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How the COVID-19 Pandemic Fueled Educational Innovation in Higher Education

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ABSTRACT

The COVID-19 pandemic was the largest disruption to educational systems in the world. Universities faced vulnerabilities such as low levels of digitization, deficits in their structures, low levels of digital literacy, and lack of financial resources. Students faced problems because they had low digital skills, less internet access and inadequate computers for a good virtual education. However, the COVID-19 pandemic had another side. On the other hand, it meant the possibility of stimulating innovation in education and it also transformed several of the contexts for the implementation of the curriculum, so that various learning and skills became more relevant. In the current investigative work, the objective is to make visible the case of the Universidad Tecnológica Indoamérica, which has a student population of 9,300 students and about 436 professors. The different actors were opened to learning about educational technological tools, which helped deal with complexity and uncertainty. In the current investigation it is established that the training in virtual education, the elaboration of digital material, the change of new educational platforms, the generation of MOOCs (Massive Online Open Courses), the radio programs and the production of academic ebooks, constituted educational innovations that supported the education processes at this university.

Keywords: COVID-19, Education, Educational innovation, Educational technologies, Virtual education

INTRODUCTION

According to data from the United Nations Educational, Scientific and Cultural Organization (UNESCO), by May 2020 approximately 1.2 billion students at all levels of education worldwide had stopped having in-person classes, from whom more than 160 million were students in Latin America and the Caribbean (UNESCO & CEPAL, 2020). UNESCO has identified big gaps in the educational results related to an unequal distribution of teachers in general, and the best qualified teachers particularly, to the detriment of countries and regions with lower incomes and rural areas, which concentrate indigenous and migrant populations (UNESCO & CEPAL, 2020). In the educational field, the countries of the region have responded to the suspension of in-person activities through: a) using distance learning modalities, using various formats and platforms, some with the use of technologies and others without;

b) supporting staff and developing learning communities; and c) attention to the health and well-being of its students. (UNESCO & CEPAL, 2020).

In Ecuador on March 20, 2020 only 37% of households had access to the Internet and only 9.1% of those living in rural áreas (INEC, 2022). As Volhonen points out in his recommendations for education in times of emergency, of that 37%, only 24% of Ecuadorians have a computer at home and only 8% in rural areas (Volohnen, 2020). The new learning way did not begin in an optimal situation, when the governmental authority aimed at educational innovation through new electronic objects, to the detriment of the educational link (Miranda & Grijalva, 2020).

This paper explores the concepts of educational innovation and the reflections that define it in order to subsequently develop and review the case study of the Universidad Tecnológica Indoamérica, through official reports, documents and statistical studies.

EDUCATIONAL INNOVATION

In the 1970s, papers published on the concepts of educational innovation by United Nations Educational, Scientific and Cultural Organization (UNESCO) made it visible in the educational system. Among the studies published were How changes are made in education: a contribution to the study of innovation by Huberman in 1973, The time of innovation in education by UNESCO in 1975 and Innovation and problems of education Theory and reality in developing countries by Havelock and Huberman in 1980.

Since the 1980s, the construct of educational innovation has been analyzed from a systemic perspective (Havelock & Huberman, 1980), understanding it as a chronological succession of events, changes in strategies and attitudes, a problem-solving process and a view of the process as an open system.

Havelock and Huberman (1980) consider educational innovation to be the study of strategies or change processes.

Elmore (1990) points out that a distinction can be made between structural changes that affect the entire educational system or the configuration of the different levels; curricular changes related to curriculum design and development, teaching strategies, curriculum components (changes in curricular materials, use of new teaching approaches); changes related to teacher training, selection and professional development; social political changes that affect the distribution of power in education and the relationship of social agents with teaching.

Moreno & Guadalupe (1995) specifies that educational innovation should not be considered an act that occurs directly, since educational innovation is a process, and as such, it necessarily goes through a series of phases.

Havelock and Huberman (1980) identify 3 models of educational innovation:

(1) Research and development model innovation: It is a process as a rational sequence of phases, by which an invention is discovered, developed, produced and disseminated to the user or potential consumer.

(2) Social interaction model: Emphasis is placed on the diffusion of innovation, stressing the importance of interpersonal networks of information, leadership, opinion, personal contact and social integration.
(3) Problem-solving model: The user is at the center of the innovation, based on the assumption that they have a defined need and that the innovation is going to satisfy it. Consequently, the process goes from the problem to diagnosis, then to a test and finally to adoption, constituting a participatory approach. This model can be placed in a critical-progressive vision of educational innovation because its vision is committed to a basic assumption: to recognize the actors of the school community as the agents of change (Barraza, 2005).

