

TRAINING PROFESSORS IN ICT: PERSONAL LEARNING ENVIRONMENTS. A GROUNDED THEORY RESEARCH STUDY

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The objective of this study is to recommend a training plan for teachers in the Department of Nursing and Rehabilitation that develops the competencies necessary for the educational integration of information and communication technologies (ICTs) in teaching and learning processes. The study was conducted with qualitative tools, beginning with a questionnaire that identified ICT competencies. Professors were able to develop reflection processes regarding their pedagogical practice that resulted in designing learning strategies centred on the student with the support of ICTs. The competencies developed by the professors allowed them to continue exploring the pedagogical technological tools available, that is, taking into consideration the learning objectives that are expected to be reached in the courses and subjects suggested. Personal learning environments served as mediating factors in the development of the professors' competencies and as a mechanism for continuing with the training process.

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1 Introduction

Various studies (Coll *et al.*, 2008; Sang *et al.*, 2010) have found that the educational integration of information and communication technologies (ICTs) targeted for improving student learning is marked by the professor's effective use of ICTs. In turn, studies emphasise the importance of training professors to enable an ICT incorporation that supports the teaching and learning process.

The competencies that professors develop for the educational integration of ICTs should be focused on technical skills (Garcia, 2009) but also mainly on teaching abilities (Casamayor, 2008). These competencies are focused on the professor's reflection to incorporate ICTs into students' learning processes and consider the abilities that they want students to develop. This focus is in line with the plan established by UNESCO (2008) with standards for professors in ICT that recognise the necessity of professor training for incorporating ICT into the pedagogical sense.

Other authors, such as Mishra and Koehler (2006), highlight the importance of the positive experience of the professor in the pedagogical integration of ICT. Therefore, training professors in ICT incorporation should consider the development of methodological competencies that allow them to connect the learning objectives that are expected to be reached with the tools that facilitate this learning development. Other aspects that have been found in these studies are focused on the advantages that the professors can attribute to ICT integration in their classes; elements such as the incorporation of technology and improvement in student learning can motivate professors to use ICTs (Mueller *et al.*, 2008).

On the other hand, authors such as Hismanoglu (2012) have found that the positive attitudes of professors toward technology determine the possibilities for integrating ICTs into their classes in an educational manner and for visualising the ways of incorporating ICTs into the curriculum. Concerning the topic of attitudes, studies conducted by Ling and Sing, Clemente *et al.*, and Peña *et al.* (2014) highlight professors' confidence levels concerning ICT integration, finding that their training had an influence in their consideration of the pedagogical possibilities of technology in the teaching-learning process.

In turn, Karsenti and Lira (2011) have found that professors required training to support the learning process through ICT integration, highlighting the practice required for integrating ICTs in an educational manner, given that it determines their subsequent use. Studies conducted by Goktas and Demirel (2012) have found that blog use by professors is a good motivator for integrating technology into their classes and facilitates the continued use of technology for them. It has also been found that teaching efficiency can determine the use of ICTs by professors (Wozney *et al.*, 2006; Mueller *et al.*, 2008; Wood *et al.*,

2005); they need to demonstrate the potential of ICTs as a cognitive tool in students' teaching-learning processes (Mueller *et al.*, 2008). Other crucial aspects of the use of ICTs by professors are related to the design of an ICT integration plan in their classes. This aspect can be included in professors' ICT training programme because, in a certain manner, the elaboration of an integration plan determines the integration that professors achieve in their classes (Hammond *et al.*, 2011).

2 Materials and methods

The objective of this study is to recommend a training plan for professors in the Nursing and Rehabilitation Department that develops competencies for the educational integration of ICTs that give an answer to the planned study: "What type of professor training plan develops techniques for the educational integration of ICTs?" This study is defined by a descriptive type of qualitative-exploratory perspective, which identifies particular characteristics and features in the study (Bernal *et al.*, 2006), because, on a global and national level, related studies on this topic exist and, at the University of La Sabana, it is the first approach that is suggested as a path for future studies to be developed (Hernandez *et al.*, 2006).

2.1 Context

The University of La Sabana is a highly qualified institution accredited by the National Council of Accreditation of the National Ministry of Education of Colombia, with 35 years' experience in higher education. Currently, it relies on 13 academic units that offer close to 21 undergraduate degrees, more than 50 specialisations and master's degrees, and one doctorate.

