U1 (Universidad de San Carlos de Guatemala)	11	6	9	**26**	**1**
U2 (Universidad de Galileo)	8	2	-	**10**	**1**
U3 (Universidad de San Buenaventura Cali)	5	5	13	**23**	**1**
U4 (Universidad del Cauca)	1	1	22	**24**	**1**
Total	**25**	**14**	**44**	**83**	**4**

4.3. Data Analysis

Different data were collected during the two different phases of the evaluation. Table 2 shows the different data sources and codes used to refer them, its nature (qualitative or quantitative), the links to the original files used for the data collection and the collected data. All the data are accessible publicly via the following link: https://osf.io/e742r/ (accessed on 21 December 2021). Three researchers participated in the different phases of the analysis for answering the different research questions addressed.

Table 2. Data gathering techniques and nature.

Code	Description	Nature of the Data Collected	Original Instrument
[Competencies Questionnaire]	Questionnaire including 50 questions in which the participants have to value from 1 to 4 each of the competencies in the PROF-XXI framework in their institution	Quantitative	[Phase1-Activity1-CompetenciesQuestionnaire-EN]: https://osf.io/zdw3e/ (accessed on 21 December 2021). [Phase1-Activity1-CompetenciesQuestionnaire-ES]: https://osf.io/ehr2t/ (accessed on 21 December 2021).

Table 2. *Cont.*

Code	Description	Nature of the Data Collected	Original Instrument
[Poster Initiatives Classification]	Collaborative digital poster created with Lucid.app for the participants to classify the different activities and initiatives conducted by their institution within the PROF-XXI framework competencies (See Appendix C). Participants had 20 min to add and discuss about the initiatives existing in their institution and associate them to a particular competence of the PROF-XXI framework.	Qualitative	[Phase1-Activity2-PosterInitiativeClassification]: https://osf.io/mfjtg/ (accessed on 21 December 2021). [ANNEX 1] For accessing the original poster used during the sessions and the main contributions.
[Pre & Post Pandemic Lockdown Forms]	For to be completed by the TLC leaders. It includes two sections: (1) a table for listing the initiatives carried out for the institution to encourage the transformation and innovation for the teaching and learning processes, indicating whether they existed before the pandemic lockdown, whether they were maintained during the this period, whether they were originated with the pandemic lockdown, whether they are currently maintained in the institution; (2) a table for indicating, for each of the initiatives in the first table, to which dimension and competencies of the PROF-XXI framework they are associated. Only those responsible of the TLC of each institution completed this form.	Qualitative	[Phase2-PosCovidForm-EN]: https://osf.io/jxhc5/ (accessed on 21 December 2021). [Phase2-PosCovidForm-ES]: https://osf.io/2trk5/ (accessed on 21 December 2021). [Phase2-U1-PosCovidForm-ES]: https://osf.io/p6rk9/ (accessed on 21 December 2021). [Phase2-U2-PosCovidForm-ES]: https://osf.io/5rac3/ (accessed on 21 December 2021). [Phase2-U3-PosCovidForm-ES]: https://osf.io/g45ty/ (accessed on 21 December 2021). [Phase2-U4-PosCovidForm-ES]: https://osf.io/s684y/ (accessed on 21 December 2021).

To address RQ1 about how the PROF-XXI framework helps managers, teaching and administrative staff with analyzing the competence level of the teaching and learning centers at their institution, data collected during the first phase from both the [Competencies Questionnaire] and [Poster Initiatives Classification] were analyzed. Firstly, one researcher analyzed the data from the questionnaire using Excel for calculating the average value given to each competence in the model per university (Administrative staff, Manager Staff and Teacher Staff) (Table A3 in Appendix D). Then, using these processed data, two researchers worked independently to extract a list of partial results about how institutions perceive their competence level (Table A4 in Appendix D). Secondly, two researchers analyzed the list of activities indicated by the participants in the [Poster Initiatives Classification] to understand what type of activities were associated with each of the competencies in the framework. Table A5 in Appendix D summarizes the partial results of this analysis, indicating some of the supporting data for each result. Finally, the quantitative results of the [Competencies Questionnaire] and the qualitative analysis of the [Poster Initiatives Classification] were triangulated to deepen our understanding of how the framework can help with analyzing the current competencies of a TLC. This process consisted of contrasting evidence obtained from the different stakeholders and from the different data sources. Three researchers participated in this process. Table 3 shows the main findings obtained from this process.

Table 3. Findings from RQ1. Cross-analysis of Tables A2 and A3 for extracting findings about RQ1.

Finding Code	Description	Partial Result Supporting the Finding
F1.1	All staff in all institutions perceive that the Competence "A. Teachers' support" is one of the most well-developed in their institution. They associated initiatives related to training the trainers (mostly for supporting the digital transition) and activities for teachers' professional development. However, we noticed that, from all the roles analyzed (Administrative, Managers and Teaching/Academics staff), the managers were the ones giving the lowest values to this competence, while the Teaching/Academic staff in two universities (U1 and U4) evaluated them as the most well-developed.	[PR1.1] In all institutions, the Competence "A. Teachers' support" was valued as one of the most developed (Table A3 in Appendix D). [PR1.3] Participants from U2 and U4 evaluated the Competence "A. Teachers' support" as the most well-developed competence in the institution, and the Competence "E. Evidence-based practices" as the least developed (Table A3 in Appendix D). [PR1.4] In all institutions, the "Manager Staff" evaluates the Competence "A. Teachers' support" with the lowest values, together with the "Teaching Staff" from U3. However, "Teaching/Academic Staff" from U1 and U4 evaluated it as the most well-developed. (Table A3 in Appendix D) [PR2.1] To the Competence "A. Teachers' support", institutions associated initiatives for training the teachers. The types of trainings vary in frequency and format depending on the institution, including courses, workshops, seminars, and diplomas (a set of courses with several ECTS credits). Most of trainings focus on learning about digital tools. Participants also associate with these competences related to teaching recognition, teaching evaluation and the share of good practices (Table A4 in Appendix D).
F1.2	All staff in all institutions perceive that the Competence "B. Students' support" is one of the least developed. Participants associated initiatives such as online courses, video-tutorials as well as academic support or on the Learning Management Systems employed by the university. Participants also recognize that, in some cases, the Competence "Students' Support" is a bit poor.	Results in Table A3 in Appendix D. [PR2.2] To the Competence "B. Students' support" participants associated initiatives such as online courses, video-tutorials as well as academic support or on the Learning Management Systems employed by the university. Participants also recognize that, in some cases, the Competence "Students' Support" is a bit poor (Table A4 in Appendix D).
F1.3	Despite the Competence "C. Leadership, Culture and Transformation" was not perceived as one of the most well-developed competencies; participants were able to associate some institutional activities, mainly related with the development of the "sense of belonging" to the institution, self-assessment activities, cross-institutional initiatives, and digital transformation.	Results in Table A3 in Appendix D. [PR2.3] To the Competence "C. Leadership, Culture and Transformation" participants associated activities such as (1) programs for developing the sense of belonging to the institution and its culture; (2) instances for self-evaluation, and instances for interacting with other institutions through research international programs. They also mentioned activities addressed to teaching/academics and administration staff related to the digital transformation of institutional processes (Table A5 in Appendix D).
F1.4	Participants evaluated the Competence "D. Technology for Learning" as one of the most well-developed competencies and associated activities mainly related to training initiatives in the use of institutional platforms. Most of these initiatives were addressed to the teachers/academic staff, which indicates that these initiatives are closely related with Competence "A. Teachers' support".	Results in Table A3 in Appendix D. [PR2.4] To the Competence "D. Technology for Learning" participants associated initiatives such as training in the use of technological platforms (i.e., Moodle, Google Classroom) and tools (i.e., Google Suit) through online material, tutorials and courses (Table A5 in Appendix D).

Table 3. *Cont.*

Finding Code	Description	Partial Result Supporting the Finding
F1.5	The Competence "E. Evidence-based Practice" was perceived by all participants as the least developed competence in the institution. Participants associated to this competence initiatives related to the use of institutional data (Learning Analytics) for monitoring students' and teachers' progress and performance as well as activities related to the continuous improvement of the curriculum and benchmarking for studying initiatives in other institutions.	[PR1.2] All institutions, evaluated the Competence E "Evidence-based Practices" as the least developed. [PR2.5] To the competence "E. Evidence-based Practices", participants associated initiatives related to the use of institutional data. The refer to initiatives for monitoring teachers and students' performance. They also associated activities and initiatives related to the continuous curriculum improvement and benchmarking initiatives looking for other institutions practices as a reference.
F1.6	The use of the model as a self-assessment mechanism also shows that we can distinguish between those institutions with the highest and lowest competencies. In this case study, U2 was one of the institutions with the highest competencies, which is one of the institutions with more experience in the digital transformation of their teaching and learning processes.	[PR1.5] Institution U2 has reported the highest values in terms of competence dimensions and compared to the other institutions.

