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GESTIÓN DEL APRENDIZAJE MEDIADO POR TIC: UNA PROPUESTA DE DISEÑO CURRICULAR DE LA UNIVERSIDAD NACIONAL DE CHIMBORAZO

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Artículo de Investigación



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Abstract

The current situation in the field of education demands teachers who are capable of functioning in new learning scenarios where the possibilities offered by ICT for information acquisition and communication processes are enormous. In this sense, it is necessary to have postgraduate programs that contribute to the development of digital skills in teachers. The main purpose of this work is to propose the curricular design for a Master's program in Education, Mention in Management of Learning Mediated by ICT, offered by Universidad Nacional de Chimborazo in Ecuador. For this, a qualitative research was undertaken in order to characterize and determine the most important features of each module of the curriculum. A documentary research design was applied through the PICOC method (Population, Intervention, Comparison, Outcome, Context). The result of this work was a curricular mesh that consists of 12 study modules wherein aspects such as: digital literacy for the new society were addressed; didactics in new digital environments; the design and development of content and digital resources for learning; new ways of learning and innovating in education; as well as research in educational technology.

Palabras clave: ICT, higher education, professional training, electronic learning

Resumen

La educación actual demanda de docentes que puedan desenvolverse en los nuevos escenarios de aprendizaje, donde las posibilidades que ofrecen las TIC para los procesos de adquisición de información y comunicación son enormes. En este sentido, se hace necesario contar con programas de posgrado que contribuyan al desarrollo de competencias digitales en el profesorado. El presente trabajo tiene como objetivo presentar el diseño curricular para un programa de Maestría en Educación, Mención en Gestión del Aprendizaje Mediado por TIC, el mismo que fue propuesto por la Universidad Nacional de Chimborazo en Ecuador. Para esto se realizó una investigación con enfoque cualitativo, para caracterizar y determinar los rasgos más importantes de cada uno de los módulos de la malla curricular. Se aplicó un diseño de investigación documental a través del método PICOC (Population, Intervention, Comparison, Outcome, Context). El resultado de este trabajo fue la malla curricular, compuesta por 12 módulos de estudio donde se abordaron aspectos como: la alfabetización digital para la nueva sociedad; la didáctica en los nuevos entornos digitales; el diseño y desarrollo de contenidos y recursos digitales para el aprendizaje; nuevas formas de aprender e innovar en la educación; así como también la investigación en tecnología educativa.

Keywords: TIC, educación superior, formación profesional, aprendizaje electrónico

INTRODUCTION

The contribution of the Information and Communication Technologies (ICT) in most fields of human activities has been substantial; however, in the educational field, progress has not been achieved as desired; there is evidence of the lack of integration and use of ICT in learning processes that have not improved for several decades.

However, the current educational context has drastically evolved, taking into account that “the 21st century marks the beginning of digital age with the extensive use of digital media, mobile devices, and Internet resources” (Leow, Neo & Hew 2016:244), being the students those who mostly use these resources and technologies.

On the other hand, there is the great offer of educational resources (videos, animations, podcast, documents, etc.), available in different repositories and even Massive Open Online Courses or MOOC, many of them endorsed worldwide by prominent higher education institutions.

In this sense, being a teacher in the current knowledge society involves the development not only of didactic and pedagogical skills, but also of digital skills to face the challenges of being an educator in this century (Guimarães 2020; Sabalete & Roblizo 2021).

Similarly, Engeness mentions that “teachers are expected not only to be profound users of educational technologies but also to engage in the design of digital environments such as online courses, learning management systems, and mobile applications” (Engeness 2021:96), that is, teachers must have complementary professional training that promotes the development and application of this type of skills.

Furthermore, the COVID-19 pandemic has revealed the importance of using educational platforms to address emerging remote education situations (Crick *et al.* 2020). The obligatory

confinement made on-site/in-person work unfeasible, as happened in Ecuador, a Latin American country, where remote education for all educational levels was adopted. Something that, in itself, confirmed the importance of online learning as a requirement for the development of knowledge in the 21st century (Meier 2021).

