Review of Trends in the Educational Model of Distance Education in Mexico, towards an Education 4.0

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Abstract

Currently, the development of increasingly sophisticated platforms to carry out Distance Education (ED) at a higher level is underway. Through the implementation of different types of emerging technologies, and with this, there is a pressing need to standardise a frame of reference sufficiently effective and adaptable that allows the restructuring of the established educational model that covers the inherent needs of the new practices of the teaching-learning process. For this reason, in this document, a brief description and analysis of the traditional educational model are carried out in this learning mode, in order to identify the most critical factors and propose an extrapolation alternative to a model within the framework of Education 4.0.

Keywords: Computation, virtual learning, educational model, distance education, virtual platforms, education 4.0

Introduction

In recent years there has been considerable growth in the demand for Distance Education (ED), from the sociological point of view. It is known that this educational modality allows the inclusion of the vulnerable population (geographically and demographically), together with this, the population usually resorts to this alternative due to the accelerated pace of daily life and the need to manage the time devoted to their educational training, and thereby achieve personalised training. It is for this reason, that it becomes a matter of the utmost importance to analyse and rethink the model that currently governs this modality towards a technological society. . (García & Vitale, 2016) (Aretio, 2018)

Based on the above, it is important to specify how this type of education is understood and the technological factors that exponentiate it. (Fundación Orange, 2016).

In this way, this document is structured in three parts:

1. A conceptualisation of Education 4.0 and its relationship and influence on Distance Education

2. A brief description of the most relevant emerging technologies currently

3. The analysis for better practice in the modality Distance Education: technologies and applications; with which, it is intended to highlight and inform the current panorama on a digital society and its tools, likewise, highlighting the need for a redesign of the model used for this teaching-learning modality

Education 4.0: The Evolution of the Educational Model in ED

Today, society is immersed in a constant evolution of information and technologies through dynamised transformation processes. In other words, innovations develop and spread vertiginously, along with it, "the fall

in marginal production costs and the increase in platforms that aggregate and concentrate activity in multiple sectors, increasing performance and the global revolution affects all countries, with system-level impacts in many areas. " Which allows us to recognise that technological development is not a definitive answer, but in no way can be ignored, the application of technology to the development of physical and cognitive faculties that can transcend the current human condition. This concept that implies the term: transhumanism . (UNESCO, United Nations Educational, Scientific and Cultural Organization, Government of the State of Guanajuato: Ministry of Innovation, Science and Higher Education, 2018)

It is essential to know the formula, which in the words of Roberto Ranz (Ranz, 2017), can describe the relationship between Industry 4.0 and Education 4.0, in a reasonably simple sequence:

$$Education\ 4.0\ \gg\ Talent\ 4.0\ \gg\ Industry\ 4.0$$

At the beginning of this new panorama, where the concept of Education 4.0 was becoming relevant, one of The biggest challenges in the digital transformation of education that was raised, turned out to be intimately related to people as a fundamental pillar in this construction, since to manage a real change should be considered some important factors, such as: (Nahón, 2018)

- ➢ Training of professors and managers

- ➢ Stimulus, attraction and development in teacher talent

- ➢ Implement training in "Education 4.0."

- ➢ Change in social and cultural practices in schools, universities and public administrations

Similarly, Industry 4.0 through its main characteristics (flexibility, speed, and efficiency), it allows recognise the most representative attributes of Education 4.0 (Ranz, 2017):

- ➢ Flexible learning according to the needs and interests of each student

- ➢ Learning at own pace and the speed of each student regardless of age and course

- ➢ Digital learning with constant feedback from the analysis of data derived from the progress of one's Learning (Learning Analytics)

