

Perceptions and research trends in ICT-mediated educational innovation: case studies in the Latin American context.

Percepciones y tendencias investigativas en innovación educativa mediada por TIC: caso estudios doctorales en el contexto latinoamericano

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ABSTRACT

Scientific production has the development of doctoral theses as one of the indicators of regional academic development. Within the educational field, academic production should consider innovations supported by ICTs in order to be in line with scientific progress. The first objective of the study was to identify trends in doctoral theses that have investigated ICT-mediated educational innovations in the Latin American context during the period 2016-2021. For this purpose, a study will be conducted in university repositories. The second objective was to learn about the perceptions of the teachers of a HEI in relation to educational innovation. At the time of the survey, these teachers were pursuing doctoral studies or had completed them. A mixed methodology was used, applying questionnaires to the participating teachers, in this case belonging to the Philosophy Faculty of the University of Guayaquil. In order to determine research trends, 88 doctoral theses from 16 Latin American universities were reviewed. A prevalence of research based on e-

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learning and a perception of lag between educational innovations and doctoral production topics in the region on the part of teachers were obtained. It is proposed that Latin American doctoral programs linked to education should emphasize the development of proposals for the dissemination of innovations, in order to be in line with global advances.

Keywords: Repositories, ICT, Innovations.

RESUMEN

La producción científica tiene al desarrollo de tesis doctorales como uno de los indicadores del desarrollo académico regional. Dentro del campo educativo la producción académica debe considerar las innovaciones apoyadas en las TIC para estar acorde al avance científico. El primer objetivo del estudio fue identificar las tendencias en tesis doctorales que han investigado sobre innovaciones educativas mediadas por TIC en el contexto latinoamericano durante el periodo 2016-2021. Para este fin se realizará un estudio en repositorios universitarios. Como segundo objetivo se planteó conocer las percepciones de los docentes de una IES, en relación con la innovación educativa. Estos docentes se encontraban al momento de la encuesta cursando estudios doctorales o los han culminado. Se utilizó metodología mixta, aplicando cuestionarios a los docentes participantes, en este caso pertenecientes a la Facultad de Filosofía de la Universidad de Guayaquil. Para el objetivo de conocer las tendencias investigativas, se revisaron 88 tesis doctorales provenientes de 16 universidades latinoamericanas. Se obtuvo una prevalencia de las investigaciones basadas en e-learning y una percepción de rezago entre las innovaciones educativas y las temáticas de producción doctoral en la región por parte de los docentes. Se propone que los programas doctorales de Latinoamérica vinculados a la educación deben hacer énfasis en el desarrollo de propuestas de difusión de

innovaciones, para estar acordes a los avances globales.

Palabras clave: Repositorios, TIC, Innovaciones.

INTRODUCTION

For the advancement of societies in all areas, it is essential that scientists make contributions in the different disciplines of knowledge. In this sense, doctoral academic training programs are one of the essential paths to follow in order to make the dissemination of science viable. Doctoral academic production should, therefore, contribute to improving the possibilities for societies to adapt to the transformations and demands of a highly changing reality. (Castillo-Bustos et al., 2023).

Among the innovations in the educational field, the contribution of information and communication technologies has undoubtedly provided countless opportunities to enrich learning processes. The incorporation of ICTs in higher education implies incorporating pedagogical practices that allow educational transformation. (Ricardo Barreto and Irriarte Diaz Granados, 2017).. Education can achieve significant goals through the use of technology and through a variety of resources and tools that help school development. Among these tools, blackboards, books and/or ICT are considered, however, many institutions do not have the digital resources to carry out innovative teaching (Camacho et al., 2020).

In the current educational context, many educators are incorporating ICT in the teaching processes; from these, it is possible to improve procedures, tools and analytical strategies for education (Cortes, 2016). The use of digital instruments, such as mobile devices, help to have quick access to information through educational applications, since these tools are related to our daily life, also allowing learners to learn anywhere (Roman and Gomez, 2018).

