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Systemic Model of Educational Teacher Knowledge: Teacher Collaboration as the Main Key

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Systemic Model of Educational Teacher Knowledge: Teacher Collaboration as the Main Key

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Abstract

Models for understanding teacher knowledge do not consider the possibility of teachers themselves generating it. The model of Verástegui and Úbeda (2022) has developed in response to the need to overcome this limitation, which it does by including teacher agency as a key element for understanding teacher knowledge. The aim of this research is to define the degree of operationalisation of the Systemic Model of Educational Teacher Knowledge, using a qualitative methodology comprising discourse analysis of a semi-structured interview and focus groups with a total of 25 teachers. The main findings show that the model is comprehensible to teachers, it partially approximates their experience, and it incorporates new elements for understanding the nature of the concept. Consequently, this research makes it possible to overcome some dichotomies in the conceptualization of educational teacher knowledge and incorporate collaborative dynamics into its comprehension and generation. Finally, updates to the model are suggested, highlighting the inclusion of three elements of pedagogical content knowledge – personal, enacted, and collective – and new research lines are proposed to validate its capacity for researching the object of study.

Keywords: pedagogical content knowledge, teacher collaboration, reflection, observation, teacher transfer



Modelo Sistémico de Conocimiento Educativo Docente: la Colaboración del Profesorado como Clave Principal

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Resumen

Los modelos de comprensión sobre el concepto de conocimiento docente no incluyen la posibilidad de su generación por parte del propio profesorado. El modelo de Verástegui y Úbeda (2022) surge con la necesidad de superar esta limitación y lo hace introduciendo la agencia como un elemento clave en su comprensión. El objetivo de esta investigación es definir el grado de operatividad del modelo de conocimiento educativo docente, siguiendo una metodología cualitativa, a través del análisis del discurso, mediante la entrevista semiestructurada y los grupos de discusión, participando un total de 25 docentes. Los principales hallazgos mantienen que el modelo es inteligible para el profesorado, que se aproxima parcialmente a su realidad y que incorpora nuevos elementos de comprensión sobre la naturaleza del concepto. Así, permite superar planteamientos dicotómicos en su conceptualización e incorpora las dinámicas de colaboración en la comprensión del conocimiento del profesorado y su generación. Por último, se proponen algunas actualizaciones sobre el modelo, destacando, la incorporación de los tres componentes del PCK: personal, enacted y collective, y nuevas líneas de investigación que permitan validar el modelo en su capacidad de investigar el objeto de estudio.

Palabras clave: Conocimiento de contenido pedagógico, colaboración docente, reflexión, observación, transferencia docente

The concept of teacher knowledge developed in the 1980s through the work of Shulman (1987). Since then, there has been interest in studying it owing to its value for better understanding teaching as a profession (Guerriero & Diligiannidi, 2017). From the outset, Shulman has offered a dynamic idea of the conceptualisation of this phenomenon. Based on his model of Pedagogical Reasoning and Action, he set out a process to explain how teachers are able to activate their knowledge in professional practice.

For Shulman (1987), the knowledge base for teaching comprises seven categories: content knowledge; pedagogical knowledge; curriculum knowledge; knowledge of learners; knowledge of contexts; knowledge of educational ends, purposes, and values; and pedagogical content knowledge (PCK). For him, PCK is what empowers teachers, setting them apart from other professions, as it enables them to transform their content knowledge with the aim of teaching (Shulman, 1987).

Following Shulman, many proposals have centred on studying teacher knowledge, in particular PCK (Abell, 2008; Carlsen, 1999; Grossman, 1990; Magnusson et al., 1999; Morine-Deshimer & Kent, 1999; Park & Oliver, 2008; Rollnick et al., 2008), in order to understand its nature, its components, its characteristics, and how teachers access it (Fernández, 2014; Kam Ho Chan & Hume, 2020).

Within this framework, in 2012 a group of researchers elaborated a model of teacher knowledge called the Consensus Model with the aim of providing researchers with a unified and agreed concept of PCK. PCK is understood as “the knowledge of, reasoning behind, and planning for teaching a particular topic into a particular way for a particular purpose to particular students for enhanced student outcomes” (Gess-Newsome, 2015, p.36). This model dialogues with Shulman’s proposal (1987) and so features a dynamic concept of teacher knowledge (Rèvai & Guerriero, 2017). That is to say, it is an action-based model in which the teacher is regarded as “a reflective agent reflecting in their practice and reassesses it to achieve better results with their students reconstructing and transforming your personal PCK, their specifics professional knowledge of a topic and its knowledge base” (Fernández, 2014, p. 92). Although this model is a good starting point for studying teacher knowledge, we still feel it is incomplete as it does not include generation of knowledge by teachers, in either the *ad-intra* or *ad-extra* aspects of the profession. Despite the fact Consensus Model was updated in 2016 with the