Because of the above, we can visualise a social paradigm in a quite ambitious digital era with many development paths. In this context, a scheme proposed by the Institution is presented Colegio Ramón y Cajal, nd, which shows a panoramic view of the fundamental characteristics of society, for the correct implementation of Education 4.0 (See Fig. 1).
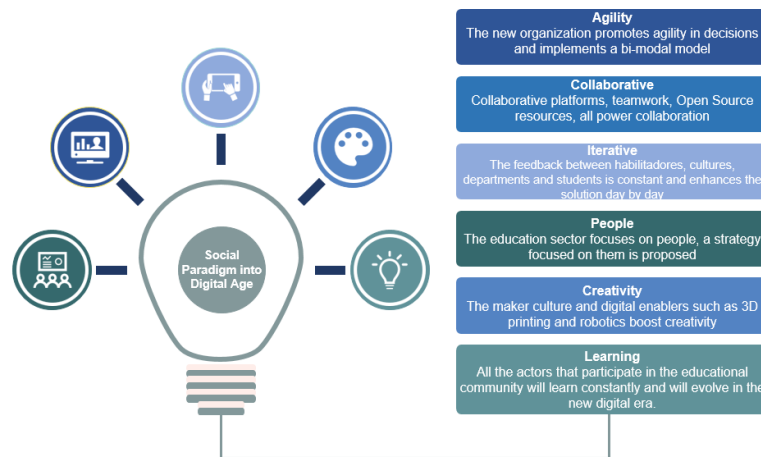
Fig.1 Social paradigm in the digital context. Adaptation of: Ramón y Cajal Schools, sf

In this way, it is evident that Distance Education plays an essential role in this panorama of the inclusion of emerging technologies. Since a great variety of tools have arisen to develop and implement a better methodology in this teaching modality.

According to the information generated in the survey "Distance Education in Higher Education in Latin America", in 2017 by the Organization of Latin American States for Education, Science and Culture; The most used educational models in Latin America show the following percentages: (UnADM Open University and Distance from Mexico, 2018). See Fig. 2.
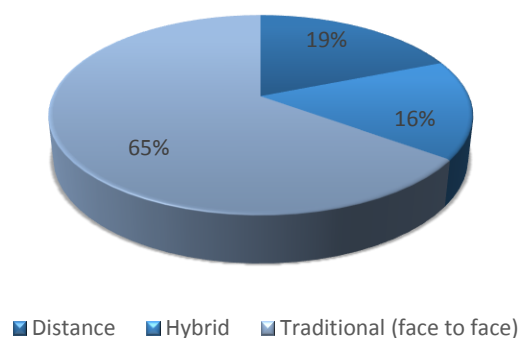

Fig.2 Imperative Educational Models in Latin America. Source: Jaime Alberto Leal Afanador (2018)

Up to this point, we can see how Education 4.0has an impact on all types of education officially implemented in Mexico, mainly representing an excellent opportunity for restructuring in Distance Education, of which it will be deepened later. (Mont, 2017)

Emerging technologies and their possibility of overlap in the current model of ED

Within a paradigm of Education 4.0, it is essential to determine emerging technologies that can be implemented within the established educational model, for this, they must know their characteristics and feasibility according to indicators recognised in this area. For this purpose, the report "was consulted NMC Horizon Report", a document prepared initially by the Higher Education Edition, the New Media Consortium (NMC) and the Educause Learning Initiative (ELI). However, at the beginning of 2018, EDUCAUSE acquired the rights to the project NMC Horizon.

In this report, are identified six emerging technologies that are predicted, will have a significant impact on higher education for the next five years. In Fig. 3, obtained from the current edition of the "Horizon Report", emerging technologies are presented in three adoption and resolution periods, which cover the period of 2018-2022 (Educause Learning Initiative (ELI), 2018). It is worth mentioning that the methodology for investigating and preparing this report is based on primary and secondary research to identify and examine the most significant trends, as well as challenges and essential developments in technology. Such information is endorsed by a panel of experts that will determine which will be incorporated into the final report (Educause Learning Initiative (ELI), 2018). See Fig. 3.
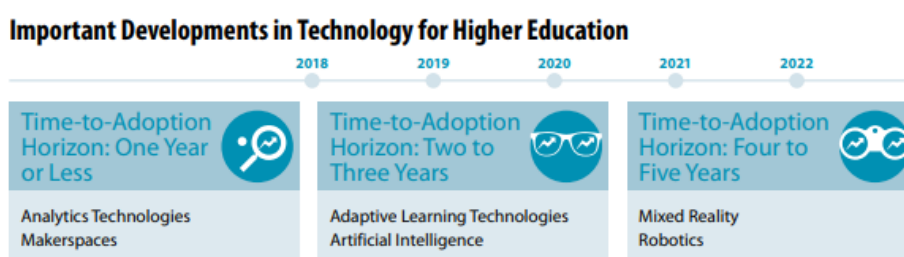

