Learning and Knowledge Technologies as Strategies in Training Teachers of *La Normal Superior School*, Cúcuta, Colombia*

[English Version]

Las Tecnologías del Aprendizaje y el Conocimiento como estrategias en la formación de los docentes de la Escuela Normal Superior de Cúcuta, Colombia

As tecnologias da aprendizagem e do conhecimento como estratégias na formação de professores da Escola Superior Normal de Cúcuta, Colômbia

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Abstract

Objective: to provide theoretical elements to lay the foundations of the strategies for Learning and

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Knowledge Technology (LKT) in the process of teacher training of *La Normal Superior School María Auxiliadora*, Cúcuta, Colombia. **Methodology**: this research was conducted under the qualitative approach, based on the experiential introspective interpretative paradigm, in order to research pedagogical strategies (LKT). This means it is based on the teachers' reality, their experiences, perceptions, and experiences. This study comprised of ten teacher trainers from *La Normal Superior School*, Cúcuta, Colombia, who were selected from the Institutional Complementary Training Programs. Data was collected through focused interviews with open questions. **Results**: three theoretical issues arose from the LKTs: Training through competences for the consolidation of LKT strategies; Critical thinking and problem-based learning using LKTs, and the construction of knowledge in the teaching-learning process. **Conclusions**: in order to be strengthened within the classroom, LKTs must be built up on theoretical issues, to allow teachers to resize their activity to become managers and mediators in the use and application of these emerging technologies.

Keywords: LKT strategies; Teaching Method; Trainers; Learning and Knowledge; Competences.

Resumen

Objetivo: generar elementos teóricos que fundamenten las estrategias de las Tecnología del Aprendizaje y Conocimiento TAC en el proceso de formación de los docentes de la Escuela Normal Superior María Auxiliadora de Cúcuta Colombia. **Metodología:** se desarrolló bajo el enfoque cualitativo, sustentado en el paradigma interpretativo introspectivo vivencial, con el fin de develar las estrategias pedagógicas (TAC) donde se realiza la investigación, es decir, a partir de la realidad de los docentes, sus experiencias, percepciones, vivencias. En este estudio participaron 10 docentes formadores de formadores de la Escuela Normal Superior de Cúcuta, Colombia, seleccionados del Programas de Formación Complementaria de la Institución. Para la recolección de los datos se utilizó la entrevista focalizada con preguntas abiertas. **Resultados:** se generaron tres elementos teóricos que fundamentan las estrategias TAC: Formación por competencias para la consolidación de las TAC; Pensamiento crítico y aprendizaje basado en problemas mediante el uso de la estrategia TAC y La construcción del conocimiento en el proceso de enseñanza-aprendizaje. **Conclusiones:** para consolidarse en el aula, las estrategias TAC deben construirse sobre elementos teóricos que permitan a los docentes redimensionar su actividad para ser gestores y mediadores en el uso y aplicación de estas tecnologías emergentes.

Palabras-clave: Estrategias TAC; Método de enseñanza; Formadores; Aprendizaje y Conocimiento; Competencias.

Resumo

Objetivo: gerar elementos teóricos que apóiem as estratégias da Tecnologia da Aprendizagem e do Conhecimento TAC no processo de formação de professores da Escola Superior Normal Maria Auxiliadora de Cúcuta Colômbia. **Metodologia**: foi desenvolvida sob a abordagem qualitativa, com base no paradigma interpretativo introspectivo experiencial, a fim de revelar as estratégias pedagógicas (TAC) onde a pesquisa é realizada, ou seja, com base na realidade dos professores, suas percepções e experiências. Neste estudo, participaram 10 instrutores da Escola Superior Normal de Cúcuta, Colômbia, selecionados entre os Programas Institucionais de Treinamento Complementar da instituição. A entrevista focada com perguntas abertas foi usada para coletar os dados. **Resultados**: foram gerados três elementos teóricos que sustentam as estratégias das TAC: Treinamento por competências para a consolidação das TAC; Pensamento crítico e aprendizagem baseada em problemas através do uso da estratégia TAC e da construção de conhecimento no processo de ensino-aprendizagem. **Conclusões**: para ser consolidadas na sala de aula, as estratégias TAC devem ser construídas sobre elementos teóricos que permitam aos professores redimensionar suas atividades para serem gerentes e mediadores no uso e aplicação dessas tecnologias emergentes.