To address RQ2 about how the PROF-XXI framework helps with identifying the TLC competencies evolution before and during the pandemic lockdown, we analyzed the [Pre&Post-COVID Form] completed per the leader of the TLC at each institution. One of the implicated researchers organized in a table the different initiatives aligned with the competencies of the PROF-XXI framework and indicated whether the initiatives were created before or during the pandemic and if they have been still carried out by the institution (see Tables A3 and A4 in Appendix D). Table 4, together with a qualitative analysis of the initiatives described, was then generated by the three researchers to extract a consensual list of findings that explains the evolution of the initiatives in the different institutions before and during the pandemic lockdown.

Table 4. Findings from RQ2. Findings for RQ2 obtained from the analysis of [Pre&Post Pandemic Lockdown Forms]. The supporting data of these findings are in Tables A5 and A6 of Appendix E. Column period indicates the period (before, during or after the pandemic lockdown) referred in the findings.

Period	Finding Code	Description
Before the lockdown	F2.1	Before the pandemic, most of the institutions counted with long training programs for teachers (diplomas of several weeks, for example). These programs were designed for training the teachers in different areas (digital tools, pedagogical support, etc.) and are still maintained after the pandemic lockdown. However, any institution create new training programs of this type during the pandemic lockdown. Only short training programs, such as workshops for showing specific tools or training teaching methodologies, were created during this period. All these initiatives are related to Competencies A ("Teachers' Support") and D ("Technology for Learning") of the PROF-XXI framework.
	F2.2	Before the pandemic lockdown, the least developed competence from the PROF-XXI framework was the Competence "B. Students' Support" (5 initiatives out of the 16 existing initiatives before the pandemic lockdown), but the initiatives related to this competence augmented during the pandemic lockdown (8 out of the 15 originated during this period). The most well-developed were "A. Teachers' support" (12 out of 16) and "D. Technology for Learning".

Table 4. *Cont.*

Period	Finding Code	Description
During the lockdown	F2.3	During the pandemic lockdown, institutions invested most of their efforts in developing the Competencies "A. Teachers' support" (10 out of 15 initiatives were related to this competence) and "D. Technology for Learning" (12 out of 15 initiatives were related to this competence); investment in Competencies "E. Evidence-based Practices" decreased (from 6 initiatives related to this competence before the lockdown, only 3 were reported associated with this competence during this period).
	F2.4	The initiatives created by the TLC before the pandemic lockdown were related with the Competencies "A. Teachers' Support" (12 of the 16 initiatives existing in this period for all universities) and "D. Technology for Learning" (13 of the 16 in total of this period for all universities). Whereas, during the pandemic lockdown, initiatives related to "B. Students' Support" doubled (5 out of 16 before the lockdown and 6 out of 15 originated during this period).
	F2.5	During the pandemic, all institutions created courses and materials (such as guidelines or video tutorials) for teachers and administrative staff that they facilitated through their online institutional systems. Some of the universities organized these materials in the form of online programs (i.e., U2). All universities related these initiatives to the competencies "A. Teachers' Support", "B. Students' Support", and "D. Technology for Learning". Only U3 related the initiative created during the pandemic to all competencies of the framework.
	F2.6	During the pandemic, U1 and U2 initiated activities for supporting teachers in the use of digital tools. Examples of these activities are coaching for teachers, personalized support, etc. These institutions explicitly mentioned that they created these initiatives for promoting innovating in online assessment practices. For example, they installed Proctoring tools for facilitating online assessment. U2 related some of these initiatives to the Competence "C. Culture and Transformation". U1 also associated some of these initiatives with the Competencies "A. Teachers' Support" and "D. Technology for Learning" of the PROF-XXI framework.
Maintained after the lockdown	F2.7	Three out of the four universities (except U3) maintain the activities that were originated for facing the pandemic lockdown. In U4, two of these initiatives are still under study to see if they are maintained or not.
	F2.8	After the pandemic lockdown, U1, U2, U4 reported they started to use the institutional platforms (i.e., VLE, Simulators, videoconferencing, etc.) in a more systematic way. These initiatives were usually related to the Competencies "D. Technology for Learning", and to Competencies "A. Teachers' Support" and "B. Students' Support" for U2.
	F2.9	After the pandemic lockdown, the number of initiatives of the TLC increased (from 16 existing before the pandemic to 27 maintained today). Although the number of initiatives associated to the different competencies increased, the universities still relate the majority of their initiatives to competencies "A. Teachers' support" (15 out of the 27 initiatives are related to this competence) and "D. Technology for Learning" (18 out of the 27 initiatives are related to this competence), whereas Competencies "C. Leadership, Culture and Transformation" (9 out of 27) and "E. Evidence-based Practices" (9 out of 27) are still the least supported competencies.

5. Results and Discussion

This section presents the main findings of the study, after analyzing the different data sources. Section 5.1 presents the findings related to the research question RQ1 about how the PROF-XXI framework can be used for analyzing the competence level of the teaching and learning centers at the institution from the perspective of different teaching staff. Section 5.2 presents the findings related to the research question RQ2 about how the PROF-XXI framework helps with identifying the competencies developed by the TLCs before, during and after the pandemic lockdown.

5.1. The PROF-XXI Framework as a Tool for Analyzing Institutional Teaching and Learning Competencies Development

Six findings were obtained from analyzing the data gathered in the workshop with 83 participants (administrative, teaching/academics, and manager staff) from four different institutions (See Sections 3 and 4 in this paper). All findings suggest that the PROF-XXI framework is a good support for getting a holistic perspective of the competencies that the institution has put more effort in developing and those that are still under development. Table 4 summarizes all these findings and the analyzed data supporting them.

The first finding [F1.1] suggests that institutions invest significantly in developing "training the trainers" initiatives for developing the competencies of their teaching staff. Most of the initiatives consist of teaching programs that vary in time, frequency, and format (online, hybrid or traditional face-to-face) for training the teachers in particular competencies and promote the exchange of good practices. Therefore, the staff perceives that the competence "A. Teachers' support" is one of the most well-developed at an institutional level. However, we observe some differences depending on their role at the university. For example, the managers are the ones giving the lowest values at this competence, whereas in two universities (U1 and U4) they rated it as the most well-developed competence [PR1.4]. This suggests that certain initiatives have more impact on some institutional staff than on others. Another possible explanation relates to the fact that this competence does not limit itself to teacher training but refers also to pedagogical and technological advising to teachers.

While the competence "A. Teachers' support" is perceived as the most developed one, the competence "B. Students' support" is perceived as the least developed [F1.2]. This finding suggests institutions consider that having an impact on teachers' competencies will have a direct impact on students' performance. Recent literature indicates that these types of approaches can have, indeed, an effect on teaching practices that influence [11] students' perception of the learning experience [32]. However, as literature on distance education has demonstrated, learner support is paramount to cover the affective dimensions of the learning experience, along with the cognitive and systemic dimensions [14]. This explains why institutions perceive that the students' support is still neglected and should be reinforced. After the pandemic, some literature reported that students had difficulties in following the courses in online environments [32,33]. As a response, some of the universities in this study initiated certain activities for supporting students in these new scenarios, such as video lectures or manuals on the use of their Learning Management Systems.

The competence "C. Leadership, Culture and Transformation" was also perceived in three of the four universities analyzed (U1, U2 and U4) as one of the least developed competencies [F1.3]. The participants associated to this competence initiatives related with the development of the sense of belonging, with mechanisms for self-evaluating the institution, or with activities including exchanges with other institutions as a benchmarking effort for identifying good practices. We observed, however, that the participants associated a smaller number of initiatives with this competence compared to others, suggesting that the institutions are developing some of the aspects related to this competence indirectly through other initiatives targeting other objectives. Nevertheless, this possibility indicates that leadership in their institutions is not implementing holistic, strategically driven integrated approaches as is recommended by the literature and best practices.

The participants from the different institutions evaluated the competence "D. Technology for Learning" as one of the most well-developed ones [F1.4]. Most of the institutions associated with this competence, with training programs targeting especially teachers for the development of digital skills. Although some of these courses were designed as tutorials for learning about a particular tool, many institutions reported initiatives focused on training teachers to operate in their virtual learning environments (VLEs). This suggests that institutions already have some digital strategy including the use of a VLE and other digital support, but they still need courses for promoting its usage among the teaching/academic staff. Since the engagement of teaching/academic staff with technology has been a recur-

rent problem in higher education [33], institutions have focused on providing support to face the resistance to change. However, prior studies suggest that teachers respond better to change when "their beliefs and practices are integrated, negotiated and reconciled with the demands of a changed context" [34]. The pandemic lockdown completely changed the context and, consequently, the teachers' demand increased, making institutions react urgently with new initiatives that could have their effect beyond the pandemic lockdown.