In Ecuador, on the other hand, there are not enough postgraduate offers in education and specifically master's programs that address the integration of ICT as facilitators and mediators of the learning processes. In this sense, many professionals in the field of education who wish to specialize in this field must study in foreign universities wherein they face, besides the economic drawback, the disadvantage that the curricula offered by these programs do not respond to the needs of the Ecuadorian context.

Thus, due to the aforementioned reality, the need to create a postgraduate program arises. The program should contribute to the development of education in Ecuador and particularly propose a curricular design that allows teachers of different educational levels to develop the skills required for the adequate use of technologies in learning while enhancing academic results in students by considering them active, critical, reflective subjects and protagonists of their own information acquisition and management processes, something tremendously required today.

This work presents the curricular structure of a postgraduate program at Universidad Nacional de Chimborazo - UNACH in Ecuador, which responds to the needs of each of the levels of curricular concretion: macro, meso and micro; in which their articulation with research and linkage, essential roles of universities as actors of the economic and social development of a country, is evidenced.

In this way, for each level and component of this curricular project, adequate evaluation processes are incorporated as a form of validation of the effectiveness and quality of the postgraduate program. This is achieved through the various instruments and evidences of the achievement of learning outcomes as proposed in this master's

program.

In addition, this curricular structure of the Master's program in Education, mention in ICT-mediated Learning Management, has been designed taking into account the holistic-systemic thinking from a humanistic perspective, with an ethical and axiological approach.

Also, the continuous interaction between human beings and with everything that surrounds us was considered, such as: situations, problems, models and systems; assessing the contribution of ICT in educational processes; all this oriented towards the search for the solution of problems and the sustainable development of the society.

METHODOLOGY

The elaboration of the proposal of the curriculum for the postgraduate program, Master in Education, mention in Management of Learning mediated by ICT, was completed after carrying out the respective analysis of demand and relevance of the program in question.

To achieve the goal of this research paper, a qualitative approach was employed with an exploratory-descriptive scope to characterize and determine the most important features of each of the modules of the curriculum (Hernández, Fernández & Baptista 2010). A documentary research design was applied comprising all the

information records (Méndez & Astudillo 2008), through the search, retrieval, analysis, criticism and interpretation of the data located on the Internet (Arias 2012).

Regarding the development of the documentary research, the PICOC method (Population, Intervention, Comparison, Outcome, Context) was applied (Petticrew & Roberts 2006). This method requires in the first instance, the formulation of a research question to guide the research towards the necessary information, in order to structure the curriculum. In the second instance, the research question is broken down into four sub-questions that correspond to each term of the acronym PICOC (Table 1) as described below, except for *comparison*, since it does not apply in the present study:

- What is the population to be investigated?
- What is the desired area of investigation?
- What are the most relevant results?
- What is the current criteria of the programs?

BIBLIOGRAPHIC REVIEW PROTOCOL

As mentioned before, the PICOC method (Table 1) was used to determine the research question and to find master's programs in international

Table 1: Description of the PICOC method

Acronym	Component	Description of components
P	Population	Universities around the world offering master's programs
I	Intervention	Master's Programs in ICT-mediated Learning Management
C	Comparison	Does not apply
O	Outcome	Modules of the master's programs
C	Context	Period 2020

Source: own elaboration

universities involving ICT-mediated Learning Management, this as part of a research project executed by the UMayuk research group of the Universidad Nacional de Chimborazo. Aforesaid postgraduate program was proposed to the Council of Higher Education of Ecuador. The parameters considered for the documentary review are described below:

1. Information sources: International universities around the world.

2. Research question: What are the master's programs in Spanish or English offered by universities worldwide on ICT-mediated Learning Management?

3. Search strategies: For the search process, terms in both Spanish and English in addition to acronyms related to the selected words were used in order to find satisfactory results in relation to master's programs related to ICT learning management.

- Search criteria customization techniques were used through the logical operator AND, and the terms were applied in the search section corresponding to each website of the universities around the world. Thus, the combination used was the following: *Maestrías en Tecnología Educativa* AND *Maestrías en Aprendizaje electrónico*.