There are several possibilities offered by information and communication technologies to mediate between content and students, facilitating learning processes. Among these technologies, augmented reality stands out (León Rodríguez and Viña Brito, 2017), which allows presenting content through multiple media, enriching static media or adding complementary information. Another technology that is making significant inroads in the training field is virtual reality (Alvarado et al., 2019). Virtual reality allows the interaction of the senses through visual stimuli, similar to the elements of the real world.

Continuing with ICT tools that can bring innovations in education, we can mention mobile applications, 5G technology, As a Service, Internet of Things and artificial intelligence. Mobile applications and devices have enabled the ubiquity of learning and expanded the possibilities for a greater number of students to access technological resources. These resources were previously limited to computers (Chamba Zarango et al. (Chamba Zarango et al., 2019).. In a short period of time, the technology for mobile device connectivity has moved from the 3G-based model, towards 4G and more

recently to 5G. 5G technology opens up a wider range of usage possibilities for mobile and related devices. (Noboa Salavarría, 2020)..

Another tool that offers important possibilities for innovation in education is undoubtedly 3D printing. The possibility of building models with the assistance of a computer and then reproducing them on the physical plane offers educators the possibility of enhancing the creative potential of students. Among its many applications, this technology is being used in the medical field for the creation of prostheses, as well as in the training process of future doctors. Such is the case, for example, at the University of Malaya, located in the Federation of Malaysia. At this center of study, medical school students, with the guidance of their professors, design 3D models of human body parts. These printed models allow them to have an experience closer to the real thing than if only digital or static images were used. (Jaramillo Castro, 2019).

As a Service technology is another innovation that overcomes the storage limitations of desktop devices. It is based on the use of cloud storage. At the same time, this technology makes available to students the use of applications that due to their high cost of licensing or physical requirements may not be accessible to the educational institution. (Delgado, 2017).

Finally, among the most recently applied technologies in education, artificial intelligence stands out. Although artificial intelligence applications can be used as a means to avoid fulfilling academic obligations, they have a great potential to produce learning. The fact of reducing the time needed to search for information, generate content and assume conceptual positions under different parameters can and should be taken advantage of by educators. Among these tools, one of the most popular at the time of writing this study is undoubtedly CHATGPT (Baidoo-Anu and Owusu Ansah, 2023)..

However, despite the potential benefits of the technologies described in the previous paragraphs, technological isolation or little contact with educational innovations produces a low development in the area of digital competence. This deficiency may be one of the causes for not allowing significant progress in the different areas of learning, even disengaging the development of knowledge. The limited access to innovations in the area of ICTs affects all aspects of the life of a society and education cannot be abstracted from this. Consequently, academic production at both the undergraduate and graduate levels will be affected by this gap. Consequently, the timeliness and quality of doctoral production in the area of ICT-mediated educational innovation will be directly linked to the introduction of technological innovations in the context of societies (Vera-Rámirez and Benavides-Sellan, 2021)..

Since Ecuador is a developing country, it is essential for society to adapt to new technologies in order to achieve significant academic production. The low use of these resources would cause a delay in the production of knowledge and in turn a difficulty in achieving national development objectives.

Based on the above, we propose to identify the trends in doctoral theses that have investigated ICT-mediated educational innovations in the Latin American context during the period 2016-2021. As a second objective, we analyze the perceptions of teachers

who are currently studying or have completed doctoral studies in relation to ICT-mediated educational innovations.

MATERIALS AND METHODS

The present study has a quali-quantitative approach, on the one hand, qualitative elements were used to classify the information and determine research trends, the period of time to which the doctoral academic productions corresponded was 2016-2021. Quantitative elements were used to express the results of the data collection instruments in numerical terms. Similarly, bibliographic research was used, since a review of the doctoral production was carried out to catalog the information. We also had the help of different research methods such as inductive-deductive and historical-logical. Induction-deduction contributed to a more generalized concept based on the particular observations of each country in the academic repositories consulted. Meanwhile, the deductive-inductive process made it possible to analyze the general trends in innovation, which were contrasted with the individual academic productions consulted.

