Pedagogical Models Based on Transversal Digital Competences in Distance Learning: Creation Parameters

Modelos pedagógicos basados en competencias digitales transversales en educación a distancia: parámetros para la construcción

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ABSTRACT

This article presents an investigation to define the parameters that guide the construction of pedagogical models (PM) based on transversal digital competences (DC) for distance learning (DL). A qualitative research approach was implemented in three stages: 1. a theoretical survey to build the initial parameters; 2. a case study of a course with teachers to apply the initial parameters; and 3. definition of the final parameters based on data comparison and analysis. A relationship was established between the concepts of pedagogical models, digital competences, and distance learning. Data was collected through questionnaires, interactions, and activities carried out during the course, which made it possible to identify the teachers' profile and the parameters for the pedagogical model based on digital competences. The data was analyzed, categorized, and treated for interpretation. Two categories were defined: pedagogical model to construct the digital competences and digital competences in distance learning. As a result, parameters were defined, in a framework, to assist in the construction of a pedagogic model based on digital competences in a gradual, integrated, and transversal way that can be used in any distance learning area, course, or discipline. The results of this work demonstrate that the proper construction of a PM consists in properly using technological tools based on digital competences. Furthermore, teachers must gain competences through training. This new approach, treating digital competences as transversal in the pedagogical model and its inclusion in institutional educational systems, aims at fostering teacher training through the construction of digital competences in education.

Keywords: pedagogical models; digital competences; distance learning.

RESUMEN

Este artículo presenta una investigación para definir los parámetros que orientan la construcción de modelos pedagógicos basados en competencias digitales transversales para la educación a distancia. Se implementó un enfoque de investigación cualitativa en tres etapas: 1. levantamiento teórico para construir los parámetros iniciales; 2. estudio de caso con profesores para aplicar los parámetros iniciales; y 3. definición de los parámetros finales y análisis de datos. Se estableció una relación entre los conceptos de modelos pedagógicos, competencias digitales y educación a distancia. La recolección de datos se realizó a través de cuestionarios, interacciones y actividades realizadas durante el curso, lo que permitió identificar el perfil de los docentes y definir los parámetros del modelo pedagógico. Los datos fueron analizados, categorizados y tratados para su interpretación. Se definieron dos categorías: Modelo Pedagógico para Construir las Competencias Digitales y Competencias Digitales en Educación a Distancia. Como resultado, se definieron parámetros para ayudar en la construcción de un modelo pedagógico sobre competencias digitales de manera gradual, integrada y transversal, que pueda ser utilizado en cualquier área, curso o disciplina de educación a distancia. Los resultados de este trabajo demuestran que la construcción adecuada de un modelo pedagógico consiste en utilizar herramientas tecnológicas basadas en competencias digitales. Además, los docentes deben adquirir competencias a través de la formación. Este nuevo enfoque, al tratar las competencias digitales como transversales en el modelo y su inclusión en los sistemas educativos de las instituciones, busca incentivar la formación docente a través de la construcción de competencias digitales.

Palabras clave: modelos pedagógicos; competencias digitales; enseñanza a distancia.

INTRODUCTION

This article presents an investigative study which sought to understand how to build pedagogical models (PMs) for distance learning (DL) based on transversal digital competences (DCs). The objective was to identify parameters that can assist teachers in the elaboration of PMs based on the necessary competences for the profile of the DL student according to different areas, courses, or disciplines. The parameters are meant to guide teachers and present methodological questions related to the construction of digital competences, such as: How can digital competences be related to pedagogical models? What digital competences are essential for the student's profile? How to build pedagogical strategies and assess digital competences in distance learning?

There is no single pedagogical model. Instead, there are different proposals according to the context, modality, and student profile that assist the teacher in the decision-making process of constructing digital competences transversally. In distance learning, the teacher enables the learning process through digital resources, planning, using pedagogical practices, defining strategies, and establishing the type of assessment. This group of procedures composes the pedagogical model, which is understood as a set of premises to guide teachers (Behar, 2019). It requires an understanding of changes and thus the current distance learning scenario as well as the need for digital competences which are considered important to engage in this teaching and learning process. All of these changes have had significant impact on education, modifying more traditional schools, other learning environments, teaching resources, as well as the characterization of the student, especially with the COVID-19 pandemic (Meinck et al., 2022). The particularities of distance learning require that the actors of this process demonstrate digital competences specific to this context (Guitert et al., 2020).

However, since the digital competences in this process are intended to assist students in their academic training and are characterized as multidimensional, this construction should be carried out transversally, rather than decontextualized from the specific course (Lázaro-Cantabrana et al., 2019; Falloon, 2020). Yet, transversal development is not simple, as it requires more effort from the teacher than traditional distance learning planning. Also, students are currently immersed in a highly digitalized society, and are therefore able to mobilize DC in different contexts. In this case, in the academic context based on methodologies and pedagogical strategies. In fact, digital competences must be contextualized from the very beginning of distance learning courses and be consistent with new forms of technological teaching and learning (Méndez et al., 2017).

Hence, this investigation sought to identify parameters to help DL teachers to define their PM based on the construction of digital competences linked to their classes in Brazil.