Fig.3 Most important technological advances in higher education. Source: The NMC Horizon Report (2018)

It can be observed that the results obtained in this edition vary significantly concerning its previous edition since the technology is in constant evolution. To mention some examples, Natural User Interfaces and Adaptive Learning Technologies, technologies contemplated in the Horizon Report of 2017, have been replaced, in the current one, by Robotics and Analytics Technologies, in the same way, the Makerspaces and Adaptive Learning Technologies appear in Place of Mobile Learning and Internet of Things (IoT) (New Media Consortium (NMC), EDUCAUSE Learning Initiative (ELI), 2017). Returning to the results of the Horizon Report 2018, below, the characteristics and application, briefly described, of the most critical technologies, regarding their development, contemplated in there displayed Horizon Report (2018). See table 1.

Table 1. Description of the most critical technologies important in higher education 2018-2022. Adaptation of: Horizon Report (2018).

TECHNOLOGY	DESCRIPTION	APPLICATION		
		TOOL	ADVANTAGES	RESULTS
Analytics Technologies (Analytical Technologies)	It covers a diverse range of tools and applications to Convert data into information. Results of learning, recruitment, relationship with alumni, management and productivity of research.	**Lehman 360** (Lehman College / City University of New York)	● Provides data from multiple sources ● Single view and easy to consult ● Correct data, at the right time, to those who need it to take action	The Higher Education Commission (UK) is leading an effort that includes 50 institutions to develop a national learning analysis service

Makerspaces	It is rooted in the movement of creators, followed by artists, technology enthusiasts, engineers, builders, manipulators and others, to create new learning spaces.	**Maker Kits** (University of Southern Queensland)	• The growth of the creative culture and skills of the manufacturer • Continuous education via courses and workshops • Rapid and accessible experiments that allow learning while creating	120 kits of manufacturers were created, free at a distance, online and in camps to students of the USQ in all of Australia
Adaptive Learning Technologies (Technologies of adaptive learning)	Technologies that adjust dynamically to the level or type of content of the course in function of the individual abilities, so that they accelerate the yield of the student.	**How People Learn** (Initiative Zuckerberg Chan)	• An online, personalised course • Common core experience for those involved at the master level	Project funded by the initiative Zuckerberg Chan- to create a specialised online course
Artificial Intelligence (Intelligence)	MachineMachine Learning, which keeps "informed "To a computer to make decisions and predictions through exposure to large data sets and natural language processing.	**Developing Virtual Patients for Medical Education** State (OhioUniversity)	• Virtual representations (avatar) of human patients AI controlled • Students have a conversation in natural language • Rehearse professional behaviour	provides immediate feedback on student performance and allows students to simulate interview techniques before working with real patients.
Mixed Reality (Mixed Reality)	comprising Technologiesenvironments combined real and virtual and human-machine interactions generated by computer and wearables technology ("wearable device").	**XR for Historical Reconstructions** (Bates College Faculty in the Humanities)	• 3D modelling for digital reconstruction Digital • reconstruction of historical structures • The sense of immersion in traditional spaces, which provides a new perspective.	These virtual reality tools are used to provide the opportunity to immerse themselves in reconstructions of different kinds.

Likewise, are identified six trends and six challenges significantly higher education; knowledge that gathers 16 years of educational changes propitiated by the accelerated evolution of technologies. This information was selected and reviewed by a group of 78 experts from different countries in an online process. (Educause Learning Initiative (ELI), 2018)