Palavras-chave: Estratégias TAC; Método de ensino; Formadores; Aprendizagem e conhecimento; Competências.

Introduction

In this globalized world, technological and scientific advancements occur at an extremely rapid pace and, therefore it is necessary to acquire knowledge from these advancements, in order to strive for an improved coexistence and quality of life. During the leap from the last century to the current one, humanity has developed a great variety of informatics. Such technologies rapidly innovate educational processes; and thus, offer of a greater information access and evident progress enriching the educational processes supported by technologies.

This article aims at providing the theoretical issues to lay the foundation of *LKT*s in the process of teacher training at *La Normal Superior School María Auxiliadora*, Cúcuta, Colombia. To do this, it draws on research by authors such as Simoes (2017) who believes that "Currently one of the most important phenomena in the transformation has been the introduction of ICT in all areas of life" (p. 10) and especially in the educational one.

These investigations, being the result of the changes in the information society, have gone further with the so-called Learning and Knowledge Technologies (*LKT*). These are focused on *learning to learn* and collaborative learning, or as Segura, Candioti and Medina (2007) have stated, they go towards the permanent updating of students' knowledge, skills and abilities development through a constantly changing teaching process. This process is developed through the creation of virtual environments.

It is, then, a change of paradigm in the formative uses of Information and Communication Technologies (ICT) by students and teachers is necessary, because this implies not only the need to master the tools but also to know how to use them and apply them for the acquisition of knowledge: the objective of the *LKT*s. For example, Moya-López (2013) states that the *LKT*s have opened a new perspective for teachers, students, educational environment and institutions which we should be aware of, not only for their formative use and development of educational content, but also for the interactive and contextualized methodologies that are applied in the teaching-learning processes.

The reflection on the approaches of Moya-López (2013) have provided theoretical evidence to researchers to enlighten us about the existing problem areas in *La Normal Superior School*, Cúcuta, Colombia. The concept that the trainers of teacher trainers have with respect to *LKT*s in the classroom are fundamental for conducting the process of learning and knowledge building.

In other words, during their training process, teachers must assume a shift from the traditional ICT scenario towards another that requires a change in

attitude, motivation, construction, knowledge generation and an adequate methodology in the classroom learning processes. Nevertheless, conversations and continuous observations have evidenced that in the educational institutions such as *La Normal Superior School*, Cúcuta, the object of this research, have been slow to introduce the *LKT* as strategies that form an essential part of the comprehensive education of the individuals.

In the educational institution in which this study was conducted, other problematic issues were identified. These problems were related to the traditional use of technological strategies in the training of teachers, inasmuch as they are used for the development of low-level cognitive processes, such as the search for data, information, events, and with scarce pedagogical strategies that allow the establishment of relationships with the practice and the search for knowledge.

To this respect, Lozano (2011) claims that "In reality, we must consider changing 'technology learning' for 'learning with technology'. This approach is entirely oriented towards the development of the fundamental skills of learning to learn" (p.1). This means that teachers, in their training process, should not only use technologies for fashion but also understand that they will help them to think, and to investigate what they are interested in learning about. Thus, they can voluntarily discard what they consider to be of little use in order for their training to be based on conscious learning, emerging from inquiry and the use of collaborative technological, interactive and metacognitive strategies.

Along with the aforementioned problem, sometimes teachers in training show technophobic behaviors and feel rejection and fear for the use of ICT regarding the changes that may occur in student learning. In this regard, Suay (2017) claims that "New technology has not been implemented without resistance from both individuals and institutions. Technophobic attitudes have been present throughout history" (p.1). Hence, teachers are inhibited by new technologies, probably due to their ignorance, which causes them uncertainty and they believe themselves incapable of utilizing them. This occurs, especially when many of their students are well versed in the use of ICT as tools for obtaining information, even if they are not intelligent and critical users of information and of the process of knowledge building.