Parameters must be used flexibly and adapted, assisting teachers with their competence construction decision-making process. This article therefore initially presents a discussion of digital competences and pedagogical models in distance learning in section 2, focusing on transversality. In section 3, the methodology of this research is presented, followed by data analysis in section 4. Section 5 then presents the definition of the parameters for the construction of a pedagogical model based on digital competences.

DIGITAL COMPETENCES AND THE DEFINITION OF A PEDAGOGICAL MODEL IN DISTANCE LEARNING

The concept of digital competences arose at a time when society was taking full advantage of technology. It was first conceptualized as a set of knowledge, skills, and attitudes (KSA), strategies, and awareness that is needed when using Information and Communication Technologies (ICT) and digital media in different areas (Ferrari, 2012; Silva & Behar, 2022). In fact, individuals are increasingly required to use technological tools in different contexts, such as at work, school, and in their personal lives. It is therefore necessary to have some minimal digital competences to make better choices between technological resources and know how to use them on a daily basis. This allows people to become increasingly autonomous in relation to their decisions, allowing them to know, understand, and reflect on technology and accordingly not accept everything that is imposed and/or shared with them. Brazil has the world's fourth largest online population according to the data on digital competences from the digital maturity index of Brazilian Google and McKinsey (2019). Yet, Brazil scores quite low when it comes to more sophisticated activities, such as E-learning, online shopping, and the construction and creation of content. Although there are more and more people with Internet connections, notebooks, tablets, and smartphones, this does ensure the construction of digital competences. Consequently, in order to be digitally competent, all citizens need KSAs to deal with and participate in this technological environment, and this depends more on these elements (KSAs), rather than on access to technologies and how to use them (Ala-Mulak, 2011).

The profile of distance learning students represents different generations and ways of dealing with technology (Tapscott, 1998; Prensky, 2001; Strauss & Howe, 2000). It is therefore necessary to consider DL students' limitations that require monitoring in relation to their learning process through technologies. This should encompass several factors, mediating the construction of essential digital competences in order to prepare them to deal with distance learning situations, including eliminating time-space barriers, as well as facilitating teamwork, communication, information management, enhancing interactivity and learning flexibility. Hence, an increasing amount of digital competences will be required for students to face difficulties in this context and discover learning possibilities (Behar, 2013). A gap has accordingly

been identified and the construction of digital competences for students in distance learning that should be further explored.

Thus, it is necessary to go beyond the use of computers, the Internet, and software in distance learning. Though improving knowledge about tools can be carried out through tutorials, manuals, and videos, critical analysis and reflective use cannot be constructed in the same way. For the DCs that are linked to the technological area, which has evolved extremely quickly, the concern should therefore be to build competences based on pedagogical models for distance learning, which allow students to orient themselves in this digital world. They must be able to assess not only the reliability of the information they receive, but also the most appropriate way of communicating and sharing personal data.

This study sought references about pedagogical models in DL in works by Santángelo (2000), Duart and Sangrá (2000), Mishra and Koehler (2006), Trindade (2009), García-Aretio (2014), and Behar (2009; 2019). Santángelo (2000) states that PMs in DL are composed of four aspects: the Virtual Learning Environment (VLE); the subjects - professors, teaching assistants, and students; the materials and content; and the cognitive educational model. Duart and Sangrá (2000) on the other hand, propose a three-dimensional model centered on three elements: teacher, student, and technological means, promoting balance and convergence among the aspects, without overlapping them. This model emphasizes an open planning process that is flexible and organized according to the student's profile, objectives, and context. Moreover, Mishra and Koehler (2006) propose the Technological Pedagogical Content Knowledge (TPCK) Model, which links content, pedagogy, and technology. Yet, according to Trindade (2009), there are two pedagogical models in the DL context: the self-directed learning model and the collaborative model, which can be integrated into the same course with emphasis on technological resources, assessment, and the development of materials (learning objects), which are considered the most important elements in DL. García-Aretio (2014) is one of the authors who incorporates competences in conjunction with didactic pedagogy. Lastly, according to Behar (2019, p. 3), "a distance learning PM is as a paradigmatic set of theoretical premises that can explain and guide the teacher's pedagogical actions, constituted by the pedagogical architecture (PA) and strategies," as illustrated in Figure 1 below.

Figure 1
A Pedagogical Model in DL
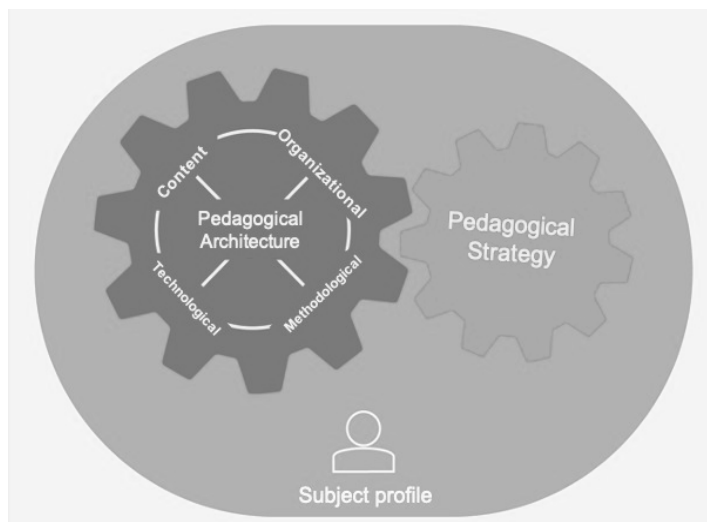
Source: Behar et al. (2019)