Refined Consensus Model (Carlson et al, 2020), introducing greater dynamism and three fields of PCK (personal, enacted and collective), it is vital to incorporate this dimension in its conceptualisation. So, the Systemic Model of Educational Teacher Knowledge, (Verástegui & Úbeda, 2022) incorporates Consensus Model (Gess-Newsome, 2015) into the ecological model of teacher agency of Priestley et al. (2015). This model of agency, based on pragmatism, incorporates of the ecological approach within the theory of action, that is, adding to the understanding of the teaching praxis the interaction between the various elements that compose it. By agency we mean the overall professional capacity of the teacher that emerges from the interaction between the capacity of teachers to formulate possibilities for action, the active consideration of such possibilities and the exercise of choice, and contextual factors, that is, the structures social, material and cultural factors that influence human behavior (Priestley et al., 2015, p. 23).

This integration of the agency in the Refined Consensus Model expands the model in four points:

1. It situates the different knowledges of teachers that comprise their knowledge base in the different dimensions of their agency: in the iterative dimension, the knowledge base of the profession and specific professional knowledge; in the practical–evaluative dimension, PCK; and in the projective dimension, the knowledge of the professional community. This makes it possible to integrate dynamically the knowledge teachers possess and the knowledge they create, without making the classical distinction between formal and practical knowledge (Domingo, 2020). Similarly, it goes beyond the debate about whether teacher knowledge is individual or collective (Kam Ho Chan & Hume, 2020), as it integrates both levels of knowledge, showing how they are interrelated.
2. It explicitly sets out the pedagogical reasoning that teachers need in order to transform the knowledge they possess into the knowledge they transfer to their students. This is a key process in PCK that makes it possible to understand teaching and differentiate it from other professions (Shulman, 1987; Carlson et al, 2020; Guerriero & Diligiannidi, 2017).
3. It incorporates the dynamics of collaboration: reflection, observation, discussion and systematization, as the nexuses that relate teachers' agency with the knowledge they generate on the

basis of their educational practice (Domingo, 2020; Romar & Frisk, 2017; Verástegui, 2019). This is undoubtedly the main contribution of the model as it incorporates the vision of the teacher as an agent who creates knowledge and not as someone who merely applies it (Reis-Jorge et al., 2020; Willingham & Daniel, 2021) and it also adds collaboration as a fundamental element of professional practice (Hargreaves & O'Connor, 2020; Rodríguez Moneo et al., 2020; Stewart & Houchens, 2014).

4. It introduces educational transfer as another collaborative dynamic which, on the one hand, shows how the process of teacher knowledge generation culminates in dissemination towards the educational community and, on the other, it indicates the collective knowledge construction of the profession, incorporated in the projective dimension of agency. It is necessary to clarify this aspect of the profession (Van Driel, 2021) in models for comprehending teacher knowledge, as it incorporates the dimension of collaborative professionalism (Hargreaves & O'Connor, 2020).

Since the development of Systemic Model of Educational Teacher Knowledge (Verástegui & Úbeda, 2022), it has become vital to incorporate the views of teachers in order to validate its operationalisation, in other words, to establish the extent to which it approximates to teachers' understanding of the knowledge generation process. This study presents the results obtained with teachers on the dynamics of collaboration that link agency with the knowledge that teachers generate and the definition of this concept.

Methodology¹

Objectives and Methodological Focus

The aim of this research is to define the degree of operationalisation of Systemic Model of Educational Teacher Knowledge (Verástegui & Úbeda, 2022). We understand operationalisation as the capacity of the model to (i) be intelligible to and understood by teachers and (ii) provide an approximation to the reality of teaching. The specific objective, then, is to evaluate the distance between the conceptualisation of educational teacher knowledge and teachers' experience of this construct.

We used a qualitative methodology, a phenomenology approach (Korstjens & Moser, 2017), which enables us to describe and understand the phenomenon of teachers' conception of educational teacher knowledge without losing sight of the complexity that its study requires (Bisquerra, 2004). To do this, we used two instruments: structured interviews and focus groups. All the phases of the research have been developed complying with the relevant ethical and legislative questions².

Research Techniques and Instruments

The structured interview³ gathered data about participants' perceptions of the concept of educational teacher knowledge and the collaborative dynamics involved in generating it. This instrument comprises two blocks. The first, "dynamics of collaboration", comprised 5 categories ("collaboration between teachers, reflection, peer observation, systematization, and transfer of practice"). The second, "educational teacher knowledge", comprised a single category with the same name. All of the categories used a combination of open-ended questions and closed questions (dichotomous yes/no, Likert-type, and ranking).

