

THE TPACK MODEL AS A TRANSITION MECHANISM FROM FACE-TO-FACE TO VIRTUAL TEACHING IN HIGHER EDUCATION IN BOGOTÁ.

Moises Edgardo Meriño Polo

Fundación Universitaria los Libertadores, Bogotá (Colombia)

Email: moises.merino@libertadores.edu.co

Ricardo Javier Aragón Gómez

Fundación Universitaria los Libertadores, Bogotá (Colombia)

Email: ricardo.aragon@libertadores.edu.co

Fernan Alonso Cardona Quintero

Politécnico Gran Colombiano, Bogotá (Colombia)

Email: facardonaq@poligran.edu.co

Marcela Esperanza Devia Barbosa

Universidad Militar Nueva Granada, Bogotá (Colombia)

Email: marcela.devia@unimilitar.edu.co

Angy Fernanda Salazar Castro

Servicio Nacional de Aprendizaje (SENA), Bogotá (Colombia)

Email: afsalazar@misena.edu.co

Ginna Paola Rojas Torres

Escuela de Policia Provincia del Sumapaz, Fusagasuga

ginna.rojas@correo.policia.gov.co

Abstract

The purpose of this research is to evaluate the pedagogical, technological, and content knowledge possessed by teachers who provide training in technical and technologist programs at the SENA technical and technologist levels and professional training in higher education in Colombia. To fulfill the purpose of the study, the TPACK instrument was applied to 183 teachers. The data analysis used statistics correlation processed through the statistical package R. As a result, the pedagogical and technological knowledge possessed by the teachers is relevant and adequate to articulate them in the teaching-learning processes, these respond to the changing needs so that they can move from a classroom training to a virtual

one. Consequently, the integration of teachers' TPACK knowledge favors students' learning at different levels of training and its impact on the transformation from face-to-face to virtual.

Keywords

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INTRODUCTION

The evolution of education is imminent, every day, it requires that the teaching-learning process be connected more with the productive and social needs of the world, which is why teachers as actors in the construction of learning, the professional competencies that science and the labor market demand of students, they must be dynamic and disruptive in their training processes, so that this human capital can respond to the changing needs of science and the work environment.

The changes that have taken place with the insertion of new technologies, the democratization of knowledge, inclusion, the growth of digital in education, have posed challenges to the people called to educate, they suggest challenges that teachers must assume to be a reference of teaching, this is how a new profile of teacher is necessary, "which requires identifying the cognitive, procedural and attitudinal elements that make it up. That is, a teaching model based on competencies" Sánchez & Tarazaga, (2012, p. 2).

In this sense, the present research evidences the different perceptions of the teachers invited to participate in this exercise, as an input to identify the pedagogical, technological and content knowledge that was evidenced with the implementation of the TPACK instrument that teachers have now and what would be necessary to make the articulation from the digital-technological to the face-to-face. taking into account the imperative need to develop a teaching process according to the changing needs of training and the evolution of the educational face-to-face context to virtual and synchronous scenarios.

Therefore, it is essential to recognize what is happening in order to generate transformative strategies that allow teachers to strengthen the competencies they have, acquiring new ones tending to involve technology with a pedagogical purpose and not as an isolated tool of the process, which many deny but is already an integral part of the daily life of individuals. that is why the school must become a facilitator of processes and possibilities of constant learning, promoting the learning and use of ICT in pedagogical spaces.

That is why the use of the TPACK model represents an important advance in the transformational dynamics implied by the new world reality, in this sense, Salas, (2018), states that the use of the TPACK model as an innovation tool for the teaching-learning process in mathematics, allows the creation of attractive and ideal spaces for teaching, To achieve the educational objectives of the subjects and facilitate the learning process, therefore, it is inferred that the model could respond effectively in the work proposed here, finding new ways to implement it and contribute to another educational area, in technical and technological education scenarios.

Likewise, Morán (2021) in his article entitled "Teacher training and its adaptation to the TPACK model", states that oriented education, mainly in high school, must be dialectical, contextualized to sociocultural changes, within relevant educational environments, leading to comprehensive learning, for this purpose, teachers must be aware of the need to carry out suitable training in the context of ICT.