Regarding the competence "E. Evidence-based practice", the associated data suggest that participants perceived this competence as one of the least developed [F1.5]. The participants did not report many initiatives for this competence, but they associated initiatives mainly related to the use of educational data such as, for example, monitoring students' performance and teachers' progress. Some of them talked about Learning Analytics initiatives for promoting continuous curriculum improvement. In some cases, the participants referred to initiatives of benchmarking as a mechanism of self-evaluation and a way for looking for new practices. This finding suggests that, although this is one of the least developed competence, institutions are starting to see in educational data a good potential for supporting decision making processes [35,36]. The capacity to collect data and evidence should be complemented though with a much tighter connection between reflective teaching practice, educational research and innovation.

Finally, data supporting finding [F1.6] suggest that the PROF-XXI framework is a good support for identifying the overall competence level of teaching and learning practices in an institution and comparing it with others in a benchmarking exercise. For example, in this study, we identified institution U2 as the most well-developed and as a potential leader in the region compared to others. In fact, U2 is one of the institutions which has a larger experience and a higher level of maturity in the use of technology for digital learning and in initiatives for promoting teaching and learning innovation.

5.2. The PROF-XXI Framework as a Tool for Analyzing and Understanding the Evolution of TLCs Strategy

Eight findings were obtained from analyzing the data from the four leaders of the TLCs of the universities participating in this study. The findings obtained from this analysis show how the PROF-XXI framework can be used to understand the evolution of the TLCs competencies. Table 4 summarizes all these findings and the analyzed data supporting them.

First, findings suggest that (1) institutions should benefit from the course and initiatives created during the pandemic for updating and re-adapting their institutional plans for training the teachers to include training in those competencies required during the lockdown; (2) these courses should be complemented with learning capsules delivered in flexible formats (such as small learning capsules or online courses) to facilitate their adaptation and consumption. Findings F2.1 and F2.2 indicate that, even if institutions already put lots of effort in developing teachers' competencies related to "A. Teachers Support" and "D. Technology for Learning" before the pandemic (especially in digital learning and quality), these competencies were not enough to face the lockdown challenges. Consequently, and as indicated by F2.3 and F2.5, institutions reinforced these two competencies during the lockdown through manuals and online courses for training teachers in particular tools. Moreover, F2.6 indicates that some institutions also implemented during this period tools such as proctoring tools for supporting new practices that they expect to maintain after this lockdown period (F2.7, F2.8 and F2.9).

These findings align with current literature, which emphasizes the importance of looking for models to adapt teachers' training to their personal needs [11] as the only way to promote actual changes in the institutions' culture and practices. Moreover, a recent publication shows that short online pedagogical training for university teachers has an effect on their interpretation of teaching–learning practices [33], suggesting that these types of courses could facilitate training teachers at scale in an effective manner. In addition, some authors show that the resources generated during this period can also be a mechanism

to transform formal education [37]. That is, institutions have now the opportunity of benefiting from the resources developed during the pandemic lockdown to expand their training offer and effectively transform their traditional practices.

Second, findings show the importance of introducing, as part of the institutional strategy, initiatives dedicated to support students in the transition to digital education, especially in the digital competencies needed to succeed in online and hybrid practices. F2.3 indicates that initiatives related to "B. Students' Support" were one of the most neglected competencies before the pandemic, but that institutions doubled the number of initiatives related to this competence during the lockdown (F2.4). Moreover, F2.5 shows that some of the material produced during the pandemic for supporting teachers was also associated with students' support competence, suggesting that this material had a double purpose, to support both teachers and students.

Recent literature on the impact of the pandemic lockdown on students provides evidence that students faced various problems during this period [28,38]. Some of these problems were (1) the lack of in-home infrastructure for following online courses, especially in countries with higher socio-economical inequalities, and (2) an unfavorable study environment [32]. However, data collected after this first lockdown period show that students adapted well to the new forms of teaching and learning [32], but that institutions should still provide support for assuring the psychological well-being of students in these circumstances [32].

6. Conclusions and Implications

This paper presents the result of evaluating the PROF-XII framework as a tool for analyzing the institutional teaching and learning competencies development, as well as the evolution of the TLC strategy. The PROF-XXI framework advances the existing frameworks for supporting HEIs in their development for facing the challenges of the 21st century by providing a holistic vision of the competencies that institutions should support and develop. For the first time, a model integrates the critical interdependence between the institutional vision, strategy, and policies, on the one hand; infrastructure, processes, and organization, on the other; as well as faculty, educational practices, teacher and learner support; and, finally, quality and evaluation.

The evaluation was conducted with 83 participants from four Latin American universities (including managers, administrative and teaching/academic staff) and the four leaders of the TLCs of these institutions. The mixed-methods analysis of the collected data shows that the framework can be used as a self-assessment method for analyzing the actual development of the teaching innovation competencies at the institution through the perspective of the different stakeholders. In addition, the model was shown useful as a reference for classifying the different initiatives conducted by the TLCs and analyzing how they evolved across time, according to the emerging contextual needs. The results of this analysis indicate that the four analyzed institutions had already installed initiatives to train the teachers in digital skills and quality pedagogical practices before the pandemic, which were reinforced with short courses and learning capsules during the pandemic lockdown. These courses were created for both teachers and students since the competencies related to the support of these last ones were a bit neglected before this emergency period.

The presented work has several implications at different levels. At a theoretical level, this paper contributes with a new framework that discusses the competencies that TLCs should consider for adapting to the new societal needs and become the core of the sustainable innovative digital development at the institution. This framework proposes a holistic perspective of all the elements to be considered, which is aligned with recent policy models proposed for facing the emergency changes derived from the COVID-19 pandemic [6]. Moreover, as suggested by Alam et al. (2021) [39], HEIs are used to prioritize market-oriented outcomes, but nowadays more and more universities are focusing on promoting sustainability in their operations as well. The PROF-XXI framework offers a starting point

to discuss about how operations related with teaching and learning innovation can become a daily practice in the long term.

At a practical level, the PROF-XXI framework can be used as a self-assessment tool to identify what the level of competency of a particular institution is and develop a strategy accordingly. This idea of self-effacement tool is in line with what is currently proposed by the UE platform "Digital Skills & Job Platform" [40], which proposes a test for teachers to self-evaluate their teaching digital skills. Similar solutions for evaluating what the level of competency of the institution is in terms of teaching and learning innovation could be offered using the PROF-XXI framework as a basis.

7. Limitations and Future Work

This is the first study that evaluates the use of the PROF-XXI framework as a reference tool for supporting the development of competencies in HEIs. Since this evaluation was conducted with four Latin American institutions, the main conclusions are limited to this sample. Although we included a sample of universities from two different countries and of different nature in terms of size and management, more studies with other universities could help extract further conclusions about the framework. These studies should also include students as part of the stakeholders' analysis, since recent students show that they play a key role when conducting institutional transformations [39]. In addition, we did not analyze weather the use of this framework will produce changes in the policies in the long term. This is another interesting aspect to explore in future studies.

Future work should include analysis of other institutions. To facilitate a large-scale evaluation of the framework with other institutions, we are currently working on a web-based dashboard to visualize data of the PROF-XXI framework. This tool will facilitate the distribution of the questionnaire about the competencies employed in this study among all the educational stakeholders, including students, and compare their perception about their innovation in teaching and learning competencies. We expect that both the framework and the results of this study could help HEIs in Latin America and beyond to understand how to improve their training programs and advance on those competencies that need to be addressed for anticipating the post-COVID-19 pandemic era in a sustainable way.

Supplementary Materials: Supplementary material could be found in https://osf.io/e742r/.

Author Contributions: M.P.-S. coordinated the preparation of this paper, designed the evaluation process, collected the data, leaded the data analysis, conducted the cross-analysis and leaded the writing process of the whole paper; I.K. participated in the data collection and analysis and contributed to the writing process about the teaching and learning centers models and Table A1; F.M. participated in the data analysis; A.T. and M.d.C.T.P. participated in the conception of the PROF-XXI framework and wrote all the section about the teaching and learning models history and evolution; J.B. supervised the evaluation design and reviewed the different versions of the paper; C.A.-H., Ó.J. and C.D.K., participated in the conception and funds of the project PROF-XXI, reviewed the different versions of the paper and contributed the introductory section; B.G. participated in getting the funds for writing this paper; M.M., M.S., L.M.O.-C. and A.H.G.L., participated in the data collection by recruiting the participants of the evaluation process and completed Table A7. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement: All data-gathering instruments and original data can be accessed here: https://osf.io/e742r/ (accessed on 21 December 2021).

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A.

Table A1. Analysis of the different models for supporting competencies of Teaching and Learning Centers (TCLs) most referred in the literature.