Within the Institutional Education Project, the University is identified as a community of people who are focused on the search for truth and who build a community of knowledge. In this mission, the discovery, communication, and conservation of the truth is emphasised in different areas of knowledge, with an eye to the social reality. Within these principles, the freedom of teaching, learning, researching, and professorship are characterised without preference or selecting any particular educational or methodological focus in the classroom, alluding to autonomy as the ability to discern, recognise, and adapt the methods for completing the mission to pursue an original and free identity (University of La Sabana, 2013).

To achieve what is proposed in the Institutional educative project and each academic unit (and attending to needs and international standards), the University has decided to implement guidelines for assessing and developing

competency in educational informatics for all professors at the University, integrating this competency within the new structure with the intention that professors perform the assessment and develop a training plan that will allow them to innovate, integrate, and adapt their educational practices and learning environments in a sequential manner, regardless of whether they are full-time professors or adjunct lecturers.

The Department of Nursing and Rehabilitation was one of the pioneers in initiating a training plan for full-time professors, showing interest in the results that the assessment produced but concerned with beginning the necessary training processes.

2.2 Population

For the purpose of this study, the population consisted of junior lecturers in the Department of Nursing and Rehabilitation with a total of 36 professors, 27 from the Nursing programme and 10 from the Physical Therapy programme. The main characteristic of these adjunct lecturers was that they were not full-time at the University and were in charge of offering some of the classes within the study plan of the respective programmes. Sample selection was performed through the non-probabilistic method, specifically through convenience sampling (Hernandez *et al.*, 2006), due to the support provided by the administration of the Department, which was aware of and responsible for the importance of and necessity for the professors (both full-time and adjunct) to develop competency in educational informatics.

2.3 Tools

During the study, a questionnaire was used as a method for collecting information (Hernandez *et al.*, *op. cit.*). It was used at the beginning of the investigation with the objective of having an initial assessment that allowed determining the current and actual state of the professors with regard to the defined standards in the guidelines, and it was the input used for designing a professor training plan.

The questionnaire, created by the Centre of Technology for the Academy (CTA), an academic unit at the University, was composed of 47 open-ended and closed-ended questions, grouped according to each of the standards that were to be evaluated. For the open-ended questions, an assessment rubric was created. The tool's assessment was performed by a pilot test with the teaching staff of the Centre of Technology for the Academy and used to make adjustments and improvements to the questionnaire.

The training plan was developed through a virtual learning environment,

implementing a learning management system (LMS) through which information was collected by capturing discussion forums, chats, and assignments that enabled identifying and describing the more relevant, basic characteristics of the study's objective. As one of the study's aims, the professor developed a personal learning environment (PLE) that functioned as a qualitative collection tool, enabling observation of the connections, activities, and significance established through the Internet that are part of the environment and proper to the uses of ICT.

3 Results

The results obtained with the questionnaire used for assessing the development of competencies in the educational integration of ICTs are shown in the following table.

Table 1
Results of the assessment questionnaire

Assessment of ICT competencies of professors			
Standard 1 use of information for academic activities	Standard 2 ICT integration in the teaching process	Standard 3 ICT integration in the learning process	Standard 4 educational inno- vation with the support of ICTs
Point range 0 - 10	Point range 0 - 20	Point range 0 - 30	Point range 0 - 30
Points received 7.8	Points received 9.7	Points received 12.9	Points received 12.14

Table 1 shows the results for each of the established standards for determining the level of development of competency in the educational integration of ICTs. In Standard 1, the professors received an average of 7.8 points out of a maximum qualification of 10, which indicates that this group of professors is able to use information in a manner that allows developing activities in their professional and academic lives that involve accessing, evaluating, and applying the information. For standard 2, the professors received an average of 9.7 points out of a maximum 20 points. This score is found to be under the expected average for this standard according to which professors should develop capacities to integrate ICTs into the teaching process of their students. In standard 3, the professors received an average of 12.9 points out of a maximum 30 points, which shows a level that is inferior to the expected competency and therefore shows few capacities for integrating ICTs into their students' learning processes. Finally, for standard 4, the professors received 12.4 points out of

30. This score is similar to those received in standards 2 and 3, which show difficulties in integrating ICTs into teaching-learning processes and for educational innovation with technology that involves the capacities for developing transformation processes in student learning with ICT integration.