For this reason, based on the results of the study, a starting point is proposed for a change that should occur in a specific and not generalized way, treating each teacher as a unique actor with different learning styles, just like the students. Recommendations will be given for teachers to acquire or strengthen their pedagogical, technical, methodological competencies with an emphasis on the articulation of technology as a key means to reach students from a perspective of an increasingly digital world, this so that teachers can be direct actors in the academic training of their students and so that they can also insert themselves into the new challenges of articulated technology to the pedagogical work of educators.

In coherence with the above, this research aims to analyze and describe the skills that teachers have to have a significant impact on the training of their students, in these times of difficulty and despair for many, as Moreno (2019) expresses in his article called, Educational innovation in the times of the Coronavirus, in which it establishes that "the training of teachers in innovative education strategies, the pedagogical use of ICTs (Information and Communication Technologies), the TPACK (Pedagogical and Technological Content Knowledge) and the implementation of new teaching and learning technologies is becoming increasingly important". (p.25). given that according to Sumba, et., al (2021) and Méndez, et., al (2021) teachers often have digital skills, but they are not able to incorporate them into their pedagogical strategies.

Therefore, it is essential to advance in this line of learning, where technological and virtual tools result in the strengthening of the educational system, since, if the teacher is not proactive and does not seek new strategies based on technology and development of their pedagogical and digital skills that impact the student's learning process, perhaps before being a positive mediator, it can become an actor that increases the lack of interest in study and consequently, the proposed educational achievements cannot be achieved and will be detrimental to the primary interests of the student's training, for this reason, with the development of this research it is intended to establish parameters that reduce the passivity of teachers in the use of ICTs and in this way the motivation of students in their training process is improved.

For the same reason, it is important to highlight what is happening in the educational context, the (OECD, 2019) establishes that in Colombia 75% of teachers have received some training in the use of ICT tools for teaching, however, teachers consider that they still have a high need for training in this subject, which indicates that the qualification received so far is not enough to be able to face the challenges of moving from a traditional training to an ICT-mediated education; likewise, the (OECD, 2019)) reports that more than 1,200 million students are affected in their training process largely by the arrival of Covid 19, the preparation of teachers was not adequate to face this evil that came to the world.

However, not only do they require training in the use of Information and Communication Technology tools, they need to update their pedagogical knowledge to new methodologies and market updates in order to be able to correctly mesh the necessary elements for the orientation of teaching, not only based on some competencies, but also on the basis of certain skills. but in sufficient and necessary to guarantee in a large percentage, the relevance of the educational offer to students who decide to bet on education as a weapon of personal, professional, family and social growth, so this research aims to describe the reality of the feelings of the participating teachers and their perception of what the dimension of teaching means in the appropriation of the different contexts of society.

As a result of the panorama described, this research aims to characterize through a quantitative study, of descriptive order with a correlational approach, the degree of acquisition and use of digital skills of the professors of the Faculty of Economic, Administrative and Accounting Sciences of the Los Libertadores University Foundation, instructors of the SENA Center for Financial Services of the Accounting Coordination, Economics and Banking, professors of the Accounting program of the University Corporation MINUTO DE DIOS, and finally professors of the Accounting program of the Politécnico Gran Colombiano, in the semesters 2023-1 and 2023-2; for this purpose, structured surveys were applied to the selected sample.

LITERATURE REVIEW

Social changes, the entry of globalization and the democratization of knowledge, demand changes in the acquisition of competencies by teachers, as one of the key actors of the Educational System, this research aims to review, explore and observe the needs of educators to promote knowledge in their area of performance, pedagogy in its way of transmitting and technology as a means to strengthen its practice, articulated with an increasingly digital world, for de Cejas, Novio and Barroso (2016) teachers must currently operate in a volatile environment, which is why they are required to adapt to the context, adapt knowledge to new situations and be in a situation of constant training throughout life.

In this sense, for Cela, et., al (2017), it is relevant that in institutions, didactic strategies are proposed from the curricular development that allow the design of training actions aimed at the teacher using technology in a didactic way with their students, since it is at this point that we should talk about digital competence for teachers; With this, the authors show the need to analyze the contents developed in the curriculum, pedagogical practice and technology, to reach the digital, where there must be clarity about what is happening in the academic world. Along the same lines, Pérez, et., al (2023) establish that it is of utmost importance to align the pedagogical strategies of the teaching work with curricular planning and curricular planning to standards of inclusive pedagogical and technological competencies, which will reduce the learning gaps of their students.

