Positive and negative impacts of digital technologies on Education and teacher role

Impactos positivos e negativos das tecnologias na Educação e na função do professor

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Abstract: The aim of this study is to analyze the impacts digital technologies have had on teachers' education and life through a systematic literature review. In order to achieve the proposed objective, a survey of academic production (articles and dissertations) was conducted in Scielo, Scopus and Catalog of Theses and Dissertations databases. After filter inclusion and exclusion criteria detailed in the methodology were applied, six studies that comprise the basis for this article were identified. There are several positive impacts with the use of new technologies in education with regard to methodologies, interaction, and in the inclusion of digital native students in the teaching and learning process; however, there are mainly physical and operational barriers that hinder the implementation of technologies in education.

Keywords: Digital technologies. Positive impacts. Negative impacts. Education. Teacher.

Resumo- O objetivo deste estudo é analisar os impactos das tecnologias digitais na formação e na vida do professor por meio de uma Revisão Sistemática da Literatura. Para atingir o objetivo proposto, foi realizada uma pesquisa de trabalhos acadêmicos (artigos e dissertações) nas bases de dados: Scielo, Scopus e Catálogo de Teses e Dissertações. Após critérios de inclusão e exclusão de filtros detalhados na metodologia, foram identificados seis estudos que serviram de base para este artigo. São muitos os impactos positivos no uso de novas tecnologias na educação no que diz respeito às metodologias, interação, na inclusão de alunos nativos digitais no processo de ensino e aprendizagem; no entanto, existem principalmente barreiras físicas e operacionais que dificultam a implementação de tecnologias na educação.

Palavras-chave: Tecnologias digitais. Impactos positivos. Impactos negativos. Educação. Professor.

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Introduction

The advancement of technologies has brought many changes to the modern world and to life in society. The modifications have occurred in all areas of knowledge and of job. They have overcome the obstacles of time and distance and have made actions and communication faster and more interactive.

From the 70's, digital technologies were emerging and integrating into the life of modern man. People were born in this decade and in subsequent decades are digital immigrants, because they have come of an analogical era and they were adapting to the technologies emerged at the end of the 20th century. By contrast, those people were born after the 2000's are digital natives because they were born in the digital age and they were introduce to the world of technology since the childhood (PRENSKY, 2012). In this way two generations coexist and contribute to the insertion and acceptance of the repercussions that new technologies have caused in people's daily lives.

For this reason, there are so many discussions about the harms and benefits of Information and Communication Technologies (ICT) in modern life. These studies serve to emphasize the benefits and detect the failures and losses caused for the use of ICT, as well as they order to improve and update these technologies, whose functions are becoming more and more advanced.

In this context, transformations on education have occurred because of digital technologies. Because of this, education has gotten new perspectives and different systematizations, it has modified the methodologies and teaching-learning process. So teachers, mostly digital immigrants, are still making this transition from the planning of a fully analog class, to gradually inserting technological elements and, perhaps, transforming the school environment into a highly technological one.

Considering this scenery the objective of this study is to analyze the impacts digital technologies have had on the education and life of the teacher through a Systematic Literature Review (SLR). An analysis has made of 6 academic papers (articles and dissertations) from the Scielo, Scopus and Catalog of Theses & Dissertations databases.

This article structures as follow way: introduction, in which this space has inserted. Followed by theoretical framework and its subdivisions; then the methodology applied for the construction of the research is explained. The results and discussion have presented and, finally, the final considerations and the possibilities of future works.

The evolution of digital technologies

The Internet is the main generator of changes caused by digital technologies and it brings with it a systematic and overwhelming evolution. Because it provides a range of possibilities for creating, replacing and renewing what can be do through it.

