

# Educational Innovation Project for the Development of ICT Competence for Education (CIE) among Higher Education Teachers

Yasbley Segovia Cifuentes, Darwin Andrés Díaz Gómez

**Abstract**—The purpose of this paper is to describe the construction of the educational project “the development of ICT competence among teachers at Universidad de La Sabana” in Colombia. ICT Competence for Education (CIE) is defined as the ability of teachers to appropriate, integrate and innovate teaching practices and enhance students’ learning through the use of Information and Communication Technologies (ICTs). In turn, the project responds to two essential aspects in the ongoing training of teachers: The integration of ICTs into the institutional curriculum on the one hand, and the role of ICTs in the improvement of the quality of education, on the other. In this regard, the construction of the project is part of the culture of innovation that the University aims to achieve through the integration of ICTs. As part of the process, an instrument was designed in order to assess ICT competence for education. In addition, the corresponding institutional regulations were obtained. The design of the instrument considered four standards: the use of technologies and the development of ICT competence, the integration of ICTs in the teaching process, the promotion of students in order to favor ICT-mediated learning and innovation in the teaching practice through the use of ICTs.

**Keywords**—Competence, Educational innovation, ICT Competence for Education, Indicators, Educational Project, Standards, Teacher training.

## I. INTRODUCTION

THE construction of educational projects that favor teacher training in the development of competences is a clear intention that must be considered in higher education institutions.

In this sense, the need arises to consolidate processes that in the long term lead to a strong and continuous training of university teachers.

For higher education institutions, the generation of strategies that encourage the development of these

competences, and even more, of competences related to the use and integration of ICTs is relevant. These strategies may be understood as mediations for the achievement of the goals set in the processes of teaching and learning.

The incorporation of Information and Communication Technologies (ICTs) in education, [2] understood as a social practice, is a reality that requires the planning and development of projects focused on understanding that the use of ICTs provides an opportunity to improve and make adjustments in the processes of teaching and learning.

In this regard, it is important to highlight that the ultimate aim is to create ICT-mediated learning settings [3] that help to enhance teaching situations for teachers and learning situations for the students.

In accordance with the above, the demands of modern society [4] require that people are able to demonstrate competences to solve complex and unpredictable situations arising from everyday activities. These competences are essential in the development and adaptation to the new educational demands and also to the integration of ICTs as an important aspect of learning.

Hence, proposals at international level related with the development of ICT competences for teachers [5] as well as other proposals recognized at country level and locally, contribute to the attainment of goals involving the use and implementation of educational practices whose aim is to improve the quality of education.

As a result of the proposals defined at international and national level, higher education institutions have become optimal settings to develop and propose action plans related with the development of ICT competences among the teachers in those institutions. Hence, ICTs turn into resources supporting both teaching and research [3]–[6].

However, through the formulation of institutional plans related with the development of ICT competences, it is important to highlight that some factors related with the training of teachers, whether personal, institutional or educational must be considered [7].

In this line, facing the opportunity to favor teacher training and considering personal idiosyncrasies, institutional goals as well as the development of ICTs, Universidad de La Sabana, Colombia, proposed the development of ICT Competence for

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Education as “a tool to improve academic quality [...] and the generation of new dynamics and contexts that favor teaching and learning processes”(p.3). [8]

The educational project for the development of such competence was elaborated taking into account national and international policies regarding the integration of ICTs as support to teaching, and also within the framework of the culture of innovation which was defined as a goal to the university.

In this sense, creating a collective atmosphere in which ICTs turn into means to improve educational practices allows the community in general to understand that the use of ICTs goes beyond being instrumental and pursues a pedagogical goal.

Innovation in this project is not in the use of technological tools per se, but in understanding ICTs as crosscutting tools which support the activities proposed in the curriculum for every area of knowledge.

It is not about using technologies without a common purpose, it is about consolidating an institutional culture characterized by the promotion of permanent reflection on educational needs, an opportunity to improve educational practices and integration with clear and defined purposes to understand the role played by ICTs in teaching and learning.

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## II. THE CONCEPT OF “COMPETENCE” AND THE DEVELOPMENT OF ICT COMPETENCES

The development of personal competences in educational practices has been increasing at different levels in modern society [4], even more so in teaching and learning processes.

Therefore, in addition to the development of competences related with the disciplines, it is necessary to take into account the development of ICT-related competences, especially because they are part of the requirements in any profession and educational activity.

It is not only about developing competences to use ICTs, but it intends to propose strategies for ICTs to turn into support and mediation tools in the different academic activities planned by university teachers.

According to the above, in the context of teacher training policies, the subject of ICTs is part of institutional agendas at national and international level. For Universidad de La Sabana, competences involve the demonstration of *performances and achievements* by people, in this case, teachers.

Therefore, it is convenient to approach the subject of ICT competences through the design and development of the educational project called “the development of ICT competence for education among all the teachers at Universidad de La Sabana”. The result of this project is the design of institutional guidelines and policies [8] around the integration of ICTs into all areas of knowledge.