Thus, the PA is organized based on organization, content, methodology, and technology. The organizational aspect encompasses all of the pedagogical planning, including the definition of objectives, time and space, and the profile of the distance learning subject (professor, student, teaching assistant, and manager). Competences that students must build are also defined here. Content on the other hand, includes the materials and can be organized in different formats such as text, games, learning objects (LO), etc. The methodological aspect addresses the technologies and content associated with how technological resources will be used, including techniques, activities, procedures, and evaluation proposals. Lastly, digital resources are defined in the technological aspect. All of these elements will be based on PS and their application.

Thus, based on these studies, although built on pre-established bases, it is understood that a pedagogical model is organized based on being applied in a particular context, based on institutional guidelines, and the professor's personal practices.

Thus, a PM for the construction of digital competences in distance learning needs to be guided by the student's profile in this modality and the definition of the necessary competences. However, there is both a theoretical and practical lacuna (Mattar et al., 2020).

Though there are many international models that have been built, such as DigComp and DigCompEdu, they focus on profile that is quite distinct from the Brazilian reality. In fact, there are few digital competence models in Brazil. Namely, at the national level, Brazil has few studies that associate the construction of a PM for the students' DC in distance learning. One example is DigCompEdu 2.0[1], who mapped seven areas and fourteen digital competences for the profile of distance learning students.

The author defines the elements, knowledge, skills, and attitudes, as well as an example of use cases and a proficiency scale for each digital competence. However, a pedagogical model is not applied to build these competences. The difficulty lies precisely in how to relate and include the construction of these competences to the pedagogical model in distance learning, which is often based on institutional planning and the specific content of a particular course. Sacristán et al. (2016) argue that adopting planning based on competences implies a substantial change in how to teach, learn, and evaluate. It is not a superficial or transient change. On the contrary, it represents establishing active learning which is a transformation in the way of understanding curriculum, teaching-learning processes, assessment, the organization of the educational context, and the role of teaching itself.

The solution may be to build interdisciplinary PMs that can link the DCs across the different courses and contexts. Establishing transversal DC recognizes their role beyond purely technological knowledge. It also contemplates the need to properly use technology to actively participate in the distance learning process and transfer it to other contexts. It is therefore necessary to understand the transversal character of the competences and how this influences the construction of pedagogical models.

According to Zabala and Arnau (2010), the transversal character of the competences is related to the interdisciplinary characteristics of its components that allow information to be extracted, helping in the formulation of teaching and learning strategies for each one separately and at the same time integrating them to develop competence.

The transversal character of digital competences is related to the influence of technological advances in different aspects of society, such as economic, political, cultural, and educational (Area & González, 2015; Zempoalteca et al., 2017). These changes transform the way people deal with technology, seeking new technological learning throughout their daily lives in a society strongly marked by technologies.

Thus, when organizing didactic-pedagogical mediation through DT, distance learning needs to combine action, reflection, and practical situations to build digital competences. If the PM's previous organization was based on content and knowledge from disciplines permeated by DT, it now must build situations relating to digital competences. However, this construction should not be decontextualized from the course, but instead be carried out using a transversal perspective. In fact, DCs allow for the development of most elements of other competences necessary for academics, professionals, and students. Thus, the need to reformulate teacher planning with the

objective of integrating DCs, regardless of the context and profile of the subjects, is highlighted (Ramos & Fincias, 2019).

The entire pedagogical model is therefore organized based on the situations and transversal digital competences that are to be built, with the content of the subjects being the necessary basis for resolution. Thus requiring the student to study all content, beyond the teacher simply presenting the material.

METHODOLOGY

This is a qualitative research study that enables deep analysis to diagnose the reality of this topic in order to define parameters for the construction of a pedagogical model based on transversal digital competences for DL. The chosen procedures were carried out as follows: 1. A theoretical survey to build the initial parameters; 2. A case study to apply the initial parameters; and 3. Definition of the final parameters based on the data analyzed from the course. The main research strategy chosen was case study, which according to Yin (2015), is an empirical investigation that explores a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly defined. The data analysis was performed from Moraes (1999) and Bardin's (1977) content analysis, where the data were analyzed, categorized, and treated in order to be interpreted.

Theoretical Survey

In the first stage, bibliographic research was carried out in order to identify pedagogical models for building digital competences in distance learning. A theoretical review and analysis of pedagogical models were carried out at national and international levels. The result was recommendations and a framework with elements/indicators for a model based on digital competences (Table 1) used in the case study. This step has been published (Silva & Behar, 2021).