At first, the idea of a communication system that survived a conflict arose during the Cold War between the power struggle between the United States and the Soviet Union. The creation of a network, composed of computers that communicated with each other, in which all nodes or interceptions had the same importance, thus, the lack of one of them would not affect traffic. In this process, the data has divided into packages that could follow different routes but they would reach the same end. Starting 1960, the concepts were improved and several American institutions were research and putting into practice what would be the prototype of the Internet. There were so many transformations and innovations, in 1992 the Internet Society was created with more than one million servers. (MILLÁN, 1999)

Since its creation, the Internet has gone through several phases and the way of propagating it has also changed, thus, in addition to the means of cable communication, there is wireless communication with its various standards that have air as an element that transmits information. In this modality, cell phone networks, data transmission via satellite or radio frequency can be highlighted, among other technologies such as: Infra-red (infrared - IR), Bluetooth, Wireless LAN (Wireless Local Area Network) and Wi- Max. (SACCOL; REINHARD, 2007)

In this context, some technologies gained emphasis and became successful at some point in this recent history. As, for example, games, they are very prestigious and cover all generations of the Internet, they are popular with teenagers, however, a game can have new configurations when it has characteristics of a serious game.

Serious games have an important role in fields such as entertainment, health, security (army) and education. Entertainment is its main objective and wins millions of fans every year. This attraction happens, most of the time, to the ease of access and understanding, and fun they provide, in addition to the interactivity between the players and sometimes with the space they are inserted. In health, they have other functions for example treat some diseases, such as depression, or even games directed to physiotherapy and reconstruction of mental processes. In addition, these games have long used in security, especially by the military, either to improve the image of the population or to recruit young people in their training. As well in education, they can be a powerful ally, for both the teacher and the student, to improve the teaching and learning process. (LAAMARTI, 2014)

Robotics is another sector of technology that has evolved a lot in many areas of knowledge. It causes great furor with each new application and speculation about how much human functions should be delegate to robots. Then, until now, it has observed that robotic engineering can be useful in various sectors. Such as sea and space exploration; in health, even in completely autonomous surgeries performed by robots; cars do not need drivers to drive them, among other functions has been researched to integrate machines into human life and they can adapt to the way of life of humans. (RUS, 2018)

In the same way that technologies mentioned above is the Internet of Things (IoT), it obtains more and more space in homes, offices, schools, countryside, industries or any other place that has interaction between man and machine, and connection with the Internet. This situation brings new perspectives on how technologies interact and the impacts of this partnership, as well as IoT is related to other technologies already mentioned in this article, such as robotics and the development of the 5G (it promises to give more autonomy, speed and applications to technologies). (BAUER, PATEL, VIEIRA, 2014)

This way, artificial intelligence, the main vector of any technological apparatus, causes concerns and expectations about the future. Because it already has not reached all of its possibilities and capacities. That is why great caution is need when proposing new technological interventions for life so that man and machine can live harmoniously. As well as, it is necessary to think and adopt laws to guarantee the security of ethics in conducting research and

implementing new technological functions so that man is protect from his own creation and ambition.

Connection among new technologies, education and teacher

Technological evolution has gotten with it many possibilities in all areas and it can be notice in everyday life. Either people wake up and the coffee is ready because the coffee maker has been programmed, or in a surgery has done with the help of robotics or even a university course take can be done to distance, with support of a computer or a mobile device with Internet access.

At this conjuncture, it is important to accentuate the insertion of technological researches in education, whose structure and methodology has rethought and has directed to an increasingly digital structure. However, the implementation of information communication technologies in education has been still very slowly and the biggest insertions have taken place in online or hybrid courses.

It is indispensable invest in technological devices in the school environment, so that the teacher can use them in his methodologies and that students have access to them. Information Communication Technologies are important resources can be use in education, since students are digital natives and have a new way of learning, realizing and interacting in the world (PRENSKY, 2012). In addition, teachers need to have training in the use of ICT and learn to introduce them into the classroom. For, there are schools with very interesting equipment and can be used in various ways in all areas of knowledge, however, few teachers use them because they do not know how to do it.

This way, Chiossi and Costa (2018) corroborates the ideas presented and highlights that most teachers need to be prepared for the use of ICT effectively and, consequently, integrate them into teaching practice. For this, research, training and experimentation are required, so that the daily digital actions taken by teachers and students have applied to integrate technologies in pedagogical practice.