As well as the interview, two discussion groups⁴ were held to triangulate the data obtained in the interviews and make the methodological process more rigorous.

The interviews (45 minutes) and focus groups (90 minutes) were held online using Zoom in November and December 2021.

Participants

The research subjects were teachers from five schools who took part in a pilot programme called "Red Pensadero"⁵ (following the accessibility criteria to the participants), implemented by the Fundación Promaestro during January and April 2022, aimed at constructing educational knowledge and collaborative professional dynamics. Table 1 shows the details of the sample by centre.

Table 1

Details of the participating schools

	Categories	Number
Ownership	Public	2
	Private	0
	State-assisted independent	3
Autonomous Region	Madrid	3
	Aragón	2
Setting	Urban	3
	Rural	2
Size of centre	<60 students	1
	150–300 students	3
	>300 students	1
Special complexity	Yes	2
	No	3

The total number of participants comprised 25 teachers: 13 teachers, 11 women and 2 men, who were interviewed and 12 teachers, 7 women and 5 men, who took part in the discussion groups. The compulsory stages of education were represented (early years, primary, secondary and special education), and 5 members of management were involved in the interviews (4 women and 1 man).

Validation of the Instruments

The qualitative instruments were validated twice and the interview was subjected to a piloting process. First, we tested the content validity. This involved an inter-rater process in which 3 experts participated as well as a population external to the sample, with 4 teachers participating (1 early years, 1 early years and primary and 2 secondary). Once the instruments had been corrected, the piloting was done by interviewing two teachers non participants in the research.

Having collected all of the data, a second validation was performed, focussing on the codebook⁶. First, the book and the interpretations of each code were prepared with two experts. The categories of analysis were constructed through a deductive logic based on Systemic Model of Educational Teacher Knowledge (Verástegui & Úbeda, 2022). This was subsequently validated during the coding of the data. To do this, inter-rater triangulation was carried out, featuring 10 experts who were sent the codebook and a questionnaire in which they were asked to choose a code for each of the 20 selected quotes. 74% of the results matched the initial coding. Of the remaining 26%, only 9.5% did not match at all and 16.5% matched in either the concept or the description. Half of the responses were obtained in three quotes with a different coding but only one category was eliminated because its coding had nothing to do with the initial one (“school culture and organisation for knowledge construction”).

Data Processing, Analysis, and Interpretation

The data processing phase was developed from the recording and transcriptions of the techniques and the encoding followed the proposed codebook, using two programs: NVivo for the discussion groups and the open questions from the interview; Excel for closed questions.

Second, a descriptive analysis was carried out from the deductive approach, based on the codebook, through two routes: interparticipants and by themes (Morse, 1994). The first, oriented to the constant comparison of the data of different subjects to obtain similarities and differences in the answers. The second, oriented to the collection of all the information of a category to identify common structures.

Finally, in the interpretation phase, an inductive analysis of the language was carried out, which allowed obtaining information on the coherence, contradictions, and absences of the answers (Pérez, 2021). We used the constant comparison of the testimonies collected in each category and the comparison of these with the closed questions, which allowed analyzing the similarities and discrepancies in their conceptions (Guba, 1989).

Finally, to anonymise participants' responses, we used the labels IPI (interview participant) and GPi (discussion group participant) with i being a number.

Results

Collaboration between Teachers

Most of the interviewees define collaboration between teachers as the process by which teachers reach agreements to achieve shared educational objectives. In other words, having time and space to create a shared vision of the teaching–learning process in order to support each other mutually in achieving the proposed objectives and to share resources and data about students.

Going beyond coordination, the teachers believe that collaboration involves carrying out processes such as peer observation, co-teaching, constructive feedback, and exchange of ideas and knowledge. In other words, they believe that collaboration involves a process of continuous training between peers and professional development, which can take place at two main levels: in a particular centre or between centres.

Purpose and relevance is a fundamental question for the teachers interviewed and it is intrinsic to the practice of teaching as it makes it possible to agree on objectives and jointly design how to achieve them. They believe that the unit of learning is the centre and the unit of pedagogical knowledge is the teaching community. This learning and knowledges are transferred and implemented at the classroom level through everyday educational practices. In this respect, they report that the best educational experiences they have encountered in their centres have been the result of this collaboration (*Everything intense, valuable, and marvellous that I have seen at school I work at has come from many teachers contributing their ideas and enriching the process, GP1*). They also report that the complexity of teaching requires this diversity of knowledges and experiences to meet the students' needs adequately (*My experience in these years is that collaboration is fundamental when we are catering for children, when we want to educate them, GP1*).