Over time, the Horizon Report has managed to collect information that reveals the evolution and coincidences between technologies, as well as their consolidation stages or, on the contrary, their decline or obsolescence. Each development trend or technological challenge creates new perspectives and innovative approaches in the educational practices implemented. (Educause Learning Initiative (ELI), 2018).
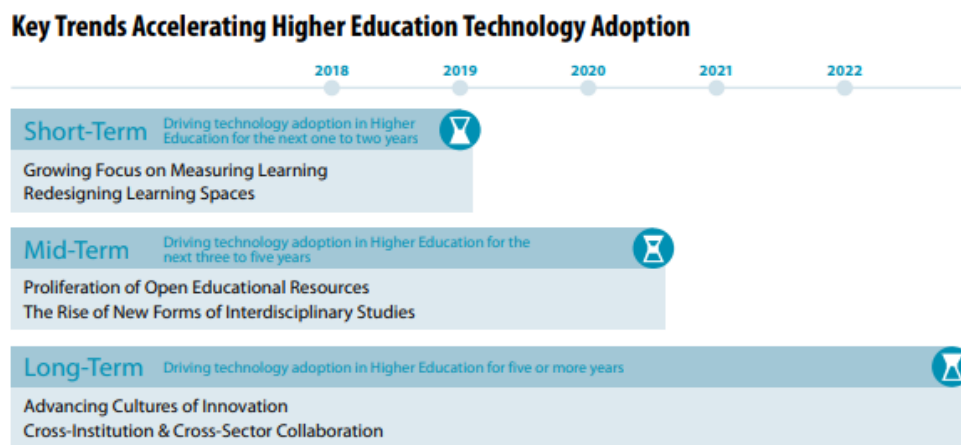

Fig. 4 Key trends in higher education in the next five years. Source: The NMC Horizon Report (2018).

As can be seen in Fig. 4, trends in higher education emphasise the analysis of information, since the "growing focus on measuring learning, the proliferation of open educational resources & cross-institution and cross-sector collaboration ", allow to collect relevant data about each, and based on this, can perform a better teaching-learning process.
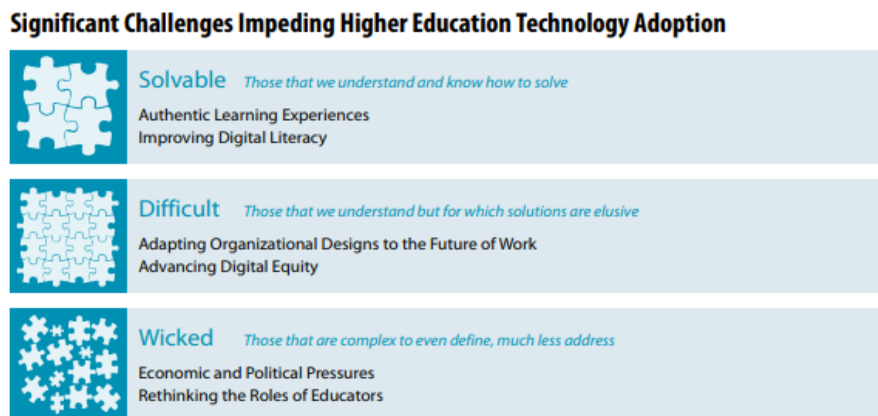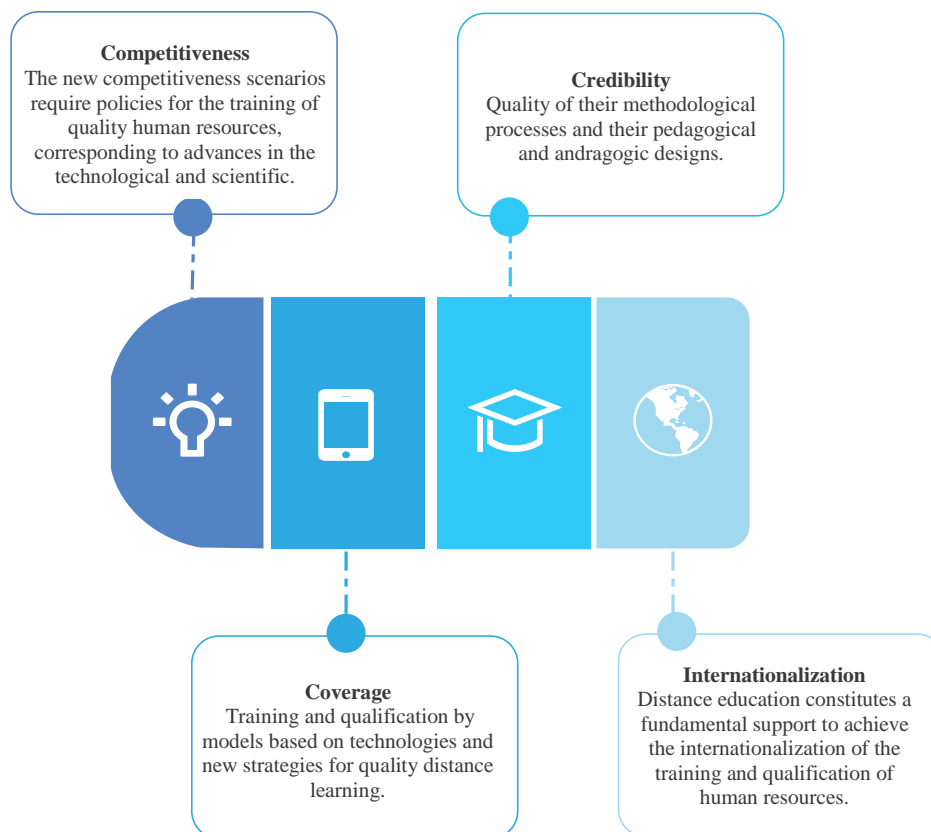