For (Lopez, et., 2020, p. 73) "digital technologies are increasingly integrated as part of the curricular content in all stages of educational systems, so that, as in other areas of their application, verbal and audiovisual languages are being universalized;

creating a multimedia language based on interaction between users who have multiplied communication channels so that if necessary or practical it is immediate and continuous regardless of time and space factors".

Valverde and Garrido (1999) and Balladares and Valverde (2022) argue that technology-mediated education must be based on a full articulation between the curriculum and teaching strategies, for this reason, the implementation of the TPACK model becomes a great alternative, since it proposes an education integrated with ICT and teaching mediated by technology.

According to Cejas, Navío, and Barroso (2016), in order for there to be a complete integration of ICT in the educational environment, teachers should have: knowledge about the content of the subjects (CK), pedagogical competencies (PK), and technological means (TK), on which synergy must be generated to create new knowledge. However, for Mishra & Koehler (2006) the objective of the TPACK model is not the instrumentalization of technology in the teaching-learning process, but the generation of an effective adaptation of it to the actions of teachers in their pedagogical work.

Other authors, such as Nantshev, et., at (2020), describe in a more detailed and conjugated way the relationships between content, pedagogy and technology, as follows: The (CK): content knowledge is about learning and teaching the subject; (PK): The teacher's knowledge of methods, strategies, and techniques used in the classroom; (TK): Infrastructures (software, hardware, internet). Thus, technological knowledge refers to the information and skills that teachers must have with respect to the use of technology; the (PCK): the teacher's knowledge of the effective use of teaching, methods and techniques to teach the course contents, the teacher knows how students learn and how to measure and evaluate their learning outcome; the (TCK): the teacher's knowledge of the use of educational technology to teach course content; the (TPK): teacher knowledge of the effective pedagogical use of educational technology.

On the other hand, technological pedagogical knowledge TPACK refers to knowledge of tools, their functionalities and the interrelationship between tools and tasks (TPACK): Teaching knowledge of the combination of pedagogy and educational technology to teach content; therefore, the authors agree on the need for a wide range of teaching competencies to guarantee a comprehensive teaching process, therefore, "the improvement of teaching practice will be achieved through the development of different competencies from a pedagogical dimension, and their level of development, and appropriation achieved, taking into account that the teacher must design educational scenarios supported by ICT for meaningful learning, and the integral formation of the student" Cejas (2018. p. 83).

In contrast to the above, Koehler, et., al (2011), Graham et., al (2009), Doukakis et., al (2021) and Jang & Chen (2010) argue that having TPACK, i.e., content, pedagogical and technological knowledge, is not enough for teachers to become creative, for this reason, teacher educators should use techniques that allow educators to explore the creative relationship between technology, pedagogy and content, in this way creative knowledge arises to design and adapt technology to the classroom. In this sense, it is of utmost importance to focus attention on teacher trainers so that they are creative in the use of technology in education, given that for Borón, et., al (2021) social networks and digital

relationships have become a communication that goes beyond face-to-face, for this reason, they propose that the educational field the use of ICTs should become the basis of teaching-learning strategies.

Thus, this research has as a differentiating axis, to describe and emphasize the importance of the acquisition of the different competencies to increasingly impact the learning process of students, it focuses on the work of teachers as key and determining actors in the process, since, in recent times, their role has changed to a more guiding one, guide, mediator, so that learning is meaningful in the trained subjects.

That is why, for Sánchez, et., al (2019) it is essential that, in the current conditions of the educational system, pedagogical processes and strategies mediated by technological tools are implemented, which provide the teacher with the possibility of applying organized procedures to lead the student to focus their attention on learning, highlighting the importance of incorporating strategies mediated by ICT effectively. However, in order to optimally achieve the integration of pedagogical knowledge with technologies, there must be supervision in the design of the activities, given the deficiencies that the teacher may present in the TPACK bundle (Kirikçilar & Yildiz. 2018).