On the other hand, with regard to the techniques applied, the survey was used to collect data for the analysis of teachers' perceptions and the word cloud was applied to identify trends in doctoral theses. The survey was operationalized through a seven-question questionnaire addressed to 20 professors of the University of Guayaquil, Ecuador, belonging to the Faculty of Philosophy, Letters and Educational Sciences. This faculty is in charge of teacher training at this IES, therefore, the participants are immersed in the educational reality. The participating teachers were selected because they are studying or have completed their doctoral studies. The word cloud was applied in the search for key words in each of the selected theses.

For the application of the survey, an electronic form was created in the Microsoft Forms tool of Office365. The surveys were sent to teachers who voluntarily agreed to participate in the study and who at the time of the study were in doctoral programs or already had a PHD degree.

For the selection of the theses used in the research, the following exclusion criteria were applied:

- Postgraduate offerings of higher education institutions, which should be related to education.
- Relevance: Those doctoral productions that include among their topics educational innovations mediated by information and communication technologies were selected.
- Accessibility: Only theses from open academic repositories were considered.
- Temporality: The selected theses were included in the period 2016-2021.

Once the exclusion criteria described above were applied, the academic productions were selected from a total of 16 university institutional repositories, as shown in Table I. The total number of academic productions reviewed was 88.

Table 1. List of HEIs corresponding to the consulted repositories.

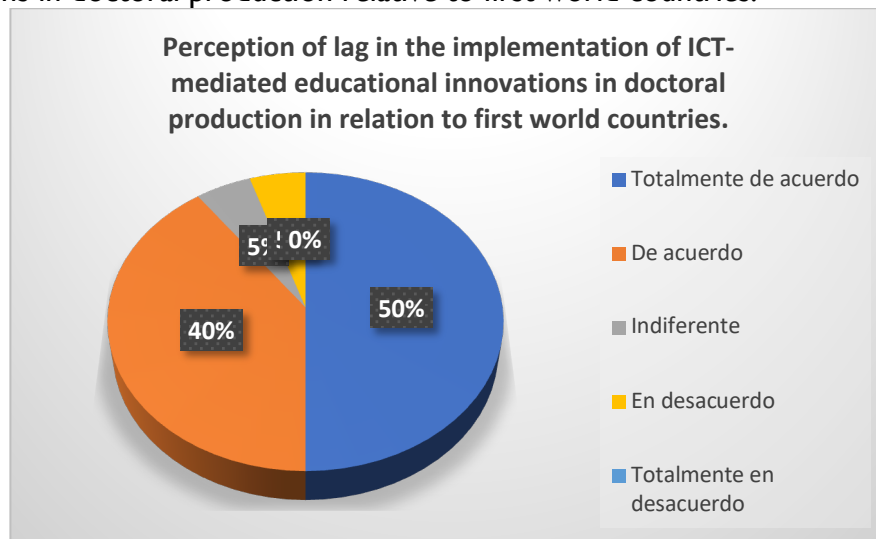
Headquarters	UNIVERSITY REPOSITORY	OWNING THE	Number of productions consulted
MEXICO	Iberoamerican University		1
Mexico	Autonomous University of Aguas Calientes		1
Mexico	Monterrey Institute of Technology and Higher Education (ITESM)		2
Venezuela	Universidad Central De Venezuela		3
Venezuela	University Of Carabobo		4
Colombia	Universidad Nacional De Colombia		6
Puerto Rico	Ana G. Méndez University		5
Puerto Rico	University of Puerto Rico		4
Peru	San Martin De Porres University		10
Argentina	National University of La Plata		5
Argentina	Latin American Faculty of Social Sciences (FLACSO)		2
Uruguay	Del Ort University Uruguay		4
Brazil	University of São Paulo Usp		18
Brazil	Universidade Estadual Paulista Júlio De Mesquita Filho		19
Brazil	Federal University of Rio De Janeiro		2
Honduras	National Autonomous University of Honduras		2
	Total		88

RESULTS

Once the selection criteria for the doctoral productions had been applied, the online application NubeDepalabras.es was used to analyze the documents in PDF format. The titles, abstracts and keywords of the selected doctoral productions were taken into consideration. From the initial results obtained, a purification of terms is made in order to include only those terms that are related to technologies in the educational context.

by ICTs. The question asked the teachers' perception based on their experience as participants in doctoral programs. As shown in Figure 3, most of the teachers consider that there is a significant lag in relation to the topics of the doctoral proposals. This perception responds to the comparison with educational innovations of recent incursion in developed countries.