The project is articulated to the pedagogical intention to integrate ICTs and especially, to develop ICT Competence for

Education.

In consideration with the above, describing the sense and the characterization of what a competence involves and, in this case, of the characteristics of ICT Competence for Education are a fundamental part of the project. In it, a single competence is analyzed as defined by some standards and indicators to be developed later.

### A. Characterization of the concept of competence

Due to the different interpretations and meanings associated with the concept of competence, provided by use and context from which it is approached, it appears to be a polysemic concept.

It is not surprising that the inclusion of this term in the educational setting originated from a tradition which is distant from it. Furthermore, in our case, competence is contextualized in the educational setting, more specifically in the formal context of higher education.

In this sense, it is worth highlighting at least two points of view on the concept within the framework of school activities as such.

On the one hand, competences in the school context help to “identify, select, characterize and organize school learning that makes educational intentions concrete” (p.9) [9]. In this respect, competences turn out to be a strategy for the curricular organization of educational institutions.

On the other hand, for the same author, the concept of competence “introduces important and novel nuances to the way we understand what kind of learning is expected in school education” (p.10). Hence, besides being a way to provide structure to the curriculum, competences make it possible to understand and to guide the learning that has been achieved through the different learning activities that take place in a person’s training.

For Universidad de La Sabana [10], competences are defined as “the set of abilities a person is capable of demonstrating through actions and performance, in particular conditions or contexts” (p. 18).

The Colombian Ministry of Education (MEN) [11] defines competence as “the set of knowledge, skills, attitudes, understanding and cognitive, socio-affective and psychomotor abilities properly related amongst them in order to facilitate flexible, efficient and sensible performance of an activity in relatively new and challenging contexts” (s.p.)

Likewise, [12] “competences are a combination of attributes, abilities and attitudes that typify the exercise of a profession, and which allow for an integral education. They must be developed throughout the process of students’ training by means of the application of different dynamics. Students must not only possess a specific ability, but they also must know how to exert it” (p.163).

In this sense, competence [13] is taken as an ability that turns into a moment of literacy in order to understand, to use something and to make sense of it. In this case, the integration of ICTs into the different contexts where educational practices take place turns into a process of literacy, appropriation and use of such technologies.

In consequence, we may state that a competence is a human capacity in which several attitudinal and procedural elements converge in order to attain some personal and institutional goals.

### B. The development of ICT competences in teacher training

In 2008 [5], ICT competence standards for teachers were defined. This proposal was framed within a political context of reforms and changes in education which intended to offer a view of education in terms of basic notions on ICT, deeper studies and the generation of knowledge.

With respect to basic notions on ICT, teacher training was focused on ICT training with the intention of training learners who would be able to support social and economic development by means of ICTs. Regarding the pedagogical aspect, the intention was to integrate ICTs to solve complex problems and to attain a process of self-management.

As a result of the above, the policy related with basic ICT notions intended to attain basic knowledge, to integrate ICTs with a pedagogical sense, to make use of basic tools and to provide the bases for digital literacy in teacher training.

On the other hand, another proposal for the development of standards [14] aims for teachers to facilitate learning and creativity of students, the design and development of learning experiences, work and learning in the digital era, education for digital citizenship, professional growth and leadership.

Other experiences related with the development of ICTs among teachers have to do with standards in information and communications technology for the initial training of teachers [15]. In this proposal, standards were organized into areas, such as: Pedagogical, technical or instrumental, management, social, ethic and legal, developmental and professional responsibility. Some standards were defined for every area.

At national level [16], the National Program for Educational Innovation through the use of ICTs was proposed, which defined a path for ICT pedagogical appropriation in the professional development of university teachers.

The axes of the proposal to incorporate ICTs in education were based on use and appropriation, access to content and access to technology. In the case of university teacher training, the path was focused on the use and appropriation of ICTs. The intention was for teachers to appropriate technological resources and to formulate use strategies for ICTs, as “a way to consolidate processes of educational innovation” (p.5). Hence, the teacher training process involved the following: a sensitization phase, and an inclusion phase.

According to this proposal [16], the aim of reaching innovation went through two ways of understanding; first, the promotion of an innovative teacher who made use of ICTs and second, the proposals of a dedicated and creative work by teachers.

However, by 2013 [11], a new proposal for the development of ICTs Competences for teachers’ professional development is made. Once the time of use and the appropriation of ICTs in teaching and learning processes had elapsed, the framework of reference for national policy focused on educational innovation and on the role ICTs play on that innovation.

Questions like *What* and *How* do students learn through ICTs? What is the point of learning? , among others, come up as part of the challenges faced by teachers.

In consideration of the above, the competences proposed by MEN are the following: Technological competence, communicative competence, pedagogical competence, managerial competence and research competence. At the same time, the scope of these competences is defined by the levels of competence called moments: exploration, integration and innovation.

With regard to the suggested proposals, it should be noted that ICT teacher training is a fundamental and ever present aspect in educational policies at international and national levels.