The previous problem has been widely discussed by the research conducted by Rosen and Weil (2000), who showed in their study with more than 2000 teachers from 54 schools in California that teachers felt a high degree of technophobia in the use of these educational technologies. Although, they had been obliged to take computer courses, their attitudes had not improved after training. This conclusion disproved the belief that by passing courses on the use of tools, teachers would become interested and improve their attitudes towards technologies. It displays the traditional conception of ICT teaching which focu-

sed on the process of receiving, collecting and processing information, transforming it into fundamental knowledge to face the changes of the learning society.

Another aspect that is the product of the limitations raised is the fact that some teacher trainers have little training and skills in the use of ICT and even less so of *LKT*s; so, in both cases, they are unaware of their significance for the comprehensive education of the student. This results in desertion, demotivation, little interest, apathy, leading to a lack of understanding the processes during the development of the activities in the classroom and the rejection from the students who will be the future teachers to practice at the Primary and Pre-School Level, both in Cúcuta and elsewhere.

In response to this problem, this study raises the following question: What theoretical elements lay the foundation of the *LKT*s in the process of training the students of *La Normal Superior School María Auxiliadora*, Cúcuta, Colombia?

Methodology

This qualitative approach research is based on the experiential introspective interpretative paradigm, which allowed the theoretical elements supporting the *LKT*s from this research to be revealed. This means it is based on the teachers' reality, their experiences, perceptions, and experiences.

The data was collected from the interviews conducted with ten teachers from *La Normal Superior School María Auxiliadora*, Cúcuta, Colombia. They were selected on the criteria suggested by Rodríguez, Gil and García (1999) regarding suitability, uniqueness, availability and complexity. These characteristics attribute a unique and revealing condition for the understanding of the reality studied. Other aspects such as seniority in the institution and open and honest communication with the researcher were also included. The interviews were conducted from September to December 2017. The phases developed in the methodological process were:

a) Review of the references related to the object of study.
b) In-depth interviews with the ten teachers of La Normal Superior School, Cúcuta. These aid in describing, understanding and interpreting their knowledge and experience in the use of *LKT* pedagogical strategies in the teaching-learning process. The questions mainly inquired about their training in the use of *LKT* within the classroom, their knowledge about *LKT*s as well as the use and application of *LKT*s in learning.

c) The transcription of the interviews allowed to take what was stated in the original sources and proceed to the segmentation of the information. This segmentation aimed at searching for discursive emerging issues in the teachers interviewed through emphasizing sentences, phrases or expressions. These made revealing the essence of the message, its sense and meaning easier.

d) From there, the dimensions that emerged from the integration and analysis of the core codes on the pedagogical use of *LKT*s were derived; in addition, such strategies were organized into components: Formative, Application and Conceptual, which led to the emergence of categories whose notions made it possible to interpret reality and summarize the dimensions stemming from the analytical process.

e) Triangulation was key for analyzing the information. To carry out this process, the data found in the investigation was intertwined with the referential bases forming the corpus of the research results.

f) Subsequently, the interpretation and the discussion of the results was made to build the theoretical elements that lay the foundation for the *LKTs* in the training process of the students of *La Normal Superior School María Auxiliadora*, Cúcuta, Colombia.

g) Finally, conclusions or reflexive ideas were formulated.

Analysis, Organization and Systematization of Information

The activity developed in the data collection led to triangulation becoming a requirement for qualitative studies. This is the process that, according to Leal (2015) consists of "… using, within the same study, the diversity of elements of the research methodology, among these methods, theories, sources and types of data, informants and inquiry techniques are highlighted "(p. 20). Therefore, triangulation means contrasting the different findings in the interpretive activities described above. Triangulation aimed at verifying and confronting the data obtained from the said stages to find out the relation or contrast between the sources of data.

In that sense, Stake (1999) sates, triangulation aims to present a description segment, obtain confirmation, and strengthen the validity of the interpretation. According to this author, there are several strategies to triangulate, and one of those is for the data source to interpret the information provided by the participants. Although, this is done in this study, it also resorted what the author calls

the triangulation of the theory, which is nothing more than comparing what it is obtained in light of the theoretical approaches that support the study.

