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The Pedagogical Knowledge of Technology Education Teachers

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Abstract: The research on the pedagogical knowledge of teachers in technological education arises from the need to address the problem of pedagogical practices, which are traditional. The classes are at the graduate level, focusing on lecturing the student while the student remains with a passive attitude. It is believed that making explicit that teachers' pedagogical knowledge will allow reflection and awareness, thereby transforming pedagogical practices. Therefore, the objective is to understand the teachers' constructions on pedagogical knowledge in technology programs in Plant Operations and Industrial Instrumentation of the Faculty of Engineering in order to reconstruct it theoretically, as well as identify its characteristics and trace action routes for teacher training. In this way, it allows education to be accessible to low-income and resource-poor populations, whose purpose is to strengthen the productivity and competitiveness of the economy through the training of human talent according to the needs of the working sector in a unique context. This research uses grounded theory as a methodological tool for data processing. In this sense, data collection procedures such as in-depth interviews were conducted with 16 teachers and seven of them were related to the industry. Whereas, 9 were linked to the teaching(educational) sector including elementary, high school and college level. The results showed differentiated, and socially constructed pedagogical knowledge that responds to teachers' nature in a particular context. These results contribute to consolidate a broad vision about the pedagogical knowledge's characteristics that the teacher builds.

Keywords: *Education, higher education, pedagogical knowledge, teacher training, technological.*

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Introduction

The search for Pedagogical knowledge has been considered as part of research interest as it allows the improvement of teachers' training process and pedagogical practice. The reviewed literature, at the international level, shows several perspectives based on the context in which they are related; for instance, Pedagogical Content Knowledge (PCK) a concept introduced by Shulman during the 1980s in the United States (Shulman, 1987) refers to the teacher's knowledge base; what is taught, and the pedagogy for that specific knowledge. In 1990, Gudmundsdottir suggested adding teachers' beliefs about the content (Hashweh, 2013). Moreover, further contributions are related to the way of teaching and the difficulties experienced by the students (Goodnough & Hung, 2009; Loewenberg Ball et al., 2008; Shing et al., 2015).

Additionally, pedagogical knowledge has been an object of study in the field of science teaching, and it includes the study of teaching/learning, knowledge understanding, pedagogical practice, beliefs, decision-making process, and reflection (Kind & Chan, 2019; Loughran, 2019). Likewise, pedagogical knowledge also belongs to the study of nature knowledge in mathematics by considering two elements that build it: content knowledge and students as well as content knowledge and teaching. Specialized content knowledge and technology teaching are also considered (Hashweh, 2013).

Recently, the study of PCK development through the use of Open Educational Resources (OERs), in this case, the Massive Open Online Course (MOOC) in a teacher training school in Israel, is considered and shows positive results in the development of content knowledge as well as pedagogical knowledge (Donitsa-Schmidt & Topaz, 2018). Furthermore,

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the foregoing is related to students' non-formal learning enrolled in teacher training programs, their contribution to the creation of pedagogical knowledge, and the development of teaching skills (Tang et al., 2017).

Other researchers relate this to teachers' professionalism. In Turkey, for instance, the motivations that are part of the professional training and categorized English's teacher features are shown as follows; personal virtues and traits, subject knowledge, pedagogical knowledge, and professional development by analyzing the participants' understandings (Korkmazgil & Seferoğlu, 2021) and how they relate to other types of knowledge such as pedagogical and content one, and PCK (Chan & Hume, 2019; Kind & Chan, 2019). This topic was addressed with the creation of virtual educational strategies during the COVID-19 pandemic in New York. Concerns were raised regarding transmitting and strengthening PCK in the best possible way within the context of early childhood education teacher training mediated by technology (Metscher et al., 2021).

Indeed, Shulman's contribution has been significant to the study of teachers, their work and assessment, the development of training programs, and the internship designs. This concept is nowadays widely undertaken within this field of study in such a way that transformations in its meaning can be observed, showing different interpretations and ways of structuring according to the context of application (Abell, 2008; Doyle et al., 2019; Hashweh, 2013; Parga Lozano & Mora Penagos, 2014; Segall, 2004).

However, according to the context of the research, from a South-South perspective, a concept regarding pedagogical knowledge is built in a more social thought that shows particular characteristics, which are different from Shulman's perspective in the search for *theoretical agreement* that leads to the construction of a broad concept that exposes its complexity. Based on O'connor and Seymour (1999), the agreement creates links between world models or ways to develop it. In this particular case, different conceptualizations and balanced relations of sense among elements are considered as world models which feature the pedagogical knowledge meaning from the South-South perspective. Thus, a theoretical link is created by being connected to a net in a place in which the coexistence of different ideas is possible (González Ferro, 2019).

A space for academic and daily knowledge which allows the construction of discourses; practices, reflections, experiences and a teacher's ways of being, thinking, feeling and doing within a training context where the other is involved in terms of social transformation and the new interpretation of the teaching profession (Abraham, 2009; Bontá, 1997; Chacón Corzo & Suárez Durán, 2014; De Tezanos, 2007; Díaz Quero, 2005; González Ferro, 2019; Latorre, 2003; Mercado, 2002; Vasco Montoya, 1995; Zambrano Leal, 2006; Zapata Villegas, 2009; Zuluaga de Echeverry, 1999).

This perspective is relevant as it makes it possible to reveal the characteristics of the teachers' pedagogical knowledge in a technology-orientated higher education institution to be uncovered. Furthermore, the convergences and divergences of such constructions of pedagogical knowledge can be determined to theoretically reconstruct it and plan paths of action for teacher training. This process is necessary due to traditional pedagogical practices delimiting the teachers' task which do not generate added value in terms of students' learning or skill development.

Currently, in the landscape of technological education in Colombia, pedagogical training has been considered less relevant compared to the specific or disciplinary training of teachers, whose qualifications focus on these aspects, relegating pedagogical training to a lesser importance. Therefore, it is necessary into the study of pedagogical knowledge to position it as a fundamental element in the formative processes of technological education is necessary.

Building upon the research question: What are the constructions of pedagogical knowledge of program teacher's technologies in the Operation of Plants and Industrial Processes and the Technology in Industrial Instrumentation of the Faculty of Engineering of a university technological institution? The objective is to address and make explicit these constructions of pedagogical knowledge so that the teacher can make them aware. In this way, the teacher becomes a stakeholder in the change of their pedagogical practice while taking into account both the formal and experiential instances of that pedagogical knowledge (Díaz Quero, 2005). With the intention of knowing its implications in teaching, observing the institutional conditions for its construction and outlining fields of action for the pedagogical training of teachers is noteworthy in a typical scenario of the Latin American context, in which technological education takes place (González Ferro, 2019). A product of a government project implemented with the purpose of improving the country´s productivity and competitiveness through training of relevant human talent with the demands of the productive sector is conceived.

This perspective is relevant as it makes possible to reveal the characteristics of the pedagogical knowledge of teachers in a technology-oriented higher education institution to be uncovered. Furthermore, the intersections and differences of such constructions of pedagogical knowledge can be determined to theoretically rebuild it and plan paths of action for teacher training. This process is necessary due to traditional pedagogical practices by delimiting the teachers' job and adding no value in terms of students' learning and skills development.