- **Inclusion and exclusion criteria:** The search yielded 35 results in the 2020 period. The inclusion / exclusion criteria detailed below were applied to the resulting list:

- Inclusion: master's programs related to: electronic learning, educational innovation and educational technology;
- Exclusion: master's programs that, although related to ICT, do not include education or learning.

RESULTS AND DISCUSSION

It is important that the curricular proposal be coherent with the governmental educational policies and with those of the proposing institution; thus, at the macro-curricular level, the Master's Program in Education, mention in Management of ICT-mediated Learning is interconnected and consistent with the educational, pedagogical model and didactics of Universidad Nacional de Chimborazo referred to as the Epistemological-methodological approach, from complexity, for the integral development of the person, rearticulating research, training and bonding (UNACH 2014).

In addition, this educational, pedagogical model and didactics, responds to the policies of the National Development Plan of the National Government (SENPLADES 2017), from where the operationalization of this complex thinking is made possible for the solution of contemporary socio-educational problems.

Similarly, this proposal is supported by the Constitution of the Republic of Ecuador, particularly art. 347 referring to the responsibility of the state in terms of: "Incorporating information and communication technologies in the educational process and promoting the link of teaching with productive or social activities." (Asamblea Constituyente del Ecuador 2008:161). It is at this point where this master's program would have an important contribution by preparing teachers to design, coordinate and execute projects integrating ICT in the field of education in Ecuador, at all levels.

For this reason, an open and flexible curricular design is proposed, which allows updating and innovation, but also guides teachers in the application of proven and replicable technological trends in our contexts based on verified cases of success.

Thus, the analysis of the macro context was taken as a starting point, considering the social demands described in the objectives and postulates of the territorial planning documents, such as the

aforementioned National Development Plan, as well as the studies of demand and relevance of the program where the need of professional educators up-to-date with the most demanded ICT skills was identified. Another concern was the modality of studies that best suits their conditions, without neglecting historical, social, cultural and technological aspects of the context.

In this way, the proposed curricular design responds both; to the policies of the national government regarding the integration and use of ICT in education, and to the pedagogical model of the UNACH and consequently with the institutional teaching practice.

At the meso-curricular level, where the curricular lines, components and institutional areas converge, the teaching component of this program has relevance and support from the academic department of UNACH, in charge of teacher training, such as the Faculty of Education, Human Sciences and Technologies, with their philosophical, sociological, epistemological and didactic references.

Similarly, taking into account the scientific, technological and humanistic domains of the UNACH, it is evidenced that one of the domains corresponds to the socioeconomic and educational development for the strengthening of democratic and citizen institutionality where the Master's program in Education, Mention in ICT-mediated Learning Management

would be aligned. This is due to the fact that technology-enhanced education would facilitate the knowledge acquisition processes of the population towards the achievement of equity and social justice.

Regarding the research component, according to the current research lines of the UNACH, this postgraduate program finds a place within the research line 16 ICT in education (UNACH 2020), in which both activities can be carried out as projects related to the formative and scientific research of this postgraduate proposal.

At the microcurricular level, it is articulated with the two previous levels, as evidenced in the learning results of each of the modules proposed in the curriculum, taking into account quality standards, innovation and flexibility in the use of computer tools within the classroom due to accelerated development in technology.

In addition, the importance of authentic learning, concrete situations applicable to specific educational contexts should be emphasized at this level which will contribute to the development of professional and graduate profile competencies, also relying on interrelated work between the different modules of training, research and degrees proposed.

Thus, to summarize, each level of curricular concretion can be structured, as presented in Figure 1.