Figure 3. Perception of lag in the implementation of ICT-mediated educational innovations in doctoral production relative to first world countries.



Source: Teacher Survey

The teachers were also asked what they considered to be the main difficulties for the implementation of ICT-supported educational innovations in Latin American HEIs. The main difficulties identified by the teachers were economic, management, limited dissemination and research aspects, as shown in Figure 4. This situation is due, among other reasons, to the fact that many of these institutions do not have the necessary support for the implementation of technological resources in teaching or that access to these resources is excessively bureaucratized. It is therefore important to incorporate policies that improve the accessibility and dissemination of ICT-mediated educational innovations, so that Latin America's academic population can access the potential benefits of educational innovation.

Figure 4. Difficulties for the implementation of ICT-supported educational innovations in Latin American HEIs.



Source: Study conducted

CONCLUSIONS

It was observed that some of the two educational innovations were not addressed in the doctoral productions consulted. Among them, the following stand out: 5G technology, As A Service, artificial intelligence and the Internet of Things. In this sense, it can be considered that these technologies have not yet been sufficiently considered within the doctoral topics in ICT-supported educational innovations and doctoral academic production. Therefore, it is important to broaden the topics and the vision of doctoral students so that the potential benefits of these innovations are disseminated in society. To cite a specific case, especially in recent years applications based on artificial intelligence are gaining significant notoriety (Ouyang et al., 2022).. In other contexts, artificial intelligence has been implemented for several decades (Chen et al., 2022). (Chen et al., 2022). Therefore, it is necessary to rethink doctoral proposals in order to include these scarcely addressed topics.

Through the bibliographic study of ICT-mediated doctoral theses, it was possible to identify that the country with the highest academic production was Brazil. This is because it offers several possibilities compared to other Latin American countries to apply for a doctorate. Also, Brazilian universities generally have the necessary resources to carry out research through technology and thus achieve significant production. Many Latin American countries have a low yield of doctoral productions due to technological backwardness. This result corresponds to the results presented in the study by Castillo Bustos, Marcelo (2023). In this study, the prevalence of doctoral productions in Brazil is exposed, marking a clear difference in relation to other countries in the region.

Through the analysis of the survey, it was observed that most of the teachers have completed or are currently pursuing their studies in different countries in Latin America and Europe due to the accessibility they offer. In Ecuador, at the moment there are few doctoral training programs, which in many cases has forced professionals to seek

alternatives abroad. The majority perception of teachers is that there is a lag in the implementation of educational innovations supported by ICTs and academic production in the Latin American context. This perception responds to the fact that there are several difficulties for the implementation of these innovations, such as economic aspects and the complexity of management. The result obtained is related to the findings of other studies, which show a gap in investment in technology and research between Latin America and developed countries, (Mendoza, Rizo, Beltrán, & Concepción, 2021)..

The current trend in doctoral production in Latin America is an increase in the number of programs and consequently in academic production (Mendoza, Rizo, Beltrán, & Concepción, 2021). (Mendoza, Rizo, Beltrán, & Concepción, 2021).. However, doctoral production in the Latin American context still lacks the necessary impact and recognition (González et al., 2020). Finally, it is concluded that it is necessary for HEIs in the region and governments to develop policies aimed at promoting the improvement of the levels of academic production in doctoral studies. Within these policies, the need to innovate teaching practice should be incorporated and considered, and ICTs are an opportunity to achieve this goal.

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