Methodology

Grounded theory was the method used to process the data because it provides a systematic path of the understanding the phenomenon. It also provides an appropriate procedure for the analysis of qualitative data in such a way that original findings emerge from the data obtained (Orlikowski, 1993). Grounded theory usage also strengthened concepts from data (Strauss & Corbin, 2002) represented in teachers' expressions as answers to the questions asked.

Its starting point is specific data. Its intention is to go beyond pre-established concepts by analyzing the processes in social interactions, thereby facilitating the interaction between data collection, coding, analysis and interpretation of information (Clancy & Vince, 2019; Vives Varela & Hamui Sutton, 2021).

In terms of data processing, the importance of the conversation as a tool to establish dialogue was taken into account for both teachers and institutional documents. In this research context, the texts are known as "a communicative fact (event) that takes place over time within a temporal space" (Calsamiglia Blancafort & Tusón Valls, 2002, p. 18). These texts filled with communicative strength have as a background the initial categorization process as they are the result of a theoretical review, that is, trajectory, conceptual and methodological ownership (González Ferro, 2019).

The theory also allowed the consolidation of the concepts from specific data (Strauss & Corbin, 2002). The concepts are represented by the teacher's expressions as answers to the given questions.

Participants

This study had 16 teachers who belong to technological programs related to work on industrial instrumentation factories. 7 of these teachers were enrolled in the industry, and 9 of them were enrolled in the educational sector in elementary, middle and higher education. 10 coordinators and 13 students were also part of the focal groups.

In this regard, the inclusion criteria related to the duration of teachers' employment in the institution with a minimum timeframe of two years being considered. In terms of "group heterogeneity and economy" (Valles, 1999, p. 308), the teachers had work experience in various levels of education, industry, and other sectors. This allowed comparisons to be made and provided a broader perspective of the phenomenon. Finally, the researcher's attempt and research design, as well as time and feasibility, are other criteria established to determine the sample (Strauss & Corbin, 2002).

Number of participants, Their backgrounds, Years of experience

A total of 16 teachers participated in the technology programs in factory operation and industrial instrumentation; 57% of teachers have postgraduate studies in master's degrees and 43% in specialization. Based on their characteristics, they were classified into two groups: the first group represents 43% were related to the industry in a range of 5 to 27 years of professional experience, while 57% were linked to the educational sector in basic, secondary, or university levels, who have between 5-29 years of experience in the field of education. In this group, the youngest teachers were between 30 and 40 years of age.

Table 1. Participants' Characteristics

Teachers	N°	Education level	N°	Professional experience	Teaching experience	N°
Industry	9	Master's degree	10	From to 5-29 years	From 5 to 10 years	10
Educational field	7	Specialization	6		From 11 to 15 years	2
					From 16 to 21 years	1
					From 28 to many more	3

Source: Interviews

Data collection

Data collection took into account the in-depth interviews before carrying out peer review. Furthermore, the informed consent voluntarily signed by the participants complying with the requirements of the Educational Institution's Ethics Committee ensured that the present research has no risks.

Qualitative Phase

Interviews

The in-depth interview was the quintessential technique used in this research. This technique was developed from a perspective that promotes freedom of speech and discourse fluency to avoid interference between the research–participant bonds (Ortí, 1994; Woods, 1993).

For the design of the interview protocol, some preliminary theoretical categories were established such as trajectory, conceptual appropriation, and methodological appropriation, which served as a basis for constructing questions to guide

the interviews. Subsequently, the research group analyzed it and made an initial selection, retaining the relevant ones. Later, it was reviewed by an international expert and four national experts in the field of education and pedagogy, who contributed to defining the protocol. Finally, the interview script was validated considering criteria such as writing style, vocabulary, relevance, and the ability of each item to address the general purpose. The rating scale used was Appropriate (A) and Inappropriate (I), with responses being categorized as Appropriate. The following aspects of the protocol were then defined: life history, changes, difficulties, and successes experienced during teaching practice, individuals or situations in their specific training that have influenced their teaching; contributions made to students; how they conceive students; rewarding experiences, evaluation processes, and their perception of technological education.

The results of the research were shared with the participants of the study and the authorities of the institution. Their perceptions and opinions were added to the final analysis.

The tools used were subjected to a rigorous review by national and international experts. Data triangulation and validation of the results by the participants and the educational institution support the credibility of the study (Patton, 1999).

Theoretical Orientation

From an epistemological point of view, this research is based on the constructivist paradigm, which focuses on the compositions that teachers make every day (Guba & Lincoln, 2002). From an ontological point of view, reality is considered as a social construction (Berger & Luckmann, 2008). In this case, the focus is on experiences lived in the classroom (Heller, 1975; Larrosa, 2003). The research is also set from a methodological perspective as it attempts to demonstrate "the deep nature of realities" (Reichardt & Cook, 1982, p. 128).

Data analysis

This process was organized in three stages: "Data collection, concept order, and theorization" (Strauss & Corbin, 2002, p.13).

In the first stage, instruments were organized according to the initial categories and the research objectives. According to the trajectory, conceptual appropriation, and teachers' methodological appropriation through interviews were recorded and transcribed, by respecting the participants' expressions and ensuring data accuracy (Espinoza Freire, 2020). In the second stage, concept order enabled the definition of categories from the open and axial codification, that is, to extract codes from the online analysis of data (open codification) In this regard, 190 codes were obtained, allowing to establish relationships between categories (axial and establish relations between categories (axial codification). Through constant comparison, trends analysis, from which categories such as training, identity, vocation, affectivity, initial practices, teaching practice, and contingencies emerged. It is worth noting that the process was verified by two external peers to the research process in compliance with the internal validity criterion (Arslan, 2022), who were responsible for assessing and providing observations and suggestions. The last stage is known as theorization, in which theory is built, or the phenomenon is explained. For Strauss and Corbin (2002) "It is a job that not only involves understanding or sensing ideas (concepts), but also formulating them in a logical, systematic, and explanatory outline" (p. 24). The software Atlas.ti, was chosen to process and analyze the qualitative data, in which two units were defined: "teachers involved in the educational sector and teachers involved in the industry" (González Ferro, 2019, p. 102).

The units of analysis were built on the discourses that explained the life experiences, perceptions, and ideas expressed by the teachers. These units were consolidated in codes, which in turn were constituted in categories emerging from the first and second level which in turn makes up the main category, which is the pedagogical knowledge of teachers in technological education.

Results

The data obtained from the interviews were transcribed and analyzed using Atlas.ti software (Bantigen et al., 2022; Joshi & Goldman, 2019; Moura et al., 2024; Nheta et al., 2022). This tool is effective in organizing data as it provides a conceptual framework through the codes (Püschel et al., 2017; Saghafi & Mirzaei, 2021). They are presented as patterns related to ideas that facilitate the categorization process and data interpretation (Mkimbili, 2024; Ochonogor & Seroto, 2021).

The analysis of the results aims to make explicit the constructions of pedagogical knowledge of technology education teachers based on two units of analysis: industry teachers and traditional teachers involved in the educational sector. The analysis of the results shows two categories emerging from the first level: formal and experiential instances. The former connects subcategories such as academic and pedagogical training as spaces of production of pedagogical knowledge of technology education teachers. The latter, connects emerging subcategories such as identity, affectivity, vocation, initial practices, teaching internships, teaching practices, successes, and contingencies.

