# Tic in Secondary School Teachers: A Systematic Review

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**Abstracts:** The objective of this research is to analyze the scientific contributions of articles referring to the use of ICTs in public management secondary education teachers in various countries of the world, between the years 2017 and 2021. The method used was a systematic review with descriptive level, using the guide of the PRISMA statement, using the search in the online databases of Scopus, SciELO, EBSCO and ERIC applying the descriptors: "ICTS in pandemic", "ICTS in teachers", "ICTS in secondary schools" in turn combining between them the use of the booleans AND and finally OR, in English and Spanish. The review took into account online education, virtual innovations, technological resources and digital skills. The results were the analysis of 21 scientific articles, of which 4 were from Scopus, 12 were from SciELO, 594 from EBSCO and 160 from ERIC. It was concluded that the development of ICT is related to the positive predisposition of teachers to include digital tools and resources in the teaching-learning process of students, for online training, putting into practice digital skills, which are very important. scarce and achieve virtual innovations.

**Keywords:** Technologies, Communication, Information, Teachers.

## 1. INTRODUCTION

The proceeding case due to the coronavirus pandemic disease highlighted the need for all teachers and students to have digital skills. In most nations, teachers had low digital skills and experience with online teaching and learning. The pandemic disease lockdown highlighted the urgent need for all teachers to be able to effectively use digital technologies for online education and learning (Gonzales, 2021; López, et al., 2021). However, before the outbreak of the pandemic, more than 60% of teachers in the European Union did not feel well prepared to use digital technologies for education. Even when teachers felt safe using digital technologies for simple tasks, they felt less confident in more complicated digital tasks such as coding, programming or robotics. In addition, only 53% of teachers allowed their students to frequently or constantly use digital technologies for projects or assignments (Perifanou et al., 2021).

The 2019 Education and Learning Survey (TALIS) revealed that of the 260,000 teachers surveyed, only 53% said they allow their students to use Information and Communication Technologies to do classwork and projects (OECD, 2019). In certain territories of Latin America and the Caribbean, more than 70% of teachers allow their students to use ICT often, whereas, in other territories, one in 5 teachers never allows students to use ICT for work in class (OECD, 2020). Teachers were concerned about the loss of learning time and most had a deep desire to contribute to their students' learning (Hordatt & Haynes, 2021).

The work of the multiple tools provided by information technology and teaching is synonymous with the development of digital skills for quality assurance in the educational system (Vaillant et al., 2020). The 21st century has been classified as the society of virtual understanding, since they directly affect the performance and mastery of the multiple tools provided by information and communication technologies, which contribute to the generation of important changes in various spheres. of the society of understanding (Martínez et al., 2018). The development of information and communication technology competencies lead to a transforming role within the education and learning process in a didactic manner, based on reasoning,

Technological skills have turned the educational system around and have created a variety of advantages such as attending virtual classrooms, which support access to content without space and time restrictions, ease of collaborative work, raising levels of motivation and simplification of tasks through assisted platforms, but they also have the possibility of bringing with them different disadvantages such as the fact that teachers are not sufficiently trained in the performance of didactic tools, as well as familiarization with the multiple educational software that have the possibility of occupying within the secondary and pre-eminent education system,or that students do not take the development of academic occupations with due seriousness to the advantage of the ease with which information can be acquired in virtual educational networks, which need to be validated and certified for approval by the scientific society (López et al.,2017).

At present, the use of technology in teaching has increased a lot and is of great importance to help students in learning education, according to the United Nations Educational, Scientific and Cultural Organization. (UNESCO, 2013), ensure that in Latin America and the Caribbean they have assumed a pioneering role in recent years and have the fastest growth in technology integration and connectivity rates in the world (Inter-American Development Bank, 2012). reaffirm global and equitable entry. Within the framework of teaching, technology is essential to not become outdated, but rather to continue generating changes at the same pace as technology; According to the authors (Sevilla, Tarasow and Luna).