Moreover, some teachers identified collaboration as the process that enables them to feel supported in their work, unlocking difficult situations with certain students or even amplifying new perspectives on methodologies and content. In this way, the teachers interviewed insisted on the need to be part of a team and an educational project.

Nonetheless, despite the importance they put on collaboration, many of the interviewees confirm that they encounter numerous difficulties putting it

into practice in their centres, most notably a lack of human resources and time. In view of these difficulties, most of them consider that it would be essential to change certain aspects of school organisation:

The part that is not so good is that collaboration does not appear on its own, there isn't a momentum that leads to this. I think the centres should create structures, dynamics, tools, moments so that these collaborative structures function because if they don't, it is impossible (GP1).

Reflection about Educational Practice and Systematic Discusión

For most of the teachers interviewed, reflection is the process that enables them to evaluate and improve their educational practice, a guide to understand better the teaching–learning process and offer more appropriate educational responses to their students. Therefore, they consider that it allows them to learn from their own practice and from that of other colleagues and that it is part of their day-to-day professional activity. Accordingly, when they are asked about systematic discussion between teachers, they regard it as a professional and collaborative way of reflecting on their practice. In other words, the capacity to think jointly about *what has worked and what has not, to achieve confirmed, valid, and reliable results (IP1)*, in both the classroom and the centre. Above all, they consider that it is a formal and enriching space for incorporating new ideas, reaching agreements, debating outlooks, and creating a professional community that offers a common framework for work and a sense of unity.

When we speak about pedagogical experiences, everyone sets out what is working for them in the classroom and what isn't; they share how their day-to-day work is going. Basically, we set out the different experiences of each day in each classroom and, as a group, we think about how to improve these practices (IP2).

For them, the essential purpose of reflection and, specifically, of systematic discussion is to expand the educational vision to approach the teaching–learning experience in the best way possible. This aim is expressed through various objectives. Firstly, to drive innovation through the incorporation of other professional perspectives, because it enables them to review their practice, learn from it and improve it. Secondly, to offer the

necessary times and spaces for collective reflection to occur in the centres (*sitting down with that objective fosters reflection, metacognition, a space dedicated to formal reflection, IP3*), and to record the educational work generated in it that *can be extracted or recovered in other circumstances [...]* and used as a source of knowledge (*IP4*). And, finally, to give continuity to the centre's educational projects, observing *which things work and which don't, so that they don't fall by the wayside* (sic) (*GP4*).

With regards to frequency, they all believe that they reflect habitually. Most of them describe this process as a spontaneous and recurrent experience, a need that emerges within their professional exercise rather than an unhurried and systematic process, which occurs on an occasional and *ad hoc* basis. In fact, a certain ambiguity is apparent in relation to the frequency with which systematic and collaborative reflection is performed. On the one hand, the respondents all seem to recognise that they have spaces for discussion, as they identify them with the coordination and staff sessions. But on the other, they consider that these spaces to be insufficient from the reflexive viewpoint, as they are not necessarily aimed at a systematic pedagogical reflection, nor, much less, systematized. Nonetheless, the majority of the teachers interviewed state that reflection with these characteristics could have major benefits for their practice. Consequently, there is a certain unanimity regarding the need for centres to have the time and space to be able to implement it.

We have spaces for reflection, but they are hallway [sic] spaces for reflection. The centres need to give us resources and spaces for coordination sessions, staff sessions, good practices. These meetings are necessary for reflection to happen (*GP2*).

Peer Observation

Regarding the purpose of peer observation, most of the teachers interviewed see it as a way of learning the profession, both when joining it and for professional development, as they report that much of what they have learnt, they learnt through their colleagues. They also consider that this learning experience serves *to improve the educational practice of both professionals, the observer and the observed (IP5)* and that it is linked to the needs of the classroom and of the educational context, making it possible to take

advantage of the experience and the resources in the centre. Secondly, they report that it is a good instrument for evaluating educational practice and professional performance that enables them to know what works and what does not in the classroom.

It stops you falling into the pattern of always doing the same thing and raises teachers' level of awareness of what they are doing, both in the things that enable them to achieve the objectives they pursue in the students and those that limit them (IP8).

In third and final place, some teachers consider that it allows them to act in a coordinated way, fostering the feeling of being part of a professional collective that offers a coordinated message of unity to the students (IP6).