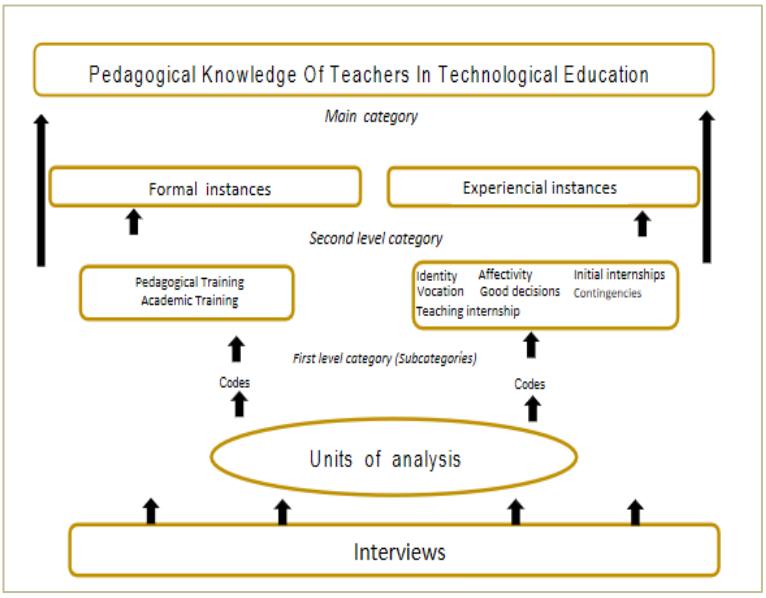

Figure 1. Categories of Pedagogical Knowledge (González Ferro, 2019, p. 103)

The following table shows teacher participation by category:

Table 2. Teacher Participation by Category

Categories	**Identity**	**Affect**	**Vocation**	**Teaching practicum**	**Contingencies**	**good and/or bad decisions**	**Experiences**	**First - steps in teaching practicum**	**Total**
In-service in the educational sector teachers	9	9	9	9	9	9	9	9	16
In-service in the industry sector teachers	7	7	7	7	7	7	7	7	

The number of codes identified from the interview data can be visualized in the following table:

Table 3. Count of Codes by Category

Categories (Themes)	Subcategory	Code	Total	Categories (Themes)	Subcategories	Code	Total
Identity	Research trend	2	9	Teaching practicum	Knowledge application	4	91
	Passion	3			Strategies	21	
	Teacher's motivation	2			Contingencies	1	
	Another type of motivation	2			Assessment	22	
	Relationship	4				15	
Affect	Self-awareness	6	14		Empathy	17	
	Assertiveness	4			Design	11	
	Familiar legacy	4			Students' behavior	11	
	Mystic	7			Time	4	
Vocation	Innate	2	15	Contingencies	Institutional support	2	28
	Dreams	2			Students' difficulties	3	
	Other scenarios	1			Teachers' difficulties	8	
First-step in teaching practicum	Education	4	9		Students' changes	4	
	Enterprise	2			Comprehend	5	13
	Research	2		Good/bad decisions	Applying knowledge	1	
	Community relatedness	1			Acknowledgement	2	
	Experiences	2			Work successes	1	
	Enterprise first-steps						
Experiences	Teaching practicum	7	24				
	Co-working relatedness	6			Total, Codes: 203		
	Peer-working activities	2					

For each group of participants, relationships were established between categories and subcategories that allowed an explanation to be constructed regarding the object of this study. Therefore, some characteristics of pedagogical knowledge in technological education that are shared by the two groups were identified: teachers linked to the industry and teachers linked to the educational sector.

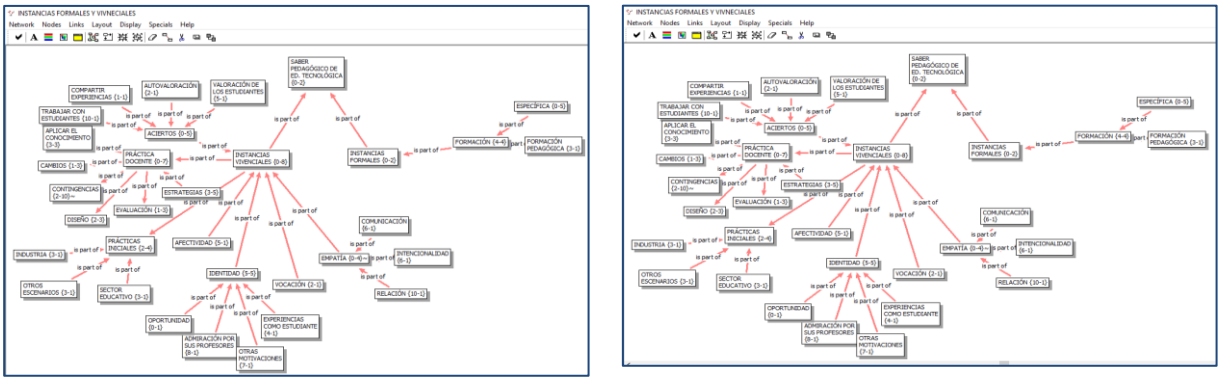

Figure 3. Relationships Between Categories and Subcategories of Industry Teachers and Those from the Educational Sector

Based on the trend analysis, it can be argued that the convergent constructions of pedagogical knowledge for both groups assume the characteristics of being an affective, applied, evolving, used, split knowledge, with assigned responsibility, and prospective knowledge.

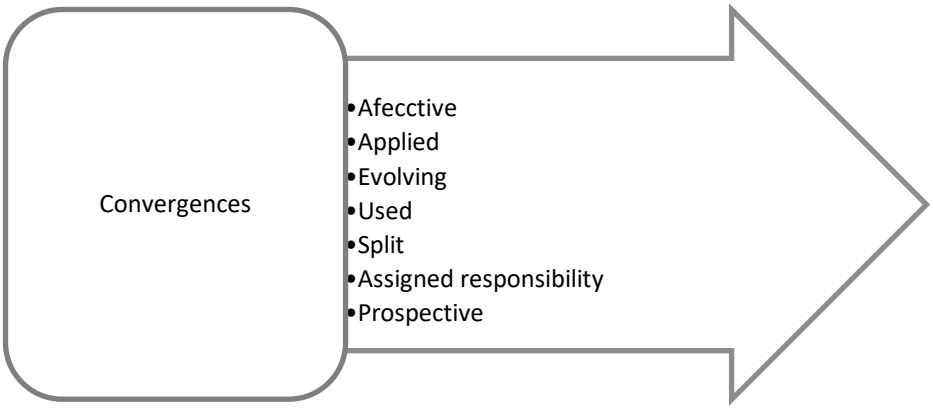

Figure 4. Convergences Between Teachers' Pedagogical Knowledge Characteristics from the Industry and the Educational Sector (Source: Interviews)

The convergences and divergences that lead to the analysis of these two units have the characteristics of the pedagogical knowledge of the technological education teacher. Thus, the aforementioned convergences point to the following: an emotional-applied-changing- adaptable knowledge; a used-split knowledge, a prospective and assigned-responsible knowledge.

The emotional knowledge takes place through the interest the teacher shows towards the students regarding their learning and competence development.