The path covered shows a base historic line that has involved the use, integration and now the achievement of innovation through ICTs at the different educational contexts. In other words, we have moved from an instrumental look on ICTs, to an educational innovation view on ICTs.

### III. ICT COMPETENCE FOR EDUCATION

Starting from the different national and international proposals on ICT teacher training, the proposal presented in this article highlights the following aspects, considered as highly relevant at the theoretical and practical level:

1. Teacher training for the incorporation of ICTs is not a purely instrumental training process.

Under the principle of not just changing outdated technological tools, but instead, of thinking of the semiotic [16] possibilities that ICTs may offer, the educational project for the development of ICT Competence for Education was thought in terms of addressing ICTs as semiotic measurements for the fulfillment of educational purposes.

2. Based on national and international proposals, our main intention was to create a project for the institution itself and according to the educational needs of our context.

On the one hand, this project was built according to the needs of the institution and this product was the result of interdisciplinary work.

On the other hand, the project responds to the needs defined by the reality of the social context and the continued training of teachers, members of the institutional community.

Ultimately, the purpose of the project serves as support and example for other educational institutions willing to organize development plans for teachers, regarding to the integration of ICTs in the teaching and learning processes.

3. The preparation of the proposal was focused on the Competence for the development ICT Competence for Education (CIE).

With the purpose of understanding the integration of ICTs, this project considers the development of a competence as the ability teachers develop to carry out the actions required in response to the needs of teaching and learning processes.

In this sense, the integration of ICTs refers to the use, appropriation and innovation in teachers’ practice when they make use of technological digital instruments to improve one or another activity, but with a specific feature: Thinking of the

integration of ICTs based on reflection and making the necessary adjustments required by educational activities in order to enhance the processes of teaching and learning.

4. The proposal for ICT training for teachers is a dynamic and personalized process, according to individual needs and the characteristics of educational activities.

The meaning of this educational project is not in training teachers, but in providing support to the needs of each educational situation which requires teacher actions.

According to the needs of every teacher, the aim is that the educational assistance provided is intended to personalize learning [18] in order to improve ICT-mediated practices by teachers.

5. The pedagogical, innovative sense of the proposal leads to a wider instrumental approach to ICTs at institutions.

In this sense, the ability of teachers to organize new ways of carrying out educational activities [19] with the support of ICTs is the focus of the pedagogical intention.

Beyond the concern to incorporate technological tools, the aim is to identify which activities can be improved and what technological resources can be used, taking into account the educational objectives.

In this regard, the pedagogical intention involves observing, reflecting and acting in order to improve both the teaching and learning of students.

6. The generation of an institutional culture with regards to the integration of ICTs as the center in the achievement of educational quality and excellence.

In order to develop ICT Competence for Education, the university intends to create an institutional culture of ICTs aimed to understand that educational quality is achieved through common objectives, targeted to promote educational innovation by means of ICTs.

In this respect, ICTs become pivotal axes for the achievement of quality and excellence in education. In consequence, the creation of the project allowed for planning, systematization and implementation to become part of innovation at the institution.

7. Accompaniment to education in the development of ICT Competence for Education is fundamental in the achievement of ICT-mediated educational innovation at the institution.

As mentioned above, the intention of the project is not solely the massive training of teachers in one or another technological tool. The aim is to provide support to the needs of every situation and intention of the teacher. It is not simply about learning how to use technologies, but also about how to integrate them in a pedagogical and intentional way in order to enhance educational practices.

8. Finally, developing ICT Competence for Education is a requirement to be upgraded at the institution teachers' ranking.

Given the importance of the project for the University, a requirement was defined for teachers: in order to be promoted in their teaching ranking, they must show evidence of progress in the development of this competence. In other words, the aim is not to get through a single activity by using ICTs; the process is a dynamic and continuous one, and it is not limited to using multiple devices, but to thinking and reorganizing the

activities that may require it.

Hence, the development of ICT Competence for Education is not limited simply to incorporating the use of tools, but to think that all educational activity is at the same time an activity of constant changes and adjustments in time.

In consequence, Universidad de La Sabana defines ICT Competence for Education (CIE) as "the capacity of a teacher to appropriate, integrate and innovate Information and Communication Technologies (ICTs) in his/her academic activity, aiming for a critical and ethical use of these (p.5)" [8].

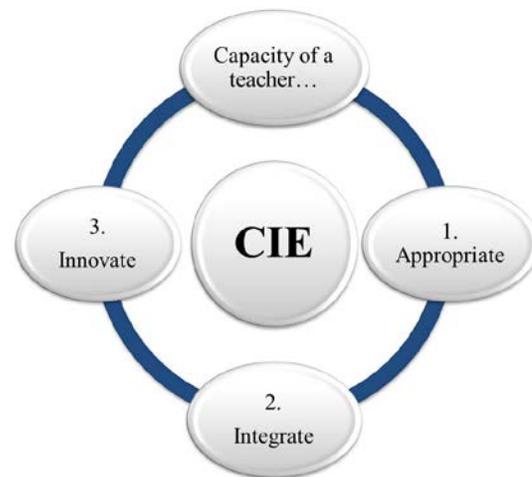


Fig. 1 Characteristics of ICT Competence for Education

According to the definition of ICT Competence for Education, the ultimate goal is educational innovation through ICTs.