Framework/Model	Description
Teachers' Focus	
European Framework for the Digital Competence of Educators (DigCompEdu)	DigCompEdu was published in late 2017 by the Joint Research Centre of the European Union (JRC) (Redecker & Punie, 2017). Its main objective is to align the European educational policies with such a reference framework. DigCompEdu is a digital competence model with six differentiated competence areas: Professional engagement, Digital resources, Teaching and Learning, Assessment, Empowering learners, and Facilitating learners' digital competence. Each area has a series of competencies that "teachers must have in order to promote effective, inclusive and innovative learning strategies, using digital tools" (Redecker y Punie, 2017, p. 4).
UNESCO ICT Competence Framework for Teachers (ICT-CFT)	This framework, developed by UNESCO, presents "a wide range of competencies that teachers need in order to integrate ICT in their professional practice" (Butcher, 2019, p. 2). It fosters practical knowledge of the advantages that ICT provides in education systems. Moreover, it suggests that teachers, apart from acquiring competencies related to ICT, must be able to use these to help their students to become collaborative, creative, innovative, committed, and decisive citizens (Rodríguez et al., 2018). This framework presents six fundamental areas or aspects of the professional teaching practice: Understanding ICT in the educational policies, Curriculum and evaluation, Pedagogy, Application of digital abilities, Organization and administration, and Professional learning.
Common Spanish Framework of Digital Competence for Teachers of the "Spanish Institute of Educational Technology and Teacher Training	The Spanish Ministry of Education, Culture and Sport launched a project in 2012 to define the Common Framework of Digital Competence for Teachers, updated four times (Instituto Nacional de Tecnologías Educativas y Formación del Profesorado, INTEF, 2017a, 2017b). It is based on the DigComp Framework of Digital Competence for Citizens (Carretero, Vuorikari, & Punie, 2017; Vuorikari, Punie, Carretero, & Van-Den-Brande, 2016). It is a generic digital competence model for educators. The competence areas (5) and competencies (21) are those of the DigComp framework.
British Framework of Digital Teaching	The British Framework of Digital Teaching was created by the Education and Teaching Foundation (ETF) in association with the JISC company (Education and Training Foundation, 2019). Its main objective is to increase the understanding of teachers in the use of digital technologies to enrich their teaching practices and improve their professional development (Pérez-Escoda et al., 2019). This framework consists of seven key areas, with three levels for each of them: exploration, adaptation, and leadership. The seven elements are Pedagogical Planning, Pedagogical Approach, Employability of the Students, Specific Teaching, Evaluation, Accessibility and Inclusion, and Self-development.
ICT Competencies and Standards for the Teaching profession of the Chilean Ministry of Education	The Education and Technology Centre of the Chilean Ministry of Education published this framework in the year 2011, as an updated version of a previous framework published in 2006 (Elliot, Gorichon, Irigoin, & Maurizi, 2011). It presents five dimensions aligned with the UNESCO Framework of ICT Competencies for Teachers (Butcher, 2019). All five dimensions work through descriptors, criteria and competencies. Moreover, each standard allows teachers to recognize how to use and integrate ICTs, identify their training needs, and define personalized training itineraries (Ríos, Gómez, & Rojas, 2018).

Table A1. *Cont.*

Framework/Model	Description
Teachers' Focus	
Framework of Implementing Collaborative Learning in the Classroom (ICLC)	The ICLC framework is based on the metacognitive framework of teacher practice by Artzt and Armour-Thomas (1998) that describes teaching in analogy to the cognitive process of solving a problem in three phases: a pre-active phase, an inter-active phase, and a post-active phase (cf. Jackson 1968). While the framework focuses on the teacher level, the student level is also presented in the framework, as the teacher's goal is to ensure a high quality of student interaction, on which the effectiveness of collaborative learning depends (Dillenbourg et al., 1996; Kobbe et al., 2007; Webb, 1989). The ICLC framework distinguishes between five teacher competencies that span across all implementation phases of collaborative learning: the ability to plan student interaction, monitor, support, and consolidate this interaction, and finally reflect upon it.
Students' Focus	
Framework of the "International Society for Technology in Education" (ISTE) for teachers	The International Society for Technology in Education develops this competence framework focusing on the needs of the students of the 21st century (Crompton, 2017). Its main objective is to delve into the teaching practice, promote student collaboration, rethink the traditional approaches, and boost autonomous learning (Crompton, 2017; ISTE, 2018; Pérez-Escoda, García-Ruiz, & Aguaded, 2019). The general teacher profile is characterized by being active and innovative in the teaching–learning process (Gutiérrez-Castillo, Cabero, Almenara, & Estrada-Vidal, 2017). Thus, the ISTE standards for teachers are divided into seven roles or profiles that an educator must develop along his/her professional career. Framework with seven differentiated competence areas: Learners, Leaders, Citizens, Collaborators, Designers, Facilitators, and Analysts.
Managers' Focus	
ICT Competencies for Teachers' Professional Development of Colombian Ministry of Education	The model proposed by the Colombian Ministry of Education aims to guide the professional development of teachers to improve educational innovation with ICT (Fernanda, Saavedra, Pilar, Barrios, & Zea, 2013). It is targeted at both designers of training programs and teachers interested in generating ICT-enriched environments: relevant, practical, established, collaborative and inspiring (Hernández-Suárez, 2016). This framework has five competencies that teachers must develop: Technological, Communicative, Pedagogical, Management, and Research.
Framework for the Center for Teaching Development and Innovation (Centro de Desarrollo e Innovación de La Docencia (CeDID) at the Universidad Católica de Temuco (UCT))	A framework for the evaluation of educational development programs in Chile. This framework was designed to support the diverse needs of different stakeholders: (1) faculty to make judgments about their teaching in their school and disciplinary context; (2) the learning center to evidence the impact of their educational development programs; (3) the university to inform its attainment of its planned strategic goals; and finally (4) the ministry on the effectiveness and impact of the programs that it has funded. The CeDID Evaluation Framework drew on Guskey's five-level model, which identifies where educational development programs can demonstrate impact (Chalmers & Gardiner, 2015). These are (1) Teachers' reaction to the development program; (2) Conceptual changes in teachers' thinking; (3) Behavioral changes in the way teachers use the knowledge, skills and techniques learners; (4) Changes in organizational culture, practices, and support; and (5) Changes in student learning, engagement, perception, study approaches.

Appendix B.

Document facilitated to the participants of the workshop for explaining the details of the PROF-XXI Framework.

Appendix B.1. Introduction

This document presents a first version of the PROF-XXI competency framework, a framework created to guide higher education institutions in the design and implementation of Teaching and Learning Centers for the 21st century.

This document presents only a first version of the framework to be revised and improved in two phases: (1) a first revision by the Latin American partners belonging to the project from activities linked to the project such as training workshops; (2) a second revision including assessments and comments from external project staff.

Appendix B.2. Context

The PROF-XXI framework is proposed to guide higher education institutions (HEIs) in the design and implementation of Teaching and Learning Centers (TLCs) for the 21st century. As framework reference, we mainly take the DigCompEdu [1], a conceptual framework defined by the European Union to support educational institutions or companies in the sector in thinking towards the systematic integration of technology-supported learning. The objectives of the DigCompEdu framework are (i) to encourage self-reflection and self-evaluation within educational organizations to support them in their commitment to digital learning and pedagogies; (ii) to enable policy makers (at local, regional, national, and international levels) to design, implement and evaluate programs, projects and policy interventions for the integration of digital learning technologies in education and training systems. Concretely, this framework proposes 7 distinct elements and 15 sub-elements that are common to all education sectors as well as 74 descriptors that help institutions to reflect on the key elements towards this integration of technology-supported learning.

Like the DigCompEdu framework, the PROF-XXI framework is aimed at leaders and managers of higher education institutions who need to design an institutional strategy for innovation in education and the use of technologies. However, unlike other frameworks, the PROF-XXI framework proposes a set of competencies that institutions can take as a reference to develop the actions and strategies of their teaching and learning centers. This strategy will have a direct impact on their teaching and learning staff and students and will support the deep transformation of the institutional strategy.

Appendix B.3. The PROF-XXI Framework

To guide higher education institutions (HEIs) in the design and implementation of Teaching and Learning Centers (TLCs) for the 21st century, the PROF-XXI framework proposes a set of competencies that these centers should be able to acquire. These competencies are organized into five levels and five interrelated dimensions.

