AN EDUCATIONAL ENVIRONMENT IN E-LEARNING OF ENGINEERING: A PROPOSAL

G. Arroyo Delgado, M.C. Espino-Gudiño and R. De La Torre Sánchez
Centro Interdisciplinario de Investigación y Docencia en Educación Técnica (MÉXICO)

Abstract

Education and current technological changes represent essential conditions, characterized by being accompanied by abrupt social changes in education and other aspects, immersed in a disruptive society, where knowledge is generated very quickly and loses validity in the same way. Technological and engineering education teachers contribute to the transformation of this social order, through their teaching labor to facilitate the appropriation of their students' knowledge with the support of the updated mastery of their discipline; the didactic strategies of learning-teaching and ICT; In the same way, they help to enhance the new generations as part of their training in skills in knowing how to know, knowing how to do and knowing how to be. The proposal arises from the analysis that was carried out of the current environment related to student learning in emerging situations and the training of teachers to face the uncertain and chaotic future that we are confronted with; for this purpose, methodologies of e-learning, e-assessment of learning and development of an e-teaching project were considered.

Keywords: e-learning Methodologies , e-Assessment, e-Project of teaching.

1. Introduction

Lifelong learning is no longer out of reach for the vast majority of school-age individuals; The administration of the Federal Government, in México, declared reaching by 2024 a higher education enrollment coverage of more than one million one hundred thousand students, which represents a coverage greater than 50 % in the training possibilities of young people aged from 18 to 22 years old. This challenge implies emerging ways to revitalize higher education, because the "old model" has already been exhausted, thus promoting a Network

of Alternative Universities (RUA) for "those who do not have access to other higher education institutions" (Cárdenas-Villareal, 2019).

Engineering teachers contribute to the transformation of this social order, through their contribution to facilitate the appropriation of knowledge of their students with the support of the updated mastery of their discipline; didactic learning-teaching strategies and ICT.

Adding to this shared effort, the Interdisciplinary Center for Research and Teaching in Technical Education (CIIDET) contributes to this task by training teachers, in the terms mentioned by Batthyány, K. Executive Secretary of the Latin American Council of Social Sciences (CLACSO), "...Interdisciplinarity makes it possible to face social challenges and build bridges between academia, research and society..." (Reunión Nacional de Centros Miembros del Consejo Latinoamericano de Ciencias Sociales (CLACSO), 2019); considering the contribution not only of medicine, psychology, sociology, law, among others, but also of engineering.

With these considerations, the diploma in e-Learning of Engineering emerges, to help train engineering teachers from the National Technological Institute of Mexico (TecNM)(Tecnológico Nacional de México, 1948) with the necessary teaching skills that allow them to facilitate the appropriation of significant knowledge to their students, through an understanding of e-learning methodologies that can be projected in an instructional design on any engineering curriculum, using relevant e-evaluation processes in order to monitor the learning-teaching process in their students and develop an e-teaching project that allows them to intervene with opportunity and comprehensively improve their teaching work.

2. Background and Importance.

The importance of this diploma is to publicize techno-educational and evaluation innovations in the performance of students in engineering subjects. Developing e-learning implies the study and practice of relevant engineering learning topics using electronic media and the Internet; Attitudes about e-learning and engineering is another of the teachers' needs that is intended to be instilled in this diploma course in a transversal way in its modules.

It is sought that teachers are builders of new horizons and learning scenarios, committed to

the new generations of students and critical visionaries of educational transformations; as well as respond to the urgent need to achieve learning through educational methodologies, performance evaluation and carry out an innovative engineering teaching e-project.

It is urgent that education in Higher Education Institutions (HEIs) be updated in digital skills, in the current context, the lag in e-learning is very marked compared to countries in America and Europe (ANUIES, 2018).

Being a teacher is a pleasure that many professionals do and for this, most of them look for alternatives that allow them to carry out these activities with educational quality to guarantee that the study plans and programs have an impact on their discipline, including, transversally, some ethical, cultural aspects and civic, which contributes to forming citizens with a sense of historical and social belonging, as mentioned by the New Mexican School (NEM) UNIR (2019).