What was carried out, according to Martínez (2007) involved examining and reviewing the information emerging from the different testimonies. Then, comparing them to establish the similarities and differences. After that, the distinction-summary was made, which lead to the representative text of the new reality under investigation. This arose from the association and divergence between data sources.

Now, according to Rodríguez, Gil and Suárez (1996; cited by Martínez, 2007) the procedure gives rise to the content analysis, with the purpose of moving beyond what is stated by the participants. As such, it is an activity to dig deeper than what has been explicitly expressed, in order to identify the theoretical arguments posed by the study, from the words of the testimonies. Thus, during the research process, the activities to obtain the data and the respective coding were emphasized. The latter facilitates grouping the data into categories, concepts or constructs, based on similarities and differences. All of this influenced the definition of emerging categories in this study, according to Ángel (2011) "The process of this category construction goes through a codification process that the researcher carries out until he reaches the selective coding" (p.17). The process applied is shown in Table 1 below:

Table 1. Analysis, Organization, and Systematization of Information

Interviewed Teachers	Central Codes	Dimensions	Categories	Theorethical Elements
1,3,4,5	Acquisition of skills to know the scope of LKTs Lack of knowledge of the theoretical foundations of LKT as strategies I don't know the meaning of LKTs. This is just another modernism of technologies I don't like working with technologies, I don't have the skills I do not have the attitudes to use technologies I think they are difficult to use	Training component	Lack of knowledge of the LKT term I know something about ICTs, but I need information I think LKTs are strategies, but I am sure sometimes I think they are techniques They are tools of technology I don't see any difference with ICT Technological modernism I do not use them because I do not know them. I need training	Training for competences to strengthen LKTs

Interviewed Teachers	Central Codes	Dimensions	Categories	Theorethical Elements
7,5,6,10	Occasional use Of ICT and not use of LKTs within the classroom I think LKTs are strategies that aid in Thinking ICT and LKTs are considered tools to make classroom work easier Technologies are useful in teaching processes as a source of information in classroom activities I have not used LKTs, but I have colleagues who have done it and they say they are very interesting tools for teaching. LKTs are very useful in the classroom because they guarantee interactions, collaboration, exchange, and discussion	Applied component	I just use the internet I do not know how to use LKTs in the pedagogical work Its use makes the classroom work easy They are strategies used to interact, share. They are strategies that help in the information search They guarantee interaction, exchange and discussion. I think I can use them to problem solving Its use and application Could be useful for Critical thinking development of students It is of utmost importance to learn about LKTs use	Critical thinking and learning based on problems through the use of LKTs

Interviewed Teachers	Central Codes	Dimensions	Categories	Theorethical Elements
2,8,9,1,2	LKTs are tools that favor learning to learn LKTs and ICT are tools but the former ones allow the construction of knowledge LKTs are alternative strategies different from ICT that can be used within the classroom They are emerging strategies that allow creativity Strategies for training through competences They contribute to the individual`s development LKT are strategies for comprehensive training	Conceptual component	Emerging strategies forr pedagogical tasks Strategies for learning to learn ICT and LKT are technological tools, but with different objectives LKTs favor creativity and comprehensive training LKTs Boost the process of learning	Construction of knowledge in the teaching-learning process supported by LKTs

Source: Author´s

Results

For the compilation and interpretation of the results, the objectives of the research, the testimonies of the teachers who participated and the dimensions and categories indicated in Table 1 were taken into account. The emerging categories were the result of the analysis of the answers given by the participants. These are analyzed as follows:

1. The Formative Component was oriented towards the answers that, regularly, indicated by the interviewees 1, 3, 4, 5 with respect to the domain or training they have on the *LKT*s. These aspects are directly

related to the common features that identify teachers which is reflected in the way they deal with technologies and *LKT*s. One aspect that was present in the interviewees is not having the necessary skills to analyze, apply and argue about the meaning and scope of the *LKT*s and the theoretical bases that underlie them. This component, once reflected and analyzed, derived the theoretical element called "Competency-Based training for the consolidation of *LKT*s".