Appendix B.3.1. Levels of Competence of the TLCs

The 5 levels of TLCs competence are organized from lowest to highest from 1 to 5, where 1 means the lowest level of competence and 5 means the highest. In addition, and in order to facilitate the understanding of these levels, each level is associated with a strategic objective of the TLC within the institution:

- **Level 1 or "Development":** This is the first level of competencies and defines the basic competencies that any TLC should have to start its activities in the institution. Institutions at this level are able to identify innovative teaching practices, needs of their students and other stakeholders, and systematize prior learning about their activity in digital education.
- **Level 2 or "Innovation"**: This is the second level of competencies and defines the competencies that TLCs must have in order to be able to generate and promote educational innovation in their institution. Institutions at this level are capable of installing new educational experiences of references, promoting the use of technologies and the most innovative teachers, as well as generating opportunities for training and exchange of good practices among the different actors in the institution.
- **Level 3 or "Value generation**": This is the third level of competencies and defines the competencies that the TLCs must have in order to be able to generate value in their institutions, generating changes and promoting transformations that affect their culture. Institutions at this level are able to disseminate new models of training and excellence to promote change, increase the educational quality of the institution, contribute to the cultural transformation of the institution, promote the installation of good practices in the use of technology and generate evidence on new practices to support decision-making.
- **Level 4 or "New Challenges and Opportunities**": This is the fourth level of competencies and defines the competencies that TLCs should have to identify new institutional challenges related to innovation and teaching quality. Institutions at this level must be able to identify and visualize new horizons on teaching practice and quality learning scenarios that enhance student learning, define indicators and metrics that allow for the evaluation of educational innovations, involve the institution's stakeholders at various levels and systematize these challenges from the information collected into concrete actions for the institutional strategy.
- **Level 5 or "Public accountability of impacts for continuous improvement"**: This is the fifth and highest level of competencies and defines the competencies that TLCs must have to be able to ensure the monitoring and transparency of the actions carried out by the TLC in order to assess their impact and make this impact visible through both internal and public reporting and research on these actions.

Appendix B.3.2. Competence Dimensions of TLCs

Each competence level is further organized into five dimensions. These dimensions refer to the institutional aspects that are affected by the different competencies developed by the TLC. Each of the levels of competence defined above is related to each of these five dimensions through different competencies, between one and three competencies depending on the level and the dimension. See details of the competencies associated with each dimension in Annex 1 of this document:

1. **Dimension A or "Support for teaching"**: Dimension A refers to those competencies of the TLC that are related to supporting teaching processes. Actions related to these competencies will have a direct effect on teachers in the institution. This dimension defines three competencies for level 1 (A1–A3), three for level 2 (A4–A6), two for level 3 (A7 and A8), one for level 4 (A9) and two for level 5 (A10 and A11).
2. **La Dimension B or "Student support"**: Dimension B refers to the competencies of the TLC that are related to student support. Actions related to these competencies will have a direct effect on the students of the institution. This dimension defines three competencies for level 1 (B1-B3), two for level 2 (B4 and B5), two for level 3 (B6 and B7), two for level 4 (B8 and B9) and two for level 5 (B10 and B11).

3. **Dimension C or "Leadership, Culture and Transformation"**: Dimension C refers to TLC competencies that are related to leadership initiatives that promote a cultural transformation of the institution towards educational innovation. Actions related to these competencies will have a direct effect on the internal processes of the institution, both in its practices and policies. This dimension defines three competencies for level 1 (C1–C3), two for level 2 (C4 and C5), two for level 3 (C6 and C7), two for level 4 (C8 and C9) and two for level 5 (C10 and C11).
4. **Dimension D or "Technology at the service of learning"**: Dimension D refers to the competencies of the TLC that are related to technological educational initiatives, both in terms of practices and infrastructures (tools, services...). Actions related to these competencies will have a direct effect on the development of the institution's technological infrastructures as well as its educational models, conditioned by these infrastructures. This dimension defines three competencies for level 1 (D1–D3), two for level 2 (D4 and D5), two for level 3 (D6 and D7), one for level 4 (D8) and one for level 5 (D9).
5. **Dimension E or "Evidence-based practice"**: Dimension D refers to the competencies of the TLC that are related to initiatives that aim to collect data and information to understand the effect of the transformations and initiatives carried out in education. Actions related to these competencies will have a direct effect on the evaluation of the institutional initiatives carried out, and the TLC itself may affect decision-making in the definition of concrete policies and initiatives. This dimension defines two competencies for level 1 (E1 and E2), two for level 2 (E3 and E4), two for level 3 (E5 and E6), one for level 4 (E7) and one for level 5 (E8).

Each of these dimensions is related to one or more of the key dimensions defined in the DigCompEdu framework. Specifically, the dimensions A ("Support for Teaching") and B ("Student Support") are related to the dimensions "Teaching and Learning Practices", "Assessment of Practices" and "Content and Curriculum". Dimension C ("Leadership, Culture and Transformation") is related to the DigCompEdu dimension "Leadership and Governance", dimension D ("Technologies for Learning") to the dimension "Infrastructures" and dimension E ("Evidence-based Practice") to the dimensions "Professional Development" and "Collaboration and Networks".

Appendix B.4. Use of the PROF-XXI Framework

The PROF-XXI framework can be used in different ways depending on the objective of the institution. In this paper we propose the two main ways in which institutions can make use of the framework. It is important to recall that the framework is primarily intended for managers of the institution (from rectors and deans to management professionals), as well as for practitioners of the TLCs (professors or professionals who will participate in TLC activities).

Appendix B.4.1. The PROF-XXI Framework as a Reference and a Form of Internal Assessment

The PROF-XXI framework can be used as a reference framework that institutions can use to make an internal assessment of the level of competence of their institution's TLCs or learning and teaching services.

By providing a list of competencies, institutions can assess what level of competence they are at. To do so, institutions can use a questionnaire that assesses the level of competence of each of the competencies associated with the different dimensions. For each competence in the framework, this questionnaire asks the institution to select a competence level. In order to simplify the assessment, for each competence, the level of competence is assessed in four grades organized from lowest to highest:

Table A2. Grades for evaluating the competences of the PROF-XX framework.

Grade 1 (Minor)	Grade 2	Grade 3	Grade 4 (Major)
My institution/center does not have this competence	My institution/center is moderately prepared in this competence	My institution/center is moderately prepared in this competency	My institution/center is prepared in this competency

That is to say, for the competencies related to Dimension "A. Teacher support", institutions should select the degree of competence (from 1 to 4) for each of the competencies in that dimension (from A1 to A11).

The result of answering this questionnaire are several quantitative indicators (numerical values) that institutions can use in different ways to better understand where they stand in terms of competencies of their TLCs or education services.

1. LEVEL INDICATOR: This numerical value is calculated by adding up all the degrees of competence of the competencies associated to a level and dividing this value by the number of competencies in this level. For example, to calculate level 1, all the degrees of competence of the different dimensions of level 1 (A1 + A2 + A3 + B1 + B2 + B3 + C1 + C2 + C3 + D1 + D2 + D3 + E1 + E2)/11 will be added up.
2. DIMENSION INDICATOR. This numerical value is calculated by adding up all the degrees of competence of the competencies associated with a dimension and dividing it by the number of competencies in this dimension. For example, to calculate the value of dimension A, all the degrees of competence of the different dimensions of level 1 (A1 + A2 + ...+ A11)/12 will be added together.

Figure A1 shows the results of the indicators for an institution where the degree of competence was the highest for all competencies per dimension and level.

	Dimensión											
Nivel	A. Apoyo al profesorado	Indicar Grado Competencia	B. Apoyo al estudiante	Indicar Grado Competencia	C. Liderazgo, Cultura y Transformación	Indicar Grado Competencia	D. Tecnologías al servicio del aprendizaje	Indicar Grado Competencia	E. Prácticas Basadas en la Evidencia	Indicar Grado Competencia	INDICADOR DE NIVEL	
	A1	4	B1	4	C1	4	D1	4	E1	4		
	A2	4	B2	4	C2	4	D2	4	E2	4	4	Nivel1
1	A3	4	B3	4	C3	4	D3	4				
	A4	4	B4	4	C4	4	D4	4	E3	4		
	A5	4	B5	4	C5	4	D5	4	E4	4	4	Nivel 2
2	A5	4										
	A6	4	B6	4	C6	4	D6	4	E5	4	4	Nivel 3
3	A7	4	B7	4	C7	4	D7	4	E6	4		
	A8	4	B8	4	C8	4	D8	4	E7	4	4	Nivel 4
4	A9	4	B9	4	C9	4						
	A10	4	B10	4	C10	4	D9	4	E8	4	4	Nivel 5
5	A11	4	B11	4	C11	4						
INDICADOR DE DIMENSIÓN	A	4	B	4	C	4	C	4	E	4		

Figure A1. Picture of the calculation of indicators for an institution where all values of competencies, by level and dimension, is maximum (grade 4).

Appendix B.4.2. The PROF-XXI Framework as a Reference for Strategic Planning

In addition to being used as an internal evaluation framework, the PROF-XXI framework can also be used as a guide for the creation of an institutional strategy for the development of educational innovation and the use of educational technologies.

Managers, practitioners, or teachers involved in the teaching/learning institution or service can refer to the competencies set out in the framework as a tool for strategic planning and projection. Each competence or set of competencies can be "the target to be achieved". From there, the institution can work on the implementation of training workshops or activities and processes related to these competencies and plan the time for their implementation.

