

Education Policies for the Integration of ICT in the Mexican National Education System

Políticas educativas para la integración de las TIC en el sistema educativo nacional mexicano

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ABSTRACT

Keywords

Education policies; ICT; National education system; innovation; teaching

The objective of this article is to present an analysis of research and studies from the decade between 2012 and 2021 on education policies for the integration of information and communication technologies (ICT) in the Mexican national education system. Using a qualitative document analysis methodology, it was found that the reviewed works are based on the guidelines proposed by international organizations regarding the use of technology in innovative pedagogical processes. It is concluded that it is essential to continue researching this topic in order to understand how technology is transforming teaching and learning processes, and to identify the progress made and proposals to improve its integration in the national education system.

RESUMEN

Palabras clave

Políticas educativas; TIC; sistema educativo nacional; innovación; enseñanza

Este artículo tiene como objetivo presentar un análisis de las investigaciones y los estudios realizados entre 2012 y 2021 sobre las políticas educativas para la integración de las tecnologías de la información y la comunicación (TIC) en el sistema educativo nacional mexicano. Al utilizar una metodología cualitativa de corte documental, se encontró que los trabajos revisados se basan en los lineamientos propuestos por los organismos internacionales sobre el uso de la tecnología en procesos pedagógicos innovadores. Se concluye que es fundamental continuar las indagaciones en este tema para entender cómo la tecnología está transformando los procesos de enseñanza-aprendizaje, e identificar sus alcances y propuestas para mejorar su inserción en el sistema educativo nacional.

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INTRODUCTION

Educational policy is understood as the set of actions implemented by the State in order to structure and regulate the educational system, ranging from the design of objectives and their organization, to the implementation of concrete actions (Rojas and Navarrete, 2019). In this way, an educational policy can be delimited as a set of guidelines that orient the interaction between the educational system, society and the State, within any political and ideological scheme in which its triad is located (Rizvi and Lingard, 2013).

In the context of globalization - a prevalent economic and global trend - there have been a series of policies and significant changes that point towards the creation of knowledge societies, this from the so-called "third industrial revolution". From this perspective, information and communication technologies (ICTs) have experienced an impetuous development, and their impact on technological innovations has led to the reconfiguration of the productive system, highlighting the importance of building the necessary skills and knowledge in individuals for their insertion in the digital era.

In Mexico, the Ministry of Public Education (SEP), throughout its history, has made various efforts to implement the use of ICTs in basic education classrooms, taking advantage of modern means to transform educational spaces and ensure that training is generated with innovative processes that allow children and young people to develop and build the necessary skills to develop in knowledge societies. Thus, within the framework of the political agenda, educational models have been developed such as the 'telesecundaria', which is supported by the Edusat Network (Satellite Education Network) and the 'telebachilleratos', together with the programs Enciclomedia, Digital Skills for All (HDT, by its acronym in Spanish), Mi Compu.mx, the Digital Inclusion and Literacy Program, and the National Digital Agenda.

Within higher education institutions (HEIs), a series of policies have been developed that focus on the creation of institutional programs aimed at contributing to the training of young students by providing them with ICT skills. This in turn has generated the basis for access to non-face-to-face modalities that have an impact on the training of those sectors that, due to their social, economic or geographical characteristics, cannot access education in face-to-face classrooms. In recent decades, both at the international and national levels, public policies have focused on proposing comprehensive strategies to incorporate the use of ICTs in education. These seek to transform educational systems so that they are more than just equipment and connectivity of institutions, and promote the formation and dissemination of new ways of thinking (Unesco, 2011).

In this context, the objective of this article is to present an analysis of the written production (articles, books and chapters) in Mexico, in the decade from 2012 to 2021, on policies for the incorporation of ICT into the educational field. The question that guided this research was the following: what is the written production in Mexico on public policies for the incorporation of ICT into the educational field? The aim is to explain how these policies have been developed in Mexico, and how they have been approached in various research studies, by exposing the theoretical and methodological frameworks used to work on this topic.