This research assumes the problem-solving model for the case of the Universidad Tecnológica Indoamérica.

THE CASE OF UNIVERSIDAD TECNOLÓGICA INDOAMÉRICA

Universidad Tecnológica Indoamérica is a private higher education institution located in the city of Ambato and with an extension in the city of Quito, capital of the Republic of Ecuador. It has undergraduate and graduate programs. In 2020, the University had 9300 students and 436 professors (Environment and Digital Resources Department, 2020). It has three modalities: in-person, blended and distance.

In 2020, the World Health Organization warned about COVID-19. In Ecuador there was a lockdown of the population. National universities had to implement the virtual modality. In the case of the Universidad Tecnológica Indoamérica, there was an accelerated educational innovation. According to what was indicated in the previous paragraphs, the educational innovation was made with the process of the Problem Solving Model. What happened at Universidad Tecnológica Indoamérica is shown below:

(1) From problem to diagnosis: Through Ministerial Agreement No. 00126-2020, dated March 11, 2020, the Minister of Public Health declared a state of public health emergency to prevent the spread of the COVID-19 coronavirus. Through Executive Decree No. 1017, dated March 16, 2020, the President of the Republic of Ecuador decreed a state of emergency for public calamity throughout the national territory, due to the confirmed cases of coronavirus and the declaration of COVID-19 pandemic by the World Health Organization. On March 25, 2019, the Transitory Regulations for the development of academic activities in Higher Education Institutions, due to the state of exception decreed by the sanitary emergency caused by the COVID-19 pandemic, comes into force. Article 5 establishes that universities may adapt learning activities to be able to teach using technologies, through digital platforms, and that they must ensure that classes and learning resources are available (CES, 2020).

The previous paragraph highlights a problem: the in-person and blended learning academic offerings had to be adapted to the virtual modality. The first step was to diagnose the technological level of the students and professors of the university. A study of the conditions of the students of Indoamerica

University was carried out with 3710 respondents with a confidence level of 99% and a margin of error of +/−1.5 (Londoño-Proaño et al., 2020) In this study it was estimated that 99.77% had a computer, cell phone or tablet, and 93% of the students had an internet connection (Londoño-Proaño et al., 2020). There was also the study of the conditions of professors at the Universidad Tecnológica Indoamérica that had 273 professors with a confidence level of 99% and margin of error of +/−1% (Naranjo et al., 2020). In this study it is established that 98% of professors had a personal computer for teleworking and 100% had internet connection (Naranjo et al., 2020). In addition, Indoamerica University had an adequate infrastructure. The Technological Infrastructure Report states that the institution had the Academic Management System, where the student and the professor have the academic information of the training project (Londoño-Proaño, 2020a). In 2020, the Universidad Tecnológica Indoamérica had: (1) a virtual campus using the Blackboard platform, in OPEN LMS Moodle version, which was accessed through a Web browser; (2) Teams, which is a Microsoft collaborative tool, integrated to Office 365; (3) students and professors had access to the virtual library, external bibliographic resources, online catalog and databases such as Scopus, Latindex, Scielo, Dialnet and other platforms (Londoño-Proaño, 2020a). In 2021, the educational platform was changed in order to provide more technology to the university community, and allow students and professors to access the platform from any location, through their cell phones, tablets and computers so as to have an intuitive virtual environment, easily accessible and 99.9% available (Londoño-Proaño, 2020a).

Then, it began to plan and develop automatic online MOOCs (Massive Online Open Courses) to be offered to the university community and the general public. These courses would reinforce students' research learning (Environment and Digital Resources Department, 2020). It should be considered that, previously, this type of courses was not developed by the university.

To this was added the initiative to develop academic ebooks as a strategy for students to have interactive study materials (Londoño-Proaño, 2020b). These materials are advanced technological and communicative elements within the learning process, tools that facilitate learning activities and interaction with people and objects (Londoño-Proaño, 2020b).

On the other hand, in February 2020 the Indoamerica radio show of the Universidad Tecnológica Indoamérica went on the air via web. Environment and Digital Resources Department planned a program called Café Indoamérica to talk with university professors and researchers about research projects and academic and university activities in times of pandemic. It was also expected to talk with national personalities about different cultural, scientific and academic topics. In addition to generating special programs that would serve as accompaniment to the university community at home.