The use of the framework in this case should be accompanied by collaborative workshops with different actors in the institution in order to create a strategy that is as inclusive as possible.

Appendix C.

The following poster, created with Lucid app., was used by the participants to classify the different activities and initiatives conducted by their institution within the PROF-XXI framework. This is a snapshot of the original version of the poster in Spanish that was filled in. It included all the dimensions and levels of the framework.

The results of the poster session are accessible for visualization at the following link: https://lucid.app/lucidspark/a0bbe847-def3-445e-b663-9b72abc0722d/edit?viewport_loc=-2275%2C99%2C6790%2C3474%2C0_0&invitationId=inv_9d5f3086-a63a-4187-9aae-c8512252fe6d (accessed on 21 December 2021). All the data collected in the poster were organized in an Excel file accessible here: https://osf.io/mfjtg/ (accessed on 21 December 2021).

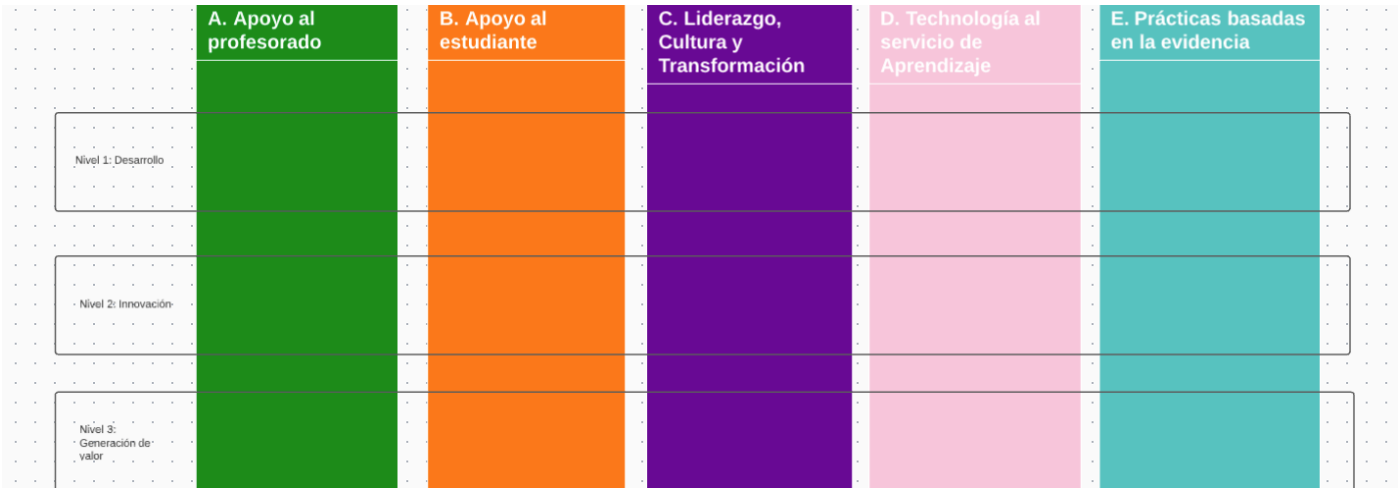

Figure A2. Poster used for the second activity of the first phase in the workshop with Administrators, Managers, and Teaching/Academic staff.

Appendix D.

Table A3. Data analysis of [Competencies Questionnaire]. We calculated the average value given for each competence dimension for the different stakeholders and per each institution. With **, we indicate the highest values for each competence per stakeholder in each institution. The values given by the participants are between 1 (minimum) and 4 (maximum).

Institution	Role in the University	Participants	Average of A. Teachers' Support	Average of B. Students' Support	Average of C. Leadership, Culture and Transformation	Average of D. Technology for Learning	Average of D. Evidence-Based Practice	Average per Competence per Role
U1 (U. San Carlos de Guatemala)	Administrative	11	2.51 (SD = 0.74)	2.44 (SD = 0.82)	2.58 (STD = 1)	2.61 (SD = 0.95)	2.63 (SD = 1.14) **	2.55
	Manager	6	2.45 (SD = 0.70)	2.45 (SD = 9.57)	2.55 (STD = 0.68) **	2.65 (SD = 0.38) **	2.58 (SD = 0.62)	2.54
	Teaching/Academic	9	2.69 (SD = 0.55) **	2.47 (SD = 0.75) **	2.55 (STD = 0.82)	2.52 (SD = 0.61)	2.22 (SD = 0.84)	2.11
	Total U1	**26**	**2.56 (SD = 0.65)**	**2.45 (SD = 0.72)**	**2.56 (STD = 0.84)**	**2.59 (SD = 0.72)**	**2.48 (SD = 0.93)**	**2.55**

Table A3. *Cont.*

Institution	Role in the University	Participants	Average of A. Teachers' Support	Average of B. Students' Support	Average of C. Leadership, Culture and Transformation	Average of D. Technology for Learning	Average of D. Evidence-Based Practice	Average per Competence per Role
U2 (U. Galileo)	Administrative	8	3.39 (SD = 0.57) **	3.13 (SD = 0.74) **	2.95 (SD = 0.85) **	3.25 (SD = 0.72) **	2.92 (SD = 1.05) **	3.13
	Manager	2	3.00 (SD = 0.64)	2.95 (SD = 0.71)	2.82 (SD = 0.64)	3.11 (SD = 0.47)	2.75 (SD = 0.71)	2.93
	Teaching/Academic	-	-	-	-	-	-	-
	Total U2	**10**	**3.32 (SD = 0.57)**	**3.09 (SD = 0.70)**	**2.93 (SD = 0.78)**	**3.22 (SD = 0.66)**	**2.89 (SD = 0.96)**	**3.09**
U3 (San Buenaventura)	Administrative	5	3.99 (SD = 0.65) **	2.93 (SD = 0.53) **	2.95 (SD = 0.82) **	2.76 (SD = 0.84)	2.85 (SD = 0.76)	2.41
	Manager	5	2.67 (SD = 0.88)	2.82 (SD = 0.71)	2.93 (SD = 0.64)	2.96 (SD = 0.58) **	2.88 (SD = 0.73) **	2.85
	Teaching/Academic	13	2.69 (SD = 0.46)	2.94 (SD = 0.56)	2.94 (SD = 0.42)	2.81 (SD = 0.58)	2.72 (SD = 0.67)	2.82
	Total U3	**23**	**2.75 (SD = 0.59)**	**2.91 (SD = 0.56)**	**2.94 (SD = 0.54)**	**2.83 (SD = 0.62)**	**2.78 (SD = 0.67)**	**2.84**
U4 (U. Cauca)	Administrative	1	3.00 **	2.45	3.36 **	3.22 **	3.13 **	3.03
	Manager	1	2.36	2.09	2.18	2.00	2.00	2.13
	Teaching/Academic	22	2.81 (SD = 0.67)	2.72 (SD = 0.72) **	2.57 (SD = 0.68)	2.52 (SD = 0.72)	2.32 (SD = 0.87)	2.59
	Total U4	**24**	**2.80 (SD = 0.67)**	**2.68 (SD = 0.70)**	**2.59 (SD = 0.67)**	**2.52 (SD = 0.71)**	**2.34 (SD = 0.85)**	**2.55**
	Total general	**83**	**2.77 (SD = 0.66) ** **	**2.72 (SD = 0.69)**	**2.72 (SD = 0.72)**	**2.71 (SD = 0.71)**	**2.57 (SD = 0.85)**	**-**

Table A4. Partial results analysis of the data collected through the [Competencies Questionnaire], corresponding to the first activity of the first phase.

Partial Result Code	Description	Supporting Data Source (Tables A2 and A3)
PR1.1	In all institutions, the competence is Competence "A. Teacher support" was valued as one of the most developed.	Competence A is evaluated with the highest values (2.77; SD = 0.66), compared with other competencies B (2.72; SD = 0.69); C (2.72; SD = 0.72); D (2.71; SD = 0.71); and E (2.57; SD = 0.85) (Table A2)
PR1.2	All institutions, evaluated Competence E "Evidence-based practices" as the least developed	Competence E is evaluated with the lowest value (2.57; SD = 0.85), compared with other competencies A (2.77; SD = 0.66); B (2.72; SD = 0.69); C (2.72; SD = 0.72); and D (2.71; SD = 0.71) (Table A2)

Table A4. *Cont.*

Partial Result Code	Description	Supporting Data Source (Tables A2 and A3)
PR1.3	Participants from U2 and U4 evaluated the Competence "A. Teachers' support" as the most well-developed competence in the institution, and the Competence "E. Evidence-based practices" as the least developed.	Competence A in U2 is evaluated with the highest value (3.31; SD = 0.57), while Competence E (2.89; SD = 0.96) with the lowest, compared with other competencies B (3.09; SD = 0.70); C (2.93; SD = 0.78); D (3.22; SD = 0.66) (Table A2) Competence A in U4 is evaluated with the highest value (2.80; SD = 0.67), while Competence E (2.34; SD = 0.85) with the lowest, compared with other competencies B (2.68; SD = 0.70); C (2.57; SD = 0.67); D (2.52; SD = 0.71) (Table A2)
PR1.4	In all institutions, the "Manager Staff" evaluates the competence "A. Teachers' support" with the lowest values, together with the "Teaching Staff" from U3. However, "Teaching/Academic Staff" from U1 and U4 evaluated it as the most well-developed.	Values for Competence A for competencies and all stakeholders in the following order (Table A2): (1) Administrative: U1 (2.51; SD = 0.74) U2 (3.39; SD = 0.57); U3 (3.39; SD = 0.57); U4 (3, 00). (2) Manager: U1 (2.45; SD = 0.70) U2 (3.00; SD = 0.64); U3 (2.67; SD = 0.88); U4 (2.36). (3) Teaching/Academic: U1 (2.69; SD = 0.55) U2 (-); U3 (2.69; SD = 0.46); U4 (2.81; SD = 0.69).
PR1.5	Institution U2 has reported the highest values in terms of competence dimensions and compared with the other institutions.	Competence values in Table A2.