Source: Own elaboration

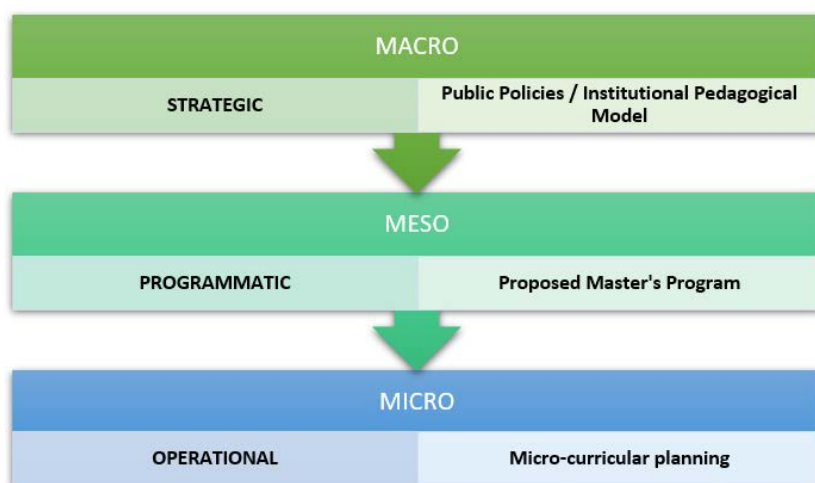


Figure 1: Summary of the Levels of Concreteness of the Curriculum Design

DESCRIPTION OF THE CURRICULUM PROPOSAL

This Master's Program in ICT-mediated Learning Management proposal stems from a study of relevance and demand developed by the UMayuk research group of UNACH. First, it was possible to evidence the limited offer in Ecuador of master's programs aimed at developing the digital skills of teachers, even less in the online mode, despite the fact that the scientific literature mentions high possibilities of guaranteeing formal learning (Martín, Mora, Añorbe & González 2017; Quiroz 2017).

Second, in reference to the study of demand developed in a previous phase, which also justifies the proposal of this master, an online questionnaire was applied to 130 people (teachers and graduates in the field of education), which was distributed via email. It was determined that 90% of the respondents would like to take

a master's program related to ICT-mediated learning management and 49% are interested in studying that program online.

Based on this information, during the months of May-August 2020, the information gathering process was carried out in order to establish the modules that would allow the development of the skills required for this postgraduate program. Following the search protocol described in the methodological section of this article and after applying the inclusion / exclusion criteria, 10 master's programs were selected.

Subsequently, the following information was extracted from each one: name of the program, objective / brief description, university, country, duration, area and modules / courses. A brief summary of the selected graduate programs is shown in Table 2.

Table 2: Revised Graduate Programs

Program Name	University	Country
Media and Technology Studies Education	British Columbia University	Canada
Learning, Design and Technology (LDT)	Stanford University	USA
Technology, Innovation, and Education	Harvard University	USA
MSc in Digital Education	The University of Edinburgh	Scotland
University Master's Degree in ICT in Education: Analysis and Design of Processes, Resources and Training Practices	University of Salamanca	Spain
Master's in teaching and Learning Environments Mediated by Digital Technologies	University of Barcelona	Spain
Master's degree. Educational Technology: E-Learning and Knowledge Management	University of the Balearic Islands	Spain
Master's Degree in Information and Communication Technologies in Education and Training	Autonomous University of Madrid	Spain
Education and Technology MA	London Global University	England
Educational Sciences: Learning in Interaction (Research)	Utrecht University	Netherlands

Source: own elaboration from the websites consulted

The information collected from each graduate program allowed to establish some common study areas such as: the design of digital resources, materials and courses; didactics and methodologies in digital environments; digital evaluation; learning in formal and informal settings.

Other common study areas were: emerging technologies for learning (video games in education, human-computer interaction, behavior design, computational thinking); educational innovation, entrepreneurship and social inclusion; quantitative and qualitative research methodologies; degree work and internships, to mention the most representative.

Taking into account these common training areas in the master's programs consulted, as well as the demands of the teaching staff, the curricular mesh with its respective learning outcomes was constituted as shown in Figure 2.

MODULE 1. EDUCATION IN THE DIGITAL SOCIETY

Society in general has been transformed culturally, socially and economically thanks to the emergence of ICT, which has disrupted human behavior in the way humans communicate, work, have fun and learn, a situation that forces them to develop their digital skills in order to be critical and reflective people about the proper integration of these resources in any field (Rangel 2015).

In the educational field specifically, it has been possible to evidence the transition from an information society to a knowledge society, which demands innovative and digitally competent professionals for efficient and effective performance oriented towards lifelong education (Tedesco 2000), and where the student not only receives information but also generates knowledge.