Next, a review is presented of the academic production generated around educational policies, together with some specific characterizations in the application of the strategies proposed by the Mexican State. With the purpose of explaining the findings obtained in the study, the article has been structured in sections that are broken down as follows: the introduction, where an overview of the article is provided; the methodology used; the research conducted on educational policies for the integration of ICT in the Mexican national educational system at the basic, middle and higher education levels, respectively; and finally, the discussion of the results and the final reflections derived from the research.

METHODOLOGY

After opting for a qualitative methodology with a documentary approach, a bibliohemerographic search was carried out in databases, which included Mexican scientific journals, university repositories, conference proceedings, meetings and colloquiums, and the production of educational research centers, institutes and departments. A total of 200 research studies were gathered and subsequently subjected to review, systematization and analysis of the information gathered in two phases: heuristic and hermeneutic.

1) The heuristic phase focused on the search and systematization of information, for which protocols were developed, one of exploration to delimit the language, period, terms and data collection strategies; and a review protocol, in which inclusion and exclusion criteria were established, using technological resources such as Mendeley and a database designed in Excel. In order to include research and papers produced within the Mexican Republic in the decade 2012-2021, various repositories and digital libraries of universities, both public and private in Mexico, research centers, associations, research networks, repositories of indexed Mexican journals and conference proceedings were consulted. The final database included articles, books, book chapters and graduate theses.

2) In the hermeneutic phase, the information obtained was manipulated according to: authors, keywords (see Figures 1 and 2), titles, abstracts and the visualization of bibliometric networks (using the VOSviewer manager), which contributed to the descriptive analysis of the research retrieved (see Figure 3).

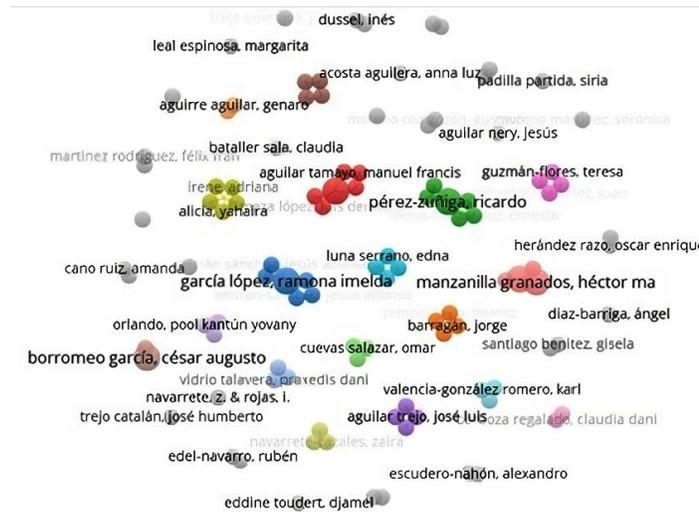


Figure 1. Bibliometric analysis by authors.

Source: visualization in VOSviewer

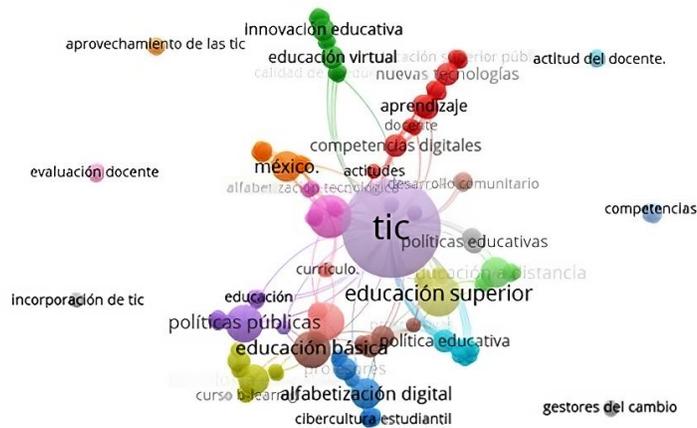


Figure 2. Bibliometric analysis by keywords.