Table 1

Initial parameters for building a DC-based PM

Identification of Course/name		
Aspects	**Elements**	**Description**
1. Organizational	Theme	Describe the theme of the course
	Semester	
	Institution	
	Modality	DL
	Education level	Undergraduate, graduate, technical, free course.
	General Goal	Define the general goal of the course.
	Specific Goals	Define the specific goal of the course.
	Time and Space	Workload, duration, other.
	Evaluation Type	Define the type of evaluation - Formative, Summative and others and relate them to competences.
	Work team	Indicate who will participate in the construction, organization, and application of the PM.
	Teacher's role	course
	Student's role	course
	Teaching assistant's role	course
	Site	state the link for the course site, if there is one.
	Competences	Define the competences of the course and the digital competences, based on Silva (2018).
2. Content	Content	State the content and how it will be presented.
	Support materials	State the students' support materials.
3. Methodological	Classes	Specify the classes' methodology, with the techniques, procedures, etc.
	Communication	Indicate type of communication and what digital tools will be used.
	Evaluation	Specify the evaluation through the proposal and the instruments.
4. Technological	VLE	State the VLE.
	Features	State the VLE's features.
	Technological Resources	State other technological resources.
5. Pedagogical Strategies (PS)	Title	State the name of the PS
	Competences	State the competences and the linked strategies that will enable their construction.
	Resources	Define the resources that will be used, such as web pages, tools, apps, and others.
	Short description	Mention the main objective of the strategy, the work dynamics, and expected result.

Source: created by the authors (2022)

Case Study

A case study was chosen as the primary research strategy. According to Yin (2015), it is an empirical study that investigates a contemporary phenomenon within its real life context, especially when the boundaries between the phenomenon and the context are not clearly defined.

The case study was done in an extension course, entitled Pedagogical Architectures and Digital Competences. It was offered in the Universidade Federal do Rio Grande do Sul / Brazil with a total of 60 credit hours and lasting nine weeks. The objective of the course was to assist in the understanding of digital competences in distance learning, focusing on students in this modality and the construction of a pedagogical model based on transversal DCs, grounded in the parameters organized in the theoretical framework, which can be seen in Table 2.

Data collection was performed during the nine weeks, through interactions in the virtual learning environment - ROODA, and semi-structured questionnaires. All of the participants were told about the goal of this study in a statement inserted in the data collection instruments. Finally, all data were organized and tabulated for analysis.

Participant Profile

The course began with 28 Brazilian professors enrolled, 22 female and 6 male. The majority between the ages of 35-40 and with academic training in areas such as Pedagogy, Literature, History, Systems Analysis, Accounting, Computing, Marketing, and Tourism. The majority had taken graduate courses, 16 had a Master's degree and 2 had doctorates. All of them had already completed at least one of their graduate programs through distance learning, the majority having completed distance learning specializations. The group had between 4 and 7 years of experience in this modality, working as professors, instructional designers, course coordinators, and teachers.

Data Analysis

Data analysis was performed based on Moraes (1999) and Bardin's (1977) content analysis. The data was analyzed, categorized, and treated for interpretation. Two categories and indicators were defined: 1. Pedagogical Model to Construct the Digital Competences and 2. Digital Competences in DL.

Pedagogical Models to construct DC in DL

To develop the pedagogical model to construct DC in distance learning, those enrolled in this course first learned about digital competences, pedagogical models, pedagogical architecture, pedagogical strategies, and assessment in distance learning. Then the framework of initial parameters[2] was made available, based on the theoretical framework, to guide the students to construct their MP. The professors had a total of five weeks and were able to carry out the activity as a larger group, a group of two, or alone. They defined the themes of the pedagogical models based on their experience as distance learning teachers, linked to their areas and transversal competences. Nine PMs were built, all for the distance learning modality, as shown in Table 2 below.

Table 2
Pedagogical Models created by professors

PM	Course Name	level
1	Interpersonal relationships for the professional tour guide	DL Technical School
2	French for short term trips	DL Open Course
3	Written communication for virtual learning environments	DL Extension course
4	Training for DL professionals	DL Extension course
5	Distance Learning	DL Undergraduate
6	Citizen services: Support and tools to work with the external public	DL open course
7	Communication	Basic industrial learning - Young Apprentice DL
8	Economy	DL technical school
9	Aspects of curricular organization and teacher planning	DL Teacher Training

Source: created by the authors (2022)

This category was analyzed based on the PM constructed and organized by the following aspects: Organizational, Content, Methodological, Technological, and Pedagogical Strategies. The analysis sought to identify how the digital competences were linked to the content in the PM.

Based on the analysis of the data regarding the **organizational aspects** of digital competences, all of the PMs had defined competences, however some pointed to the KSA, whereas others only named the competences. There was no homogeneity here. They also had difficulty in understanding how to construct the transversal

digital competences in the main objective of the course. Confusion also arose in terms of the definition of the type of evaluation, which appeared as a parameter in the organizational aspect, and at the same time it was also linked to the methodological aspect.

Regarding the **content aspects**, although some PMs had a relationship between the specific course and the digital competences, it was not presented concretely in the content. This requires understanding that digital competences are transversal and should be addressed simultaneously with the course specific content.

A problem was also found in the **methodological aspects**, namely the description of the classes. They were described through procedures, time, and space. In fact the majority presented a text explaining the methodology superficially. Some defined procedures, other presented learning activities, yet it was not clear how the classes would be held. Moreover, there was no consensus in terms of evaluation in the PMs. Some define only the type of evaluation, whereas others addressed instruments (Ortiz-López et al., 2021). The teacher needs to understand that the methodological aspects must be aligned with the organization and content. If the teacher is not clear about the previous aspects, the methodology will also not be clear.