In this way, education at all levels requires substantial changes to adapt to a digital society, which can break down traditionalist barriers

Source: Own elaboration

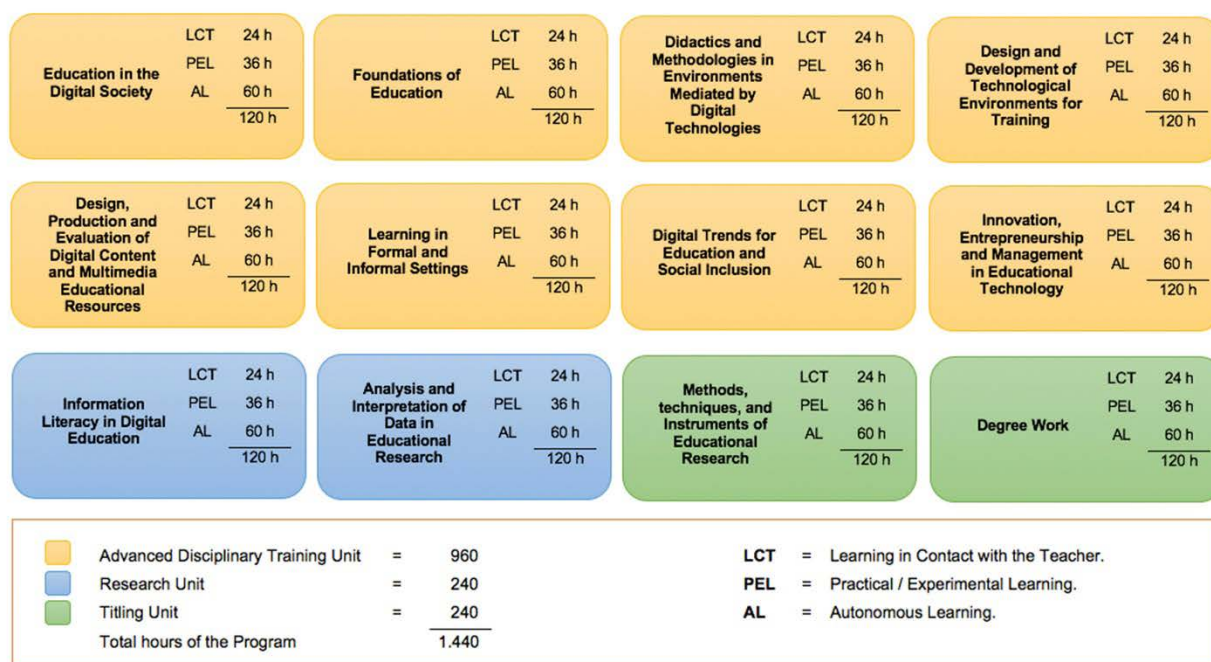


Figure 2: Curriculum Structure: Master of Education, Mention in Management of Learning mediated by ICT

in current systems, in order to build flexible student-centered curricula (De Pablos 2010).

Hence, the importance of approaching a module in which the role of the teacher and the student in today's society can be perceived to strengthen the integration of ICT in educational processes, and thus seek quality training in education which content is not replicated with digital media in a similar way to a traditional class (Cela-Renilla *et al.* 2017).

In this sense, at the end of the proposed module the teacher will be able to:

- Explain the main characteristics of the knowledge society to contextualize education in the new digital society.
- Argue the possible innovations for the management, access and / dissemination of information.
- Determine the particularities, advantages and limitations of each of the e-learning typologies and their possible applications.
- Compare the characteristics of face-to-face teaching with the role of the teacher in the digital age.

MODULE 2. INFORMATION LITERACY IN DIGITAL EDUCATION

The human being, as an active entity, must be prepared for the changes that are frequently generated in a society. Even more so, when the growth of information has been exponential in its different forms of presentation (oral, written, multimedia, audivisual,...), which requires information literacy as to be able to search for it, select it, analyze it and transform it into knowledge (Area & Guarro 2012), "basic competencies that are part of the map of competencies needed to achieve the goal of multi-literacy of citizens of the information society" (Martínez-Abad 2013:38).

Although the information literacy concept emerged in 1974, today it is considered a requirement to be immersed in the knowledge society, since it is essential to know when and why information is needed, where to find it, how to evaluate it, in order to use it and communicate it in a critical, reflective and ethical sense (Gómez 2007).