> *"I am always looking… trying to be a guide for them, but it is not clear how to grasp it or adapt it" (Pablo).*

This knowledge is presented as it is applied and changes. The teacher always tries to connect theory with reality. Teachers' stories are as follows:

> *"It was something quite satisfactory. Not only were they (the students) in the classroom, but also, they were in the company while applying what they had learned. That was indeed pretty satisfactory." (Anastasio).*

Pedagogical knowledge in technological education is constantly changing as it is influenced by the context, changes in science and technology, and thus remains in flux.

Teachers in their educational practice are confronted with certain guidelines and demands to which they must respond, often displacing the autonomy and creativity of the teacher. Likewise, the used knowledge takes place as it is subject to the paradigms and guidelines which favors the processes and actions that support the quality's paradigm.

> *… In regard to the administrative part of teaching, it must be done in the easiest way to the teacher; however, it takes longer than expected, and this particular part burdens me (Levin).*

The characteristics of split knowledge are related to teaching difficulties in learning such as didactics, time, resources even the type of hiring. These characteristics greatly affect the *split knowledge.*

> *[...] But it is difficult, it takes time, and grading is a time-consuming task" (Guillermo).*

> *"Sometimes my classes are scheduled, but not the lab. Then, I am always like hey!! please, do not assign class and then you might forget to schedule the lab too. The due process is to schedule class plus the lab" (Marcelo).*

> *"It is difficult not to have financial stability. That issue hinders teachers' commitment to the 100 percent as it should be. There is this feeling of uncertainty every semester that teaching hours are not enough for our daily income" (Estanislao*).

Prospective knowledge encourages the students to think as future professionals, always taking into account their working and social performance based on their profile. Last but not least, delegated responsibility is the official requirement set by the institution that tells the teacher what to do. The teacher must therefore take care of the requirements related to the student's development of basic skills.

> *"Sometimes students have severe deficiencies in basic knowledge, which are difficult to overcome. It hinders class development and the normal flow. […] Then, I try to balance it as much as possible without jeopardizing the assigned hours" (Felipe).*

On the one hand, a teacher's level of experience can be defined according to divergences, that is, for experienced teachers in the industrial sector. The shared knowledge is characterized by technical-experiential, late-teaching vocation, emergent and empathetic. On the other hand, the pre-service teachers in the educational sector had yearned knowledge, innate and meaningful knowledge.

"Well, it all started when I was a child… I'd play the role of a teacher. I taught some trees that surrounded my house." (Eucaris).

"Well, I wanted to do that since I was a child; teach people to serve society." (Benjamin).

Differences are defined according to the teachers' experience level, that is, for teachers who are experts in the industry:

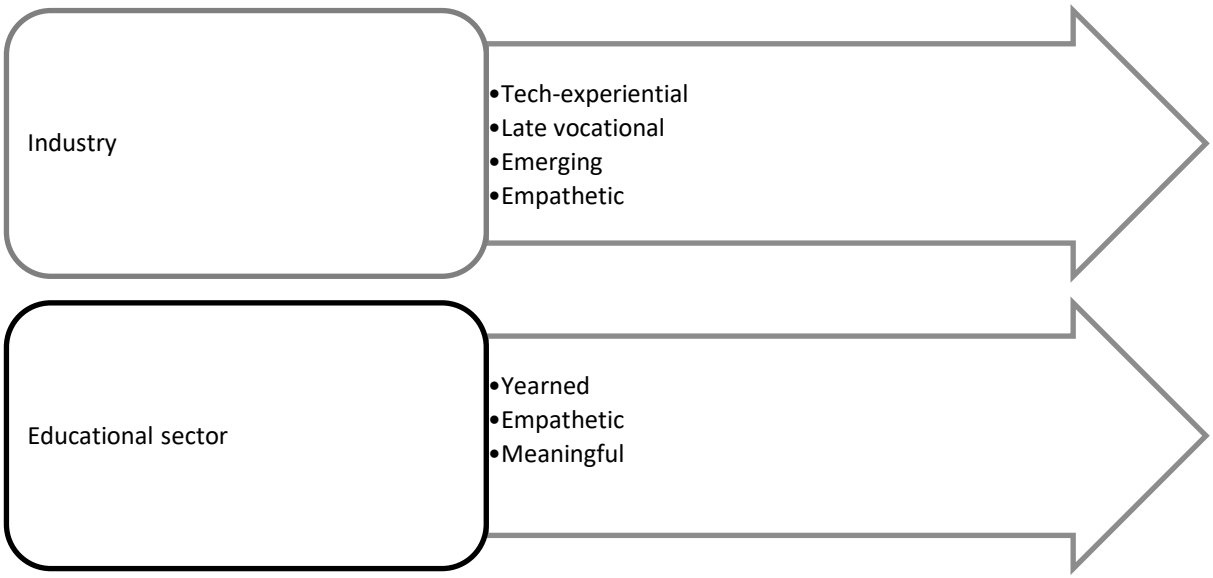

Figure 5. Differences Between the Characteristics of Pedagogical Knowledge of Teachers From the Industry and the Educational Sector (Source: Interviews)

This knowledge assumes characteristics such as technical-experiential, late, emerging, or empathetic vocation. Conversely, teachers' characteristics related to the educational sector are related to their longing for natural and meaningful knowledge.

Discussion

There is pressure between the two units: in-service in the educational sector teachers and in-service in the industrial sector ones. This pressure will be addressed through an analytical loop controlled by a constructed theoretical agreement.

Concerning convergent elements, a well-defined knowledge is featured by pedagogical relations that are mixed of affection and desires. These are, of course, subjectivity encounters that are related to each other (Beyes & Steyaert, 2021; Fried, 1995; Hernández-Hernández, 2020; Leijen et al., 2022; Michels & Beyes, 2016; Eloff & Dittrich, 2021; Malva et al., 2023; Xue, 2024). Student's understanding and interest in their development is a changing scenario that adapts to the context's condition (De Tezanos, 2007; Lutovac et al., 2024; Mercado, 2002; Suárez Durán, 2006). The knowledge that takes place is influenced by the institutional conditions, the student's reality (Nguyen & Trent, 2020; Zhang & Zhang, 2020), and the paradigmatic ideologies that run the institution. The split function weakens this knowledge because it shows the teacher's burden without considering institutional responsibilities.

Assigned responsibility knowledge represents the institutional mission that the teacher must undertake while facing the structural deficiencies that students have in terms of basic skills. These deficiencies derive from schools and are automatically inherited by the teacher. Therefore, the teacher must find ways to compensate for such contingencies (Goodnough & Hung, 2009; Loewenberg Ball et al., 2008; Shing et al., 2015). Finally, prospective knowledge refers to projected knowledge; that is, it considers the student's future, which is motivated by hope. The teacher must accompany skills development for their future (Kara et al., 2022) and must be prepared for the challenges demanded by the knowledge society and technological changes (Yurtseven Yılmaz & Sever, 2021).

However, there are different aspects of pedagogical knowledge: for teachers related to industry, pedagogical knowledge is experiential, technical, late vocational, emerging, and empathic knowledge. These features are linked to the teacher's life course, workplace experiences, and how the teacher gets into the teaching field. It is thus a socially constructed knowledge (Kind & Chan, 2019; Loughran, 2019; Marbán & Sintema, 2023; Smit et al., 2023).