Only one PM left the **technological aspect** blank. All of the others pointed to the VLE and the tools used. Nonetheless, it was not clear whether there was any relationship between the specific tools defined and the construction of competences.

In the category of **pedagogical strategies**, most of the PMs did not clearly present the construction of the course competences, focusing only on the digital competences. Only one PM presented a PS focused on both competences and organized the specific strategies to address them. It was quite easy for them to build the PS regarding digital competences, precisely because of the use of technology. Yet they encountered difficulties to mobilize both the digital and specific competences of the course. There was also confusion regarding the construction of PS with activities, which is an element of the methodological aspect.

Digital Competences in DL

Before building the PM in the course, the professors reflected on the importance of digital competences in distance learning, the profile of distance learning students and their own digital competences. Through activities and discussions, they understood **the importance of DC in both the distance teaching and learning process**. However, they did report a lack of knowledge and/or ability to define digital competences. They realized that students need to know different tools, know how to communicate in various ways through the network, analyze the sources of information, conduct research, interact, work in teams, plan, organize, etc. They also understood that the construction of these competences impacts on the students' determination and engagement in the distance learning process (Cabero-Almenara et al., 2020).

However, all of these issues should be undergirded by teacher training in their institutions with the objective of building digital teaching pedagogical competences by improving and adapting distance learning teaching-learning strategies focused on the student. They must also know how to evaluate and create methodological planning based on competences.

These professors stated that the institution needs to define the digital competences required of educators, because it is not enough to define students' DCs if teachers have no idea how to relate them to their planning, nor how to guide the teaching process. Professors also understood that it is necessary to change pedagogical and methodological practices to incorporate DC in their planning. However, they do not know how to do this.

Regarding the identification of **DC for students in distance learning courses**, teachers did not report whether digital competences are mapped in the institutions where they work. Nonetheless, they pointed out which competences would be important to build with the DL student profile. Yet, there are differences in each area and type of course, whether professional, undergraduate, or graduate. Hence, it is necessary to have a list of pre-defined competences linked to digital and academic training, such as: network communication, basic functions of the desktop computer and mobile devices, interaction, collaboration, organization, time management, teamwork, information management. However, the most suitable competences are related to the student's academic profile, which are the organization and planning of studies based on digital technological resources. However, the teacher also needs to develop their digital competences in order to help the student (Durán Cuartero et al., 2019).

The professors who participated in the class concluded that there is no definition of digital competences at their institutions. Moreover, it was difficult for them to analyze which competence was more important, since the students' profile changes according to the type of course, influencing the digital competences that need to be built.

The teachers report that there is no introductory course or definition of DC in their institutions. Once again, they highlighted the need to define DC by their institutions and to include all the subjects involved in the process of distance teaching and learning in these discussions. An academic response to technological changes that influence the teaching and learning process in this modality is required.

Discussion of results

The objective of the course was to provide orientation and initial training for the construction of a transversal DC based PM. However, because the teachers did not yet have their own digital competences developed for distance learning, they had a great deal of difficulty relating to their PM and defining all aspects.

The table of initial parameters, which was built based on the theoretical framework, helped at some points, but it also generated confusion. There was a general difficulty in relating the DCs transversely with those specific to the course. When the parameter about competences was presented in the organizational aspect, the teachers did not identify the need to relate them to the other aspects of the PM. Thus, the results regarding the evaluation, application, and definition of the elements of the PM seem contradictory. Some of the PMs that were created followed pedagogical models linked to their institutions that already had an assessment format and pedagogical strategies but were not based on competences. In some ways this limits what the teacher can do in favor of building competences, but it also made them rethink this format, since creating a PM to build digital competences across the board requires teachers to use new methodologies for teaching-learning and assessment. Yet, this isn't necessarily understood by teachers, who have demonstrated difficulties aligning institutional PMs with competence-based PMs. This is perhaps more because of failures in their training than because of their unwillingness to innovate (Guillén-Gámez et al., 2020). The PMs constructed mostly used traditional methodologies, from the format of the activities to the evaluation. In general, all were related to current themes, but there was weak integration of situations to promote the mobilization of digital competences transversely.

As a result, it became evident that the teachers need to better understand the concept of digital competences, both their own and those their students need to build. At the same time, understanding the changes that their insertion causes in teaching and institutional planning. This process requires a change in practices not only for teachers, but also for the institution. In any teaching modality, the institution plays a fundamental role in proposing practices linked to the construction of competences. However, in distance learning, specifically through the use of digital technologies, online teaching and learning requires the definition of procedures, which help both teachers and students in building competences (Howard et al., 2021). Among these procedures are the definition of digital competences for all of the institution's DL subjects as well as the training of teachers, both to construct their digital competences and construct the students' DCs in a transversal way in different areas.