Source: visualization in VOSviewer.

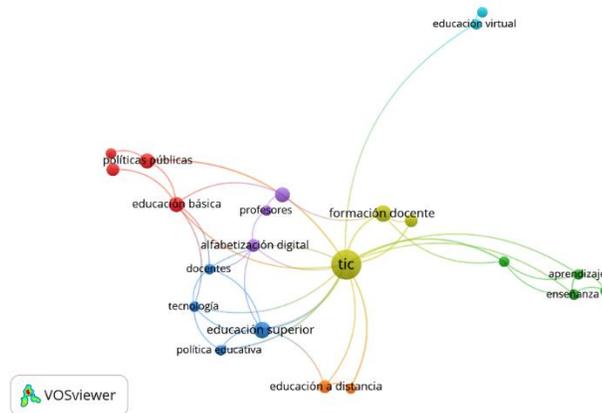


Figure 3. Descriptive analysis of the recovered research.

Source: visualization in VOSviewer.

Since the objective of this research is to provide an account of the research and theoretical contributions produced in Mexico on the policies proposed for integrating ICTs into education, several refinements were made to the first 200 research studies recovered. Although a wide variety of documents related to the topic were found, an analytical approach to the works in extenso showed that quite a few did not specifically analyze the educational policies adopted by the State, which is why they were excluded. After the selection, analysis and retrieval filters, the final database included 38 works: 18 journal articles, one authored book, eight book chapters, ten papers and one graduate thesis.

STUDIES ON EDUCATIONAL POLICIES FOR THE INTEGRATION OF ICT IN THE MEXICAN NATIONAL EDUCATION SYSTEM

Basic education

This section included the works of Santiago and Sosa (2012), Cano and Vaca (2013), Herrera (2014), Beltrán *et al.* (2015), Glasserman and Manzano (2016), García *et al.* (2015), Beltrán *et al.* (2017), Guzmán (2017), Trejo (2019), Dussel and Trujillo (2018), Conejo *et al.* (2021) and Navarrete *et al.* (2021). It is worth mentioning that the order of presentation of the research corresponds to the development of the topics addressed by the programs established in Mexican policy in the different six-year terms: the Challenges of ICT inclusion in basic education, Digital

skills for all, Mi Compu.mx, National Digital Strategy, Aprende.mx, the 2018-2024 Agenda and the appearance of ICT in sectoral programs.

The work of Santiago and Sosa (2012) aims to identify the challenges around the introduction of ICT in basic education schools. Based on a qualitative documentary methodology, the authors recover essential aspects to expose the challenges faced by the Mexican government for the inclusion of ICT in classrooms, taking up that partial progress has been made in the equipment of technological infrastructure in primary and secondary schools, as well as in the development of educational software and digital materials (Trucco, 2008, cited by Santiago and Sosa, 2012).

These authors point out that policies have not yet developed strategies that take into account teacher training, digital literacy and inequality of access, so that decisions must be made to address these situations in order to generate equity in the distribution of devices and achieve adequate teacher training. In conclusion, this paper suggests the need to design a curriculum that guides the use of technologies, learning about ICTs, defining in the public agenda not only the access to these technologies but also the planning of pedagogical proposals for their implementation.

Cano and Vaca (2013) present a study aimed at analyzing the incorporation of the digital skills for all (HDT) strategy at the secondary level. The researchers opted for a qualitative ethnographic methodology, carried out in the state of Veracruz in two 'telesecundaria' schools and a general secondary school. The work presents a brief overview of HDT, mentioning that it is a strategy derived from the Sectorial Program 2007-2012, whose objective is to make use of digital resources to support the understanding of concepts and develop skills and competencies in this area (SEP, 2007, 2011, cited by Cano and Vaca, 2013).

Through interviews, questionnaires and observations, it was found that, despite the fact that the program is oriented towards the introduction of ICT in the classroom, teachers make little use of them, which evidences the distance between the official discourse set forth in the educational agenda and what the school is in a position to do when considering its institutional dynamics and access to resources. The authors propose as an initiative to adapt the strategies proposed to the contextual differences and the needs of each educational modality, which in this case are secondary schools: general, technical and 'telesecundaria'.