Table A5. Partial results analysis of the data collected through the [Poster Initiatives Classification], corresponding to the second activity of the first phase.

Partial Result Code	Description	Selected Supporting Data (Translated from the Original Data)
PR2.1	To the Competence "A. Teacher support", institutions associated initiatives for training the teachers. The types of trainings vary in frequency and format depending on the institution, including courses, workshops, seminars, and diplomas (a set of courses with several CETS credits). Most of trainings focus on learning about digital tools. Participants also associate to these competencies' initiatives related with teaching recognition, teaching evaluation and the share of good practices.	"Training courses for teachers in new digital tools" (U1) "Creation of a support and training unit to support teachers in virtual education. Training for teachers in the use of ICT. Workshops on good practices in Moodle, Meet, zoom, classroom and other tools" (U4) "Training for teachers" (U3) "Monthly training workshops on the use of the institutional educational platform" (U2) "Sharing and supporting teachers' successful experiences" (U4) "Learning from different experiences that led to good practices" (U4) "Evaluation on the teaching practice carried out" (U4) "Recognition of the teaching work" (U2)
PR2.2	To the Competence "B. Student support" participants associated initiatives such as online courses, video tutorials as well as academic support or on the Learning Management Systems employed by the university. Participants also recognize that, in some cases, the Competence "Student Support" is a bit poor.	"Facilitate technological tools for cooperative, collaborative and participatory work" (U1) "Only some help for internet connection" (U4) "Support to the student through a web page" (U2) "Video-lecture for the laboratory sessions" (U2)

Table A5. *Cont.*

Partial Result Code	Description	Selected Supporting Data (Translated from the Original Data)
PR2.3	To the competence "C. Leadership, Culture and Transformation" participants associated activities such as: (1) programs for developing the sense of belonging to the institution and its culture; (2) instances for self-evaluation, and instances for interacting with other institutions through research international programs. They also mentioned activities addressed to teaching/academics and administration staff related with the digital transformation of institutional processes.	" Institutional Membership Program" (to promote the sense of belonging to the institution) (U2) "Organizational culture program" (U2) "TLC project and organizational culture focused on innovation and presentation of results and indicators" (U3) "Summa Project: Impact of the university in its context, through continuing education programs" (U4) "Culture of continuous institutional and program self-evaluation" (U2) "Each department has a person in charge of digital education" (U4). "Group work between managers and teachers for the best choice of objectives and platforms for the new modalities of virtual teaching" (U4) "Institutional training plan in competencies oriented to Technology, Communication, pedagogy, management and research" (U1) "ICT training pathway for teachers" (U2) "Workshops on good practices: In what? Teacher support leaders" (U3)
PR2.4	To the competence "D. Technology for Learning" participants associated initiatives such as training in the use of technological platforms (i.e., Moodle, Google Classroom) and tools (i.e., Google Suit) through online material, tutorials, and courses	"Support materials and tutorials for the use of digital platforms and tools" (U2) "Training in visual and audiovisual technologies, for use in virtual classes" (U4) "New tools adapted to our own institutional platform, constant innovation" (U2) "Training courses, google classroom" (U3) "Training on the use of technology in the classroom" (U1) "Implementation of technologies and educational platforms for teaching, training of students and teachers" (U3)
PR2.5	To the competence "E. Evidence-based practices", participants associated initiatives related with the use of institutional data. The refer to initiatives for monitoring teachers and students' performance. They also associated activities and initiatives related with the continuous curriculum improvement and benchmarking initiatives looking for other institutions practices as a reference.	"Data analysis of educational data from online courses" (U4) "Learning analytics" (U4) "Curricular design based on students' performance" (U2) "Curricular updates at the end of the semester" (U1) "Evaluation of programs to determine innovation in teaching practice Preparation of a related semester report" (U3)

Appendix E.

Table A6. Original list of initiatives collected through the [Pre&Post Pandemic Lockdown Forms] translated to English and indicating the code we use to refer to them. U1, U2, U3 and U4 are the codes used to refer to each of the four institutions.

Code of the Initiative	Code of the Initiative
U1.1	Creation of the Distance Education in Virtual Environments Policy
U1.2	Creation of the Division of Distance Education in Virtual Environments
U1.3	Teacher training programs related to educational innovation
U1.4	Creation of the RADD (Digital Teacher Support Network)
U1.5	Enabling videoconferencing systems for the teachers in all academic units at the institution
U1.6	Creation of official accounts for the use of the videoconferencing system
U1.7	Creation of virtual classrooms with the Moodle platform for each academic unit
U1.8	Workshops for teachers and administrative staff, related to communication and technological innovation
U1.9	Diploma courses in digital teaching, virtual tutoring and instructional design
U1.10	Manual for quality in distance education
U1.11	Creation, in some academic units, a group for supporting distance learning
U1.12	Creation of the first online diploma "Bachelor's Degree in Criminology and Criminalistics"
U1.13	Design and creation of educational tutorials to support teaching
U1.14	Implementation of the remote supervision tool for online exams "proctorizer" in the School of Medicine and in the Bachelor's Degree in Criminology and Criminalistics
U2.1	Institutional implementation and management of an LMS: At the institutional level, the use of an LMS (Zoom, Meet) was standardized for the execution of synchronous and asynchronous sessions for academic continuity.
U2.2	Hybrid education: Academic programs currently have the particularity of being hybrid given the case that students can either attend their virtual classes or review the recording of the same.
U2.3	Use of tools for the improvement and quality of virtual classes: use of tools for the improvement and quality of the teaching-learning process and interactivity during the development of virtual classes.
U2.4	Supporting resources for teachers: Specialized resources available to all teachers (video tutorials, guides, podcasts, websites) were created for the process of academic continuity in the digital environment.
U2.5	Webinars for teachers: We implemented webinars on the different topics of our specialized programs.
U2.6	Personalized management advice and accompaniment: We decentralized the mentoring and coaching carried out by the project administration, with the objective of supporting teachers in the process from moving from a traditional teaching style to a virtual learning style.
U2.7	Automation of services: We conducted an automatization of certain existing processes to facilitate the access to university tools to all the educational community and assure its immediate use.
U2.8	Use of simulators, Learning Scenarios: The use of simulators is established with the objective of generating learning scenarios, to create a space for collaboration and practice for students.
U2.9	Formal assessment scenarios: The use of tools is implemented to strengthen the virtual teaching-learning process by creating a formal scenario for evaluation and assurance of academic integrity on the part of students.

Table A6. *Cont.*

Code of the Initiative	Code of the Initiative
U2.10	Continuous Learning Workshops for Teaching staff: The teacher training and education strategy was implemented on a continuous basis to achieve a development of Technological pedagogical competence.
U3.1	Diploma in Pedagogical Training
U3.2	Diploma in Design of Virtual Learning Environments
U3.3	ICT training plan for teachers
U3.4	Seminar-Workshop on e-Learning Activities
U3.5	TICatlón: An event to explain and show cases using ICT for educational practices
U3.6	Digital Competence Teacher Training Plan
U4.1	Diploma in Educational Innovations for Higher Education: training designed to encourage innovation in university teaching practice
U4.2	Diploma in University Teaching: training designed and offered to university professors who have recently joined the Institution
U4.3	Management of Teaching, Learning and Assessment Course: training designed and offered to university teachers in the context of the emergency remote teaching caused by the COVID-19 pandemic (it is a mini-course created from the Diploma in Educational Innovations for Higher Education, designed for a mass education environment)
U4.4	Visual and Auditory Narratives course: training designed and offered to university teachers in the context of the emergency remote teaching caused by the COVID-19 pandemic, focused on the production of multi-format educational materials (designed for a mass education environment)

Table A7. Original list of initiatives collected through the [Pre&Post Pandemic Lockdown Forms] translated to English. Columns of section "Periods": Before, the initiative existed before the pandemic lockdown; Originated, the initiative was originated during the pandemic lockdown; Continues, the initiative is maintained at the institution after the pandemic lockdown. We indicated under study those initiatives that the university is still studying whether to be maintained or not.