This is a complicated process. It is necessary to address the relationships in terms of the pedagogical model, starting with the definition of digital competences and the competences related to the specific course. Not only in the definition of organizational aspects, but also related to all of the elements and analyzing the necessary changes to the PM. Thus, the definition of competences cannot be reduced to only the organization of the model, the distance learning process is much more complex and comprehensive. The solution, in theory, seems to comply with the proposed objectives. However, teachers have limited training in how to construct competences, since teaching a PM never corresponds to the pure and simple implementation of the content and the institutional pedagogical model as written. The teacher interprets, makes choices according to the students' level, their

pedagogical options, their preferences, and many other parameters. In fact, they have the autonomy that allows pedagogical models based on competences to be constructed even though their institutions don't have this type methodology. On the other hand, an institution that does not provide the opportunity to build competences gives autonomy to the preparation of PM focused on the teachers' specialty with an emphasis on content. Therefore, it is crucial to have institutions with pedagogical models based on competences and teacher training that is consistent with this institutional proposal. Though it is admittedly a slow and gradual process, there are already different alternative proposals. Given the complexity of building competence, we conclude that there is not a single method, but rather many answers to distinct needs according to the educational context and profile of the subjects.

Thus, based on the studies carried out, the initial framework with parameters and the results of the case study, these parameters were redefined, mainly from the difficulties encountered by teachers when constructing their PM.

Based on these initial definitions, subject profiles, context, and competences, the teacher must establish the aspects of pedagogical architecture and strategies that make up the PM. When building digital competences in a distance learning environment, it is necessary to define the type of methodology, the technological tools, as well as the pedagogical strategies, and evaluation format based on the competences. Since the DCs are transversal, it is possible to build them based on any theme, however they must be linked to the process as a whole.

The parameters are presented below based on all of the findings. They are organized by the definition of the elements of Behar's (2019) pedagogical model, defining the description and guiding questions to assist teachers.

Table 3
Parameters[3]

Aspects	Elements	Description
1. Competences	**Course specific competences; Digital Competences (Transversal).**	The definition of the pedagogical model's competences are based on the definition of competences already determined by the institution or mapped by the teacher. Therefore, it starts with the subject's profile and the course objectives. This initial process of establishing competences will assist the teacher to construct all aspects of the PM. Fundamental competences are those that the institution seeks to build with students in all different areas and disciplines.
2. Students	**Student's profile**	The aim of defining the student's profile is to analyze the specific competences in relation to course specific and digital competences. Though all students need digital competences does not mean that when they complete the course, they will be digitally competent or that they will not have DC when they start. Therefore, it is important to understand the student profile, as well as the importance of working with digital competences together with the course and also how to identify them.

Aspects	Elements	Description
3. Organizational	**Objective; Justification; Workload; Target Audience; Teacher's Role; Student's Role.**	this aspect aims to present the pedagogical proposal in a given course based on competences. Thus, the teaching and learning processes must be defined based on the objectives, organization of time, space, and profile of the subjects. When related to the construction of competences, the organizational aspects must be planned, based on the defined competences so that all the items that compose it are harmoniously related to each other in order to make it concise and reliable to be implemented.
4. Content	**What? (Content); How? (Content format - digital); Content Evaluation.**	The content refers to the "what" will be done. Thus, it is necessary to define the content and the type of formats that will be made available and presented to the students. In the case of a competence-based PM, it is necessary to analyze whether the digital educational materials can assist students in the construction or reconstruction of the discipline's competences and digital competences. Competences cannot be considered content but understood as a reference point for their selection due to their practical utility and the potential for building students' knowledge, skills, and attitudes that must relate to their context to transform it.
5. Methodological	**Class Structure/ Procedures; Activities; Student evaluations; Student Feedback; Students' evaluation of classes and activities.**	These should address not only the methods, activities, and educational resources to be used, but should also address the proposals for interaction, communication, and evaluation based on their relationship with each other and all elements of the PM. Thus, the methodology depends on the objectives, defined competences, and content and can be structured based on the class through: planning, meetings, activities, selection of techniques, procedures, and technological resources.
6. Technological	**Technological tools; Virtual Learning; Environment; VLE tools.**	This is related to the choice of technological resources and their features. In the case of a competency-based PM, each aspect of the model must be analyzed, proposing the technological resources necessary to build competences. The resources chosen should be in accordance with the distance learning modality, target audience, context in agreement with the institution, to develop teaching and learning as well as the interaction with the subjects involved in the construction of competences.
7. Pedagogical Strategies (PS)	**Organizational Aspects; Content Aspects; Methodological aspects; Technological Aspects.**	They are defined as the actions and ways of achieving an educational goal. They are the set of practices, procedures, and interventions that can help to develop the activities to be closer to the context to be implemented. The pedagogical strategies aimed at a competence-based PM must ensure the construction of both the course specific competences and transversal digital competences, mobilizing all aspects of the PA.

Source: created by the authors (2022)

FINAL CONSIDERATIONS

This article presented a study that searched for parameters for the construction of pedagogical models based on transversal digital competences in distance learning. It was possible to define parameters based on the methodological steps carried out, organized on the definition of course specific as well as transversal digital competences, the four aspects of pedagogical architecture, and application strategies.

Parameters were defined to assist teachers to organize and transversally link DCs to the PM, relating to the specific competences of the disciplines and respecting the specificities of each area.