According to the classification proposed by Corbin & Strauss (2008) the analysis of data was done considering the different ways of encoding: open, axial and selective. This analysis allowed to obtain relevant information on the data collected. In the information below there is evidence of the three phases of data classification.

a. Open coding

At this stage the data were examined to find similarities and differences that allowed performing groups. Open coding allowed separation of data according to their meaning and later set the relevant concepts identified.

b. Axial coding

This phase was characterized by grouping data into categories that allowed display relevant data, that allowed to identify concepts / categories that may be related to generate an explanation of the information found in the data.

c. Selective coding

In this phase the creation of categories and subcategories of analysis that showed the important information for the project according to the data collected was done; achieving theoretical saturation thereof. The previous information allowed the generation of theory from data, from the approaches of Strauss and Corbin (1994). This theory is based on concepts that are generated directly from the data collected.

Grounded theory for data analysis was used as methodology considering the four characteristics proposed by Glaser and Strauss (1997). The theory corresponds with real-world data, is not based on personal desires or predetermined categories, it is easily understandable for people in the area in which it focuses. It could have generality; the concepts generated from the data do not specifically apply to a small group of people or a specific situation, it is hardly impossible to develop new theory for each person and situation. Finally, the theory allows having control of the phenomenon studied in some degree.

Next, the analysis of the qualitative results in the implementation of the

project is presented; the categories are defined in advance (student profile, educational computer technology, pedagogical reflection, evaluation of pedagogical strategies, design of pedagogical strategy) and involve pedagogical and technological elements in the project. During codification and segmentation, it was necessary to include some emerging categories (challenges and appropriation) that had not been conceived but were considered important for the results of this study. Having both a priori and emerging categories present and the respective semantic network, the information analysis and inferences they lead to be conducted using the program Atlas Ti version 5.1.

This software for systematic analysis of qualitative data, allowed the researchers to carry out the coding of all primary documents that made up the hermeneutic unit in two phases. The first phase was intracode, in which each researcher performed individually encoding. In the second phase, intercode was used, where researchers contrasted the coding previously made to check the reliability of the process analysis of the data.

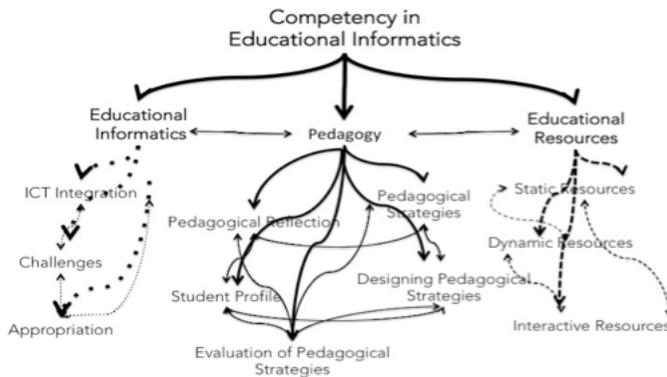


Fig. 1 - Semantic Network

Student Profile Category (Teacher)

The teachers who are studying the training plan have studied health sciences (nursing, medicine, and physical therapy). They have a master's degree and high expectations regarding the topic of educational informatics, with goals of improving their teaching practice, as seen in AI, Presentation from LMCU: *“With a degree in chemistry and M.S. in Biology, I work with first-semester students in the Nursing and Physical Therapy programmes with an integrated study course in basic sciences. I like the topic of technology as a tool for improving pedagogical strategies and have had good results when using this tool.*

I like learning about this topic and hope to become familiar with new tools”.