The mission of the Undersecretariat of Higher Education is proposed as support for the diploma: Ünderstood quality education as that which is: equitable, relevant, flexible, innovative, diversified and broad coverage"(SECRETARÍA DE EDUCACIÓN PÚBLICA, 2015). "The teacher is the central subject of educational and social transformation", as well as "the promoter of values such as love for the country, respect for human rights, freedoms and dignity of people, the culture of peace, honesty..."(SECRETARÍA DE EDUCACIÓN PÚBLICA, 2019).

The diploma contributes to the purposes of the NEM, meeting the requirements of the public policy lines of the HEIs, promoting innovation in the teaching of disciplinary fields and guiding the future of teaching work in the face-to-face or virtual classroom, in each one. of their contexts. The emphasis is focused on innovation in teaching in disciplinary fields, in an emerging way of teaching that recovers research topics, in its incidence in solving problems and in generating critical and creative thinking.

The NEM proposes that teachers are responsible for choosing their training to transform and innovate their teaching practice according to their profile; contemplating the four levels of professional teacher development and transversal training aspects ((Subsecretaría de Educación Media Superior, 2020), (EMPOLI, 2020)); It also proposes to develop the capacities to achieve the necessary knowledge in methods and technological advances, aimed at appropria-

ting meaningful learning for life; which fosters creative freedom to innovate and transform reality (Subsecretaría de Educación Media Superior, 2020).

The teacher creates the set of necessary and sufficient conditions to transform the conceptual, procedural and attitudinal contents into cognitive resources (Tecnológico Nacional de México, 2016), the competencies related to TecNM teaching are resumed and complemented with their own proposals and those of other relevant authors such as Fielden, M. A. Zabalza, J. Gairín, B. Gross and T. Romaña, P. Knight; cited in (Cano García, Mª Elena, 2008); and (Perrenoud, 2007), in this order of authors they are more similar to the TecNM proposal and others that are mentioned in the diploma; face duties and ethical dilemmas of the profession, participate in the management of the school, organize their own continuous training (Perrenoud, 2007).

E-learning is constant innovation with a wide variety of educational tools and platforms similar to MOODLE, MOOC, Miriadax and Google Classroom that, using learning object theory (LO), allow e-learning, m-learning, b-learning. and endless innovations, favored by ICT, which imply creativity, knowledge, growth and planned change to achieve quality in services, products or the learning-teaching process, with applications of artificial intelligence assistants, neural networks, machine-learning, avatars, virtual environments and education big data, among others (del Carmen Espino-Gudiño, 2019).

3. e-Learning Methodologies.

In teacher training we pursue that higher education teachers can plan their instructional designs in a well-founded way, providing e-learning methodologies based on e-learning standards of learning objects (LOs), but mainly such methodologies, in a way more comprehensive, based on the knowledge and understanding of a learning unit (UoL) modeling standard (Global Learning Consortium, 2003). We will deal with a projected methodology for technological higher education, which in turn is based on an educational model, already implemented, called Face-to-Face Distance Education (FFDE) where emphasis is placed on the design of teaching and learning activities for three actors: the advisor, the tutor and the students (Arroyo et al., 2013). The adviser carries out the design of the activities of the three

actors and is located in a central node; in the case of the tutor and the students are in a remote point. We also argue for the approach to learning through professional competencies embodied in practice, and not only in knowledge and perception; presenting and requesting to apply our own methodology called: Approach to Learning by Professional Competences (ALPC)(Arroyo et al., 2019). In the latter we request a good knowledge of a cognitive taxonomy to establish the cognitive level of the specific competence of the learning unit from which its instructional design will be elaborated; the teaching and/or learning activities must be sufficient to meet the previously established cognitive level. ALPC also requires identifying the application of some learning theory, if possible, for each activity designed.