Initiatives	Period			Competence Dimensions of the PROF-XXI Framework				
	Before	Originated	Continues	A. Teacher Support	B. Students' Support	C. Leadership, Culture and Transformation	D. Technology for Learning	E. Evidence-Based Practices
U1.1	X		X			X		
U1.2	X		X	X	X	X	X	X
U1.3	X		X	X			X	X
U1.4		X	X	X			X	
U1.5		X	X				X	
U1.6		X	X				X	
U1.7		X	X				X	
U1.8		X	X	X			X	
U1.9	X		X	X			X	
U1.10			X			X		X
U1.11		X	X	X	X	X		

Table A7. *Cont.*

Initiatives	Period			Competence Dimensions of the PROF-XXI Framework				
	Before	**Originated**	**Continues**	**A. Teacher Support**	**B. Students' Support**	**C. Leadership, Culture and Transformation**	**D. Technology for Learning**	**E. Evidence-Based Practices**
U1.12			X		X	X		X
U1.13		X	X	X		X		
U1.14		X	X	X	X		X	X
U2.1		X	X				X	
U2.2		X	X					X
U2.3		X	X	X	X		X	
U2.4	X		X				X	
U2,5	X		X					
U2.6	X		X			X		X
U2.7	X		X	X	X		X	
U2.8	X		X	X	X		X	
U2.9		X	X	X	X		X	
U2.10	X		X				X	
U3.1	X			X		X	X	
U3.2	X			X		X	X	
U3.3	X			X		X	X	
U3.4	X			X		X	X	X
U3.5	X			X	X	X	X	X
U3.6		X	X	X	X	X	X	X
U4.1	X		X	X	X		X	X
U4.2	X		X	X				
U4.3		X	Under study	X			X	
U4.4		X	Under study	X	X		X	
TOTAL	16	15	27	**22**	**12**	**14**	**25**	**11**
Competencies Before				12	5	7	13	6
Competencies Originated				10	6	4	12	3
Competencies Continues				15	10	9	18	9

Appendix F.

This appendix contains all the information regarding the different institutions participating in the experience.

Table A8. Information from all the institutions participating in the evaluation.

U1	
Country	Guatemala
Type of administration	Public
Number of Students	235,212
Number of Academics	6856
Origins and mission	The founding of the Universidad de San Carlos de Guatemala (USAC) began with the management of the first bishop Francisco Marroquin to the King of Spain in his letter dated 1 August 1548, and after more than 120 years in which multiple projects were carried out to perfect the concept of a university based on the dream of a society that needed professionals to promote development, on 21 January 1676, was embodied in a Royal Charter the birth of the first university in Central America (USAC). Over time, it went through five eras where different names were established. It was with the revolution of 1944 that it was declared as a secular institution with a social orientation. USAC is the only state university; therefore, it is exclusively responsible for directing, organizing, and developing state higher education, as well as the dissemination of culture in all its manifestations. As part of its mission, it promotes research in all spheres of human knowledge, cooperating and solving national problems. USAC currently has an academic offer of more than 600 training programs that have allowed professional growth at the Central American level and the fulfillment of its motto "Go and teach everyone".
Existing Teaching and Learning Center	The Teaching and Learning Center (TLC) of the Division of Distance Education in Virtual Environments of the University of San Carlos de Guatemala "EDUMEDIA" has, as its mission, to implement and innovate educational practices through knowledge management and research, as well as learning in virtual environments using educational technologies as didactic-methodological resources, to achieve the purposes of the university and for this, it has proposed strategic actions framed in six objectives: (1) develop training and capacity building activities; (2) improve the generation of digital educational content; (3) promote educational innovation projects; (4) systematize experiences and good practices; (5) reinforce the use of virtual learning spaces; and (6) carry out technological surveillance for educational innovation. Among the services offered by the EDUMEDIA TLC are (a) advice on innovation projects for virtual education; (b) pedagogical-technological training; (c) space for the design of digital educational content; (d) technological and digital content production consulting; (e) University of San Carlos de Guatemala repository of learning objects; (f) systematization of good practices; (g) LMS installation and hosting service; (h) Google Workspace for teachers; (i) live streaming. To ensure the proper functioning of the TLC, an evaluation framework has been established with indicators that measure the development of the strategic objectives.
Link to TLC	https://youtu.be/ON7qZh0-SbU (accessed on 21 December 2021).

Table A8. *Cont.*

U2	
Country	Guatemala
Type of administration	Private
Number of Students	25,000
Number of Academics	1200
Origins and mission	Located in Guatemala, Galileo University is a higher education institution, the product of 40 years of constant work and effort of an elite group of academics and professionals, lead by Eduardo Suger Cofiño, Ph.D., founder and President. He has been able to put forward a completely innovative and non-traditional educational approach that Galileo calls "The revolution of education", which is also impelled by very a clear motto: "To educate is to change visions and transform lives." With thirty-eight years of successful experience, facing the rapid-changing times and the knowledge globalization, Galileo University has positioned itself as a relevant leader and a reference in the field of technology. This gives the University a very important role, not only in professional training, but also in the generation of knowledge, that responds to the needs of an increasingly competitive world, becoming an excellent choice for the education of the Guatemalan and Latin American new generations. Our mission is preparing professionals with world-class academic excellence, a high spirit of justice, human, and ethical values, at the service of our society by incorporating contemporary science and technology. We are committed to give everyone the opportunity to access university studies without distinction of race, social condition, or geographic location.
Existing Teaching and Learning Center	The Learning and Teaching Center (TLC) collaborates with the academic community at Galileo University to provide and promotes excellence in teaching and learning through different services and resources. TLC (Teaching and Learning Center) About Services Teaching support Student support Webinars Contact Us
Link to TLC	https://www.galileo.edu/page/cea/ (accessed on 20 December 2021).
U3	
Country	Colombia
Type of administration	Private
Number of Students	5000
Number of Academics	403
Origins and mission	The University of San Buenaventura in Colombia was founded by the Franciscan Order in 1688, named after the exalted doctor Saint Bonaventure. In 1973, the Colegio Mayor of San Buenaventura requested the change of its name to the University of San Buenaventura, an application that was accepted and ratified by Decree 1729 of 30 August 1973. In accordance with Article 19 of Law 30 of 1992, it retains its category of University and is based in the city of Santafé de Bogotá and sections in the cities of Medellín, Cali and Cartagena. The Cali campus was created on 24 August 1970, began academic work with the Bachelors of Law, Education and Accounting. The academic organization of the San Buenaventura Cali is made up of five faculties: Architecture, Art and Design; Economic and Administrative Sciences; Law and political science; Human and Social Sciences and Engineering, with 20 undergraduate programs, 21 face-to-face specializations, 4 virtual specializations, 24 masters, 5 PhD and 1 post-PhD, which guarantee their graduates and the general public to update and continue to advance in different fields of their professional development.

Table A8. *Cont.*

Existing Teaching and Learning Center	The Learning and Teaching Center (TLC) is a high-quality bet of San Buenaventura University as a fundamental element for the training processes and as a guarantor of high-quality strengths in higher education, promoting competitiveness, faculty development from research as the main source of generation and transfer of knowledge. From the infrastructure, there are multimedia rooms, sound laboratory and administrative office where the processes of innovation, teacher training and creation of didactic resources involving teachers and students of the educational community are centralized.
Link to TLC	Under construction
U4	
Country	Colombia
Type of administration	Public
Number of Students	16,562
Number of Academics	1309
Origins and mission	The Universidad del Cauca is an autonomous university entity of the national order, created by the Decree of April 24, 1827, issued by the President of the Republic Francisco de Paula Santander at Popayán (Cauca) Mission The Universidad del Cauca is an institution of higher education, public, autonomous, of national order, created in the origins of the Republic of Colombia. The Universidad del Cauca, founded on its tradition and historical legacy, is a cultural project that has a vital and permanent commitment to social development through critical, responsible and creative education. The University forms people with ethical integrity, relevance and professional suitability, democrats committed to the welfare of society in harmony with the environment. The Universidad del Cauca generates and socializes science, technology, art and culture in teaching, research and social projection.
Existing Teaching and Learning Center	The Teaching and Learning Center of the Universidad del Cauca is linked to the Center for Quality Management and Institutional Accreditation. It is in charge of organizing the Diploma in Educational Innovations, diagnosis and teacher training and the articulation of student orientation services of the Vice Rector's Office for Culture and Welfare.
Link to TLC	https://cgcai.unicauca.edu.co/innovacioneducativa/ (accessed on 20 December 2021).

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