Under this bias, the European document Digcomp is a resource that has used to assess the digital competences of the citizens and claims that the teacher needs to be prepared with these competences in both personal and professional

life. For students, they need to demonstrate their digital competence and make them rethink how they use digital technologies. (DIGICOMPEDU, 2018)

In addition to the digital competences inherent to ordinary people, as a facilitator of learning, the educator needs to have specific competences to their role as a teacher (DIGICOMPEDU, 2018). Beraldo, (2016) points out the way in which teaching and learning using technological devices requires a personal and cultural change of teachers who need to rethink the way in which the teaching and learning process takes place. Besides, they can make the classroom an open, dialogical space and emancipatory space. Then, students get involved and feel part of the process and not just a listener or a function operator.

Then, it is necessary to think about impacts ICT has caused on education and, therefore, on the function of the teacher, it seeks to understand how the process of active teaching-learning methodologies has happened and what are consequences? Whether positive, either negative, one can infer from this movement.

Methodology

The research methodology describes the procedures and techniques that have used to analyze the facts from the empirical prism, and one of the most important elements of this description is the technical procedures that have applied.

Planning

The research problem, aims and the databases for state-of-the-art research and the criteria for inclusion and exclusion of scientific works for systematic review have defined in the planning phase. For this reason, two databases have been chosen for the selection of articles: Scopus and Scielo and a base: Catalog of Theses and Dissertations - CAPES for the selection of Master thesis. Search descriptors have been defined as: (("new technologies" OR "new Technologies") AND (education) AND (professor OR teacher OR professor)). The filter criteria identified as follows: Scopus and Scielo - works in Portuguese and English, published between 2011 and 2020; Catalog of Theses and Dissertations - CAPES – Dissertations in Portuguese, published between 2016 and 2017, education as an area of knowledge and evaluation. After these filters, the results have shown in the tables below.

Table 1 - Number of articles have found per database after all selection criteria

Database	Number of articles
Scopus	5
Scielo	12

Source: Authors

Table 2 - Number of dissertations per database after all selection criteria

Database	Number of Dissertations
Catalog of Theses and Dissertations - CAPES	18

Source: Authors

From on, the inclusion and exclusion criteria for articles and dissertations to this study have stipulated, according to Chart 3.

Table 3 - Inclusion and exclusion criteria

Inclusion criteria	- Complete studies - Studies according to scope - Studies between 2014 and 2020 - Studies that include the words technology and / or education and / or teacher in the title or abstract - Studies with impacts of new technologies in education - Studies in Portuguese
Exclusion criteria	- Studies do not available; - Studies with specific technologies; - Duplicate studies, - Incomplete studies.

Source: Authors

From the inclusion and exclusion criteria, a selection of 6 articles have been made to confront concepts and expose discussions and results.

Results and discussion

The connection between digital technologies and education is quite recent, but very promising. Because it allows for greater interaction between teacher and student and offers the possibility of using technologies already available to people in the school environment as a resource propels the teaching and learning process.

Chiossi e Costa (2018) states students can learn better with the use of digital technologies as a methodology in the classroom and they allow content or text to be presented in different ways, such as: videos, images, podcasts, blogs, and others. In this way, teachers and students stay integrated through a mediation of knowledge.

The use of digital technologies as a pedagogical resource can motivate the student to learn the content and be interested in applied classes. However, its use does not guarantee the success of effective learning, everything depends on the way it is inserted into the process. Since its intention as a resource is to improve teaching and learning, bringing to the student new possibilities of using digital technologies. (AZEVEDO; JÚNIOR; DARÓZ; 2014)

This way, it is interesting to emphasize the training of teachers for the insertion of digital technologies as a teaching methodology in their daily work. For this, maintainers and teachers need to invest in time, money and technological equipment. Constant updates, with structures in the school itself and the teacher can share knowledge with his colleagues from all areas, as well as, establish partnerships with these colleagues, so they can introduce interdisciplinary activities through digital technologies.

Almeida (2018) reports people are excited about the possibilities that digital technologies offer in their daily lives, however in education there are many teachers reluctant and hesitant to make this transition between analog teaching and digital age. Brizola (2017) complements the idea by stating that the teacher needs to reinvent himself and ignore the old way of teaching. Contentist

and individualistic education which places the teacher as the holder of knowledge and the students as recipients, must be overcome by a more digital and collaborative education.