The results described above agree with the teachers' responses to the Likert-type questions (where 1 is totally disagree and 6 is totally agree). Firstly, they consider that it is not a dynamic that is easy for teachers to execute. Only one of the thirteen teachers answered yes, while another five gave this statement a score of 4 and the remaining (seven) scored it below 4. Secondly, apart from two of them, the remaining teachers consider it to be a tool that allows the teacher to understand better the teaching–learning process and that is a good instrument for evaluating professional performance (only one scored it negatively). Regarding the rest of the statements, all of the teachers scored them positively (mostly either 5 or 6) and so they consider it to be a valid tool for teachers to gather evidence about their practice, that fosters a culture of collaboration and that allows teachers to learn from the practice of others.

As for frequency, they have all been observed or been the observer more than once (apart from one who had not had the latter experience). However, observation is not a habitual practice, especially planned and prepared observation with criteria and a log. Those who have undergone this experience say that it is very enriching as it guides the observation (there are established criteria that both parties know), makes it more manageable and successful (it pursues a specific objective), and so make it possible to validate educational practice. In this sense, the teachers who are part of the management team note the importance of creating systematized observation processes that, on the one hand, offer rigour and objectivity to the validation

of the practice and, on the other, strengthen and increase the security of the teachers who are observed.

When it is done systematically, you gain objectivity. The data is recorded so it can be used appropriately. In the end, all of the expectations are suitably set out: yours as an observer and those of the person who is observed because they know what is going to be observed (IP8).

Systematization of Practice

When we speak of systematization, the interviewees understand this as the process that enables use of the knowledge available in each centre. This is because, on the one hand, it makes it possible to capture the personalised progress of each student and, therefore, offer greater security and greater objectivity to their educational experience (*It is what will make us take suitable decisions [...] and it directly impacts the students, IP5*). And, on the other, it facilitates the continuity of the centre's project and favours dynamics of professional collaboration (*Apart from improving these student learning processes, it strengthens you as a teacher and improves the school, IP2*).

When they are asked about how they gather the data that enables them to know whether their educational practice meets the objectives it pursues, many of them answer that they do this through direct observation of students, evaluation indicators, or capturing the voice of the students.

You have to start from the objective you want to fulfil and systematize the criteria and evaluation indicators, which lets you see whether you are fulfilling it. In another less systematic way, as often happens, it is true that you do not have the necessary data (IP5).

Furthermore, regarding the continuity and coherence of the educational project, systematization makes it possible to have a logical framework in teaching, both in classroom practices and at the centre level, and so makes it possible to make better use of the pedagogical resources and efforts available in it, as *it saves a lot of work later on and a lot of internal stress during the term (IP4)*. In addition, it makes it possible to know how other colleagues work and incorporate novice or new teachers into schools in a more satisfactory way. Therefore, teachers regard it as fundamental because it

offers a working framework, a shared outlook that stabilises the educational process, and security for teachers, although they feel it should be flexible; in other words, it should make it possible to improvise and better fit the reality of the students. Nonetheless, the systematization carried out is not aimed at transfer but at planning and evaluation.

Although all of the teachers believe it is important for them to dedicate part of the working day to systematize their educational practice, their experience of it is occasional and individual, with a lack of systematized and shared processes relating to the format or time of this task in most cases. This means that the aim of sharing and collectively taking advantage of the knowledge available in the centre is not fully achieved and that dissemination of practice is limited and uncommon.

Individual practices, the ones you do everyday in the classroom, are not normally set down in writing. There are very good teaching practices that are not disseminated. Those good practices are the ones that have to be shared and if they aren't recorded, you can't spread them (IP6).

Transfer of Practice

Most of the teachers understand transfer as participation in staff seminars to share educational practice (spontaneously or systematically), experiences of interchange with other centres, and seminars or publications (although these are less common). Indeed, many consider transfer to be the culmination of the processes of collaboration between teachers (*It is the shared knowledge, teachers speaking, listening to each other, sharing and building, GP1*).

Another aspect that was discussed was the need for teachers to adapt the knowledge they spread and its objective depending on the person to whom it is directed. Consequently, they identify three areas of diffusion: the immediate educational community (staff and families); a wider educational community (other centres and teachers); and the rest of the system (other educational agents).

The first sphere, for them, comprises interchange of knowledge about how to teach, what resources and materials to use, what educational practices to implement, and how they function in the classroom. As in systematization, the aim in this environment is training between peers that makes it possible to have teaching staff who work collaboratively and for them to share the

available knowledge about *how students learn and what they need (IP10)*, and, furthermore, to foster a positive relational structure with families that offers them peace of mind and confidence and enables them to be part of the process of their children's education.

In the second sphere, the teachers consider that the transfer between centres greatly enriches the educational experience and fosters belonging to a stronger professional body with the capacity to have an impact, although most of them believe that this capacity is currently minimal.