In this sense, the process of innovation not only helps to re-think educational practices of teachers in their teaching and learning activities, but also, the participation of students becomes necessary in the process of integrating ICTs.

Therefore, the responsibility of teachers goes beyond the mere use of technological resources; it involves reflecting on their responsibility to be up-to-date according to the needs of the academic context [20].

Considering the above, the appropriation of ICTs, added to institutional intentions and the personal effort for training require a pedagogical sense so that an educational project with ICTs yields results that expand the technical use of these tools and frame their use as mediation with the intention of improving and organizing the educational practices of teachers in different ways.

In this regard, the new educational paradigm based on competence development requires and demands institutionalized and systematic pedagogical training. [21]

Hence, the pedagogical sense involved in using technological resources is a substantial part of the development of ICT Competence for Education.

Another element to take into account in ICT Competence for Education is the integration and innovation of ICTs in the academic work of teachers. For Universidad de La Sabana, educational innovation is a process of planning teachers

follow, starting from a *follow-up, feedback* and *assessment* of the teaching and learning processes by making use of ICTs.

ICT mediated educational innovation turns pedagogical activity into a practice of permanent reflection and action on the products of knowledge provided by students. [8]

For Universidad de La Sabana, innovation is understood as a process that integrates technological resources through time, but which focuses on the importance of pedagogical sense. Beyond technological infrastructure, the reason for proposing the development of ICT Competence for Education (CIE) is to strengthen practice taking into account the techno-pedagogical design of academic activities. [22]

For the Colombian Ministry of Education [11], ICT-mediated educational innovation involves teachers building innovative settings by adequately integrating ICTs so that students articulate the contents with the objectives proposed in order to attain the expected levels of learning.

In view of the above, educational innovation turns into a process that does not start with a change in technological resources, but which starts with permanent reflection on the pedagogical intention, the *what* for and *how* of the integration of ICTs in the curriculum.

The last aspect to consider in the development of ICT Competence for Education (CIE) has to do with the critical and ethical use of ICTs.

Using technologies in educational practice is not enough. It is convenient to think about the use some resources will have and the way in which they will be used.

Thinking about how *teaching and learning take place; what is taught and how it is learned* [23] through ICTs is highly important, especially when the following aspects are taken into account: Respect for copyright, not affecting others through digital media, the responsible use of technological resources, among others.

In short, it is about educating responsible and ethical digital citizens in all forms of action; a vision that underlies the development of the ICT Competence for Education (CIE) among teachers in the educational institution.

#### IV. THE EDUCATIONAL PROJECT OF ICT COMPETENCE FOR EDUCATION

The construction of the educational project for the development of ICT Competence for Education (CIE) is designed to offer a program to support teachers when it comes to integrating ICTs to assist the processes of teaching and learning.

Within the framework of the institutional organization, the Universidad de La Sabana appointed the Center of Technologies for the Academy to coordinate the entire process of construction, design and implementation of the project.

The Center of Technologies for the Academy is “an academic unit at Universidad de La Sabana which promotes the integration of Information and Communication Technologies to educational and organizational processes through research, implementation and development of integrated on campus and/or virtual education and training strategies aimed to solve academic and business needs”. [24]

With respect to research, the group Technologies for the Academy, *Proventus*, was created in 1998 to reflect, research and act in order to recognize the role of ICTs in educational action, considering the relationship between computer science and education. Therefore, the object of study of the research group is “Educational ICTs” and its academic production revolves around the two research lines created: 1. ICT-supported learning environments and 2. design, development and evaluation of software solutions for the academy.

Similarly, the *Proventus* research group is recognized by the Colombian System of Science, Technology and Innovation – Colciencias-, which validates its scientific production regarding the integration of ICTs in education.

Taking into account the experience of the *Proventus* group, an interdisciplinary team was formed to formulate the educational project of ICT Competence for Education, which was integrated by professionals from the areas of psychology, pedagogy, engineering and educational administration.

The proposal for the educational project on “CIE” experienced three moments in the process of consolidation and final approval by the institution: Reflection and conceptual foundations, designing the instrument to assess ICT Competence for Education and the approval of institutional guidelines.