2. The Application Component was derived from the repeated responses of the interviewees 7, 5, 6, 10. All of them stated that technologies are important in the classroom because they facilitate the learning process, problem solving and critical-reflective thinking. Despite this approach, the interviewees indicated that they use them sporadically, since the institution does not provide them with the resources to develop them nor do they have the appropriate learning environment in the classroom to implement them. All agreed, however, on the importance and scope of *LKT*s as strategies to achieve possible interactions, collaboration, exchange and discussion. However, repeatedly indicated that teachers do not use them because they do not know their theoretical and practical utility. From this analysis, it emerged the second theoretical element: "Critical thinking and problem-based learning through the use of the *LKT* strategy".
3. The Conceptual Component was the product of the answers given by the interviewees 2, 8, 9, 1, 2. Here it was disclosed that teachers, despite not having the skills to use *LKT*s, they consider them important. They pointed out that they only know what they have heard from their peers, since these are emerging alternative strategies for the construction and generation of knowledge. However, they think that this requires that teachers have the theoretical basis that underpin the *LKT*s.

They also stated that the *LKT*s are tools that not only allow the students to learn, but to learn how to learn in support of the teachers' pedagogical. Others stated that what is most important is to know how to use the technologies, since they allow the classes to be modernized, guiding decision-making and improving the quality of education. The theoretical element resulting from the interpretation of this category was: "The construction of knowledge in the teaching-learning process based on *LKT*s".

The findings were the result of the collection of the data indicated in Table 1 and its interpretation and systematization. From there, the following theoretical elements that support the *LKT*s were derived.

Skills-Based Training for the Consolidation of *LKT*

The development of emerging technologies oriented towards the generation of knowledge and collaborative work has produced changes and modifications in learning and information processes, in which education cannot remain on the sidelines. On the contrary, these developments must make them a crucial part of education, and welcome them for the processes of students' comprehensive training – even more, with those who will be the future teachers of the country.

In this regard, Vivancos (2008) points out that digital tools were originally known as ICT. But, they have progressed in recent years to become Learning and Knowledge Technologies (*LKT*). Hence, the importance of teachers using *LKT*s in the training of students. This implies that teachers must be trained through skills-based strategies, to overcome the role of transmitting knowledge and focus their teaching to help students adjust their abilities and deploy them in real situations.

From this perspective, teachers must have a solid training in the development of conceptual, procedural and attitudinal contents. Internalizing technology as a means to generate 'learning how to learn' processes. In this regard, Mejías indicates that hypertexts, multimedia, Internet, virtual reality or satellite television must be understood and interactively applied by teachers, relying on telecommunications, computers, and audiovisuals and their hybridization as multimedia (Mejías, 2011, p. 8). Thanks to them, we have access to the information of texts, images, and sounds that are fundamental in the process of skills-based training.

Similarly, Chavarría analyzes the importance of technologies and conceives them as mega-tendency, since this is a current of thought and action, a stable and generalized behavior towards which all educational activity is directed with the accompaniment of the leading role in the field, because it is a common denominator in all areas (Chavarría, 2004, p. 15). Medina-Rivilla and Salvador-Mata (2002)focus their attention on the importance of didactic knowledge for training processes; emphasizing that strategies, resources and techniques for learning are fundamental for face-to-face and distance activities.

Nofal (2007) also points out the importance of being up to date with the processes of Entrepreneurship and Technological Knowledge Management (TEC). Since, it is a logical, organized and systematic process to produce, transfer, and apply in concrete situations a harmonic combination of knowledge, experiences, values, contextual information and expert judgements that provide a framework for their evaluation and incorporation of new experiences and information (Nofal, 2007, p. 1), of notable value in the competencies of teachers.

Consequently, the teacher must have the competencies to make ICT resources allies in teaching and learning experiences. Thus, *LKT*s proposed to allow students and teachers to build knowledge that promotes critical thinking, independence, and autonomy. And also to be analytical and autonomous in their learning which can not only generate significant experiences and processes but also the development of educational proposals for the insertion of *LKT*s in the classroom.