In this order of ideas, for teachers it is relevant to generate reflections that allow them to find, in their academic work, the competencies to be acquired, determining how and when they could program their development, this in order to survive a changing, disruptive and complex educational world; For this reason, institutions are urged to reflect on the strategies that allow them to build and contribute to the team of teachers assigned to the programs, so that they achieve, collaboratively and autonomously, the competencies required by the productive and social world.

RESEARCH PROBLEM

In line with the above, the question on which this research focuses is: Are the pedagogical, technical and methodological knowledge possessed by teachers at the professional, technological and technical levels in higher education educational institutions, Los Libertadores University Foundation, Minuto de Dios University Corporation, Grancolombiano Polytechnic University Institution and the National Learning Service SENA, currently sufficient and adequate to articulate them with the use of technologies in the development of the teaching-learning process according to the changing needs of training and the evolution from face-to-face to virtual?

METHODOLOGY

This research was designed with a quantitative, correlational and descriptive approach. A correlational study "aims to establish the causes of the events, occurrences or phenomena that are studied" (Hernández, Fernandez & Baptista, 2010, p.83) and "aims to answer for the causes and events of physical and social phenomena. It focuses on the way in which a phenomenon occurs, as well as the conditions in which it manifests, in the same way it analyzes why and how two or more variables are related" (Hernández, et. al., 2010, p.85). In the context of this study, this means that it will seek to explain the correlation between the

variables of the TPACK model, gender, the level of training it guides, among other possibilities.

On the other hand, a descriptive study "seeks to specify characteristics and important features of any phenomenon that is analyzed and describes trends in a population group" (Hernández, et. al., 2011, p.80), taking into account the above, this research aims to describe the actions found in the teaching population studied, especially those related to pedagogical competencies, technological and content knowledge.

The quantitative model proposed to demonstrate the working hypothesis is a linear econometric model that correlates the twenty-two (22) variables, which was developed through the R data processing package, the primary data of the research were results of the application of the TPACK model, or "Technological Pedagogical Content Knowledge" which is characterized by being a model of Teaching and learning. which allows us to identify the types of knowledge that a teacher must master in order to integrate information and communication technologies effectively into the teaching that is taught.

The pioneers in the implementation of this TPACK model were professors Punya Mishra and Matthew J. Koehler (between 2006 and 2009). For these researchers, there are three elements involved in the acquisition of knowledge:

1. Content Knowledge (CK) or knowledge about the content of the specific subject to be taught.
2. Pedagogical Knowledge (PK) or knowledge of the pedagogy necessary for students to achieve these contents.
3. Technology Knowledge (TK) or knowledge of the technology involved in the learning process.

The dynamics of this model consists of making various combinations so as to build a structure of correlations that every teacher must know and use for a correct integration of ICT in their daily activity (Mishra & Koehler, 2006). In this sense, the TPACK model integrates 4 more elements that in the end allow this model to be structured with 7 variables, the four additional variables are:

4. Pedagogical Content Knowledge (PCK).
5. Technological Content Knowledge (TCK).
6. Technological Pedagogical Knowledge (TPK).
7. The Technological Pedagogical Content Knowledge (TPCK or TPACK).

In general terms, the model states that in order for teachers to have the training to incorporate ICT in the classroom, they need not only to possess the "base" knowledge (contents 1, 2, 3) in an isolated and independent way, but also to possess it in interaction (4, 5, 6 and 7). Only in this way, technology will be incorporated into the training process in an adequate way and achieve the E-A objectives foreseen by the student (Gómez, 2015, p.23).

RESULTS

The data for the elaboration of this exploration came from the application of the TPACK tool, which was applied to 182 teachers who guide training at the following levels: professional 31.1%, technologist 39.9% and technicians 29% in educational institutions, Los Libertadores University Foundation, Minuto de Dios University Corporation,

Grancolombiano Polytechnic University Institution and SENA National Learning Service. in the different training programs such as Public Accounting, Business Administration at the undergraduate level, at the technologist level in the programs of Accounting and Finance, Banking and Insurance Services, Business Management and at the technical level in the training program in Accounting of Commercial and Financial Operations and the Administrative Assistance program, as evidenced in Table 1.

Table 1.

Descriptive statistics Educational institutions, training programs and level of training.