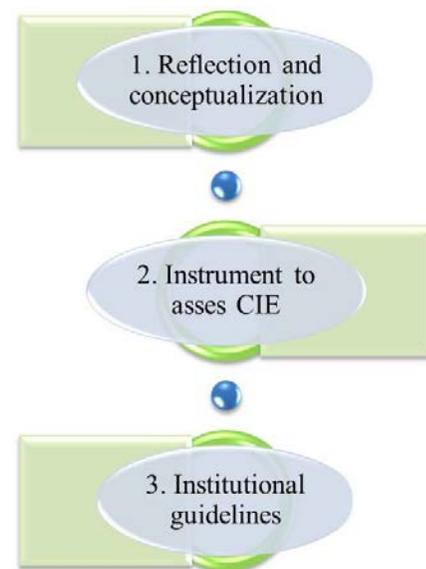


Fig. 2 Moments of the Educational Project of CIE

#### V. INSTITUTIONAL REFLECTION AND CONCEPTUAL FOUNDATION TO INTEGRATE ICTS

The first stage in the design of the proposal for ICT Competence for Education by the coordinating team was aimed to think about the needs of the University in terms of the use of ICTs to strengthen and improve the processes of teaching and learning.

Taking into account that *Proventus'* object of study is ICT Competence for Education, the need to propose the project in terms of the development of competences arose. As already

mentioned, ICT Competence for Education was defined by means of some specific features corresponding to the local, national, and international context.

Therefore the initial reflection pointed to the conclusion of addressing the educational project to the development of a unique competence with some standards and indicators.

Also, after reviewing the literature on a national and international level, the following issues arose which were also part of the first project:

1. The existing literature on proposals and guidelines [5]–[11]–[14]–[16] allowed for an initial stance to then establish a proposal for ICT Educational Competence.

In this regard, the conclusion was the need to develop a unique competence that would take into account specific aspects of educational actions with ICTs: The pedagogical, technological and administrative aspects; the latter, considering that the project was devised for the short, medium and long terms and also supported by the University's teaching director's office.

2. However, the pedagogical sense was at the center of reflection to approach the *What* and the *How* of the proposal for teacher training in ICTs.

Within the educational project, the pedagogical aspect was central to addressing the intention of developing this competence. However, the pedagogical aspect was considered to be a gradual, cross-cutting contribution [3] to the integration of ICTs.

That is, we consider that the pedagogical intention to incorporate ICTs does not appear spontaneously or casually, nor abruptly. It requires support in the pedagogical training of teachers.

This is because not all teachers have pedagogical training and this training is not a requirement in all areas of disciplinary training. Having said that, the importance of gradually inserting the pedagogical aspect in order to integrate ICTs in the curriculum of all areas of knowledge was key to the design of the project.

3. According to what was mentioned in the previous item, the training of teachers on the incorporation of ICTs requires personalized support.

At this point, the idea of carrying out the project proposal was isolated from the idea of providing massive training in educational technologies.

For the Universidad de La Sabana, personalized training is a substantial part of its actions regarding members of the academic community. Therefore, when dealing with the training of teachers, the project could not be far from that purpose.

At the same time, we believe that the integration of ICTs with a critical and reflexive sense cannot be understood as training which occurs at a specific point in time, without any follow-up being done over time.

To sum up, personalized support is fundamental, since it responds to the needs of every teacher and to the activities organized in different pedagogical situations.

After the initial reflections and once the institutional purposes were considered, we moved on to the second phase

of the project: the construction of an instrument that would assess the ICT Competence for Education.

## VI. AN INSTRUMENT TO ASSESS ICT COMPETENCE FOR EDUCATION

Starting from a conceptualization on ICT Competence for Education (CIE), an instrument to carry out a diagnosis and assess the development of this competence was designed.

Hence, in order to assess CIE, some standards and indicators were proposed.

First, it is convenient to describe the concept of standard and indicator.

According to the Colombian Ministry of Education [11], standards are referents that make it possible to assess the levels of competence development. Even so, they comply with some characteristics: 1. they are based on general guidelines, 2. they describe knowledge and skills, 3. they are recognized at national and international level, 4. they are capable of being observed and assessed, and, 5. they are periodically reviewed.

Second [15], "a standard helps to know how to materialize the competence and how to assess it, so that the assessment of a competence is achieved through the evaluation made on each one of the standards belonging to the competence "(p.17).

Standards provide orientation and guidelines to plan education programs for teachers [5].

As a source for reflection, both national and international organizations suggest that standards are proposals which make it possible to observe transformation in the achievement of and compliance with some goals through time, in this case, of the ICT Competence for Education.

However, besides the conception of the standard, it is also important to formulate indicators that make it possible to attain the achievement of standards; this is the case of the CIE proposal.

Turning to the definition provided by the Merriam-Webster Dictionary [25], an indicator is a sign that shows the condition or existence of something. In this sense, the indicators proposed for the ICT Competence for Education make it possible to focus the achievement of some elements that will serve as the bases for compliance with the standards.

Here, indicators are viewed as the actions and manifestations of the standards proposed for ICT Competence for Education.

On the other hand, it is worth highlighting that besides standards and indicators, the description of some examples is underscored as a way to help teachers to understand some actions or activities related with the achievement of every standard and indicator.

To sum up, Table I describes the instrument prepared for the development of the ICT Competence for Education.