Compared to other territories of Ecuador, for this reason, everything possible has been done to improve technology (Naverrete & Mendieta, 2018) say about ICT in the 21st century The Ecuadorian regime has done everything possible to make better use of the technology in the classroom, but there is a long way to go to implement the technologies in educational institutions, so the regime must be prioritized at the time of resource allocation according to the regions with the greatest need in order to make a fair teaching that reduces the differences and contributes to the process of human education for life and social transformation (Tamay-Chimborazo et al., 2020).

Flexible teaching, so that it does not become a discriminatory choice, should be compatible with socio-constructivist pedagogical approaches such as cooperative learning, learning societies, networked learning or peer learning, supporting students bearing in mind their properties. individuals and the environment in which they develop. The use of digital technologies in classrooms is still far from producing a systemic change, rather "islands of innovation" are promoted, based on the work of excellent teachers who carry out innovation in their teaching practices using Information Technology. Information and Communication (ICT) without mediating a formal process of persistent learning. By the way.

The objective of this research is to analyze the scientific contributions of articles referring to the use of ICTs in public management secondary education teachers in various countries of the world, between the years 2017 and 2021.

## 2. MATERIEL AND METHODS

The research carried out was a descriptive systematic review on articles of a scientific nature, which began from an exploration of scientific literature from 2017 to 2021.

The electronic searches were carried out between August 6 and September 20, 2021. In different online databases (Scopus, EBSCO, SciELO and ERIC) using the following descriptors in the searches in Spanish and English: "ICTS in pandemic", "ICTS in teachers", "ICTS in secondary schools", in turn combining the use of the booleans AND and finally OR.

The exclusion criteria were: duplicity, not being scientific articles (lectures, reviews, publications in newspapers, doctoral or magisterial theses, testimonials, etc.) and not corresponding to the topic of interest. For the inclusion criteria, the name of the title, abstract, methodology, as participants, undergraduate higher education students from various countries of the last seven years and results were considered; of the articles retrieved with the search strategies, in addition the articles found were exhaustively reviewed by blind peers.

For the search strategy, the PRISMA Declaration (Preferred Reporting Items for Systematic Reviews and Meta Analyzes) was considered as a methodology. (Varón Castañeda, 2017;Yepes-Nuñez et al., 2021). All studies that had the potential to respond to the proposed objective were collected, full text and open access were searched. The flow of the systematic review for the study selection process was carried out, then they were classified in a table, using the Mendeley manager. (Gallegos et al., 2017).

## 3. RESULTS

In the flowchart, 770 registered in the online databases were found, of which 447 were excluded due to duplication; leaving 323, then 158 were excluded for not being a scientific article; Remaining 187 of this new total, 166 were excluded because they did not correspond to the topic of interest; to then remain 21 articles, the same ones that are analyzed in the present study.