Thus, in human development— the cognitive, bodily, social, communicative, ethical, recreational, work and spiritual dimensions must be considered. When addressing competency-based training, it is necessary to contemplate that the realization of the human being occurs when the identity itself is constructed, as well as how individuals project themselves to others and the surrounding and of course, their social welfare. Therefore, technological skills should be included in teacher training so that teachers can face the challenges that are currently presented in the use of ICTs for the teaching process.

For their part, López and Matesanz (2009) indicate that the main competences in the knowledge society are learning to know, b) learning to love and feel, c) learning to do, d) learning to live together, e) learning to be, f) learning about knowing, wanting, feeling. These must be grasped by teachers in order to meet the challenges of the twenty-first century. This means that skills-based training is the fundamental basis for understanding the meaning and scope of *LKT*s in the teaching-learning process.

In this order of ideas, the proposal made by Reig (2012) is highlighted, when he states that in the current world it is essential to direct efforts towards new skills training and education in values, as well as the role of teachers and institutions in the construction of meaning in all educational exchanges with new generations.

The Educational Portal Colombia (2014) proposes five competencies that are fundamental for teachers: a) Technological; b) Communicative; c) Pedagogical; d) Managerial; and e) Investigative. Likewise, Tobón in terms of competencies, presents a socio-formative approach, in which they are assumed as one more dimension of the human being, who is considered in their entirety, becoming phylogenetic and ontogenetic, articulating the biological dimension with the psychological, sociological and spiritual dimension (Tobón, 2013, p. 45), . That is to say, it includes beyond the capacity to do, in terms of the operative, since it adopts a global and integrating approach.

For this reason, technological competency seeks to integrate education with ICTs to improve teaching and learning spaces; in addition, it strengthens skills to increase the ability to select and best use technological tools. Communicative competency shows that ICTs allow a connection of expression between stu-

dents, teachers and researchers, among others, to relate in virtual and audiovisual spaces. Pedagogical competency, evidences that through ICT the teacher in their work enriches the art of teaching. The competency of Educational Management emphasizes that the use of technology contributes to the development of the planning processes that are necessary in the work of the teacher. As such, investigative competency is tied together with knowledge management and creation.

Considering that the Internet has been —in recent decades— the archive of the knowledge of humanity, teachers must have the capacity to use *LKT*s to transform and generate knowledge.

Now, these competencies must be seen integrally, because they are interdependent and crucial in the actions of the teacher regarding the use of technological strategies. These are complemented by those outlined in the project "ICT Competency Standards for Teachers" (United Nations Educational, Scientific and Cultural Organization UNESCO, 2008). According to this document, the teacher is the person who plays the most important role in helping students acquiring the skills that enable them to be: a) competent in the use of information technologies; b) information seekers, analyzers and evaluators; c) problem-solvers and decision-makers; d) creative and effective users of productivity tools; e) communicators, collaborators, publishers, and producers; f) informed citizens; and g) responsible and capable of contributing to society.

The above competencies require a profound transformation of education and its institutions. In this regard, says Davini (2008) that in this century marked by cognitive abundance, in a connected and networked society, new challenges are posed to the teacher who must be aware of the new skills implied by (their role, which is not only to educate but generate and transform knowledge.

In the achievement of the above competencies, the teacher trainer of trainers has a fundamental role to play, as they must contribute to students acquiring these skills by designing learning environments with *LKT*s that are conducive to achieving collaborative, meaningful and metacognitive learning.

Critical Thinking and Problem-based Learning Using *LKT*s

This theoretical element is based on two central aspects: argumentation and action, which are achieved through the use of *LKT*s. For this, the teacher must rely on various techniques and organized activities with the aim of achieving students' participation and interaction and, therefore, the development of critical thinking and problem solving. From this viewpoint, Reig (2012) suggests that there is currently a communication revolution towards *LKT*s and EPT

(Empowerment and Participation Technologies). Therefore, the great challenge for teacher-trainers of trainers is to learn *LKT*s that allow students to experience interactive situations, solve contextualized problems and develop practical activities to stimulate critical thinking and facilitate knowledge transfer.