Herrera (2014) analyzes the Mi Compu.mx program, aimed at the inclusion of ICT in basic education in two secondary schools in Guerrero and Querétaro. In this work, the author questions the supposed use of technologies as generators of a revolution in the teaching-learning processes, by posing as a research problem the way in which educational policies of ICT inclusion are perceived and re-signified by teachers at the basic education level.

Using a qualitative methodology and a historical-anthropological analysis, a review is made of the implementation of ICT in Mexican policy, from the introduction of the telesecundaria to the educational system in 1968, to the strategies that provide equipment and connectivity to schools as a basis for the constitution of innovative educational processes, in this case, the Mi Compu.mx program.

As a result of the research process, it was found that the vision that ICTs and the strategies developed for their equipment bring benefits to education, especially to the students who use them, must be sustained with guidelines that make it sustainable, such as accompanying educational actors, giving them pedagogical support, acting against inequality and amplifying the advantages of the use of technology.

The analysis of Beltrán *et al.* (2015) presents the teaching experiences in the application of the educational program Mi Compu.mx. The elements taken up in their research are: ease of learning, efficiency of use, viability to recover errors as a means of learning and justification. By applying the qualitative phenomenological method and three semi-structured interviews with teachers of a public elementary school, the authors obtained that teachers consider the program as a good technological resource that could support the educational process and consolidate digital competencies in students, but there are still certain obstacles and challenges for its implementation, such as teacher training and access to technological infrastructure.

Along the same lines, Glasserman and Manzano (2016) conducted a diagnosis on the degree of integration of laptops and the pedagogical educational practices of teachers for the purpose of the Mi Compu.mx program. Their quantitative methodology of descriptive exploratory cut takes up the investment that the program meant for the Mexican government, as well as the series of challenges involved in its implementation, related to the improvement of pedagogical practices and teacher training (Lagos and Silva, 2011, cited by Glasserman and Manzano, 2016).

In analyzing the data obtained, the authors found that the programs related to the 1-to-1 model with respect to ICTs (provision of one computer per student) show advantages that have a significant impact on the school system; despite this, the strategies defined in educational policies need to plan features aimed at improving pedagogical training, teacher training and certification, in addition to ensuring access to digital equipment, aimed at closing the digital divide and offering a more equitable education.

The development, implementation and evaluation of educational programs requires the recovery of the points of view not only of teachers, but also of the people who receive the inputs, in this case the parents. In this regard, the work of García *et al.* (2015) seeks to know the opinion of

tutors on the policies implemented related to the Mi Compu.mx program, which began its pilot test in Sonora, Colima and Tabasco, with the aim of reducing the digital divide and building digital competencies and skills (Martínez and Cabello, 2012, cited by García *et al.*, 2015).

Using a qualitative phenomenological methodology, four parents were interviewed, who expressed that the equipment has not had a significant impact on academic performance; this implies that the design of strategies within educational policies should be oriented towards technical training in the use of these tools.

The work of Beltrán *et al.* (2017) recovers the factors related to the integration of the Digital Inclusion and Literacy Program (PIAD, by its acronym in Spanish) in teaching activities. The authors start from presenting the program and the way in which the Mexican government, through the SEP, has developed efforts to include ICTs in basic education (Martínez and Cabello, 2012). In this way, PIAD proposes the 'One Laptop Per Child' initiative as the principles of application, by providing computers to fifth and sixth grade students, as well as to teachers and administrative staff.

With a quantitative methodology and using the survey as an instrument, information was collected from 203 teachers in Sonora. After analyzing the data, it is concluded that the policies and programs implemented present great challenges, such as the lack of teacher training, low interest and little pedagogical integration of technology in Mexico. The authors propose that public agendas aimed at ICT pay attention to the area of improvement that exists in teacher training, so they recommend the design and implementation of programs aimed at building skills for the mastery of technologies, in order to put them into practice within schools.