Evidently, the majority of teachers who participated in the plan describe it using verbs such as “reinforce”, “consolidate”, and “improve”. They perceive or feel that they currently use technology in their classes, as in the case of VSM in the presentation: *“With a medical degree from the University of La Sabana and specialisation in medical microbiology, my expectation of the course is to consolidate and integrate the educational informatics into my teaching activities”.* The group is homogeneous; some teachers such as LVR express in the presentation that *“I really want to learn about ICTs, especially the special video beam, including videos and making videos. Face-to-face interaction is important in my course. Maybe that is a reason for not using ICTs, although my students do use them in their presentations”.*

Educational Informatics Category

After having developed some of the activities from module 1, the reassessment that the teachers have made concerning educational informatics is obvious; DCMC relates this educational technology with teaching and learning processes in Activity 3, module 3. *“It’s a tool that looks to improve the educational system, creating pedagogical strategies that are converted into a focal point of technology and learning by means of innovative environments that allow working on a team and clearly seeing the strengths and weaknesses that each person has, thereby creating an evaluative and socialising environment that focuses on finding solutions”.*

Progress is observed in the articulation between technology with the curriculum and study plans and also as an opportunity for taking advantage of the quantity of resources that are offered. As GLGL notes in Activity 3, module 3: *“ICTs have interceded in some of the traditional practices, encouraging the art of teaching. Integrating this resource within the curricular programme makes it possible to take advantage of resources online, express new ideas, and be innovators. It is time to go beyond what is already known”.*

Pedagogical Reflection Category

The teachers reflect on and are critical regarding the case studies that present the integration of ICT, suggesting improvements and changes in the planning and methodology and arriving at important affirmations as in Activity 2, module 1. GLGL states: *“It is important before implementing a pedagogical strategy to perform an assessment of the students for the purpose of planning and executing the strategy”.* They know when an activity is well planned. In activity 2, module 1, GLGL states: *“it was a well-implemented strategy with respect to the first strategy because an introduction focusing attention, motivation, producing*

questions, and evaluation was observed”, which highlights important aspects such as motivation, producing questions and evaluation. Regarding Activity 2, module 1, DCMC also notes: *“It seems like video is a support for the class because they are concerned with emphasising what is important and explaining the concept that they want to clarify. However, it is not the best way of doing it because they all have different speeds, which questions the tool used by the teacher to explain a topic”*.

Within these reflection processes, ICTs are observed not only as tools but also as means of support for the teacher’s work and how they can help the teacher in different processes within the classroom, as seen in Activity 2, module 1: *“Different scenarios are worked with that allow a person to be attentive to the topic, learn at his or her own pace, because the presentation is organised clearly and proposes an evaluative methodology for nationalising the topics and also seeing them clearly, given that ICTs provide support for improving the teacher’s work and integrating them more in the students’ comprehension processes”*.

Evaluation of Pedagogical Strategies Category

The term “pedagogical strategy” is different for every teacher, leading some to refer to it as a particular activity for the class or as a topic or case study. When requesting a DOFA matrix concerning the strategy, small learning problems were detected, as in the case of LMCU in Activity 4, module 1.

Pedagogical Strategy Design Category

When the teacher is asked to suggest a pedagogical strategy with ICT integration, he or she not only reflects on and modifies the activities included in ICTs but also integrates ICTs with objectives that favour a pedagogical focus, providing a solution to possible learning problems and thinking about favouring the learning styles of different individuals, as CMAP expresses in activity 5, module 1: *“In the exploration of knowledge and experiences, initially showing a video on the computer about CPR can work to complement the lesson in such a way that it would be able to integrate the knowledge seen with what is live in practice. In turn, this would connect what was learned in a practical way with what is being seen live. The reviewed knowledge beforehand makes it possible to redefine and compare what was learned with what was lived”*. A discovered opportunity is also observed in the DOFA matrix, giving a pedagogical focus within the strategy modifying the activity, as in the case of CMAP in Activity 5, module 1: *“It favours meaningful learning to the extent that they become involved in the situation; through continuous dialog and analysis, critical thinking and reflection are permitted in the exploration of knowledge among the*

students, contributing to this process". Next, the emerging categories that were suggested from the data analysis are presented.

Emerging Challenges Category

The teachers identify the moment of appropriation of competence in educational informatics that they found and define its impact and future challenges, as in the case of LAAL in Activity 3, module 1: *"I believe that it refers to the ongoing progress from exploration, a time in which I find myself because, at present, I am leaving my fears and prejudices behind, opening up my mind, dreaming about new teaching scenarios and being able to find all of the marvels that ICTs bring to me. When this time passes, I will continue with this integration, where I will develop abilities to use ICTs autonomously, being able to integrate them into the processes of the University and understand the social implications of the integration of ICTs in educational processes. The last part was what seemed most difficult to me, innovation, everything required to create new things, new knowledge is always a challenge"*.