Therefore and without a doubt, in the educational field, having the competence to know how to use and process the vast amount of information available on the network is unquestionable, especially when it aims at promoting a more equitable access to develop research in all educational levels (Moreno *et al.* 2018). The learning outcomes that are intended to be achieved in the proposed module are described below:

- Assess the importance of the information on the network to promote the dissemination of scientific knowledge.
- Plan the search for scientific information and collect meaningful content that supports a research process.
- Identify bibliographic review techniques that allow systematizing the scientific production published in different academic resources.
- Organize scientific information through bibliographic managers for the proper application of international citation standards.

MODULE 3. FOUNDATIONS OF EDUCATION

Due to the evolution and integration of ICT in the educational field, institutions must consider substantial changes in their curricular structures that guarantee continuous learning of students throughout life (Hanna 2002) so as to avoid

having schools from the 19th century with teachers from the 20th century and students from the 21st century (Cabero 2008). That is, through pedagogical knowledge, teaching and learning environments must be restructured, considering the student as the center of the process to form integral human beings (Aragón 2007).

Hence, the need for teachers to master issues related to the integration of ICT, but with a pedagogical and didactic sense, so that they can critically select resources aimed at solving the diversity issues of current groups by bearing in mind the learning styles that students have (Alonso & Gallego 2010).

In this sense, the teacher has the opportunity to combine learning theories such as constructivism with computer and telematic resources. This is turn, gives way to the transformation of static pedagogical models in the face of a reality that requires different dynamics to make a qualitative leap in the teaching-learning processes and, in this way to achieve an education with the scheme of learning to learn, learn to do, learn to live together and learn to be (Martí 2010).

Therefore, the module aims to achieve the following learning results:

- Explain the learning theories on which educational processes are based.
- Propose the construction of knowledge through network connections and interactions to develop learning in the digital society.
- Assess learning styles to respond to students' educational needs, interests, motivation, and pace of learning.

MODULE 4. DIDACTICS AND METHODOLOGIES IN ENVIRONMENTS MEDIATED BY DIGITAL TECHNOLOGIES

Throughout the years, education has been a

controversial issue due to the connotations that are generated around it (psycho-pedagogical, social, cultural), and even more, in a time when students are different, and in turn, demand for another type of educational system with teachers who master the didactic knowledge of the content, in an attempt to improve the relationship between these two parties (teacher-student) (Imbernón 2014).

Therefore, a change of conception is necessary, both in teachers and in students, to overcome the traditional models that have been perpetuated for a long time. Thus, today the possibility of combining teaching strategies with ICT arises, a combination that can facilitate the flexibility of educational environments in time, place and space (Salinas 2004).

The aforementioned, forces the teacher, as the cornerstone of the educational process, to have technical, technological and pedagogical skills, to make an adequate use of ICT, through which innovative environments can be generated that motivate the active participation of learners (Sevillano 2010). Hence, the interest arises for the teaching professional in this module to be able to:

- Analyze the different didactic methodologies and their application in the classroom.
- Reflect on the potential and didactic usefulness of ICT and LKT (Learning and Knowledge Technologies) resources in the classroom.
- Prepare curricular designs adapted to the use of technological resources.

MODULE 5. DESIGN AND DEVELOPMENT OF TECHNOLOGICAL ENVIRONMENTS FOR TRAINING

The irruption of ICT in education has caused a shift in the pedagogical and didactic paradigms due to the possibilities that they can offer in the communicative aspect, in the access and

management of information in different digital formats, in human-machine interaction, among others (Area, Gros & Marzal 2008).

In this sense, as part of the ICT that support the training processes, there are the Content Management Systems (CMS) for learning, which can be used in the virtual mode, however, they are also considered a support for face-to-face as a complement to the activities that the teacher plans, for which they become allies to organize and structure a subject (García-Valcárcel 2009).