Guzmán (2017) makes a study about the National Digital Strategy, an important and necessary instrument of the educational policy that aims to insert Mexico into the knowledge societies, since within its lines of action it is intended to provide technological infrastructure to all schools that make up the educational system (Casillas, 2014). The main objective of the research is to analyze the impact of technologies as instruments of oppression and liberation of indigenous populations based on Freire's postulates (2002, 2005).

By using the mixed method with the application of a questionnaire to 54 students and two interviews with teachers and administrators, the author obtained as a fundamental problem of digitization the politicization of reforms, thus questioning the viability of this strategy for high marginalization communities, and establishes that this proposal requires a series of improvements to adapt its simplistic, superficial and rhetorical content.

Regarding the National Digital Strategy, Trejo (2019) focuses on the conceptual foundations around information and knowledge societies by analyzing the emergence, evaluation and sustainability of this public policy based on its achievements, limitations and current situation. Taking into account that the incorporation of ICT in the classroom entails a series of significant actions on the logic, structure and meaning of education, it is important that the contextual situation of each educational space is taken into account in the development of policies, avoiding highlighting inequalities and the digital divide (Sancho and Alonso, 2012).

Thanks to the qualitative method and its documentary approach, it was concluded that the implementation of the political agenda can have better results if the collaboration of the teaching communities is requested, by making a timely shift that satisfies inclusion and social equity, in the context of knowledge societies, retaking the importance of the participation of society in the implementation of public policies.

Dussel and Trujillo (2018) take up the Aprende.mx program with the purpose of reflecting on how Mexican schools incorporate the use of digital media in the classroom. Aprende.mx aims to promote digital inclusion in broad sectors of the population, in order to develop strategies for teacher training and curricular renewal to ensure educational change in different areas and learning environments, mobilizing the knowledge of students and teachers (Latour, 2005; Winner, 2004).

By employing a qualitative documentary methodology, the research recovers aspects related to educational policy. Among its results, it was found that its integration in classrooms presents numerous and challenging difficulties related to the spaces that lead to a common task due to contextual variation. For this reason, it is expected that States can include in their agendas the work with digital media, along with the knowledge that these can offer to schools to meet the demands of participation, autonomy and creativity.

Conejo *et al.* (2021) analyze some approaches to science, technology and innovation policy proposed in the Mexican State, as well as its integration process to the 2018-2024 Agenda; they recognize that public policy reflects the beliefs of those who make it and that its changes are a consequence of learning or external alterations (Sabatier, 2018). Through a documentary analysis, the authors mention that it has not been possible to configure a science, technology and innovation agenda and policy for the remainder of the six-year term, which limits access to ICTs by the education sector. In view of this, they stress the importance of designing policies aimed at their growth, development and implementation.

Finally, Navarrete *et al.* (2021) present a study in which they analyze the educational policies proposed in four sectoral education programs in Mexico (2001-2006, 2007-2012, 2013-2018 and 2019-2024), with the

objective of giving an account of the development of the strategies proposed to address innovation, inclusion and ICT; they start from conceptual knowledge through which the importance of the chosen categories is recognized -taking up the works of Navarro and Navarrete (2017) and Fernández (2015).

For the development of the research, a comparative methodology is used, which allows identifying similarities and differences to detect trends when reviewing some of the policies and guidelines proposed in the 2030 Agenda and the Sustainable Development Goal established by Unesco (2020). The authors conclude that ICTs have been inserted in public agendas as a means and as an end, since they take into account the benefits they present when incorporated in the teaching-learning processes and how beneficial they are in relation to innovation; for this reason, national policies have emphasized their insertion in all educational modalities and levels, however, it is still necessary to increase the strategies that enable their growth.