VARIABLE	VALUES	NUMBER	PERCENTAGE %
INSTITUTION TO WHICH HE IS LINKED	University foundations	28	15,30%
	University Corporations	29	15,80%
	University Institutions	1	0,50%
	Sena National Learning Service	125	68,30%
TRAINING PROGRAM	Bookkeeping	59	32,20%
	Administration	57	31,10%
	Economy	10	5,50%
	Finance	28	20,80%
	All of the above	19	10,40%
PROGRAM LEVEL	Technician	53	29%
	Technologist	73	39,90%
	Professional	57	31,10%

Note. The table objectively shows the elements extracted with the TPACK tool from the collaborators of the different universities consulted voluntarily and their respective academic systems. Fountain. Own elaboration.

As evidenced in Table 1, in the institutions in which the survey was applied, 15.30% participation was observed by the Los Libertadores University Foundation, 15.80% by the Minuto de Dios University Corporation, 68.30% by the SENA National Learning Service, 0.5% by the Gran Colombian Polytechnic University Institution, as well as the training programs in which the surveyed teachers and instructors carry out their academic work. they are Accounting represents 32.20%, Administration 31.10%, Finance 20.80%, Economics 5.50%, finally, the level of the program is evidenced where technicians represent 29%, technologist 39.90% and professional 31.10%.

Of the 183 teachers surveyed, 101 are male corresponding to 55.20% and 82 female represent 44.80%, in terms of age the most representative ranges are reflected between 41

to 50 years old with 39.30%, likewise, the range between 51 to 60 years old represents 30.60%, and the ranges from 31 to 40 years old represent 22.40%. Likewise, it can be observed that in the years of experience as a teacher the most important ranges are from 6 to 10 years with 35%, from 11 to 15 years it represents 27.30%, as can be seen in Table 2.

Table 2.
Descriptive statistics demography.

VARIABLE	VALUES	NUMBER	PERCENTAGE %
SEX	Men	101	55,20%
	Women	82	44,80%
AGE	20-30 years	7	3,80%
	31-40 years	41	22,40%
	41-50 years	72	39,30%
	51-60 years	56	30,60%
	Over 61 years old	7	3,80%
YEARS OF TEACHING EXPERIENCE	0-1 years	0	0,00%
	2-5 years	25	13,70%
	6-10 years	64	35%
	11-15 years	50	27,30%
	16-20 years	28	15,30%
	20-25 years	10	5,50%
	More than 25 years	6	3,30%

Note. The data were extracted with the Tpack tool. Source: Authors.

Results and interpretation of the models.

In this section, the analysis of the information collected from the applied instrument, such as the closed survey, is presented, in addition to a relationship of the general objective set at the beginning of the exploration with the data collected and proceeds to analyze how the technological, pedagogical and content training of the teacher influences the teaching from face-to-face to virtual.

On the other hand, the transcripts of the open survey corresponding to the sample selected in the institution of the exploration of the phenomenon were made, based on the discrimination of the data according to participation, responses, types of intervention, these interventions were analyzed under the categories established in the TPACK tool as components of the construction of the impact on the technological training, Pedagogical and content of the teacher for teaching: from face-to-face to virtual, each participant was

surveyed individually in the case of teachers to then determine an overall result of the sample.

To interpret the results obtained through the instrument were processed by means of the statistical package R, Pearson's correlation coefficient was calculated with a significance level of 5% and a confidence level of 95%. The Pearson test measures the statistical relationship between 2 variables resulting in a coefficient that can take a range of values from +1 to -1. When the value is zero, it indicates that there is no correlation or association between the 2 variables. When the value is less than zero, it means that the correlation is negative, which indicates that the variables are inversely related; the opposite happens when the result is +1 since the correlation is positive. (Mendenhall, Beaver, & Beaver, 2010)

In this case, the correlation between the variables proposed in the hypotheses is verified, taking into account the criteria proposed by Mendenhall, et., al (2010) The results of the linear correlation are presented in the following order in this part: Linear correlations The teachers' PK pedagogical knowledge and TK technological knowledge, as shown in Table 3.