Impacts of the use of digital technologies on education and the role of teachers

It realizes through the analyzed authors that there are many impacts caused by new technologies in education, both positive and negative. Better illustrate the ideas defended by these survey takers, the following is a table with the works selected for Systematic Review and the main impacts mentioned in the studies, divided into positive and negative.

Table 4 - Positive and negative impacts regarding the use of digital technologies (DT) in the classroom

Arthors	Positive impacts	Negative impacts
Almeida (2018)	- DT, namely the internet, allowed the opening of educational cyberspaces and new workspaces for teachers and students. - Emergence of innovative teachers.	-It is not determined whether pedagogical activities are mediated by the digital element; -Teacher needs to use his own technological resources; -Some teachers' beliefs and perceptions against the use of DT; - Few training for teachers; -Lack of technological resources offered by government agencies or by school; - Little time to prepare classes.
Azevedo (2014)	-Distribution of computers for teachers and students; -Variety of resources available to the teacher; -It allows the student to discover new knowledge; -It allows the teacher an environment conducive to interaction with the student; -Technological resources can function as a motivational factor for learning; -It perfects the teaching and	- It does not guarantee, by itself, the improvement of teaching quality or the relationship between teacher and student; -Teachers do not feel prepared to take advantage of technologies digital as a pedagogical resource; -Impotence of teachers in the face of students' seduction to digital technologies.

	learning process; -Enables the student to live in the digital age; -Autonomy in the search for knowledge.	
Brizola (2017)	- Analyze critically the data present on the internet and get the best out of it; -Pedagogical practices with more open activities, collective and collaborative work; -Digital literacy. -Possibility of proposing ways to bring education closer to the demands of the new generation of students; - Develop certain competences that allow the teacher to get closer to the way of learning and interacting with the information of this generation.	-Technologies alone are not a guarantee of alteration, reframing or even change in your pedagogical practice. -Teachers and the educational system almost entirely still based on an analog narrative; -There are few teaching activities mediated by technologies implemented through official government programs.
Chiossi (2018)	-Numerous resources can bring benefits to the teaching-learning process; -Multiple possibilities for pedagogical work using DT; -Teachers can manage several spaces, mixing moments of classroom activities and moments in virtual environments; -Possibility of overcoming knowledge fragmentation; -Stimulating digital literacy; -The identification of students with the contents has facilitated.	-Most teachers were not prepared for the use of digital technologies; -The use of digital technologies as an end in itself is not capable of transforming teaching practices; -Resistance of some teachers to use of DT; -Schools do not have the pedagogical proposal for the use of DT incorporated into the school routine; -Lack of teacher training for new methodologies for working with DT.
Oliveira (2014)	-Teacher and student can correspond through DT; -Formative assessment; -Self-learning; -It reduces distances and brings people together; - Collaborative learning; -Enables the exchange of experiences;	-ICT-mediated teaching can cause communication and understanding errors; -The use of sophisticated technologies is not sufficient to ensure quality learning.

	-Interactionism and interactivity.	
Vieira (2016)	-Facilitates the dissemination of ideas and information; -Present, to the students, learning tasks that enable them to face the challenges inside and outside the classroom; -More dynamic learning that includes theory and practice; -Process of methodological renewal of knowledge production; -Social interaction between school, teacher and student; -They favor interaction and socialization of thought; -Technologies can stimulate and develop students' autonomy; -Engage in educational practices that can, at the same time, place students in the contemporary world, as well as develop citizen autonomy; -Perform transdisciplinary relationships with other areas of knowledge; -Renew the training of teachers.	-If ICTs are not used well as a pedagogical resource that develops cognitive skills, they will be useless; -Difficult to insert ICT through outdated curricula; • Knowledge and most curricula still promote fragmentation.

Source: Authorship by reading selected articles for SLR

The table above resulting from the study shows there are more positive than negative impacts regarding the use of digital technologies in education as a methodology. However, there are still some obstacles preventing effective technologies implementation.

Positive impacts, in general, refer to innovation in methodologies, when they allow teachers to use them in their classes, either face to face or online. In interaction between the stakeholders involved in the teaching and learning process. In ease in planning interdisciplinary practices. In the opportunity to train teachers in technologies.