Because it makes us open ourselves up to what they do in other centres and I think that this makes you reflect on education. [...] It makes you stronger, a more cohesive group, and it makes you progress and see that your opinion can change something in education, which before was unthinkable (IP7).

In the third sphere, directed towards transfer to other educational agents and society, they underline the importance of valuing the teaching profession and the questions that arise in the classroom, with the objective of the system taking into account the knowledge that comes from the teachers.

The education system should be based on teacher knowledge, because we are the ones on the front line and we know how it works. If it was treated with the proper importance, teaching would have a great impact. An education law based on the real knowledge of the schools would be framed (IP4).

In essence, transfer would ultimately have knowledge generation as its objective. That is to say, it makes it possible to know what happens in centres and classrooms, increases professional interchange, improves the dissemination of teacher knowledge, improves trust of the educational community and families, and finally makes school situations visible that would not otherwise reach society.

With regards to frequency, we also encounter two levels of transfer. Firstly, all of the teachers consider that they disseminate their work (they share practices or exchange materials) or that they are in centres that have structures and systems for internal dissemination for the immediate community. This level is more or less spontaneous depending on the organisational culture of the centre and the individual experiences of each teacher. The second level of transfer, which is more systematic and requires dissemination outside the educational community (publication in journals,

presentation in workshops and seminars, systematic interchange of practice within faculties and between centres), is much less frequent among the interviewees, although those who have experienced it have a very positive view of it.

Educational Teacher Knowledge

Faced with the definition of educational knowledge (educational processes and knowledge that involve the holistic development of a person), the teachers emphasise two notions. The first, which is global and holistic, is understood as *society's knowledge of education (IP9)*. The second, aimed at the teaching–learning process, is understood as *the knowledge students obtain at school (IP9)*. In this second one, the knowledges that teachers need to acquire and develop through training and their practice in order to teach are identified.

Moreover, when asked whether they believe that they are capable of generating educational knowledge, the teachers all answered yes except for one (who considers that it depends on the starting knowledge of the teacher). They agree that this knowledge construction requires prior training and a professional community that legitimises it. Regarding the type of knowledge they generate, they are clear that it is knowledge that comes from experience, practical knowledge that is aimed at encouraging students' learning and offering the best teaching available. For most of them, this knowledge is related to pedagogical strategies (didactic and evaluation), bond strategies (with the students and families), values, and subject-specific content.

To build this knowledge, the interviewees suggest that, separately from the classroom experience, teachers require particular professional dynamics such as reflection and discussion about practice, observation and systematisation, and also continuous training and evaluation.

Planning systematically and reflexively. Thinking about the purpose for which I am doing this, why I'm doing it, and how I will evaluate whether it is having an impact on the students. Being systematic in execution, having clear evaluation indicators and evaluating to then go back to reflect on what was planned and propose improvements. If you don't do all of this, it is hard to transmit educational knowledge (IP5).

Furthermore, they consider transfer to be the culmination of this construction of knowledge, since it makes it available to the whole of the educational community (*Educational knowledge is reflection, systematization, developing strategies, techniques, resources, emotions, and evaluation indicators. It is all of our teaching work and if in some way it can be shared and can be spread, it is more enriching, GP3*). In fact, the idea that this transfer of knowledge could lead to greater recognition of the profession is present in some of the interviews. (*When families see how a centre works, how the teachers work, it gives them an overview of education [...]. It creates positive knowledge of our work and of the work that is being done, IP7*).

Finally, when they were asked to define the concept of educational teacher knowledge, some did not differentiate it, practically, from educational knowledge, although they did qualify their response more.

The set of knowledge and experiences of a teacher. Life skills and knowledge of the curriculum and their speciality; knowledges acquired through experience with their students and families, from teamwork, from study and staying up to date with training and the data generated in their school, in their country, in the world, with reading, with reflection, with designing objectives, and with systematization (IP2).

Two dimensions stand out in this definition: one relating to the question of why and one relating to the question of how. The more pedagogical questions and the ones relating to the teacher–student relationship stand out in the former. Ultimately, *the set of strategies the teacher uses in the classroom so that the students achieve the set objectives (IP4)*. Therefore, they emphasise pedagogical knowledge, subject-specific knowledge, knowledge about the students and their context, and strategies for performing well in the classroom, in other words, knowledge that is learnt on the basis of training, both initial and ongoing, and through practical experience. In the second dimension, teachers emphasise the processes covered in the interview: reflection, observation, systematization, and transfer of educational practice.

The knowledge that develops from the transfer, from reflection, from being systematic when planning and evaluating students and educational practice to then be able to gain some awareness of what has been done and propose improvements or share it with other teachers (IP5).