Table 3.
Pedagogical correlation and technology

	<i>Horsepower</i>	<i>HP.2</i>	<i>Horsepower.3</i>	<i>HP.4</i>
<i>TK.5</i>	0.44***	0.54***	0.50***	0.49***
<i>TK.6</i>	0.41***	0.46***	0.34***	0.34***
<i>TK.7</i>	0.49***	0.60***	0.49***	0.46***

Note. The table makes visible the numerical correlation in the pedagogical and technological processes evidenced through the TPACK tool. Fountain. Own elaboration.

According to the correlational results, teachers who use various pedagogical strategies and teaching methods tend to introduce greater varieties of technological tools in their teaching-learning process, this can be affirmed because the correlation coefficient is 0.54, which indicates that there is a strong positive connection between these two variables. for the variables PK2 (I am familiar with a wide range of practices, strategies, and methods that I use in my teaching) and TK5 (I am familiar with a variety of hardware, software, and technology tools that I can use to teach).

Similarly, there is a strong positive correlation between the variables PK2 (I am familiar with a wide range of practices, strategies and methods that I use in my teaching) and TK7 (I can decide when technology can be beneficial to achieve a learning objective); PK3(I know how to assess student learning) and PK1(I have a clear understanding of pedagogy in designing instruction, assessing student learning)

All of the above indicates, in order, that teachers use various pedagogical strategies in their teaching processes, they are also able to discern when the use of technology is useful to achieve a learning objective; in the same way, teachers know how to evaluate the level of learning of students, using different technologies for this purpose. However, the other

pedagogical and technological variables show positive correlations between them, but less strong than those described, as evidenced in the coefficients in Table 3.

On the other hand, Table 4 shows the correlations presented between pedagogical knowledge and teachers' content knowledge.

Table 4.
Pedagogical correlation – content

	<i>Horsepower</i>	<i>HP.2</i>	<i>Horsepower.3</i>	<i>HP.4</i>
<i>CK.8</i>	0.40***	0.53***	0.52***	0.48***
<i>CK.9</i>	0.40***	0.52***	0.53***	0.51***
<i>CK.10</i>	0.37***	0.48***	0.49***	0.50***

Note. The table makes visible the numerical correlation in the pedagogical and technological processes evidenced through the TPACK tool. Fountain. Own elaboration.

According to the results of the correlation, it was found that content knowledge is directly related to the pedagogical strategies implemented by teachers in training, evidently it can be observed in table 4 how the correlation coefficients reflect a positive result, therefore, it is worth highlighting the strong positive correlation between the PK variables.2 (Be familiar with practices, strategies and methods for teaching) and CK.8 (Have a complete understanding of the curriculum developed in the teaching process), with a correlation coefficient of 0.53, which shows that teachers who appropriate the curriculum apply pedagogical practices, strategies and methods more regularly in their teaching process.

Likewise, the strong positive correlation that exists between the variables PK.2 (Be familiar with practices, strategies and methods for teaching) and CK.9 (Explained to students the value of knowing concepts in my discipline), PK.3 (Know how to evaluate student learning) and CK.8 (Have a complete understanding of the curriculum developed in the teaching process). PK.2 (Be familiar with practices, strategies, and methods for teaching) and CK.9 (Explained to students the value of knowing concepts in my discipline), PK.3 (Know how to assess student learning).

Similarly, CK.9 (Explained to students the value of knowing concepts in my discipline), PK.4 (I know how to motivate students to learn) and CK.9 (I explained to students the value of knowing concepts in my discipline), PK.4 (I know how to motivate students to learn) and CK.10 (I make connections between the different topics in my discipline). which reflects that teachers provide training taking into account the contents of the program and the various pedagogical strategies, to teach the topics addressed in the most appropriate way possible, on the other hand, it is worth mentioning that the other pedagogical and content variables also show a positive correlation although of lower impact, which shows that they are coefficients that are related to each other.

Table 5 shows the correlations presented between the TK technological seasoning factors and the PCK pedagogical content knowledge.

Table 5.
Pedagogical correlation content – Technology.

	<i>TK.5</i>	<i>TK.6</i>	<i>TK.7</i>
<i>PCK.11</i>	0.38***	0.36***	0.53***
<i>PCK.12</i>	0.42***	0.31***	0.39***
<i>PCK.13</i>	0.47***	0.33***	0.43***

Note. The table makes visible the numerical correlation in the pedagogical and technological processes evidenced through the TPACK tool. Fountain. Own elaboration.