Fig. 5 Main challenges that prevent the adoption of technology in higher education. Source: The NMC Horizon Report (2018).

Finally, in Fig 5, the Horizon Report, shows which are the most critical challenges that prevent the adoption of technologies in higher education. Same, which includes a part called "solvable", referring what data included in that section are those that have been addressed and developed a solution. Among these, is "digital literacy improvement", which is extremely important in a scenario where Distance Education is taking a real relevance among the population, which, gives credibility and formalism to this educational method.

Overview of Distance Education in Mexico

The Distance Education model, implemented in Mexico, is influenced by the National University of Distance Education (UNED), with characteristics of the Open University of the United Kingdom (1969), the German Fern Universität (1974) or the Dutch Open University (1981), who have in common, a methodological model that emerges from that established by the British university. This is how the main evolutions of this model have been determined by the adaptation to the educational practices of each country, and by the incorporation of the services, means and tools provided by the technological field. (Yuste, 2015)

As mentioned throughout the article, Distance Education is mainly characterized as a flexible, dynamic and adaptive modality to the environment where it is implemented. Likewise, as mentioned by Maldonado (2016), it is a modality of practical utility, since it links its programs with the needs of students who are in a remote location, develops self-esteem, enriches knowledge, learning and, above all, stimulates creativity. (Flores, 2018)

Competitiveness
The new competitiveness scenarios require policies for the training of quality human resources, corresponding to advances in the technological and scientific.

Credibility
Quality of their methodological processes and their pedagogical and andragogic designs.

Coverage
Training and qualification by models based on technologies and new strategies for quality distance learning.

Internationalization
Distance education constitutes a fundamental support to achieve the internationalization of the training and qualification of human resources.

6. Scenarios for the distance mode. Own elaboration based on information retrieved from: PNPC Foundations on educational quality in the out-of-school mode (2014)

In Fig. 6 the stipulated scenarios are presented, according to the "Fundamentals on educational quality in the non-schooled modality" of Conacyt (2014), suitable for distance education in Mexico; It must be remembered that the reference model is the Distance Education model at a higher level. Organism, also presents the models for this type of educational modality.

1. **Remote Classroom.** This model of distance education, also called "au-la distributed", by Miller (2004), is based on the use of ICT to reproduce the practices that are conventionally done in face-to-face classes. It has the use of technologies that allow, according to Bates (1995) and Levenburg (1998), the synchronous transmission of audio and / or video. However, this model only contemplates the predetermined ones (chosen) by the institution and not by the students. Likewise, as I said Heydenrych (2000), the remote classroom is defined by its technological infrastructure and not by its instructional design. (Conacyt, 2014)

2. **Interactive model based on ICT.** The interactive model based on ICTs is based on the use of technologies, mainly those tools provided by the Internet for access to teaching materials and communication with academics. It is also known as distance education based on networks or online model. This model favors the interaction between the teacher and the student, without limiting it only to a classroom. On the other hand, this type of fashion does not guarantee the correct implementation of educational models based on the construction of knowledge by students. (Conacyt, 2014)

Technologies and Applications

In reviewing the advancement of technology in Distance Education and comparing it with other areas such as administrative, business, military or engineering, it is possible to determine a significant advance in the pair of the integration of technology and its almost perfect integration. (Ayuste, Escofet, Gros, Payá, & Rubio, 2018)