Similarly, two characteristics of educational knowledge stand out: collegiality and mutability. The former condenses the individual and collective levels of knowledge that feedback to each other, and the idea that it is contextual and influenced by the more institutional and organisational dimension of teaching. The second defines knowledge as something in constant transformation, moving away from a static idea of the concept (*Educational teacher knowledge has to be something in complete transformation, something that is continuously growing and that you have to update, GP5*).

Discussion and Conclusions

The results of this research confirm that the conceptualisation done by the teachers interviewed of both the dynamics of collaboration and educational teacher knowledge approximate the theoretical elaboration proposed in the Systemic Model of Educational Teacher Knowledge (Verástegui & Úbeda, 2022). A model based on an epistemic perspective that positions teachers as a professional collective with the capacity to generate educational knowledge based on their practice (Domingo, 2020; Shulman, 1987). According to the participants' perception in this study, the teacher becomes an agent who generates knowledge, moving away from the idea of someone who delivers knowledge provided by others and someone who receives it (Reis-Jorge et al., 2020; Willingham & Daniel, 2021). This does not mean that educational knowledge is a domain that only belongs to teachers, as other agents and disciplines swell this phenomenon and give it meaning. But it does position teachers as central agents in the construction of educational knowledge, linking them to other agents and knowledges from a strengthened and symmetrical position (Reis-Jorge et al., 2020; Rêvai & Guerriero, 2017). This positioning is one of the contributions that Systemic Model of Educational Teacher Knowledge (Verástegui & Úbeda, 2022) makes to models of comprehension of teacher knowledge. Furthermore, this model adds collaboration and some of its dynamics as the nexuses that make it possible to understand generation of knowledge by teachers and integrate this process into the model of comprehension (Domingo, 2020; Romar & Frisk, 2017; Verástegui, 2019).

Regarding the operationalisation of the model, as the results show, the definitions given for each concept are close to the interviewed teachers' perceptions of them. Dynamics of collaboration are experienced as processes that, on the one hand, allow teachers to be aware of the impact educational practice has in the classroom (through systematic discussion and peer observation) and, on the other, to collate this knowledge and share it with the immediate educational community (through systematization and transfer) (Rodríguez Moneo et al., 2020; Stewart & Houchens, 2014). In other words, dynamics that enable them to generate knowledge and take ownership of it (Rèvai & Guerriero, 2017; Verástegui, 2019). Similarly, the teachers believe that when this knowledge is transferred to other centres or communities, knowledge is enriched and expanded, building a collective common knowledge (Van Driel, 2021) that makes it possible to raise the social and political status of the profession and classroom reality, thus improving the educational system (Reis-Jorge et al., 2020; Rèvai & Guerriero, 2017).

With regards to educational teacher knowledge, the results allow us to argue that the concept makes it possible to describe the phenomenon with the appropriate complexity, although the interviewees do not distinguish between this concept and that of educational knowledge. This could mean, on the one hand, that they identify education with a sphere that belongs to them and, on the other, that they do not recognise educational knowledge that comes from other agents as something distinct to their own knowledge. That is they understand the educational teacher knowledge as an amalgam of knowledges. Furthermore, the way teachers define the type of knowledge they are capable of generating is similar to the definition of PCK, that enables them to transform content or skills into a learning experience in their students (Carlson et al, 2020; Gess- Newsome, 2015; Guerriero & Diligiannidi, 2017). Both aspects are reflected by the sistemiceducational teacher knowledge model of this research.

Ultimately, we could say that the Systemic Model of Educational Teacher Knowledge is operative (Verástegui & Úbeda, 2022) in its characteristic of being intelligible. In other words, teachers understand this model and so it enables us to consider better the question of educational teacher knowledge from the point of view of its nature. Firstly, because it transcends the dichotomous approaches of formal–practical knowledge (Domingo, 2020), and individual–collective, tacit–explicit, declarative, and procedural knowledge (Rèvai & Guerriero, 2017). Secondly, because, thanks to agency,