Table I Instrument to assess CIE

Standard	Indicators
1. The teacher makes basic use of information technology tools and information management	1. Use of ICTs for activities.
	2. Identification of information needs with the use of ICTS.
	3. Efficient access to information.
	4. Articulation and application of criteria to assess information and its sources.
	5. Application of information for planning and creation of a product or activity.
2. The teacher integrates ICTs to improve teaching.	1. Design and use of digital educational resources in the teaching process.
	2. Preparation of assessment activities for students.
	3. Development of assessment and feedback strategies.
	4. Support to teaching activities through VirtualSabana or platforms complying with similar goals.
	5. Participation in academic networks mediated by ICTs to support their teaching activities.
3. The teacher promotes ICT-mediated learning among students.	1. Design and use of digital educational resources to enhance the learning process among students.
	2. Proposal of activities to facilitate students' independent work and interaction through VirtualSabana or platforms complying with similar goals.
	3. Proposals for activities that lead students to design and develop products of knowledge through the use of ICTs.
	4. Proposals for activities that lead students to design and develop products of knowledge through the use of ICTs.
4. Teachers innovate in their pedagogical practice	1. Planning, systematization, follow-up and assessment of strategies for the design and development of products of knowledge by means of ICTs.
	2. Follow-up to students in the design and development of products of knowledge through the use of ICTs.
	3. Assessment of strategies that lead students to design and develop products of knowledge through the use of ICTs.

Having defined the standards and indicators required to determine the development of CIE, Universidad de La Sabana, through the teaching division and the Center of Technologies for the Academy awarded a maximum of 90 points as the highest score in the development of this Competence. Points were distributed by levels, as shown in Table II.

Table II CIE Scoring

Level	CIE Scoring
1	Between 10 and 18 points
2	Between 19 and 37 points
3	Between 38 and 56 points
4	Between 57 and 75 points
5	Between 76 and 90 points

With respect to Table II, the distribution of the scores was characterized into five levels of CIE, with a range of 8 points between levels. The reason for this distribution is directly related with quantitative assessment leading to faculty promotion.

In other words, the development of CIE awards teachers a quantitative assessment in the statutes for teacher ranking at the university.

In the same way, a figure is allotted to every standard as part of the total CIE score.

In consequence, every standard has a score within the total value for CIE, that is, over 90 points. In turn, the scores for every standard are distributed among the indicators, according to the corresponding item. Table III shows the scores and their corresponding distribution.

Table III CIE standards and indicators scores

Standards	Score	Indicators	Score
Standard 1	10 points	1.1	4 points
		1.2	1 point
		1.3	1 point
		1.4	2 points
		1.5	2 points
Standard 2	20 points	2.1	4 points
		2.2	4 points
		2.3	4 points
		2.4	4 points
		2.5	4 points
Standard 3	30 points	3.1	5 points
		3.2	5 points
		3.3	10 points
		3.4	10 points
Standard 4	30 points	4.1	10 points
		4.2	10 points
		4.3	10 points

## VII. STANDARDS AND INDICATORS

In order to understand the proposal for standards and indicators, the features of each of these components are outlined below.

### A. Standard 1 and Indicators

For the first standard, which corresponds to the basic use of tools and information management through ICTs, indicators refer to the use of digital tools by teachers to carry out daily activities, not necessarily within the school setting. Likewise,

this standard aims to know about the information management by teachers as they access scientific information.

In this sense, the aim is to know about the process of information search and the use of technological means to attain that goal.

The importance and the role of information technologies literacy is relevant in the development of scientific, adequate digital information search skills to attain the goals defined in educational activities. Hence, information technology literacy is defined as the “set of skills required to find, retrieve, analyze and use information”. [26]

Indicators for standard one aim to identify two aspects which in turn are complementary:

The first has to do with an initial exploration to determine the use of ICTs in terms of both personal and academic life. It is about recognizing the kinds of tools and activities that every individual uses in their daily lives.

The second aspect explores the characteristics of ICT literacy or competence [26], five of which are mentioned specifically:

1. Identifying emerging information needs in academic activities which require digital access.

2. Access to information by means of sources depending on the nature of the information required.

In this sense, academic sources used by teachers such as databases, institutional pages from universities, government sites, scientific journals, repositories of scientific information, digital libraries, recognized academic networks, among others, are included.

3. Articulation and evaluation of the criteria used to assess information which is accessed digitally.

This indicator aims to identify the process by which teachers assess scientific information. It is convenient to highlight some of these aspects: Authors, year of publication, nature of the source, recognition of research groups, information resulting from research in the field of discipline, research design, among others.

4. Application of scientific information to create new products.

For this indicator, the idea is to identify the type of products that teachers obtain with the information retrieved. Likewise, we intend to know about the uses given to the literature retrieved. For example, the writing of new scientific publications, electronic presentations, reading activities for students, data to compile databases, or simply sending and sharing the literature with colleagues and /or students.

### *B. Standard 2 and Indicators*

The second standard is defined so that teachers reflect on their teaching practice and in consequence take a path of improvement to take advantage of technological resources with pedagogical sense. Among the indicators defined for this standard, the process of evaluating the teaching practice is fundamental.