The advance of technology in the educational field represents the factors representative of the theory of B. Holmberg (1985), the theoretical foundations of Distance Education represent a subject that must be analysed when it becomes necessary to look for certain assumptions that guide the daily practice. Of decisions or research projects. . (Humberto, 2016)

Martín Rodríguez (1999) points out in the literature how profound changes have occurred in distance education, in its characterisation and relationship with the vision that was had of it in the eighties, worldwide. He also compares this author, the works of D. Keegan written in 1983 where a formal definition is made which defines Distance Education and Foundations of Distance Education. (Zapata, 2014)

The most characteristic features of Distance Education are:

1. The quasi-permanent separation of teachers and students throughout most of the learning process.

2. The use of technical means, printed, audio, computer for the teacher-student relationship and as a support for the course.

3. The establishment of bidirectional communication.

Keegan in his work "Six Theorists of Distance Education", published in 1983, classifies in three groups the theoretical considerations on distance education.

It is not possible to ignore the new theories of "Conectivism" (Siemens, 2005, Downes 2006), which define as the theory of learning for the digital age and is, without a doubt, the theory that has had the greatest impact in recent years in the online education and, in general, in the use of information and communication technologies in learning. (Adell & Castañeda, 2012).

Tools of ED in a perspective of Education 4.0

Based on the work entitled "Six Theories of Distance Education", published in 1983, work in which D. Keegan, lay the theoretical foundations of education At that time, at present, as we will see, other livelihoods of distance education are already known. (Zapata, 2014)

Keegan stressed that the efforts being made were on a practical level and that the theoretical foundations of distance education were fragile. (Zapata, 2014)

It was considered at the beginning of the eighties, that there was a delay between practice and theory and that possible accumulation would give the elements to create and sustain this theory in distance education, something that in our time no longer exists and the opposite now the practice is far ahead. (Zapata, 2014)

Luisa A. Noa Silverio (2003) classifies in three groups the theoretical considerations that up to now had been published on distance education:

1. Theory of the autonomy and independence of Ch. Wedemeyer (USA) and M. Moore (United Kingdom): Ch. Wedemeyer's thesis is based on C. Rogers' ideas about continuing education or lifelong education. They are a reflection of the sociopolitical problems of the 60s and 70s, and criticisms of the university system. The central axis in this approach is the adult, characterised by its independence and self-control in the learning process. Moore adds the recognition of individual differences that are expressed in the rhythm and dosage of the study in the adult.

2. Industrialisation Theory of O. Peters (Germany): For Peters, distance education is an indirect form of instruction and considers that its didactic structure can be better understood from the mechanical principles, especially those of productivity, the division of labour and mass production.

3. Theory of interaction and communication by B. Holmberg (Germany), J. Baath (Sweden) and D. Stewart (United Kingdom): This thesis by B. Holmberg, Baath and Stewart are based on communication.

For Keegan, a theoretical foundation of distance education must be found in attempts to artificially recreate the teaching-learning interaction and reintegrate it into the instructional process. . (Aretio, 2011)

Conclusions

In the face of attempts to find a strong theory that supports distance education, allowing the possibility of serving for decision-making in new projects oriented to Education 4.0. It is as well as evaluating the results and providing a theoretical framework for future research; it is necessary to cite adult education which is recognised as a general body in structuring, with its professionals, their research and their results. It is for this reason that it is necessary to consider that adult education is one of the primary theoretical sources on which distance education should be based.

Simultaneously with the emergence of new information technologies, the Internet and Web 2.0, a current has been created that allows a particular orientation in the new realities arising from these technological advances and the creation of so-called environments or learning environments. It is format by a wide range of theories supports them, emerging concepts from the year 2000 such as heutagogy, connectivism as established by Kop and Hill (2008).

Located, contextualised knowledge and learning networks based on collaborative learning are undoubtedly aspects that must, in one way or another, be considered when rethinking the theoretical foundations of distance

education towards 4.0 education. These elements have an essential role for the creation of a general body that supports the practice of distance education at this time and fundamentally, for its approach towards intellection of a new reality in principle, which is closely linked to the virtual.

Acknowledgments

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