***Figure 1***

*Systematic review flowchart*

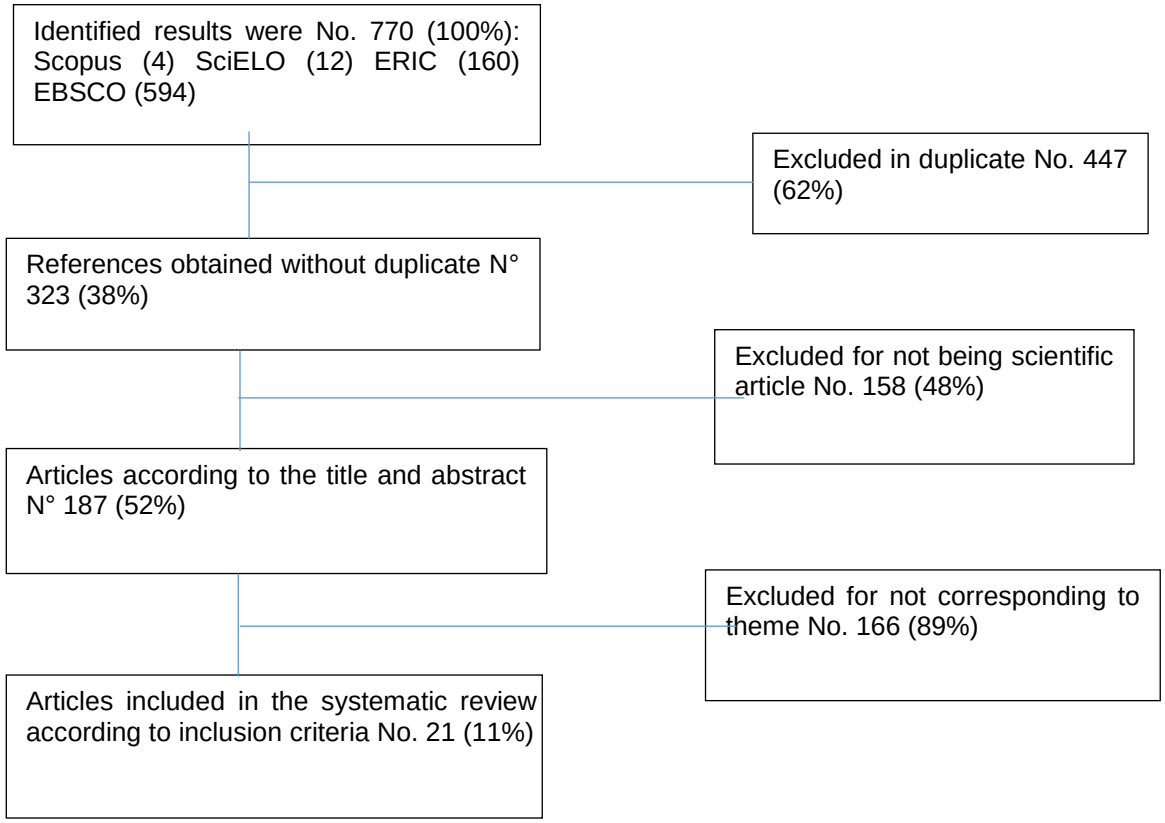


**Table 1** *Articles analyzed*

| No | Author/Year | Country | Type of study | Sample | Indexing | contributions |
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| 1 | (Dele-Ajay, et al.,2021) | Nigeria | quantitative, descriptive | 340 teachers | Scopus | The study shows that teachers' concerns about the use of ICT in the classroom are not taken into account.Addressing these concerns should facilitate the adoption and integration of ICT in classrooms, thus helping teachers and students reap the many benefits of learning with technology. |
| 2 | (Hidson, 2021) | England | Qualitative, multiple case study | 9 teachers | ebsco | The results of this analysis suggest that teachers need to be proactive in developing their levels of digital competence to ensure their ability to respond correctly to changes in the pedagogical requirements of their familiar functionalities. |

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| 3 | (Flores-Tena, et al., 2021) | Costa Rica | Quantitative, non-experimental, descriptive and correlational. | 100 secondary school teachers | Scopus | The little or no use of ICT in the classroom isdue to the lack of digital competence on the part of the teaching staff. Their training is important to improve their educational task. Teachers who use digital competence through ICT at some point or never may be out of fear that students will learn more about digital competence. |
| 4 | (Kundu & Bej, 2021) | india | mixed approach | 200 high school teachers | ebsco | It is difficult for secondary school teachers in India to take classes online, because many of their students do not have devices, there is no Internet network and there is no encouragement from the educational authorities. Teachers are struggling to keep the learning candle burning in this new normal. |
| 5 | (Prieto-Ballester, et al., 2021) | Spain | quantitative, descriptive | 177 teachers | ebsco | It is essential that teachers receive continuous training in digital competence.There is clearly a gap between reasoning and the degree of use of ICT by teachers. Teachers remain sufficiently trained in ICT, however, they require tools and motivation to carry out their knowledge. |
| 6 | (Dolighan & Owen, 2021) | canada ontario | Quantitative, non-experimental correlational | 432 high school teachers | ebco | Teachers need resources and training for their online instruction, with virtual tech support and ongoing support. Continuing education should last a lifetime, providing teachers with the means to design and deliver meaningful and engaging learning experiences for students in an online learning environment. |
| 7 | (Aguilar-Cruz & Medina, 2021) | Colombia | Qualitative, narrative research | Professors in practice, Colombian Amazon University | ERIC | English teachers before graduating perceive that online education technology includes problems of connectivity and awareness for learning. On the other hand, technology has turned out to be an important element in the teaching process, allowing them to develop educational activities in 2020. |
| 8 | (Sandoval, 2020) | Colombia | mixed approach | 25 teachers | ERIC | Teachers had to begin a literacy process in the operation of ICT instruments, as didactic tactics in the training process of their students. The objective of integrating ICT to improve the educational process by encouraging educators through training their skills. |
| 9 | (Ait & Elfatihi, 2020) | Morocco | mixed approach | 80 high school teachers | ERIC | The results of the present are evidencedanalysis together with a sequence of previous studies, most of the Moroccan teachers frequently integrate ICT in the classroom in an eventual way, in which a quite limited number of teachers add it in their teaching practices on a daily basis. |
| 10 | Spoel, et al., 2019) | Holland | mixed approach | 200 teachers | ERIC | The analysis aims to match the expectations and experiences of teachers about online education. The use of ICT tools positively influences the perception of teachers |