Assessment understood as a continuous and educational activity [19] makes the development of indicators be based on prior preparation of contents, activities, assessment and

technological means.

According to standard 2, there are several indicators to be considered when training teachers.

The first indicator refers to the design and use of different digital resources. Another one refers to the activities re-organized and proposed by teachers so that students can develop different activities.

Similarly, reference is made to the use of the virtual platform of the university, VirtualSabana to support independent work. In this sense, more than using the tools, the aim is for teachers to develop skills and abilities to propose different activities to be carried out through this virtual platform.

Finally, a search is made on the type of academic networks teachers belong to.

### *C. Standard 3 and Indicators*

For the third standard, the comprehension emphasis is on the improvement of learning when ICTs are incorporated. In this sense, the role of teachers involves the personalization of learning through participation of students and group work [28].

Hence, participation and the construction of knowledge among peers are fundamental to allow interactions through technological means to support learning.

In this sense, the use of ICT mediated platforms with pedagogical sense is a way to support interaction and joint work between students and teachers.

It is worth highlighting that for Universidad de La Sabana, the technological means which articulates individual work and teaching and learning activities is called VirtualSabana. It is a Moodle-based technological platform; it works as a learning-management system (LMS), incorporating several tools and advanced technology- based activities. [29]

VirtualSabana supports the students' independent work and it is directly linked with academic credits according to nationwide regulations, which indicate that for every hour of face- to- face lessons, two hours of independent work must be articulated.

In this fashion, proper integration of ICTs into the curricular process is fundamental and it turns into an aspect of quality and compliance with educational policies.

To conclude, VirtualSabana has become a proper setting for teachers to plan, systematize and follow-up on the independent work students are expected to do outside their face-to-face experience in class.

Another feature of this third standard has to do with the preparation of ICT-mediated products of knowledge. Such products are understood as tangible evidence of a learning process through which students, with the guidance of teachers, manage to convert what has been taught into meaningful learning through the use of ICTs.

The third standard indicators allow us to observe the type of activities that students develop under the guidance of every teacher.

In consequence, these indicators are very important, since they aim to identify the coherence existing between what has

been taught through ICTs and the learning intentions that teachers plan in every activity. Thus, the aim is to know about the use and the interaction of students through ICTs to carry out certain activities prepared by the teacher.

By way of example, the subject of the development of ICT Competence among students is made explicit in an indicator. In order to identify the support of students to the development of this competence among them, inquiries are made on the type of search and the type of activities that students should develop, as well as the type of products to be delivered.

#### D. Standard 4 and Indicators

Finally, the fourth standard involves the demands and achievement of educational innovation by means of the critical use of Information and Communication Technologies.

According to Universidad de La Sabana's institutional regulations, ICT mediated educational innovation is the teaching planning process that involves follow-up, feedback and assessment of one's own teaching process as well as learning achieved by students thanks to such technologies. In this case, thinking about innovation does not involve variety in the use of the technologies used, but recognizing the disposition and perception by teachers [30] to make decisions on the process of innovation.

ICT educational innovation becomes a process to re-think the educational practices teachers apply in their teaching and learning activities, and also, the participation of students becomes necessary in the process of integrating ICTs.

Therefore, the responsibility of teachers goes beyond the mere use of technological resources; it underscores sense and reflection to update themselves according to the needs of the academic context [21].

The indicators taken into account in the fourth standard involve three aspects that teachers must meet:

1. Evidence of integrating ICTs with a specific intention into every subject program or academic commitments.

This implies that at the start of every academic process both teachers and students recognize the role of ICTs in the teaching and learning process.

With this indicator, it is clear that the incorporation of ICTs is not understood as improvisation without prior planning by the teacher.

2. The second indicator has to do with planning of the follow-up and assistance provided by teachers to their students prior to the design of ICT-mediated products.

3. The third indicator implies that the teacher designs a strategy so that students participate actively in the process of incorporating ICTs.

This means that teachers must undertake self-assessment and peer assessment processes with the students regarding the ICT resources and strategies used over a period of time.

In addition, it involves encouraging the participation of students in ICT-mediated academic networks and in products that promote the development of different areas of knowledge.

### VIII. GUIDELINES FOR THE DEVELOPMENT AND FOLLOW-UP OF CIE

Within the framework of Universidad de La Sabana, teacher education is substantial.

Therefore, establishing regulations, models or guidelines is a requirement to guide efforts, strategies and proposals in the direction desired, as proposed by the institution.

In 2010, Universidad de La Sabana, aiming to strengthen the development of ICTs among teachers, approved and defined the "*Guidelines for diagnosis and development of the ICT Competence for Education amongst teachers*".

These guidelines are also based on the Institutional Educational Project, PEI dispositions. To provide some contextualization, Universidad de La Sabana defines itself as a community of people who aim to take part in the advance of higher knowledge, taking into account the development of substantial functions made up by research, social projection and teaching.

Amongst the institutional aims, it is convenient to highlight the promote of the development of pedagogical practices and creative learning by students, as well as their capacity for innovation and problem [31] solving in any situation.