Medium higher education

Within the research on upper secondary education, the work of Aguilar (2016) was located, which analyzes in a general way the inequalities in ICT in the upper secondary system, related to the availability of equipment and internet connection (León and Tapia, 2018). With this qualitative and documentary-type work, the author exposes some of the reforms in the upper secondary level in which technologies have been present, and in which inadequate planning with an absence of clear procedures is shown.

As a result of the search and organization of the information retrieved, it is inferred that inequalities are closely related to the distribution of computers and Internet access in educational institutions, so it is required the design of strategies that favor equipment and connectivity in schools to reduce the digital divide and expand the impact of ICT at this educational level, while implementing a critical digital training of the new media used.

Higher education

Among the works that highlight the importance of ICT incorporation in higher education, the way in which these are inserted in institutional policy and their main challenges are those of Torres *et al.* (2012), Valencia *et al.* (2015), Borromeo (2019), León and Tapia (2018), Zempoalteca *et al.* (2018), Borromeo and Fernández (2019) and Torres *et al.* (2017).

Torres *et al.* (2012) present a paper on the advances and limitations in the process of building a knowledge society, the development and use of ICTs and the role they play in higher education institutions. The parameters that international organizations such as Unesco and the UN have indicated

for the generation of a digital policy (based on the use of ICTs) to be implemented at the global and local levels, which would provide greater social equity, are taken up.

The authors conducted a case study at the Universidad Autónoma del Estado de Morelos, and as part of the results they found that within their institutional policies, strategies and guidelines that the same international organizations have proposed are followed, assuming the integration of ICTs into the curricula as a tool that allows the dissemination of knowledge and access to knowledge societies.

Valencia *et al.* (2015) delves into the urgency for HEIs to adapt to the technological needs of today's society. Although international organizations have had an impact on this, making incursions into the use of technologies to improve education and quality, this presents a series of challenges. This research exposes the complexity of defining public policies for the integration of ICTs at this educational level (Aguilar, 1992), which require the definition of realistic and useful agendas that can be evaluated after implementation. In this way, the strategies applied in these institutions seek a transformation and innovation of education, which develops in young university students a series of skills to face the knowledge societies.

The authors use a qualitative documentary methodology. The collection of information and the analysis culminate in the fact that educational policies and their elaboration require knowledge of the problems that arise in a given region in order to design and implement strategies that contribute to educational transformation, for which it is necessary to keep in mind the challenges that may be faced, such as the lack of resources or teacher training.

The work of Borrromeo (2019) aims to know the perceptions of teachers about the incorporation of ICT into their practice at the higher level, as well as the way in which policies impact it. Through a documentary review, the author gives an account of a state of knowledge about educational policies in ICT, by exposing that there is scarce information on the subject between 2011 and 2018, so he recommends reviewing the documents that have been discussed around this line of research to increase the information in this field.

The research by Torres *et al.* (2017) accounts for the perceptions of teachers, related to the experience in the process of appropriation and application of ICT to their academic activities at the graduate level within higher education institutions. Using a qualitative methodology, and based on Strauss and Corbin's grounded theory, the authors analyze the strategies implemented by the Mexican government as of the digital revolution, which expands global interconnections through the advances in telecommunications and tele-information that constitute network

societies (Castells, 1996). Thus, the elements of educational policy presented in the Education Sector Program 2013-2018 involve the interaction of public and private organizations to support transformations in the area of science and technology; one of these is the National Council of Humanities, Sciences and Technologies (Conahcyt, by its acronym in Spanish) that strengthens the research industry.

Through a digital consultation to coordinators and professors belonging to Conahcyt, it was found that it is common to observe an absence of comprehensive policies for the incorporation of technological networks; added to the above, the generation of evaluation committees is required for the application of ICTs to present significant changes, so it is necessary to carry out training for teachers. Focusing on a single institution, León and Tapia (2018) reflect on how the inclusion of ICT has been promoted at the National Autonomous University of Mexico. The researchers begin with an analysis of the global framework for the insertion of technologies in the educational system (Haddad, 2007; Unesco, 2011), and then study the contributions generated in the country, presenting the National Development Framework and the National Digital Strategy -whose objective is to achieve a digital Mexico that adopts and uses ICTs, maximizing their positive impact on economic, social, political and cultural branches.