These characteristics are related to the teacher's life journey, their experiences in the working field, and teacher's path toward teaching. This is therefore socially constructed knowledge (Barak, 2024; Blanco-Figueredo & Arias-Ortega, 2022; Husu, 2022; Loughran, 2019; Marbán & Sintema, 2023; Shi et al., 2023; Smit et al., 2023).

Experience and know-how become the support and axis of teaching (Tang et al., 2017; Weber & Mofield, 2023). The teacher shares the knowledge that has been built in the industry as a result of the lived experiences, and this kind of

knowledge cannot be found in books. Hence, it is valuable for students. Tracking the knowledge that teachers build in their classes is essential as it allows them to address the complex issues that arise from practical implementation (Kim et al., 2023; Loughran, 2019; Peel, 2021; Sharma et al., 2023; Villalpando et al., 2020).

Moreover, this is late professional knowledge, as the vocation emerges during the practice of teaching; it did not exist prior to the desire or engineers' ideals. However, this arises strongly from identity and it is rooted in the desire to continue being a teacher. Therefore, this is an emergent knowledge that is formed during the teaching process, and it is empathic since because it considers the other—the student—as the center of teaching (Hake, 2022; Mičiulienė & Kovalčikienė, 2023).

Differentiating characteristics of the pedagogical knowledge of technological education of teachers related to the educational sector refer to longing for natural and meaningful knowledge. These teachers' life stories allow observing teaching as an essential part of their lives. This profession takes strong roots in teachers from a very young age (Hansen, 2001; Hargreaves, 2000), which is also supported by the influence of other teachers who train them or, in some other cases, by the teaching models present in their families.

This knowledge is inherent, having been acquired by the individual at a very young age. It is the result of the desire and passion to be a teacher (Carr, 2005). Likewise, this is meaningful knowledge since it supersedes being a tool and goes beyond consciousness and social duty, which becomes a human duty. This knowledge humanizes in such a way that the profession is not strictly considered as a work commitment but as a philanthropic commitment that drives and identifies teachers' desires and actions (Efilti & Gelmez, 2024; Eloff & Dittrich, 2021; Gates & Curwood, 2023; Gill & Hooper, 2020; Mehta & Gleason, 2021). It is knowledge that is identified with dialogic mediation that facilitates the implementation of other processes, such as research (Nind, 2020).

Conclusions

The number of participants may limit the research in terms of results; however, this study allowed providing an answer to the proposed objective from a more inductive perspective in which individual constructions are privileged. The study of pedagogical knowledge in teachers of technological education allows for a reflective scenario toward the professional development of teachers in this type of education. This reflection comes from a critical approach that observes the conditions in which the institution promotes the pedagogical knowledge's construction and the ways this knowledge is acquired through the teacher's experiential journeys.

The essence of this pedagogical knowledge showed the influence of the teachers' life journeys, ways of feeling and doing, motivations, and good and/or bad decisions. These aspects uncover the root causes in their workplace, which is a result of socially constructed knowledge.

Furthermore, there are several instances where pedagogical knowledge comes from formal and experimental. These are the result of a wide range of elements that show convergences and divergences of the pedagogical knowledge's main category of technological education. This knowledge requires knowledge of the disciplines and experience in the industrial sector, classroom, and teaching.

The study shows convergences related to affective knowledge characterized by a changing and moldable understanding; likewise, instrumentalized and fragmented knowledge emerges, mainly determined by the challenges related to student learning.

The divergences are defined by teachers' experiential level. For some experts in the industry, knowledge assumes characteristics from technical experience, late vocational, and empathy. For others, linked to the educational sector, it is a desired, innate knowledge and knowledge of purpose. Furthermore, there are several instances of pedagogical knowledge production, such as formal and experimental instances, that result in different similarities and differences in the main category of pedagogical knowledge in technological education. This knowledge requires knowing about the disciplines and having experience in the industrial sector, classroom, and teaching.

Likewise, dissection lines that go through pedagogical knowledge hamper teachers' work, which distances knowledge from the true social meaning of education, are identified. Additionally, these lines respond to the structural framework of institutional conceptions, policies, structures, and students' structural deficiencies in terms of basic skills, knowledge, technology requirements, dynamics, and others. These conditions require human context to guide the pedagogical processes by considering the young population's new social and real scenarios.

Pedagogical knowledge in technological education is an urgent task. The proposed path to follow is to understand and systematize as well as to generate transformations within a collaborative environment, which involves teachers' professional development and, therefore, leads to a pedagogical process improvement in the institution.

Recommendations

The study of institutional conditions for the construction of pedagogical knowledge emphasizes the need to adopt a vision that facilitates a concurrent transformation of institutional culture related to educators' professional development.

Institutional culture is committed to creating spaces for the construction of teachers' Pedagogical Knowledge as a pathway to professionalism. Therefore, institutional culture should aim at valuing teachers and their pedagogical knowledge.

It is necessary to include the variable of time in teachers' work plans, distinguishing between institutional time and actual time in teachers' work environments, framed within teaching, research, and social outreach processes. Human talent management could review working conditions through an analysis of methods and time allocation.

Furthermore, it is a priority to address assigned responsibilities in relation to knowledge. Implement an institutional-level strategy that allows sustained support for students with deficiencies in basic competencies; this responsibility does not rest solely on the shoulders of the classroom's teacher. The commitment to educational change includes the creation of spaces for the construction of Pedagogical Knowledge among teachers in order to promote teacher professionalism. The former is achieved through the development of a culture that values teachers and their Pedagogical Knowledge. In this way, it enables scenarios imbued with a sense of belonging.

Limitations

The number of participants may limit the research in terms of results; however, it has allowed responding to the proposed objective from a more inductive perspective in which individual constructions are privileged. The study of the pedagogical knowledge in teachers of technological education allows a context for reflection in the light of their professional development.

Ethics Statements

The Institutional Bioethics Committee, convened to review the proposed for the research project entitled "Education, Inclusion, and Transformation: Perspectives, Challenges, and Opportunities". The foregoing has granted its endorsement in accordance with Rectorial Resolution No. 787 of 2022, Article 5, Subsection E, which stipulates: "The Committee shall actively promote compliance with the current legal framework governing the process and oversight of informed consent application in Colombia." This approval was formalized by Meeting Minutes 08 of 2023, a prerequisite for its subsequent implementation.

Authors Contribution Statement

González-Ferro: Research design, data collection, results analysis, critical review of content, writing, and final article approval. Alfaro-Ponce: Results analysis, critical review of content, writing, and final article approval. Torres-Rivero: Literature search, results analysis, review, and final article approval. Martínez-Díaz: Literature search, results analysis, review, and final article approval. Cárdenas-Barrios: Visualization, graphics, results analysis, review, and final article approval.