In this way, it is necessary for teachers to have the necessary skills to take advantage of the potential of ICT to generate different cognitive effects and in turn, improve the attitude, imagination and creativity of the student during the teaching-learning process (De la Torre 2010). Thus, the learning outcomes for this module are described below:

- Apply the instructional design process for the development of learning environments or other educational resources.
- Design and implement a Virtual Learning Environment (VLE) within a Learning Management System (LMS), which allows to develop a specific domain theme, and integrate both synchronous and asynchronous resources and activities.
- Differentiate the particularities of traditional learning assessment in relation to E-assessment, in addition to proposing strategies and resources for its design and implementation.
- Assess the importance and characteristics of technological ecosystems for learning, as an alternative to traditional CMS, LMS and Learning Content Management System (LCMS), and their possible implementation in real educational contexts.

MODULE 6. DESIGN, PRODUCTION AND EVALUATION OF DIGITAL CONTENT AND MULTIMEDIA EDUCATIONAL RESOURCES

The integration of digital content and multimedia educational resources in educational processes have been shown to improve the engagement, understanding and learning of students, since by transmitting a message with the support of ICT, it can become a powerful communication tool (Palomo & Sánchez 2013).

For this reason, teachers at all educational levels must be able to design, produce and evaluate educational resources with the aim of redefining their role by allowing them to adapt to technological, social and cultural changes, and thus address different situations and special students in the teaching-learning process (García-Valcárcel 2003).

In addition, teachers must be aware that apart from having well-designed digital content and multimedia resources through methodologies that guarantee student usability, they must consider the context and access that their students have in a clear and transparent way (Cebrián 2009). In this sense, the following learning outcomes to be covered in this module have been proposed for teachers interested in continuing their professional training to perform in the educational field:

- Apply methodologies to design multimedia digital content and resources with a pedagogical and didactic approach.
- Design open educational resources that can be used both independently, as well as integrated within a LMS as e-activities.
- Select technological tools with technical and pedagogical criteria for the development of digital content and multimedia educational resources.

MODULE 7. LEARNING IN FORMAL AND INFORMAL SETTINGS

Education with the support of ICT and the contexts in which learning takes place have diversified, that is, school is no longer the only place where you can learn. Today, there are also talks of non-formal and informal environments which help the continuous and permanent formation of a person (Martín 2014).

Among the resources that can generate knowledge in any context, are the Personal Learning Environments or PLE, which supposedly break rigid schemes and principles of education in a training institution, thereby increasing a student's self-organized learning based on their interests and needs (Llorente & Cabero 2012). In addition, Rus-Casas and other coworkers mention that with PLE "sustainable learning objectives such as information management and organization, collaborative work, and integration were achieved" (Rus-Casas *et al.* 2021:13).

Thus, the application of this type of technology generates higher cognitive processes through socio-cultural learning, in order to create new knowledge based on shared information, in addition to fitting in with one of Lev Vygotsky's postulates that it is learning to learn (Adell 2013). Thus, after a critical analysis, the following learning outcomes for this module have been assessed:

- Explain the relationships that are established between learning and development, relying on the sociocultural theories proposed by Vygotsky and others.
- Assess the learning evidence generated in non-formal and informal settings, as well as its possible integration for accreditation purposes for formal learning settings.
- Rebuild your PLE, starting with the incorporation of new resources and tools available on the Internet.

MODULE 8. DIGITAL TRENDS FOR EDUCATION AND SOCIAL INCLUSION

Today's students, considered digital natives, demand other ways of learning, for which the design of teaching strategies mediated with ICT could make education more flexible and democratized. In this sense, Llorente, Cabero & Barroso (2015) mention as alternatives: social and collaborative learning, decontextualized learning (inverted classroom) and ubiquitous, mobile personalized learning (m-learning), combining the real with the virtual, among others.

On the other hand, technological trends have emerged that can also meet educational needs, with the aim of strengthening social inclusion, among which Castañeda, Prendes & Gutiérrez (2015) mention are: MOOC, webquest, gamification, reality augmented, personal learning environments, among others.

In this way, it is important that teachers are prepared to train new generations, which is why the need arises to generate training processes to develop digital skills that allow to facilitate and manage learning, evaluate adequately with the support of ICT, integrate didactic strategies to innovate in classrooms, promote educational research, and be in constant reflection and preparation (Professional Development), for its proper integration into teaching practice (Gutiérrez, Prendes & Castañeda 2015).