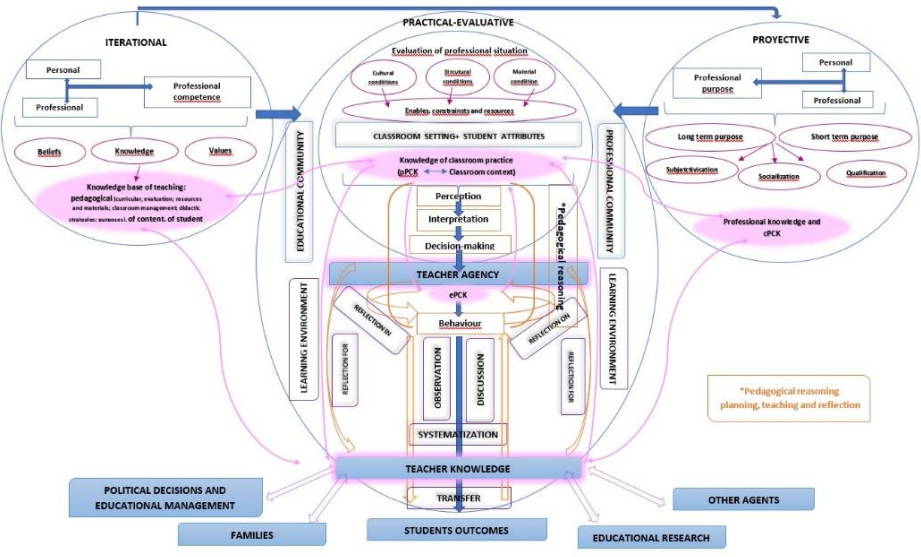
it explicitly introduces the keys to the pedagogical reasoning necessary for understanding the generation of educational knowledge and PCK (Shulman, 1987). And, finally, because it includes collaboration and its dynamics as a vital element for understanding teaching and teachers' knowledge (Hargreaves & O'Connor, 2020; Rodríguez Moneo et al., 2020).

Moreover, the characteristic of approximating to the reality of teachers only happens partially. The reality of teachers is approached because, to a greater or lesser extent, these dynamics form part of their daily activity and because they form part of the actions they consider to be essential to their performance. Nonetheless, we cannot describe the proposed collaborative dynamics, carried out in a systematic and systematized manner, as a reality at schools. Consequently, procedures for generating educational knowledge are weakened, being relegated, on most occasions, to an individual and residual space in professional development (Escudero, 2020). Accordingly, it is vital to foster the key elements that make it possible to organize schools through collaborative professionalism (Hargreaves & O'Connor, 2020) and emphasise the professional community as an essential requirement of the specificity of teaching (Stewart & Houchens, 2014). This would allow teachers to integrate collaborative dynamics into their professional activity, making the generation of educational knowledge a cornerstone of teacher performance (Verástegui, 2019). So, in future the model could embody the organisational and collaborative reality of schools.

In conclusion, we believe that this model, along with the contribution made by the teachers, is a good stepping stone for further research into educational teacher knowledge from the epistemic outlook described above. Increasing the sample size and introducing other methods to validate the model in its capacity to investigate the phenomenon would be desirable to overcome the limitations of the study. In addition, it would be of interest to consider in greater depth how to introduce the outlook of teachers to ensure a model by which they feel represented, revising the name and definition of educational teacher knowledge given. In this sense, we consider that the name of the model can be changed to Systemic Model of Teacher Knowledge, due to the scarce and limited differentiation found between educational knowledge and educational teacher knowledge in our results. This requires further research but, in this way, we maintain the conceptualization developed in the previous literature and research, broadening and overcoming the limitations they carry. Finally, we believe it

would be of interest to make some updates to the model. Firstly, to incorporate the three components of PCK (personal and enacted in the practical–evaluative dimensions, and the collective in the projective dimension), relating them to the teachers’ knowledge base, incorporated into the iterative dimension of agency. Secondly, to include the learning environment as another element of the practical–evaluative dimension of agency and eliminate specific professional knowledge, which is already included in PCK. Finally, to explain better the relationship between pedagogical reasoning and students’ results. These changes are shown in the Picture 1. Systemic Model of Teacher Knowledge which represents an update of the Systemic Model of Educational Teacher Knowledge (Verástegui & Úbeda, 2022).

Figure 1
Systemic Model of Teacher Knowledge. Source: Own elaboration adapted from model of Verástegui and Úbeda (2022)



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² Ongoing doctoral research approved by the ethics committee of the Autonomous University of Madrid (CEI-119-2390)

³ To see the instrument interview:

https://docs.google.com/document/d/1pbiOUksNMr1kT7iMb8p5Wje4Bp_sx9DTM_w2LqnF-ek/edit?usp=sharing

⁴ To see the instrument of focus group:

<https://docs.google.com/document/d/1sHFDvbuxtuipec78AxOfdSib0BzJwG2Z-B7TjpPXssS0/edit?usp=sharing>

⁵ For more data see <https://promaestro.org/red-pensadero/>

⁶ To see the codebook:

<https://docs.google.com/document/d/1ulMRjKQBihYeaLrHA1y6lYv3J87FuvueFHBhluEI9nU/edit?usp=sharing>

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