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| | | | | | | regarding the adoption of technology in teaching that will have a powerful influence when using computers in educational practice for women than for men. |
| 11 | (Ribeiro & Capobianco, 2019) | Brazil | Quantitative, correlational descriptive | 25 teachers | ebsco | It should be noted that, in public institutions, technological resources are provided to teachers for their pedagogical work. The expansion in the use of virtual environments, as well as the relationships between the different tools that interact with these systems, tend to favor innovative experiences for both students and teachers. |
| 12 | (C. New, 2019) | Philippines | quantitative, descriptive | 150 teachers | Scopus | In this study it was found that the link between teachers' attitudes towards technology and their technology integration practices exist. However, only their perception of operational ease was significantly related to the use of technology as a teaching and learning tool as indicators of their technology integration practices. |
| 13 | (Buabeng-Andoh, 2019) | Ghana | mixed approach | 376 secondary teachers | ERIC | The effectiveness of ICT in student learning depends entirely on the teacher, its use will bring new, stimulating and satisfying learning experiences for educators and students. Teacher training and skills are crucial to integrate ICT in schools and classrooms. |
| 14 | (Singhavi & Basargekar, 2019) | India | mixed approach | 515 teachers | ebsco | There is a logistical delay in the English study centers, if certain obstacles are eliminated, such as the lack of knowledge of the teaching staff, the lack of pedagogical models and the lack of flexibility in the application of ICT, the willingness of teachers to use ICT in the classroom. |
| 15 | (Khaliq & Ahmad, 2018) | Pakistan | descriptive quantitative | 175 high school teachers | ERIC | ICTs are of great importance for the effective professional development of secondary school teachers in the public sector, since in the current context they bring transformation and innovation in education. In essence, ICTs are a potential vehicle to accelerate, encourage, promote, facilitate and support independent learning. |
| 16 | (Beneyto-Seoane &, Collet-Sabe,2018) | Barcelona, Spain | qualitative, phenomenological | 4 primary and 3 secondary teachers | ebsco | Teachers show digital competence outside of school, they do not use it in the training of students, because it is an imposed technology. A change is necessary in the conception and practices of teacher training, which considers, values and enhances their technological skills continuously and gradually. |
| 17 | (Fernandez, et al., 2018) | Spain | quantitative, correlational | 1,433 teachers from 80 primary and secondary | ebsco | The ICT skills of teachers in Madrid correspond to a medium-low degree, that is, the classroom tactics that teachers have in the implementation of these resources have not yet been developed as didactic methods in the development of digital competence in |