In this sense, the proposed module is intended for teachers to achieve the learning outcomes described below:

- Assess the importance and applicability of digital environments as spaces for social inclusion to facilitate learning processes.
- Determine the possibilities of ICT for an education with principles of equity and access for all.
- Select tools from the social web with didactic and pedagogical criteria for

an adequate integration in teaching practice that encourages social inclusion.

MODULE 9. INNOVATION, ENTREPRENEURSHIP AND MANAGEMENT IN EDUCATIONAL TECHNOLOGY

Educational institutions have the challenge of transforming didactic processes, where human talent plays a decisive role in developing innovations in the classroom, through which they allow the fulfillment of training objectives with higher quality, train more people, and in different spaces and times (Salinas 2008).

In this sense, educational innovation can be a factor that favors entrepreneurship, something very necessary within the training of students, and that can help to fulfill one of the substantive functions that the university has, such as the link between university and society, and that it should also be approached as a transversal axis (Vásquez 2017). Hence the obligation for teachers to promote projects aimed at undertaking the learning results indicated below:

- Analyze the possibilities of integrating ICT to promote entrepreneurship and educational innovation projects.
- Design educational innovation projects with a social and business nature in both the public and private sectors.
- Evaluate educational innovation projects to promote local and national entrepreneurship.

MODULE 10, 11, 12. RELATED TO THE METHODS, TECHNIQUES, AND INSTRUMENTS OF RESEARCH AND CERTIFICATION

Another of the substantive functions of the university is research, which has grown ostensibly in recent years, especially research in educational technology, which has focused

on the study of instrumental, organizational, contextual, cognitive, and strategic aspects of use, among others (Cabero, Barroso & Llorente 2015).

Hence, the need for teachers at all levels to know about aspects that research demands, such as: direct link with reality, constant practice and reflection on educational problems, interdisciplinary work, participation in multidisciplinary projects, the mastery of methodological processes to achieve significant results in favor of scientific knowledge, and educational quality (Rojas 2015). In this sense, with the modules proposed to raise the investigative level of the teacher, the following learning outcomes are proposed:

- Explain the main characteristics of science, the scientific method and its different paradigms for the interpretation and transformation of reality.
- Design a research project profile, in which information and communication technologies are integrated in the solution of real socio-educational problems.
- Select the use of techniques and propose instruments for data collection depending on the focus, design and type of research.
- Differentiate the usefulness and application of the main descriptive statistics for the analysis and interpretation of information using electronic sheets or specific software.
- Differentiate the usefulness and application of the main statistics used for the analysis and testing of hypotheses using spreadsheets or specific software.
- Prepare the degree work through specialized and personalized tutorials.

CONCLUSIONS

From the present study, some important conclusions can be mentioned, which by their very nature would depend on the academic context studied. Thus, taking into account that the training of postgraduate teachers in the development of ICT skills is a necessity, in Ecuador there is no a postgraduate program that includes these curricular characteristics and other areas such as entrepreneurship and research oriented to solving socio-educational problems.

In the same way, the modality of studies that is currently most demanded by education professionals to pursue postgraduate studies is virtual or online, due to the flexibility and ease it offers, as it allows them to accommodate an academic program together with their professional work and personal life.

This form of studies is also highly valued at present, since during 2020 and until the date of submission of this paper, due to the global pandemic of COVID-19, the whole world adopted an emerging mediated form of education by technologies, where the need for teachers to have knowledge for an adequate use and integration of ICT in learning processes is constantly evident.

Therefore, a postgraduate program where ICT-mediated learning has been designed. The curriculum design proposal includes lines of study which must be analyzed from a holistic and integrative perspective such as: digital literacy for the new society; teaching in new digital environments; the design and development of content and digital resources for learning; new ways of learning and innovating in education; and, of course, research in educational technology. Finally, it is essential that in this type of curricular proposals that involve the use and exploitation of ICT in learning, due to the same level of updating and improvement that

they experience, flexible study modules are incorporated, so that future cohorts can adapt its curricular contents to the constant innovations and trends in the use of technologies in learning.

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