Based on this aim, in order to promote the students' capabilities for innovation and autonomy, it is necessary that teacher training matches the institution's mission and vision.

The Regulations issued by the institution consider what is defined in the teachers' ranking regarding the supplementary training offered by the university.

In consequence, provisions were made so that all teachers, with no exception, demonstrate compliance with the development and achievement of CIE in order to access or be promoted in the teachers' ranking.

In order to assess this competence, a procedure was suggested. This procedure is now presented, step-by-step.

### IX. CIE ASSESSMENT

The process of assessing CIE starts when teachers carry out a diagnosis to determine the stage of their development in CIE.

Then, the results obtained are assessed and informed and finally, a personalized path is suggested in order to enhance their development in CIE. The steps followed in order to assess the teachers' CIE are presented below:

#### A. Initial diagnosis

Every teacher at the institution must follow an initial CIE diagnosis.

The process to carry out this diagnosis involves:

1. A face-to-face or virtual, personalized interview.

2. The application of the "CIE assessment instrument" previously described.

Regarding the face-to-face interview, every teacher must undergo this process, which takes from 1 to 2 hours, depending on the case. The purpose of this interview is to know about the experience of every teacher regarding the use, integration and education process involving ICTs. The interview data sheet is presented in Table IV below.

Table IV CIE interview data sheet

Aspect	Description
ICT Competence for Education	A CIE proficient teacher strengthens the teaching and learning processes through the innovative integration of ICTs.
Aspects to be assessed during the (interview)	Information management competences Integration of ICTs into the teaching process Use of ICTs to improve the students' learning process ICT supported innovation of pedagogical practice
Observation of evidence of teaching and learning (Interview)	During the interview, evidence of the work done by means of integrating ICTs into, for example, the design of educational materials, simulators, electronic presentations, digital portfolios, etc. developed in teaching and learning processes will be observed.
Time allotted to interview	60 to 120 minutes
Mode of application	Direct- real time- interviewer and interviewee

Regarding the aspects considered in the personal interview, the instrument presented in Table 1 is used to assess CIE.

Through the assessment of the 4 standards, a deep inquiry is made on the use of ICTs in personal and academic processes by teachers. The instrument applied is shown in Fig. 3, which consolidates the qualitative and quantitative assessment in the diagnosis.

Fig. 3 Format for the initial diagnosis of CIE.

B. Assessment of results by experts

The step following the personal interview is the quantitative and qualitative assessment of the diagnosis.

Qualitative assessment consists in discovering the scope and aspects to be improved for every standard and indicator, whereas quantitative assessment determines the score for every indicator and standard.

In order to carry out the assessment, a committee was created to assess the initial diagnosis. This committee was made up of professionals from different disciplines, including psychologists, pedagogues and engineers.

C. Results

Once the assessment is carried out, every teacher is given a personalized report, so that the score attained in CIE development and the aspects to be improved in forthcoming evaluations are made evident, as shown in Fig. 4

Fig. 4 Individual assessment report. Qualitative and quantitative results.

D. Teacher training path

Besides the qualitative and quantitative results of the personal interview – initial diagnosis-, the report sent to every teacher includes suggestions for training in order to incorporate ICTs, known as the teacher training path for the development of CIE.

Fig. 5 Model for individual training path.

### E. Personalized accompaniment

Starting off from the assessment and the suggested personalized training path, the Center of Technologies for the Academy provides permanent and personalized guidance to teacher training in order to advance in the development of the ICT Competence for Education. In consequence, some of the features of the accompanying process are:

1. Providing personalized guidance on the needs of every teacher according to the educational intentions.
2. Offering training courses that integrate ICTs into the teaching and learning processes and according to the needs of teachers.
3. Designing different communication paths to support the activities of teachers in their academic life.
4. Providing permanent follow-up on CIE progress.

### X. CONCLUSION

The construction of the educational project to develop of ICT competence for education was a process to support the training of teachers, improve teaching and learning, promote educational innovation and the creation of guidelines to help promote critical and pedagogical use of ICT.

Regarding teacher training, the project was intended to support and accompany teachers to promote the use of ICT in any educational activity and any area of knowledge. For the institution, the integration of ICT implies forming leaders with critical, ethical and pedagogical sense and also to create a culture of educational innovation with ICT.

Moreover, in the process of ICT Competence for Education, the institution sought to strengthen and help improve teaching practices of the professors when they use ICT and improve student learning using ICT in any educational practices and knowledge areas.

We also believe that management and planning in the construction of an educational project to integrate ICT is essential in the search for educational quality. The consolidation of an interdisciplinary team work and collaborative work were other issues of great importance in the development of the project.

Finally, the educational project of the Universidad de La Sabana is a model that can be applied in other educational institutions requiring teacher training processes and also it is a strategy for the curricular integration ICT in the educational institutions. So, for the University the development of ICT competence for education it is an innovative approach to help improve and promote the integration of ICT in all areas of knowledge with a pedagogical and critic sense.

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