(**2**) **A test:** Although the university had an instructional design, it was redesigned because the old design was considered rigid. An instructional guide and a new instructional design were designed. It should be taken into account that the instructional design guarantees that technology does not surpass methodology and learning strategies (Agudelo, 2009). The new model of

instructional design of the virtual classroom was the result of scientific research and the support of coordinators, professors and students, in addition to considering the corresponding regulations (Londoño-Proaño, 2020c). The research showed that 86% of students preferred the new model and 96% indicated that they liked the experience of using the new virtual classroom model (Londoño-Proaño, 2020c). In contrast, coordinators, professors and students considered the new model to be intuitive, orderly and easy to use (Londoño-Proaño, 2020c).

Professors were then trained. The Indoamerica University committed to strengthening online education by training its 436 professors in a total of 150 hours in undergraduate and graduate programs (Academic Subdirection et al., 2020). They were trained in instructional design, instructional guide, digital narratives as teaching strategies, multimedia tools, development of virtual classrooms, and flipped-classroom methodology mediated by the use of virtual platforms (Academic Subdirection et al., 2020).

MOOCs were produced and published, in 2020, two courses, which were offered to the university community and the general public (Environment and Digital Resources Department, 2020). And the development of new MOOCs courses was encouraged.

A process of academic ebooks was established that began with the training of professors in the content template, then the writing of the academic content, the approval of the collegiate bodies of the faculties, and the subsequent editing and layout of the ebook (Londoño-Proaño, 2020b).

The radio programs were planned, and the technology with which the programs were to be aired was reviewed, considering that they would be broadcast from the producers' homes.

(3) **Adoption:** The instructional design was developed and virtual classrooms were duplicated. In the A20 period, 919 classrooms were implemented in Quito and 1090 in Ambato. In B20 period, 769 classrooms were created in Quito and 1041 in Ambato [9]. In other words, all the university's courses were virtualized. Professors were accompanied in the development of multimedia and digital resources, so that each of the classrooms had sufficient resources (Academic Subdirection et al., 2020). The university professors created 1861 digital teaching materials public (Environment and Digital Resources Department, 2020). To review the results of the implementation, the statistical study Perception of students and professors of the A20 period was conducted, it had 2070 students and professors with a confidence level of 95%, and a margin of error of +/− 1.9% (Environment and Digital Resources Department, 2020a). This study establishes that 90.4% of the professors perceived that the virtual learning environments made it possible to achieve the learning outcomes proposed in the syllabus; that 83.8% indicated that the use of multimedia tools such as Genial.ly, powtoon, h5p, facilitated maintaining students' interest; and 85.5% indicated that the instructional design facilitated students' interaction with the different learning resources (Environment and Digital Resources Department, 2020a). While students evaluated on a scale of 1 to 5, where 1=insufficient, 2=average, 3=good, 4=very good and 5=excellent, the same components above and considered

as 4 (very good) all the above questions (Environment and Digital Resources Department, 2020a).

In the MOOCs courses, 18,283 people were enrolled, including students and the general public (Environment and Digital Resources Department, 2020). In 2021, the MOOCs offer got its own microsite and has 9 courses.

Professors carried out the process of writing academic ebooks during 2020 and 17 academic ebooks were edited, typeset and published in 2021.

Between 2020 and 2021, 96 Café Indoamérica radio programs and their respective specials were produced and broadcast. In 2021, the new platform was implemented, which improved the educational technology and provided greater possibilities for further innovation.

According to the above, it can be indicated that, in the course of two years, an accelerated educational innovation was implemented at the Universidad Tecnológica Indoamérica, ensuring that learning activities continue without interruption or setbacks, with interactive learning resources, new digital forms of learning and linked to communication technologies.

CONCLUSION

The health crisis accelerated the migration to the virtual modality; this change was carried out quickly, adapting curricular content, incorporating appropriate pedagogies, training professors and having sufficient technological resources to maintain the quality of service provision.

This research establishes that the Universidad Tecnológica Indoamérica carried out an accelerated educational innovation guided by the problem-solving model. It had previous strengths such as its technological capacity and that it was a guided and controlled process with statistical data. It was established that the training of the virtual modality, the development of multimedia resources, the change of the virtual learning environment, the generation of MOOCs, the production of academic ebooks and radio programs, allowed, on the one hand, that the academic activities were not interrupted and supported the holistic university educational processes; and on the other hand, the opportunities of the communicational and educational technologies of the digital era were taken advantage of.

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