The research methodology called Didactic Engineering (Artigue, 2014) and the characteristics that make up the Ontosemiotic Approach of the so-called Didactic Suitability (Godino et al., 2022) will be analyzed, both didactics applied to the teaching-learning processes of mathematics. The second didactics suggests trying to coherently articulate the various facets involved, among which we must mention the ontological (types of objects and their nature), epistemological (access to knowledge), sociocultural and instructional (teaching and learning organized within educational institutions). The suitability of one dimension does not guarantee the global suitability of the teaching-learning process. These suitabilities must be integrated taking into account the interactions between them, which requires talking about didactic suitability as a systemic criterion of adequacy and relevance with respect to a global educational project.

4. e-Assessment of learning by competencies

For the successful achievement of the evaluation process, teachers are provided with the theoretical-conceptual elements necessary for the ideal selection of assessment strategies and instruments used by the teacher in the different contents and topics of their subjects, showing in this process a continuous improvement attitude. Teachers contrast the concepts they have due to their daily assessment practice against the concepts raised by the authors reviewed in the selected literature, in a process of deconstruction-reconstruction, becoming aware of the changes that, collaboratively, they must incorporate into their assessment practice, supported

by solid theoretical foundations and as concrete products or evidence of their learning, all based on e-Assessment concepts. Teachers fulfill two of the basic functions of evaluation, pedagogical and social, both being of equal importance in the teaching-learning process; since in the first, the students monitor the progress in the acquisition, construction, learning and training of the professional skills of their students, while in the second, the results of the educational process are reported to the different actors in it, be it for the purposes of selection, accreditation, promotion, certification, statistics, subsequent improvement or to provide information for other purposes or for other training actors. Teachers also have the theoretical-conceptual elements necessary for the ideal selection of assessment strategies and instruments to be used in the different contents and topics of their subjects, showing in this process an attitude of continuous improvement of their teaching practice. They complement two moments, the first concepts, techniques, procedures and evaluation methodologies are reviewed, in the second the theoretical part is practiced, most of the time in synergistic collaboration with their peers, evaluating their performance when comparing it with established standards. Throughout this process, teachers carry out a self-assessment exercise, consisting of a permanent reflection on the progress in the acquisition, construction, learning, development and training of these teaching skills, debating ideas, planning their evaluation process and making predictions of their work, all this related to the e-evaluation. Aimed at taking corrective actions in the training of their students, giving them feedback in a timely manner, with the attitude of being a fundamental actor in this process.

5. e-Project of teaching innovative

The innovative project in the philosophical practicism of action requires a combination of transformational evolutionary methodologies and technologies e-Learning, b-Learning, c-Learning, p-Learning, u-Learning (del Carmen Espino-Gudiño, 2019), this is based on the experiential learning in teaching in a constant metanoia to improve results and skills with strategies to advance ingenuity and knowledge SECRETARÍA DE EDUCACIÓN PÚBLICA (2019, 2015), in order to generate improvements in the quality of higher education (Cárdenas-Villareal, 2019). A didactic model of e-education is proposed from holistic education, where

learning is a process that involves many levels of human consciousness such as affective, physical, social and spiritual, strengthening deficiencies and weaknesses recognized individually and collectively in the field. The dialogical communication in teaching is through experiential learning to achieve the long-awaited knowledge. It consists of a didactic model where the didactic guides are analyzed to improve the activities planning, the work resources used, the meaningful independent learning as proposed by ISTE, this with identification, use of technological tools, exploration, evaluation, curation and adoption. These topics are so interesting in a fast-paced world with students so accustomed to technologies and disruptive change (Sociedad Internacional para la Tecnología en la Educación, 2011) (Arroyo Delgado et al., 2023).

6. Conclusions

Based on an exploration of the current environment, the emerging requirements of a changing and disruptive society, as well as the pressing need to update TecNM teachers in relation to the preparation of the instructional design of their subjects mediated by the Internet, ICT and others online training applications, a project for teacher training in e-Learning of Engineering is being proposed, which responds to the needs and contributes to solving these challenges.

The proposal comprises three modules considered relevant and necessary in the teaching performance of engineering professors: e-Learning Methodologies, e-Assessment of learning by competencies and e-Teaching Innovation Project, based on the analysis carried out on the contributions of various authors on these topics; as a result of a new educational environment to contribute to a better educational quality of the TecNM.

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