Emerging Appropriation Category

Appropriation was developed through the virtual learning environment at different times or levels when the teacher was expected to appropriate ICTs as a solution, alternative, and tool in his or her current pedagogical strategies. This appropriation was measured according to the level of knowledge and application of each teacher after having studied the learning environment. In this sense, professor AAMG in Module 3, activity 1 created a blog as a product of this programme, stating: *"This blog (which I just found out two minutes ago was free) appears as a great programme product for the University of La Sabana (Bogota, Colombia), encouraging the use of information and communication technology as tools for learning. Indeed, ICTs are useful tools. From here on, I will set up a personal program (My Cyber Space), where anecdotes, questions, and content can be put that will promote anyone's training"*.

In Activity 1, module 3, Professor VASM designed a personal learning environment as a product of the teacher training plan that demonstrates the appropriation of certain tools for her own personal use and other sources to integrate into her pedagogical strategies, as shown in the following image.

Regarding the personal learning environments that the professors developed during the implementation of the training plan, the following was found: Personal learning environments allowed the professors to connect the appropriation of concepts to ICT integration and served as a method for performing this incorporation in the curriculum. The teachers stated that personal learning environments would allow them to continue enhancing their pedagogical prac-

tice and integrate ICTs into their classes. As professor AM states in the final activity of Module 3.

Conclusions

Regarding the analysis of the categories, the conclusions derived from the results of the completed study will be presented next.

Concerning the profile of the participating professors in the formative process, the majority were professionals in the area of health, with studies in teaching-related disciplines. The teachers had high expectations for integrating ICTs into their academic and curricular processes as a means for contributing to students' learning processes.

The professors' strong willingness in the formative process, through the proposed plan, allowed them to be involved in activity production in such a way that allowed the objectives of each learning module to be achieved. One aspect to be improved upon within the process is course completion, given that a total of 14 professors actively participated but only three ended up finishing the training.

The professors were able to appropriate the conceptual elements necessary for adequately connecting pedagogical and technological elements, allowing them to integrate ICTs into the focused curriculum to reach the competencies on the students' behalf. Doing so allowed them to change their perspective towards educational informatics, marking them as a crossroads with disciplines that were efficiently focused and could contribute to the developed processes in education. These discoveries coincide with the plans of Garcia (2009) with regard to the importance of developing technological competencies in professors that allow them to identify possibilities for the pedagogical integration of ICTs.

The pedagogical integration of ICTs that the professors achieved allowed them to demonstrate the technological possibilities within the training process. This identification made it easier for professors to focus on student competencies, determining for professors the best way to connect the curriculum to ICTs.

As a process, reflection makes it easier for professors to identify the competencies that need to be developed in students. It also facilitates a method so that the competencies can be worked into the pedagogical integration of ICTs. Discoveries show that this process, performed through the analysis of case studies, allows professors to delve into planning and methodology and incorporate elements of ICT.

The reflection process also demonstrates the capacities of the professors

to identify the elements that should be considered for connecting the competencies of the students with the incorporation of technologies, especially as intermediaries of the teaching/learning process.

Concerning the pedagogical strategies designed with ICT integration, the professors, bearing in mind the problems identified in the formative process of the students, tend to favour the pedagogical focus that sustains their educational practice in such a way that they structure learning activities that favour the proposed educational goals in the assignments for which they are responsible. From this perspective, the relationship between the strategies with ICT developed by the professors and the pedagogical focus that goes against their pedagogical practice could not be concretely revealed. According to previous studies, such as those conducted by Sang *et al.* (2010), the common pedagogy that guides professors determines the incorporation of ICT that reaches their classes. A professor with a constructivist focus tends to use ICTs for the construction of knowledge with their students and to integrate the construction in the learning process in an effective manner. The establishment of pedagogical strategies for the formative process demonstrates the connection that the professors made among the pedagogical elements and activities that marked the process towards a true construction of knowledge on behalf of the students.

It is found that a personal learning environment is appropriate for the teacher as a source of primary information and, as a result of the training process, will enable a lifetime of continuous learning.

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