With regard to negative impacts, the management aspects of these technologies stand out, such as, for example, it is not being sure of real learning

when using ICT. The lack of training for many teachers is still the cause of the non-use of ICT; the lack of equipment in schools and the teacher has to use his own technological devices several times.

Although it is clear that there is a lot to do for integrate new technologies into education, the importance of the teacher and the surrounding stakeholders is highlight in the teaching and learning process. So, the role of teacher is, little by little, trained the students to use new technologies to acquire scientific knowledge, as well as to understand they are sociohistorical-ideological being able to influence thoughts, create new things and share with their peers. (AZEVEDO; JÚNIOR; DARÓZ; 2014)

Furthermore, this work reflects how important the teacher is in creating possibilities for the inclusion of ICT and his role as a mediator of knowledge and the link between the student and the opportunities for access to scientific knowledge.

Although this work does not focus on the Pandemic COVID-19 initiated in the beginning of 2020, it is worth mentioning here the rupture in the insertion of ICTs for the realization of distance-learning pedagogical activities. Pandemic has brought the reality of social distance and has transformed cyberspace into the classroom, and suddenly education managers and teachers had to adapt the communication channels and the methodologies by which the contents they taught. (MARTINS; ALMEIDA, 2021)

From this point on, education has passed irreversible transformations, this has done digital education is happening and it has continued to happen in the future. Success of a quality digital education depends how people improve it, have experience it, correct it, think it and systematize it for face-to-face return and with the implementation of blended learning in many realities (TAVARES; SOUZA, 2021).

The importance of the teacher in the implementation of new technologies as a methodology in the classroom

In the context of education with technological inclusion, the role of the teacher has stood out, since he is the stakeholder who makes the transition between the analog and digital world, allowing greater interaction with the students as they connect to the environment and the way whose they live.

In Almeida (2018), the term innovate teachers is cited and the need for the involvement and effort of all stakeholders involved in the educational process to overcome the barriers that still exist regarding the implementation of ICT is highlighted.

> [...] to analyze what needs to be done and what changes need to be considered is to analyze the relational issue between school and society, its members, and, mainly, how changes and the social context change the way of thinking and culture of individuals, which implies changes in the school sector taking into account globalization and technology. (VIEIRA, 2016)

Vieira (2018) also reports that it is necessary to rethink the pedagogical practices and see the student as a citizen, bearer of rights and duties, inserted in a digital world with which he interacts, this individual needs that theory and practice are related in the environment school, taking into account their condition as digital natives.

Corroborating this thought Brizola (2017) states the teacher needs to know of the most diverse ways of interacting with the terabytes of information that are made available on the network every day so that he can guide his student to critically analyze the data present on the internet and get the best out of it. The teacher understands that student carries out its activities educational, social or family through the interaction with multimedia. The teacher of the digital generation in order to better dialogue with his students, has the possibility to start thinking and acting from digital ideas, which means to say that this teacher needs to leave behind the "old" way as he taught, with centered practices in himself, as "know everything", passive students and individual and predetermined works. Now, he starts to insert more open activities in their pedagogical practices, centered on student participation, collective and collaborative works, with a view to the production of knowledge, through of the different types of technology existing.

Final considerations

New technologies are transforming the educational environment and it is necessary to be attentive and prepared to act in the face of this situation. Thus, the present article has shown, through a Systematic Literature Review, the positive and negative impacts that ICT caused on education and the role of the teacher.

In this way, as positive aspects we can mention the variability of methodologies in the classroom, the various possibilities of communication between teacher and student and digital inclusion. However, there is still much to be done, and among the negative aspects can be highlighted the lack of teacher training and the lack of equipment and devices available in schools,

Through the studies analyzed, it has established that both impacts have described with great expressiveness and their identification is important to know what it has already done, what is being do and what still needs to be done for the integration of ICT to the education to happen in an effective, inclusive and democratic way.

This work contributed to thinking about this theme and reflecting on the part of the stakeholders involved in the school environment. However, it is necessary to continue discussions and produce new works that may include the opinions of teachers, students and management; perhaps designing possibilities for new methodologies and contributing to digital inclusion.

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