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| | | | | schools | | their students. |
| 18 | (Left, et al., 2017) | Mexico | mixed approach | 100 high school teachers | ERIC | Principal's value the school's efforts to provide technologies, pointing out that foreign language teachers do not like to use them to improve their teaching. They raise questions of how to help maximize the resources available in their learning environments. |
| 19 | (Dudaite & Prakapas,2017) | Lithuania | Quantitative | | ERIC | The knowledge of teachers in interactive management in classes is favorable. Teachers stand out in response to the audience. They allow self-assessment and student evaluation. The student learns from her mistakes. The response of the activities is differentiated. The program allows making amends based on failures. |
| 20 | (Maharaj-Sharma & Sharma, 2017) | Trinidad and Tobago | mixed approach | 12 teachers and 100 students | ERIC | ICT tools support further training if they are taught effectively in science. They have a predominance of involving the student and allowing them new routes to culture. But it is necessary to achieve a harmonious management in the use of virtual tools in collaborative work. The lack of new ICT proposals in a science environment will discourage a scientific environment. |
| 21 | Gil-Flores, et al., 2017) | Spain | quasi-experimental quantitative | 3,339 teachers from 192 educational centers | Scopus | In order for the changes to be possible in the teaching staff, educational leadership policies are required that help the development of teachers' competencies in ICT issues and create a collaborative student culture that supports the use of technologies. |

## 4. DISCUSSIONS

The literature shows that, despite the large global investment in digital innovations, most of them are not used in the classroom, because teachers' concerns about their integration in classes are not addressed (Dele-Ajay et al., 2021). Teaching innovation is essential as part of their professional competence. It is possible to continue in this analysis to check whether the teacher, in addition to using new technologies in the classroom, does so with peers and how often he takes refresher courses in ICT (Flores-Tena et al., 2021).

The current situation forced teachers to train in ICT, as strategies in the training process of their students. It is essential to stimulate educators through training in technological skills. There must be provisions on virtual teaching that include ICT in teacher professional development (Sandoval, 2020). The purpose of this analysis is to find out about the use of ICT by Moroccan teachers. Most teachers integrate ICT in the classroom eventually, a fairly limited number of teachers add it to their daily teaching practices (Ait & Elfatihi, 2020).

Despite using technological resources in the classroom, teachers reported that it is not enough.The use of an online platform was a great progress for teaching practice. The use of virtual environments by students and teachers is taking place at a remarkable rate (Ribeiro & Capobianco, 2019). The most relevant obstacles according to the teachers are external, such as the low Internet signal, the lack of PCs and computer programs, the lack of

time and the lack of adequate pedagogical models. Most of the teachers are convinced of the value of ICT in education, and they also trust to apply them (Singhavi and Basargekar, 2019).

TheThe effectiveness of ICT in student learning depends on the teacher.It is necessarytrain teachers to help students use ICT in the classroom.positive perceptionthat teachers have about ICT is the desire to integrate it into their teaching (Buabeng-Andon, 2019). ICTs facilitate the effectiveness and importance of teachers' pedagogical skills, allow them to learn independently, increase their motivation, improve their self-efficacy, broaden their access to information, improve their confidence, help them find teaching materials on the Internet and it makes them more supportive (Khaliq and Ahmad, 2018). TIC when effectively integrated can facilitate the learning of science in the classroom. Overreliance on computers for science teaching creates distance between teachers and students and makes the learning process callous and devoid of passion. When used wisely, ICT can make science easier to understand and enjoyable for students (Maharaj-Sharma & Sharma, 2017).

ICT regulation for foreign language teaching is hampered by some factors in the public sector with young learners, there are concerns about the effectiveness of public-school policies to encourage teachers to take advantage of limited TIC in their educational environments. Current educational policies need to be reconceptualized to help teachers maximize the resources available in their school settings. These results corroborate those teachers do not usually have adequate support systems to transition their good idea beyond their classrooms (Izquierdo et al., 2017).

The analysis indicatesthat teachers used high levels of digital competence looking for didactic materials to teach analysis programs. For a group of computer science teachers who are experts in digital competence, the battle to develop pedagogy was observed to be improved by having these capacities (Hidson, 2021). The sudden global progress due to ICTs requires continuous training in digital competence for teachers. Teachers think they have a high intermediate level in mastering the instruments that define their digital competence. The study concludes that the greater the scope of teaching work, the greater the need for digital competence (Prieto-Ballester et al., 2021).