Vivancos (2008), on the other hand, states that *LKT* competencies are achieved through information search and processing activities, to which the author attributes the development of digital competence. This is acquired through educational practice that ranges from systemic ICT planning in the educational institution to different examples of activities and strategies in the classroom.

Díaz, states that technological strategies should be used by teachers in a reflective and flexible manner to promote meaningful learning in students (Díaz, 2003, p. 4). The material must be motivating for the students and planned by the teacher with the intention that students achieve knowledge, taking into account their previous knowledge. On the other hand, Ochoa and Sylva point out that it is vital to achieve a true use of technological strategies because they represent an information resource that drives learning beyond the insertion of content in the network (Ochoa and Sylva, 2014, p. 341).

In this work, *LKT*s are proposed as tools that are based on different formative strategies for both the student and the teacher and guarantee autonomous, meaningful and metacognitive learning processes. This implies not only knowing them but also looking for ways to use them and apply them taking into account the technological tools, needs and profiles of the students.

The above-mentioned approach is related to the project of didactic strategies of the "Everyone to Learn" Program (Programa *"Todos a Aprender"*, PTA). Which is looking for teachers that improve their classroom practices with the development of learning environments and strategies that are dynamic, interactive, and that contribute to and complement the process of teaching and learning of the students and generate, therefore, meaningful learning.

Consequently, the authors of this study suggest that there is a link between the use of interactive and collaborative strategies with the meaningful learning that students can achieve in their training process. For this, they are based on Ausubel (1995) when it emphasizes that a) The content of the learning has to be potentially significant; b) The student must possess in their cognitive structure the concepts utilized previously, in such a way that the new knowledge can be linked with their previous knowledge and c) The student requires to adopt a positive attitude towards meaningful learning, showing disposition to relate the learning material with its cognitive structure.

This last aspect indicated by Ausubel (1995) reaffirms the importance of learning material, including strategies and resources for the didactic process of teachers. This requires that such strategies are planned and organized, through

the development of practical or problem-solving situations that integrate technologies into teaching and learning processes and contribute to the development of innovation, creativity and knowledge generation.

Some of the strategies, techniques or resources that can be used in the classroom and provide meaningful learning are, among others, the following: social networks (Facebook, Twitter, LinkedIn, etc.), learning by projects, concept maps, information search, debates (forums, blogs, e-books, chats, video conferences, etc.), concept networks, problem solving, essays, project managing, educational programming and robotics, augmented reality and geolocation, 3D printing and modeling. Additionally, educational gamification and videogames, learning platforms such as: Moodle, Chamilo, Edmodo, among others. All teachers should use them, analyzing their advantages and disadvantages to expand knowledge and consequently; to analyze, understand, represent and solve complex problems looking for the interrelation between theory and practice and the development of critical thinking.

In view of the above, the current teacher should be able to use *LKT*s as pedagogical strategies for planning learning situations in collaborative groups and carrying out diverse activities that promote interactive and meaningful learning.

Knowledge Building in the Teaching-learning Process Based on *LKT* Strategies.

This theoretical foundation is based on the conception of *LKT*s as pedagogical strategies that favor the construction of knowledge. This requires a shift from ICT that is oriented towards producing information to a different conception for knowledge building. For this, learning settings must include higher-order or metacognitive processes, which means learning environment focused on the wider context and the search for social construction.

Knowledge is a complex, contextualized, historical, social and cognitive process, which means that the *LKT*s used must guarantee the solutions to problems through the use of techniques that contribute to the development of creativity, critical thinking and social interaction in the classroom. In this sense, the work is based on Vygotsky (1979), who points out that human development is a construction that is produced in the exchange of the subject with his social environment. In this approach there are concepts such as Level of Real Development, Level of Potential Development and Zone of Next Development. The Level of Real Development is determined by the ability to solve a problem independently. The Level of Potential Development refers to the ability to

solve a problem under the mediation or guidance of other subjects of greater competence.