Therefore, a pedagogical model for the construction of digital competences in distance learning for professors needs to respond to the emerging needs arising from the paradigms of the network society, such as methods of communication, searching for, evaluating, and sharing information, as well as interacting and relating to others. At the same time there is a specific student profile in Brazil, both study needs as well as problems organizing, managing time, and even using technology. However, even the most well-intentioned teacher will not be able to address all digital knowledge, skills, and attitudes or predict all situations. Yet, they will be able to help students prepare using the digital competence resources that they have already built and create new ones to face unforeseen situations linked to the distance learning process.

Overall there is a lack of knowledge about methodologies for building competences in Brazilian DL, making digital competences important for building the student's academic profile. However, the results show that in order for professors to use technological tools to create an appropriate PM based on students' digital competences, they also need to acquire their own through teacher training. Thus, a new approach would treat digital competences as transversal in the PM and include them in the institutions' educational system. It seeks to encourage teacher training to include educational technology for the construction of digital competences in the curricula of undergraduate courses to a greater or lesser extent, depending on each university, enabling the so-called digital teacher competence for teaching. A pedagogical model based on a teaching practice for building digital competencies in DL should take into consideration emerging aspects of the paradigms of the network society, including ways of communicating, searching, evaluating, and sharing information, as well as interacting and relating to others. It must also respond to the needs of a student profile that is looking for training, but struggles with organization, time management, and even using technology.

Thus, these resolutions necessarily imply transversal professional training in the educational context to equip future teachers with digital competences. This requires professors to reflect on and address problem situations, based on knowing how to use the technologies that they teach, which the research results demonstrate is one of the limitations in the construction of a competency-based PM.

Unfortunately, there is a lack of knowledge about methodologies for building competences in distance learning and digital competences as important for building the student's academic profile. Future work will better define activities based on problem situations and the format of assessing competences. In fact, competence-based education is not simple, and the results reveal the need to deepen a competence-based, specifically digital, methodology. Finally, this study can hopefully encourage reflection regarding the construction of digital competences in distance learning.

NOTES

1. Link: https://drive.google.com/file/d/1i0Yqtm5lVniITsfIcKf6J2rtEodocN_P/view?usp=drivesdk
2. The table of initial parameters was organized based on the theoretical framework, based on the elements of Behar's (2019) Pedagogical Model adding the competences.
3. Link: https://drive.google.com/file/d/1i0Yqtm5lVniITsfIcKf6J2rtEodocN_P/view?usp=drivesdk

REFERENCES

Ala-Mulak, K. (2011). *Mapping digital competence: Towards a conceptual understanding*. Institute for Prospective Technological Studies, 7-60. https://doi.org/10.13140/RG.2.2.18046.00322

Area, M., & González, C. S. (2015). De la enseñanza con libros de texto al aprendizaje en espacios online gamificados. *Educatio Siglo XXI, 33*(3), 15-38. https://doi.org/10.6018/j/240791

Bardin, L. (1977). *Análise de conteúdo*. Trad. Luís Antero Reto e Augusto Pinheiro, 3.

Behar, P. A. (2009). *Modelos pedagógicos em educação a distância*. Artmed Editora.

Behar, P. A. (2013). *Competências em educação a distância*. Penso Editora.

Behar, P. A. (2019). *Recomendação pedagógica em educação a distância*. Penso Editora.

Cabero-Almenara, J., Romero-Tena, R., & Palacios-Rodríguez, A. (2020). Evaluation of teacher digital competence frameworks through expert judgement: The use of the expert competence coefficient. *Journal of New Approaches in Educational Research (NAER Journal), 9*(2), 275-293. https://doi.org/10.7821/naer.2020.7.578

Durán Cuartero, M., Prendes Espinosa, M. P., & Gutiérrez Porlán, I. (2019). Certificación de la Competencia Digital Docente: propuesta para el profesorado universitario. *RIED-Revista Iberoamericana De Educación a Distancia, 22*(1), 187–205. https://doi.org/10.5944/ried.22.1.22069

Duart, J. M., & Sangrá, A. (2000). Aprendizaje y virtualidad: ¿un nuevo paradigma formativo? En J. M. Duart, & A. Sangrá (Comps.), *Aprender en la virtualidad*. Gedisa.

Ferrari, A. (2012). *Digital competence in practice: An analysis of frameworks*. JRC IPTS. https://doi.org/10.2791/82116

Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Educational Technology Research and*

Development, *68*(5), 2449-2472. https://doi.org/10.1007/s11423-020-09767-4

García-Aretio, L. (2014). Bases, tendencias y futuro de la educación a distancia en la sociedad digital. *RIED-Revista Iberoamericana de Educación a Distancia*, *2*(1), 8-27. https://doi.org/10.5944/ried.2.1.2084

Guitert, M., Romeu, T., Romero, M., & Clougher, D. (2020). Testing training models aimed at improving teachers' competence in the digital era. *Testing training models aimed at improving teachers' competence in the digital era*. 193-207. https://doi.org/10.1007/s10758-018-9390-z

Guillén-Gámez, F. D., Mayorga-Fernández, M., & Álvarez-García, F. J. (2020). A study on the actual use of digital competence in the practicum of education degree. *Technology, Knowledge and Learning*, *25*(3), 667-684.