Finally, they present the University Development Plan 2011-2015 to recognize the way in which technology has been integrated into training practices. With this documentary review, the authors conclude that ICTs potentiate the work of teachers and participation in knowledge societies, in addition to benefiting communities and fostering an increase in the quality of life, being a social good that should be brought closer to education and all population levels, especially those in vulnerable situations.

The work of Zempoalteca *et al.* (2018) takes up the lack of consolidation of ICT incorporation at the higher level. Their study aims to identify the factors that influence the insertion of technology in the classroom, taking into account the self-perception and the internal and external factors that favor it, that is, those that are of interest for the design and implementation of institutional policies so that these are oriented to meet the needs of students.

The authors used a quantitative methodology and applied a questionnaire to 334 teachers from five different educational institutions to learn about the way in which a holistic integration of ICTs is being implemented (Valverde, 2004). The results showed the need to promote constant and mandatory training to ensure the updating of teachers and the inclusion of the use of technological elements by all teachers from a pedagogical perspective that should be present in the action plans of each institution.

Finally, focused on the importance of the elaboration of "adequate" institutional plans, Borrromeo and Fernández (2019) analyze the educational policies in technological matters of the Universidad Veracruzana facing 2030. This project takes up that the strategies proposed are broadly related to the public agenda, considering actions that impact society and the general population carried out by an authority (Aguilar, 2010).

Through a qualitative and documentary type research, the authors point out that, at present, HEIs do not have fully defined guidelines for the incorporation of ICTs in the curriculum, a situation that triggers generic decision-making that impacts on a deficient service and leads to the creation of challenges related to the lack of equipment, training and poor connectivity. In conclusion, the authors state that higher education institutions should implement policies that propose high-impact objectives, goals and strategies related to the needs of the centers where they are developed, establishing spaces for discussion that allow a clearer vision of the problems in order to reach operational levels that contemplate lines of action in the short, medium and long term.

DISCUSSION OF RESULTS

As can be seen, we find extremely interesting research from the last decade focused on the analysis of policies oriented to the integration of ICT in the Mexican national education system at each of its levels. It should be emphasized that the works presented here are based on the guidelines proposed by international organizations on technologies and their importance for the development of innovative pedagogical processes. These documents take up different methodologies, approaches and techniques to account for the complexity involved in incorporating technologies into the different teaching processes, and the challenges that arise in this establishment. By way of summary, a summary of these documents is included in Table 1.

Between January 2012 and December 2021, the topic of educational policies related to ICT was analyzed from different perspectives and positions through which the authors sought to account for the process of constituting the public agenda, which is based on the recommendations issued by international organizations, the needs of the population to adapt the proposals and the technological infrastructure available to Mexican educational institutions.

In relation to the analysis carried out by these researchers on the educational policies proposed by the Mexican State for the insertion of ICTs at all educational levels, it is worth noting that most of them carried out deductive research, indicating how the international agenda is

interwoven with the national agenda to design strategies that have an impact on the Mexican territory.

Thus, the works made at the basic level stand out, where emphasis is placed on the implementation of programs such as Mi Compu.mx, Habilidades Digitales para Todos, Aprende.mx and the Estrategia Digital Nacional, whose objective is to provide the necessary resources to schools so that they can effectively use information and communication technologies. It is essential to point out that most of the authors suggest the need to pay attention to the context in which the proposed policies and programs are developed, in order to incorporate ICTs into pedagogical practices, to transcend from 1 to 1 programs, where only students and teachers are provided with technological infrastructure, and thus witness a truly innovative change in the education of students.

The challenges of each of the programs are related to the lack of training, the absence of digital skills development and the poor integration of technological resources in schools, so future policies should generate high-impact strategies to address the digital divide and the areas of improvement that have not been covered today.