That is, the learner can reach higher and more complicated hierarchical levels of knowledge with the help of another person; in this case, the teacher or a colleague with greater competence. The Next Development Zone is the distance between the two levels (Real and Potential). The teacher should encourage the student to go from his real development zone to his potential development zone; this is done through a mediational process. Whereby, he will have to organize the learning environment and work in it so that the mediation is effective. To do this, you must have the necessary skills and use all the resources that technology offers to develop a creative educational process from the potential development of your students. This encourages the development of cognitive processes, in both basic and higher level, through the promotion of thinking mechanisms.

Vygotskyian theory is relevant in this context —and particularly in this investigation. Because the *LKT*s in the process of teacher training of the Normal Superior School *María Auxiliadora*, Cúcuta Colombia—and in any other—would allow the student to move into a more advanced level of development with the support of the teacher that favors the interaction of new psychological functions or the restructuring of existing ones. In this regard, Mena refers that;

> Building (...) relevant and representative knowledge requires a careful combination of theoretical knowledge provided by science and technology and contextualized knowledge from the social memory of the peoples that make up the region with their convictions, needs, expectations and dreams (Mena, 2004, p. 11).

In other words, it is not enough to have knowledge, but to know how to apply it. For this reason, Campos, Gaspar and Cortés (2003) refer that the use of the *LKT* strategy can: a) provide conditions to students for the construction of knowledge and conceptual transformations; b) favor an anchorage to the development of analytical-categorical and strategic-methodological skills, and c) propitiate an active, reflexive, critical and participative learning environment. Thus, knowledge development means understanding, analyzing, synthesizing, arguing, aspects that must be present in the implementation of *LKT*s that require activities, techniques, and resources for students to acquire knowledge.

From this perspective, the proposal for educational institutions oriented in the use of this strategy should redefine the role of all elements involved in the educational act; students, teachers, institutional managers, pedagogical models and the classroom environment. This means that the construction of knowledge with the use of *LKT* will depend on the coupling of all the above elements, i.e., the institution as a whole is oriented in theory and practice to manage the

processes of change and to modify everything that inhibits the development of knowledge.

Conclusions

LKT are strategies that favor the construction of knowledge through processes oriented towards problem solving, interpretation, argumentation and analysis. From this point of view, teachers must know the scope and meaning of its application in the classroom, taking a paradigmatic leap from the traditional concept of ICT as a means of obtaining information, in order for students to achieve significant and metacognitive learning processes.

In the development of the work, three theoretical elements that support the *LKT*s were generated: Skills-based training for the consolidation of TAC, critical thinking and problem-based learning through the use of the *LKT*s and the construction of knowledge in the teaching-learning process underpinned by *LKT*s.

The theoretical elements mentioned previously should be reinforced through the performance of the teacher in the classroom, which will imply changes and modifications that will undoubtedly contribute to seeking others that will guarantee the process of learning to learn with the use of ICTs, *LKT* and PET, which make possible the development of cognitive processes such as the expansion of the nearby development zone, greater empowerment, the passage from interaction to participation and strengthening of situational learning, one of the great challenges of education in the 21st century. That is why Perrenoud (2009), when referring to the training of trainers and their institutions, says that the latter must work with a common vision that aims to democratize access to knowledge, to develop the autonomy of subjects, their critical sense, their competences as social actors, their capacity to construct and defend a point of view, both individually and collectively.

To conclude, this work is part of a doctoral thesis in education in which there is a desire to contrast the results so far with other conceptual and empirical contributions and inputs that may or may not ratify the assumption that *LKT* as pedagogical strategies are the basis for the achievement of significant and creative learning, and for the generation and construction of knowledge.

There is no doubt that this topic has been widely discussed in conferences, seminars, workshops aimed at finding the necessary strategies and resources for students to learn with technology (Sancho, 2008; Lozano, 2011; Calderón, 2013); these authors highlight the importance and need for the students to incorporate

technology to develop their knowledge. However, the discussion continues and has been deepening due, mainly, to the questions that teachers formulate about the need to consolidate *LKT* in the classroom as strategies that contribute to the generation of knowledge. In addition, some teachers continue to teach in the traditional way and despite the aspiration to establish skills-based training, the implementation of a behavioral, technical, and linear curricular model that does not reflect the integral formation of the individual which still persists in many institutions.

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