Table 5 shows the existence of a positive correlation between the pedagogical variables of content and the technological variables, especially in the relationship PCK.11 (I understand that there is a relationship between the content and the teaching methods used to teach that content) and TK.7 (I can decide when technology can be beneficial to achieve a learning objective) which indicates that teachers who have full certainty that there is a relationship between content and teaching methods, they are able to decide when they use technology to achieve a learning objective, evidence of this is the coefficient of 0.53 which shows a strong positive correlation between the variables, the other variables also show a less strong correlation.

In this same sense. Table 6 shows the correlation presented between knowledge of CK contents and pedagogical knowledge of PCK contents.

Table 6.
Pedagogical correlation content - Content

	<i>CK.8</i>	<i>CK.9</i>	<i>CK.10</i>
<i>PCK.11</i>	0.58***	0.70***	0.68***
<i>PCK.12</i>	0.32***	0.46***	0.43***
<i>PCK.13</i>	0.53***	0.55***	0.51***

Note. The table makes visible the numerical correlation in the pedagogical and technological processes evidenced through the TPACK tool. Fountain. Own elaboration.

Table 6 shows that there is a strong positive correlation between most of the content variables and the teachers' pedagogical variables, especially in the relationships PCK11 (I understand that there is a relationship between the content and the teaching methods used to teach that content) AND CK.9 (I explained to students the value of knowing concepts in my discipline) which have a coefficient of 0.70, indicating that teachers who understand the

relationship between content and teaching methods also explain to their students the importance or value of appropriating concepts in the discipline of study. Along the same lines, there is a strong positive correlation between the variables PCK.11 (I understand that there is a relationship between the content and the teaching methods used to teach that content) AND CK.8, (I have a complete understanding of the curriculum I teach) which indicates that knowing the relationship between the content and the teaching methods, It allows the teacher to really understand the importance of the curriculum and develop it efficiently. The same compartment is present in the other variables in Table 6.

CONCLUSIONS

The teachers of the IES, Los Libertadores University Foundation, Minuto de Dios University Corporation, Gran Colombiano Polytechnic and SENA National Learning Service, have pedagogical, technological and content knowledge, they are able to adapt technologies to take the student to the achievement of the learning objectives, from which it is inferred that they also have the ability to move from traditional face-to-face training to virtual training.

The teachers studied in this research, the more knowledge of pedagogical methods and strategies they have, the more willing they are to use technology as a mediator of their learning teaching process, which is of great relevance, because it will allow the directors of the educational instructions to propose complementary training strategies in pedagogy so that human talent can improve and respond to the challenges presented in education.

The results of this research coincide with the authors proposed in the theoretical framework, in the case of Cejas (2018), he states that teachers must acquire different competencies in the pedagogical, technological and content dimensions, but the art is in knowing how to articulate them at the same time in order to offer comprehensive teaching that promotes improvement in the different moments and contexts of learning.

Finally, the use of the TPACK model is central in this research, because it allows relating the necessary knowledge required by teachers to generate an effective development in the teaching process by articulating in a single dimension the key elements such as pedagogy, technology and content.

Recommendation

The results of the TPACK model provide input to recommend strategies that allow teachers to put into action in a single space key elements such as pedagogy, technology and content, in order to enhance their capacities to relate their actions with a clear and applicable teaching intention in real contexts.

I understand that the teachers object of this research have abundant pedagogical, technological and content knowledge, in some cases generated by their experience, in others by their training, they must try to articulate it with their daily work, especially at times when external situations demand it, it is of high importance that they maintain a constant update so that they can go from developing content to generating advances in the integral formation of their students.

Regarding the use of technological tools, in the teaching process, the priority should be focused on teacher training so that he can transfer this skill to students and consequently impact their growth.

As required by the TPACK model, it is necessary that the pedagogical, technological and content knowledge possessed by teachers be integrated in a relevant way in order to be effective in the teaching they teach.

Educational institutions must be active actors in the preparation of teachers, they must become the main promoter of the acquisition of pedagogical, technological and content skills of their teachers, all this in order to channel the great benefits that the appropriate use of information technologies brings to the training of students regardless of the modalities.

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