The attitude towards technologies is that, toelderlyteachers' level of assignment, the lower their assessment of the use of technology in the classroom and vice versa.Technology is now used more as a learning tool than as an extension of conventional teaching strategies. Only your perception of ease of use will besignificantly related as a teaching and learning tool.This studioshows that teachers are already making greater use of technology as a learning tool (C. Nueva, 2019).

A response about teachers who show an interest, activity and media and digital competence outside of school, do not use them in the training of students, is the way in which this technology is added in their teacher practice (imposed technology) and the lack of meaning and usefulness of the training they carried out (systematized training - closed). We see that, in practices of forced technology and systematized training, teachers do not develop their technological skills in the classroom, but rather, paradoxically, rejection reactions are created. Contrary to these initial technology practices, teachers easily couple technology to their work, based on their knowledge, interests, and daily practices in student work (Beneyto-Seoane and Collet-Sabé, 2018).

The pedagogical use of ICT in Madrid schools depends on the training and profile of teachers, as well as on the technological and pedagogical resources inside and outside the classroom. In conclusion, the ICT competence profile of teachers is in a medium-low degree, that is, teaching skills in ICT resources are not yet being developed as didactic methods in the development of digital competence in their students (Fernández et al., 2018).

It is necessary that educational policies promote the development of their ICT skills in teachers, such as online teacher learning societies. In addition, the development of ICT competence must be considered in the initial teacher training (Gil-Flores et al., 2017).

Many teachers hope to return to the classroom and to normality, the reality is that education has changed and online learning will be an integral part of secondary education. Online skills will be an important aspect of initial teacher training and continuing development. Due to the need to design and implement effective online learning

environments, in-service education will need to adapt to better support the new reality (Dolighan & Owen, 2021). Secondary school teachers in India are in a dilemma because the authority told them to take classes online, it is difficult for them because a large number of students do not have a device, there is no internet and there is a lack of positive encouragement from the authorities. Even teachers are struggling to keep the learning candle burning in this harsh time of the new normal (Kundu & Bej, 2021). The main discovery of this analysis has interaction with the significant differences in the perceptions of teachers in relation to their expectations and experiences of online education. Other results of this analysis revealed the lack of differences between the expectations and experiences of teachers in online education in relation to the various educational sectors. (Spoel et al., 2020). The report of the English teachers of the training course said that the practice of online education during the end of the pandemic has its advantages and also some disadvantages. Pre-graduation faculty perceptions of the role of technology in online education include connectivity issues and awareness of the importance of technology to continue and learn. Technology has turned out to be an important element in the teaching process, since without it it would not be possible to offer participants the opportunity to carry out their teaching activities in 2020 (Aguilar-Cruz and Medina, 2021).

The interactive evaluation system in the classroom is positive, the teachers highlighted the usefulness of the audience response system, it facilitates the evaluation and self-evaluation of the students, it enables teachers to save the results of the learning process, as well as to make summaries of the development of students at all times. The negative experience of the implementation of the evaluation system does not fit each of the classes, it requires extensive preparation time, and it does not always make it easier to achieve the goals of analysis sought (Dudaite and Prakapas, 2017).

## 5. CONCLUSIONS

There must be provisions that guarantee the professional development of teachers in ICT skills.

Educational policies must contemplate the implementation of classrooms with digital tools that enable a better learning process for students.

There is a positive predisposition of teachers to include digital tools in the teaching-learning process of their students.

A large percentage of teachers perceive that they have little or no digital competence.

The inclusion of ICT in the development of science can make it more understandable if used wisely.

The use of digital tools will allow a better learning of foreign languages.

The adequate digital skills of the teacher and their mastery of ICT tools indisputably favor online learning.

The use of ICT tools is essential in the development of educational activities and will remain in the educational system due to innovations and the current situation

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