Table 1. Studies on the educational policies proposed in the Mexican national educational system aimed at the integration of ICT

NIVEL EDUCATIVO	AUTORES	ESTADO DE LAS INSTITUCIONES	ENFOQUE	MÉTODO	TÉCNICA
Educación básica	Santiago y Sosa (2012)	Ciudad de México	Cualitativo	Documental	Revisión bibliohemerográfica
	Cano y Vaca (2013)	Veracruz	Cualitativo	Etnográfico	Entrevistas, cuestionarios y observaciones
	Herrera (2014)	Ciudad de México	Cualitativo	Análisis antropológico	Observaciones
	Beltrán <i>et al.</i> (2015)	San Luis Potosí	Cualitativo	Tipo fenomenológico	Entrevista semiestructurada
	Glasserman y Manzano (2016)	Sonora	Cuantitativo	Exploratorio descriptivo	Cuestionario
	García <i>et al.</i> (2015)	Morelos	Cualitativo	Tipo fenomenológico	Entrevistas
	Beltrán <i>et al.</i> (2017)	Nuevo León	Cuantitativo	Transversal	Encuesta
	Guzmán (2017)	Veracruz	Mixto	No específica	Cuestionario Entrevista
	Trejo (2019)	Guerrero	Cualitativo	Documental	Revisión bibliohemerográfica
	Dussel y Trujillo (2018)	Ciudad de México	Cualitativo	Comparativo	Revisión bibliohemerográfica
Educación media superior	Conejo <i>et al.</i> (2021)	Puebla	Cualitativo	Documental	Revisión bibliohemerográfica
	Navarrete <i>et al.</i> (2021)	Ciudad de México	Cualitativo	Comparativo	Revisión bibliohemerográfica
Educación superior	Aguilar (2016)	Ciudad de México	Cualitativo	Documental	Revisión bibliohemerográfica
	Torres <i>et al.</i> (2012)	Morelos	Cualitativo	Estudio de caso	Observaciones
	Valencia <i>et al.</i> (2015)	Guanajuato	Cualitativo	Documental	Revisión bibliohemerográfica
	Borromeo (2019)	San Luis Potosí	Cualitativo	Documental	Revisión bibliohemerográfica
	León y Tapia (2018)	Ciudad de México	Cualitativo	Documental	Revisión bibliohemerográfica
	Zempalteca <i>et al.</i> (2018)	Ciudad de México	Cuantitativo	No específica	Cuestionario
	Borromeo y Fernández (2019)	Guerrero	Cualitativo	Documental	Revisión bibliohemerográfica
Torres <i>et al.</i> (2017)	Morelos	Cualitativo	No específica	Cuestionario	

A FINAL REFLECTION

Since their emergence, ICTs have been presented as a tool for innovating and improving teaching processes and strategies. They show their potential to modify the roles of teachers and students, directing their action towards the quality of training. For this reason, it is essential to integrate them into educational policies in order to achieve democratic ways of inclusion, equity and quality that meet the proposals of the international agenda and the priority needs of the national context.

From the analysis of the research on this topic, it is possible to point out the articulation between the policies generated at national and international level that guide the design and development of programs that allow the insertion of ICT in innovative academic projects, seeking to use them in and for the training of students accessing the national education system.

With the passage of time, research has shown the establishment of a series of programs aimed at equipping school institutions, which recover the 1-to-1 design to provide students and teachers with the necessary infrastructure to achieve the objectives set out in the projects. However, the authors have emphasized the different challenges faced and that should be addressed as areas of opportunity, which are related to professional training, the development of digital skills and knowledge of the different contexts in which these policies are implemented.

Several works recovered in this article agree that it is necessary to carry out a greater number of studies that analyze educational policies in relation to ICTs. It should be noted that since the covid-19 pandemic, studies on this topic have increased. In this sense, we consider it essential to continue with the development of projects, research and reflections that integrate these topics in order to know the progress and implementation of policies aimed at the incorporation of ICT, how technology has been included in the teaching-learning processes, the scope they have had and the proposals to improve their insertion in the national educational system.

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