References

Abell, S. K. (2008). Twenty years later: Does pedagogical content knowledge remain a useful idea? *International Journal of Science Education, 30*(10), 1405-1416, https://doi.org/10.1080/09500690802187041

Abraham N., M. (2009). Pedagogía, saber pedagógico y prácticas educativas: Reflexiones sobre una experiencia [Pedagogy, pedagogical knowledge, and educational practices: reflections on an experience]. Paulo Freire: *Revista de Pedagogía Crítica,* (7), 119-131. https://doi.org/10.25074/07195532.7.474

Arslan, E. (2022). Nitel araştirmalarda geçerlilik ve güvenilirlik [Validity and reliability in qualitative research]. *Pamukkale University Journal of Social Sciences Institute/ Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, (51), 395-407. https://doi.org/10.30794/pausbed.1116878

Bantigen, K., Kitaw, L., & Negeri, H. (2022). Lived experience and risk reduction behaviors among sero-negative discordant male partners living with Hiv-positive women in Addis Ababa, Ethiopia, 2019: A qualitative phenomenological study. *HIV/AIDS-Research and Palliative Care, 14*, 119-128. https://doi.org/10.2147/HIV.S353286

Barak, M. (2024). Educational ideals and classroom realities: Developing teachers' concepts of dialogic pedagogy in real-world contexts. *Teaching and Teacher Education, 138*, Article 104401. https://doi.org/10.1016/j.tate.2023.104401

Berger, P. L., & Luckmann, T. (2008). *La construcción social de la realidad* [Social construction of reality]. Amorrortu Editores España SL.

Beyes, T., & Steyaert, C. (2021). Unsettling bodies of knowledge: Walking as a pedagogy of affect. *Management Learning, 52*(2), 224-242. https://doi.org/10.1177/1350507620979713

Blanco-Figueredo, L. L., & Arias-Ortega, K. E. (2022). Approaches, epistemic, and ethical bases of the formation of intercultural pedagogical thought in indigenous contexts. *Formación universitaria, 15*(2), 71-82. https://doi.org/10.4067/S0718-50062022000200071

Bontá, M. I. (1997). *La construcción del saber pedagógico* [Pedagogical knowledge construction]. Academia Nacional de Educación.

Calsamiglia Blancafort, H., & Tusón Valls, A. (2002). *Las cosas del decir* [Things about saying]. Editorial Ariel.

Carr, D. (2005). *El Sentido de la Educación* [About education meaning]. Editorial Grao.

Chacón Corzo, M. A., & Suárez Durán, M. E. (2014). La valoración del saber pedagógico desde la relación teoría-práctica: Una consideración necesaria en la formación de docentes [Pedagogical knowledge assessment from a theoretical-practical relation: A necessary consideration in the training of teachers]. Universitas tarraconensis: *Revista de Ciències de L'educació*, (1), 301-311. https://acortar.link/PQKaOC

Chan, K. K. H., & Hume, A. (2019). Towards a consensus model: Literature review of how science teachers' pedagogical content knowledge is investigated in empirical studies. In A. Hume, R. Cooper, & A. Borowski (Eds.), *Repositioning pedagogical content knowledge in teachers' knowledge for teaching science* (pp. 3-76). Springer. https://doi.org/10.1007/978-981-13-5898-2_1

Clancy, A., & Vince, R. (2019). Theory as fantasy: Emotional dimensions to grounded theory. *British Journal of Management, 30*(1), 203-216. https://doi.org/10.1111/1467-8551.12304

De Tezanos, A. (2007). Oficio de enseñar, saber pedagógico: La relación fundante [Teaching job, pedagogical knowledge: The founding relationship]. *Revista Educación y Ciudad, 12*, 7-27. https://doi.org/10.36737/01230425.n12.175

Díaz Quero, V. (2005). Teoría emergente en la construcción del saber pedagógico [Emergent Theory in the Construction of Pedagogical Knowledge]. *Revista Ibero Americana De Educación, 37*(3), 1-18. https://doi.org/10.35362/rie3732711

Donitsa-Schmidt, S., & Topaz, B. (2018). Massive open online courses as a knowledge base for teachers. *Journal of Education for Teaching, 44*(5), 608-620. https://doi.org/10.1080/02607476.2018.1516350

Doyle, A., Seery, N., Gumaelius, L., Canty, D., & Hartell, E. (2019). Reconceptualisisng PCK in D&T education: Proposing a methodological framework to investigate enacted practice. *International Journal of Technology and Design Education, 29*, 473-491. https://doi.org/10.1007/s10798-018-9456-1

Efilti, P., & Gelmez, K. (2024). A deep dive into the impacts of empathy on design learning and teaching. *International Journal of Technology and Design Education, 34*, 809-852. https://doi.org/10.1007/s10798-023-09835-9

Eloff, I., & Dittrich, A.-K. (2021). Understanding general pedagogical knowledge influences on sustainable teacher well-being: A qualitative exploratory study. *Journal of Psychology in Africa, 31*(5), 464-469. https://doi.org/10.1080/14330237.2021.1978166

Espinoza Freire, E. E. (2020). La investigación cualitativa, una herramienta ética en el ámbito pedagógico [Qualitative research: An ethical tool in the pedagogical field], *Revista Conrado, 16*(75), 103-110. https://bit.ly/4bZ2pUz

Fried, R. L. (1995). *The passionate teacher, a practical guide*. Beacon Press.

Gates, E., & Curwood, J. S. (2023). A world beyond self: Empathy and pedagogy during times of global crisis. *The Australian Journal of Language and Literacy, 46*, 195-209. https://doi.org/10.1007/s44020-023-00038-2

Gill, A., & Hooper, D. (2020). Integrating conversational analysis and dialogic reflection within reflective practice. *Iranian Journal of Language Teaching Research, 8*(2), 1-23. https://doi.org/10.30466/IJLTR.2020.120886

González Ferro, V. P. (2019). El saber pedagógico de los docentes de la educación tecnológica [Teachers' pedagogical knowledge in technological education] [Doctoral dissertation, Universidad de Cartagena]. Universidad de Cartagena Repositorio Institucional. https://doi.org/10.57799/11227/132

Goodnough, K., & Hung, W. (2009). Enhancing pedagogical content knowledge in elementary science. *Teaching Education, 20*(3), 229-242, https://doi.org/10.1080/10476210802578921

Guba, E. G., & Lincoln, Y. S. (2002). Paradigmas en competencia en la investigación cualitativa, [Skills paradigms in qualitative research] In C. Hermosillo & J. A. Haro (Eds.), *Por los rincones: Antología de métodos cualitativos en la investigación social* (pp. 113-145). El colegio de Sonora.

Hake, B. J. (2022). Negotiating border-crossings when 'adult education' meets 'vocational learning'. Comparative historical notes on defining the 'research object'. *Zeitschrift für Weiterbildungsforschung, 45*, 491-511. https://doi.org/10.1007/s40955-022-00227-5

Hansen, D. T. (2001). *Llamados a enseñar* [Calls to teach]. Idea Books.

Hargreaves, A. (2000). Mixed emotions: Teachers' perceptions of their interactions with students. *Teaching and Teacher Education, 16*(8), 811-826. https://doi.org/10.1016/S0742-051X(00)00028-7

Hashweh, M. (2013). Pedagogical content knowledge: Twenty-five years later. From Teacher Thinking to Teachers and teaching: The Evolution of a research Community. *Advances in Research on Teaching, 19*, 115-140. https://doi.org/10.1108/S1479-3687(2013)0000019009

Heller, A. (1975). *Sociología de la vida cotidiana* [Daily life sociology]. Ediciones Barcelona.

Hernández-Hernández, F.-(2020). Affection as a movement of desire bound to pedagogical relations. *Matter, 2*, 75-96. https://doi.org/10.1344/jnmr.v1i2.31970

Husu, J. (2022). *Representing the practice of teachers' pedagogical knowing*. Finnish Educational Research Association.