Howard, S. K., Tondeur, J., Ma, J., & Yang, J. (2021). What to teach? Strategies for developing digital competency in preservice teacher training. *Computers & Education*, *165*. https://doi.org/10.1016/j.compedu.2021.104149

Lázaro-Cantabrana, J., Usart-Rodríguez, M., & Gisbert-Cervera, M. (2019). Assessing teacher digital competence: The construction of an instrument for measuring the knowledge of pre-service teachers. *Journal of New Approaches in Educational Research (NAER Journal)*, *8*(1), 73-78. https://doi.org/10.7821/naer.2019.1.370

Mattar, J., Piovezan, M. B., Souza, S., Santos, C. C., & Santos, A. I. dos. (2020). Critical presentation of the European Digital Competence Framework (DigComp) and related frameworks. *Research, Society and Development, [S. l.]*, *9*(4), p. e172943062. https://doi.org/10.33448/rsd-v9i4.3062

Mckinsey. Digital Skills (2019). *Index: Índice de Maturidade Digital a maturidade digital dos brasileiros.*

Meinck, S., Fraillon, J., & Strietholt, R. (Eds.). (2022). *The Impact of the COVID-19 Pandemic on Education: International Evidence from the Responses to Educational Disruption Survey (REDS)* (No. 978–92-3-100502–2). United Nations Educational, Scientific and Cultural Organization (UNESCO).

Méndez, V. G., Martín, A. R., & Rodríguez, M. D. M. (2017). La competencia digital en estudiantes de magisterio. Análisis competencial y percepción personal del futuro maestro. *Educatio Siglo XXI, 35*(2 Jul-Oct), 253-274. https://doi.org/10.6018/j/298601

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: a framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Moraes, R. (1999). Análise de conteúdo. *Revista Educação*, *22*(37), 7-32.

Ortiz-López, A., Olmos-Migueláñez, S., & Sánchez-Prieto, J. C. (2021). Calidad en e-Learning: Identificación de sus dimensiones, propuesta y validación de un modelo para su evaluación en Educación Superior. *RIED-Revista Iberoamericana De Educación a Distancia, 24*(2), 225-244. https://doi.org/10.5944/ried.24.2.29073

Prensky, M. (2001). Digital natives, digital immigrants part 2: Do they really think differently? *On the Horizon*, *9*(6), 1-6. https://doi.org/10.1108/10748120110424843

Ramos, J. P. H., & Fincias, P. T. (2019). Percepción del profesorado universitario sobre la integración de las Tecnologías de la Información y la Comunicación (TIC) en las modalidades docentes. Influencia del género y la edad. *Edmetic, 8*(1), 128-146. https://doi.org/10.21071/edmetic.v8i1.10537

Sacristán, J. G., Gómez, Á. I. P., Rodríguez, J. B. M., Santomé, J. T., Rasco, F. A., & Méndez, J. M. Á. (2016). *Educar por competências: o que há de novo?* Artmed Editora.

Santángelo, H. N. (2000). Modelos pedagógicos en los sistemas de enseñanza no presencial basados en nuevas tecnologías y redes de comunicación. *Revista Iberoamericana de* educación, *24*(2000), 135-159.

Silva, K. K. A. D., & Behar, P. A. (2021). Modelos Pedagógicos Baseados em Competências Digitais na Educação a Distância: Revisão e Análise Teórica Nacional e Internacional. *EaD em Foco*, *11*(1). https://doi.org/10.18264/eadf.v11i1.1423

Silva, K. K. A. D., & Behar, P. A. (2022). Modelo de Construção e Avaliação de Competências Digitais para Alunos da EaD — MCompDigEAD 2.0. In P. A. Behar, & K. K. A. D. Silva (Org.), *Competências digitais em educação: do conceito à prática,* 1. Artesanato Educacional.

Silva, K. K. A. D. (2018). *Modelo de competências digitais em educação a distância: MCompDigEAD um foco no aluno*. Tesis. Universidade Federal do Rio Grande do Sul. Centro de Estudos Interdisciplinares em Novas Tecnologias da Educação.

Strauss, W., & Howe, N. (2000). *Millennials rising: The next great generation*. p. 29. Vintage Books.

Tapscott, D. (1998). *Growing up digital: The rise of the net generation*. McGraw-Hill.

Trindade, A. R. (2009). *Os modelos pedagógicos em contexto de educação a distância: como definir os objectivos de aprendizagem*. Tese de mestrado, Ciências da Educação (Tecnologias Educativas), Universidade de Lisboa, Faculdade de Psicologia e de Ciências da Educação.

Yin, R. K. (2015). *Estudo de Caso: Planejamento e métodos*. Bookman editora.

Zabala, A., & Arnau, L. (2010). *Como ensinar e aprender competências*. Artmed, 197.

Zempoalteca Durán, B., Barragán López, J. F., González Martínez, J., & Guzmán Flores, T. (2017). Formación en TIC y competencia digital en la docencia en instituciones públicas de educación superior. *Apertura (Guadalajara, Jal.), 9*(1), 80-96. https://doi.org/10.32870/Ap.v9n1.922