Joshi, M., & Goldman, J. Z. (2019). Endure, evolve, achieve: Stakeholder perspectives on the effectiveness of the Swamp Apes program in restoring biopsychosocial functioning of American veterans. *Cogent Psychology, 6*(1), Article 1584081. https://doi.org/10.1080/23311908.2019.1584081

Kara, A., Anagün, Ş. S., Boyaci, Ş. D., & Yasar, S. (2022). Investigating the link between teacher´s perceptions of 21st century skills efficiency and student´s perceptions of learning experience: Mediating role of teacher´s self-efficacy. *Journal of Pedagogical Research, 6*(4), 50-65. https://doi.org/10.33902/JPR.202215268

Kim, M., McFeetors, P. J., Jin, Q., Rose, K., Carey, J., Miller-Young, J., Jamieson, M., & Adeeb, S. (2023). "We learn things to solve real-life problems": Understanding how nature of engineering beliefs situate developing pedagogical content knowledge in a modular engineering education professional development program. *Journal of University Teaching and Learning Practice, 20*(3), Article 07. https://doi.org/10.53761/1.20.3.07

Kind, V., & Chan, K. K. H. (2019). Resolving the amalgam: Connecting pedagogical content knowledge, content knowledge and pedagogical knowledge. *International Journal of Science Education, 41*(7), 964-978. https://doi.org/10.1080/09500693.2019.1584931

Korkmazgil, S., & Seferoğlu, G. (2021). Teacher professionalism: Insights from Turkish teachers of English into the motives that drive and sustain their professional practices. *Journal of Education for Teaching, 47*(3), 366-378, https://doi.org/10.1080/02607476.2021.1897781

Larrosa, J. (2003). *La Experiencia de la lectura* [Reading experience]. Fondo de Cultura Económica.

Latorre, M. (2003). En el Ojo del huracán: ¿Qué características tiene el saber pedagógico en uso de nuestros profesores?, Es posible contribuir desde la formación inicial? [In the eye of the storm: Which are the characteristics of the pedagogical knowledge applied by our teachers? Is it possible to contribute from initial training?]. *Boletín de Investigación Educacional, 18*, 285-296.

Leijen, Ä., Malva, L., Pedaste, M., & Mikser, R. (2022). What constitutes teachers' general pedagogical knowledge and how it can be assessed: A literature review. *Teachers and Teaching, 28*(2), 206-225. https://doi.org/10.1080/13540602.2022.2062710

Loewenberg Ball, D., Hoover, M. H., & Phelps, G. (2008). Content knowledge for teaching. Wat makes it special? *Journal of Teacher Education, 59*(5), 389-407, https://doi.org/10.1177/0022487108324554

Loughran, J. (2019). Pedagogical reasoning: The foundation of the professional knowledge of teaching. *Teachers and Teaching, 25*(5), 523-535. https://doi.org/10.1080/13540602.2019.1633294

Lutovac, S., Uitto, M., Keränen, V., Kettunen, A., & Flores, M. A. (2024). Teachers' work today: Exploring Finnish teachers' narratives. *Teaching and Teacher Education, 137,* Article 104378. https://doi.org/10.1016/j.tate.2023.104378

Malva, L., Leijen, Ä., & Arcidiacono, F. (2023). Identifying teachers' general pedagogical knowledge: A video stimulated recall study. *Educational Studies, 49*(4), 588-613. https://doi.org/10.1080/03055698.2021.1873738

Marbán, J. M., & Sintema, E. J. (2023). Prospective mathematics secondary teachers' perceptions of their pedagogical content knowledge: An approach in the educational context of Zambia. *Research in Mathematics Education*. Advance online publication. https://doi.org/10.1080/14794802.2023.2281942

Mehta, R., & Gleason, B. (2021). Against empathy: Moving beyond colonizing practices in educational technology. *Educational Technology Research and Development, 69*, 87-90 https://doi.org/10.1007/s11423-020-09901-2

Mercado, R. (2002). *Los saberes docentes como construcción social* [Teachers' knowledge as social construction]. México D.F. Fondo de Cultura Económica.

Metscher, S. E., Tramantano, J. S., & Wong, K. M. (2021). Digital instructional practices to promote pedagogical content knowledge during COVID-19. *Journal of Education for Teaching, 47*(1), 121-124. https://doi.org/10.1080/02607476.2020.1842135

Michels, C., & Beyes, T. (2016). Spaces with a temper: On atmospheres of education. In C. Steyaert, T. Beyes, & M. Parker (Eds.), *The Routledge Companion to reinventing management education* (pp. 312-329). Routledge.

Mičiulienė, R., & Kovalčikienė, K. (2023). Motivation to become a vocational teacher as a second career: A mixed method study. *Vocations and Learning, 16,* 395-419. https://doi.org/10.1007/s12186-023-09321-2

Mkimbili, S. T. (2024). Do biology syllabi provide opportunities for secondary school students to engage with critical thinking skills? *Journal of Biological Education, 58*(2), 444-459. https://doi.org/10.1080/00219266.2022.2067582

Moura, J. F., Negreiros, D. J., Lykes, M. B., Oliveira Neto, J. D. S., Lima, L. B., & Peraira Barros, J. P. (2024). Racialized and gendered impoverishment and violence in Ceará, Brazil: Narratives of surviving mothers and sisters of murdered black women. *Journal of Poverty, 28*(4), 300-317. https://doi.org/10.1080/10875549.2023.2173707

Nguyen, C. D., & Trent, J. (2020). Community perceptions as a source of knowledge for transforming teaching and teacher education in Vietnam. *Journal of Education for Teaching, 46*(3), 281-295. https://doi.org/10.1080/02607476.2020.1733401

Nheta, D. S., Shambare, R., & Sigauke, C. (2022). Micro-perspective lens on entrepreneurs in the early stage of business: Expectations vis-à-vis realities. *African Journal of Science, Technology*, *Innovation and Development, 14*(2), 384-391. https://doi.org/10.1080/20421338.2020.1835175

Nind, M. (2020). A new application for the concept of pedagogical content knowledge: Teaching advanced social science research methods. *Oxford Review of Education, 46*(2), 185-201. https://doi.org/10.1080/03054985.2019.1644996

Ochonogor, V., & Seroto, J. (2021). The influence of home factors and parental characteristics on learners' career choices in a South African secondary school. *Africa Education Review, 18*(5-6), 113-130. https://doi.org/10.1080/18146627.2022.2157741

O'connor, J., & Seymour, B. (1996). *PNL para formadores* [NLP for trainers]. Urano Editores.

Orlikowski, W. J. (1993). Case tools as organizational change: Investigating incremental and radical changes in systems development. *MIS Quarterly, 17*(3), 309-340. https://doi.org/10.2307/249774

Ortí, A. (1994). *La apertura y el enfoque cualitativo o estructural: La entrevista abierta semidirectiva y la discusión de grupo* [Openness and the qualitative or structural approach: The semi-structured open interview and group discussion]. In M. García Ferrando, J. Ibáñez, & F. R. Alvira Martín (Eds.), *El análisis de la realidad social: Métodos y técnicas de investigación* (pp. 189-221). Alianza Editorial.

Parga Lozano, D. L., & Mora Penagos, W. M. (2014). El PCK, un espacio de diversidad teórica: Conceptos y experiencias unificadoras en relación con la didáctica de los contenidos en química. [The PCK, a space for theoretical diversity: Unifying concepts and experiences in relation to teaching contents in chemistry]. *Educación Química, 25*(3), 332-342. https://doi.org/10.1016/S0187-893X(14)70549-X

Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health Services Research, 34*(5 Pt 2), 1189-1208.

Peel, K. L. (2021). Professional dialogue in researcher-teacher collaborations: Exploring practices for effective student learning. *Journal of Education for Teaching, 47*(2), 201-219. https://doi.org/10.1080/02607476.2020.1855061

Püschel, K., Riquelme, A., Moore, P., Rojas, V., Perry, A., & Sapag, J. C. (2017). What makes a medical school socially accountable in Latin America? A report from a Latin American panel based on a qualitative approach. *Medical Teacher, 39*(4), 415-421. https://doi.org/10.1080/0142159X.2017.1296119

Reichardt, C. S., & Cook, T. D. (1982). Más allá de los métodos cualitativos versus los cuantitativos [Beyond qualitative methods versus quantitative ones] *Estudios de Psicología*, *3*(11), 40-55. https://doi.org/10.1080/02109395.1982.10821318

Saghafi, M. R., & Mirzaei, B. (2021). The spatial configuration analysis of a high school through a participatory approach. *Architectural Engineering and Design Management, 17*(1-2), 17-35. https://doi.org/10.1080/17452007.2020.1744420

Segall, A. (2004). Revisiting pedagogical content knowledge: The pedagogy of content/ the content of pedagogy. *Teaching and Teacher Education, 20*(5), 489-504. https://doi.org/10.1016/j.tate.2004.04.006

Sharma, G. V. S. S., Naidu, A. L., Rao, K. S., Venkata Suresh, B., Kumar, P., Shireesha, Y., Simhadri, K., Gurugubelli, S., Mondal, B., Sudhakar, U., Choudhary, P. K., Reddy, G. D., Janardhan, G., Prasad, K. S., Babu, C. V., Ravi Babu, S., Rao, S. C., Pavani, P. N. L., Vykunta Rao, M., … Sobhanachala Vara Prasad, C. L. V. R. (2023). Bridging the industry–academia gap: An experiential learning for engineering students. *Journal of Formative Design in Learning*, *7*, 139-157. https://doi.org/10.1007/s41686-023-00086-4

Shi, L., Chen, S., & Zhou, Y. (2023). The influence of social capital on primary school teachers' creative teaching behavior: Mediating effects of knowledge sharing and creative teaching self-efficacy. *Thinking Skills and Creativity, 47*, Article 101226 https://doi.org/10.1016/j.tsc.2022.101226

Shing, C. L., Saat, R. M., & Loke, S. H. (2015). The knowledge of teaching, pedagogical content knowledge (PCK). *Malaysian Online Journal of Educational Sciences, 3*(3), 40-55. https://bit.ly/45q1SbD

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reforms. *Harvard Educational Review, 57*(1), 1-23. https://doi.org/10.17763/haer.57.1.j463w79r56455411

Smit, E., Tuithof, H., Savelsbergh, E., & Béneker, T. (2023). Geography teachers' pedagogical content knowledge: A systematic review. *Journal of Geography, 122*(1), 20-29. https://doi.org/10.1080/00221341.2023.2173796

Strauss, A., & Corbin, J. (2002). *Bases de la investigación cualitativa. Técnicas y procedimientos para desarrollar la teoría fundamentada* [Qualitative research basis. Techniques and procedures to develop founded theory]. Editorial Universidad de Antioquia.

Suárez Durán, M. E. (2006). *El saber pedagógico de los profesores de la Universidad de los Andes Táchira y sus implicaciones en la enseñanza* [The pedagogical knowledge of professors at the University of the Andes, Táchira, and its implications in teaching] [Tesis doctoral, Universitat Rovira i Virgili, Tarragona, España]. Repositorio de la URV. http://hdl.handle.net/20.500.11797/TDX700

Tang, S. Y. F., Wong, A. K. Y., Li, D. D. Y., & Cheng, M. M. H. (2017). The contribution of non- formal learning in higher education to student teachers' professional competence. *Journal of Education for Teaching, 43*(5), 550-565. https://doi.org/10.1080/02607476.2017.1342052

Valles, M. S. (1999). *Técnicas cualitativas de investigación social: Reflexión metodológica y práctica profesional* [Social research qualitative techniques: Methodological reflection and professional practice]. Editorial Síntesis S. A.

Vasco Montoya, E. (1995). *Maestros, alumnos y saberes. Investigación y docencia en el aula* [Teachers, students, and knowledge. Research and teaching in the classroom]. Editorial Magisterio.

Villalpando, C. G., Estrada-Gutiérrez, M. A., & Álvarez-Quiroz, G. A. (2020). El significado de la práctica docente, en voz de sus protagonistas [The meaning of teaching practice, in the voice of its protagonists]. *ALTERIDAD: Revista de Educación, 15*(2), 229-240. https://doi.org/10.17163/alt.v15n2.2020.07

Vives Varela, T., & Hamui Sutton, L. (2021). La codificación y categorización en la teoría fundamentada, un método para el análisis de los datos cualitativos. [Encoding and categorization in grounded theory: A method for qualitative data analysis]. *Investigación en educación médica, 10*(40), 97-104. https://doi.org/10.22201/fm.20075057e.2021.40.21367

Weber, C. L., & Mofield, E. L. (2023). Considerations for professional learning supporting teachers of the gifted in pedagogical content knowledge. *Gifted Child Today, 46*(2), 128-141. https://doi.org/10.1177/10762175221149258

Woods, P. (1993). *La escuela por dentro: La etnografia en la investigacion educativa* [The school on the inside: Ethnography in educational research]. Paidós.

Xue, M. (2024). How teachers' enthusiasm influences Chinese students' school belonging: The mediation role of teaching practices. *International Journal of Educational Research, 124*, Article 102310. https://doi.org/10.1016/j.ijer.2023.102310

Yurtseven Yılmaz, H., & Sever, S. (2021). A professional development analysis for Turkish language teachers: What did they expect? What have they found? *Journal of Pedagogical Research, 5*(1), 88-113. https://doi.org/10.33902/JPR.2021067243

Zambrano Leal, A. (2006). Tres tipos de saber del profesor y competencias: Una relación compleja [The teacher's three types of knowledge and competences: A complex relation]. *La Revista Venezolana de Educación Educere, 10*(33), 225-232.

Zapata Villegas, V. (2009). La evolución del concepto saber pedagógico. Su ruta de transformación [The evolution of the pedagogical knowledge concept. Its transformation route]. *Revista Educación Y Pedagogía, 15*(37), 175-184.

Zhang, L. J., & Zhang, D. (2020). Dialogic discussion as a platform for constructing knowledge: Student-teachers' interaction patterns and strategies in learning to teach English. *Asian-Pacific Journal of Second and Foreign Language Education, 5*, Article 22. https://doi.org/10.1186/s40862-020-00101-2

Zuluaga de Echeverry, O. L. (1999). *Pedagogía e historia. La historicidad de la pedagogía la enseñanza, un objeto de saber* [Teaching and history. Teaching history, teaching, means for knowledge] Siglo de Hombre Editores. Anthropos, Editorial Universidad de Antioquia.