



USING AND INTEGRATION OF ICT IN A DIVERSE EDUCATIONAL CONTEXT OF SANTANDER (COLOMBIA)

Glenn Elmer Hernández Camelo¹, Juan Manuel Trujillo Torres²,
M^a Pilar Cáceres Reche², Rebeca Soler Costa³

¹Universidad Industrial de Santander (Colombia)

²University of Granada (Spain)

³University of Zaragoza (Spain)

glenn.hernandezc@gmail.com, jttorres@ugr.es, caceres@ugr.es, rsoler@unizar.es

Received September 2017

Accepted February 2018

Abstract

The integration of Information and Communication Technologies (ICT) in the academic context caused a change in the way teaching and learning is carried out. It also broadened the usually formal educational contexts and the way these are accessed. Nonetheless, gaps can still be found concerning the inequality in the access to ICT resources and tools and, therefore, in the universal access to knowledge and education. This paper studies the use and integration of ICT through students' perceptions from the educational centers of the municipality of San Juan Girón (Santander, Colombia). The population is composed of 208 participants with ages ranging between 12 and 18, 59% female and 41% male. Statistically significant results were obtained concerning the use of school-owned resources and teaching methodologies. One of the most outstanding results shows the population analyzed needs to apply a new teaching methodology to promote the integration of the ICT in the classrooms in a more suitable and coherent way. Moreover, training processes and pedagogical updating are required to motivate a curricular change considering rhythms, forms, quality and different learning styles in the municipality of San Juan Girón.

Keywords – Students' perceptions, ICT, Teaching and learning, Knowledge.

1. Introduction

In the last years, the integration of ICT in educational systems has emerged as a result of new cultural and socioeconomic requirements, which must be met by the different governments of each country in a satisfactory way. This represents a challenge that is both relevant and complex, mainly due to the need for significant changes in educational centers and more participative and student-centered pedagogical models (Trujillo, Aznar & Cáceres, 2015).

Hence, technological changes in the educational context require not only the acquisition of technological equipment but also the connection to high-speed networks or the definition of spaces for their secure and adequate use. Teacher training programs are another fundamental aspect. Finally, it is also necessary to establish adequate mechanisms and methodologies that guarantee the use of these technologies as actual support tools, both for students and for teachers. Thus, quality of education is improved by providing society with access to these technological resources and training opportunities.

There is currently an international generalized effort on the part of all institutions to achieve this goal, although each country has a specific process of conceiving and adapting to change (Hinojo, Aznar & Cáceres, 2009; Marín, Sampedro & Vega, 2017).

In the particular context of Latin America, there is a vast heterogeneity characterized by a large number of inequalities in social, economic and educational areas, despite the democratization of its countries (Moreira, 2009; Lugo & Brito, 2015). A general decline is taking place in most age groups, especially in the urban-rural gap, which opens positive perspectives in the sense that families with fewer economic resources, and thus risking social exclusion, have now more opportunities to access education (Poggi, 2010, 2014).

The consideration of an inclusive planning of ICT in the classroom is a key aspect in order to attend existing diversity. This planning should attempt to compensate the families' difficulties regarding the lack of resources and technological means, which can aggravate if there is no intervention in scenarios of socio-educational inequalities.

Nonetheless, these expectations do not appear to be fully accomplished according to the results of the most recent PISA (Programme for International Student Assessment), from 2015. Specifically, there are still inequalities that significantly influence academic outcomes. Thus, in the report presented by OECD (Organisation for Economic Co-operation and Development), Latin-American countries and, among these, Colombia, scored significantly below average. Specifically, the report shows low scores in fifteen-year-old students regarding reading, sciences and mathematics, with only 22.9% of students passing the assessment.

The socioeconomic status and the countries' lack of resources can be pointed out as two of the possible causes for this reality. This is especially true in secondary schools, in which the poor access to internet and to other sources of information, together with the scarcity of technological resources, contribute to the increase of inequalities in education.

The goals for 2007 concerning the improvement of secondary education were set in 2005, in the Action Plan of the fourth Summit of the Americas. In 2008, the Ibero-American Convention on the Rights of Youth came into force, guided by the aim of promoting integral, continuous, efficient and quality education, and fostering inter-culturalism, universality of education and democratic values (Organization of Ibero-American States, 2010).

The "Educational Goals for 2021" project was born precisely to alleviate these inequalities and establish basic and common principles for social cohesion and inclusion in Iberian America. This project is built on the premise and consensual decision that education is the fundamental mechanism and strategy to address the social challenges of all Latin-American countries (Organization of Ibero-American States, 2014). Therefore, a group of goals was established that includes increasing the number of students that study for longer periods of time, with a quality educational offer that is both equitable and inclusive.

1.1. ICT as a "Tool" for Diversity Context in Latin America

Inclusive education aims at educating all students together in a common environment, attempting to eliminate situations of socioeconomic and cultural inequality due to the lack of access to basic resources (e.g. food), to culture and information (ICT), among others (Sola, López & Cáceres, 2009: page 37).

Considering that all contexts impact the development of students, it should be noted that, in order to achieve inclusive schools, it is inevitable to use common practices and knowledge as a first step towards improvement. Differences among students should be seen as an opportunity to learn instead of being regarded as problematic. The teacher should detect the underlying obstacles and needs to achieve total student participation as well as the efficient and effective use of all the available resources for learning. This should be accompanied by a development of the practical language and by creating the necessary conditions to encourage risk-taking (Ainscow, 2001).

Thus, the incorporation of inclusive education at school through ICT and the work towards equal opportunities for all presupposes a range of actions (Area, 2009):

- Integrate ICT in the school system
- Substantially redesign the curriculum, incorporating an education for resources and technologies
- Adapt occupational training of new social and labor needs and demands
- Empower the use of ICT by local communities, providing access to a large variety of social groups
- Incorporate ICT in existing social and cultural networks

Despite all the protocols, plans and conventions signed by the member states of the different Latin-American institutions and organizations, inequality still exists, according the distribution of wealth in all countries. Therefore, according to the 2016 report “Educational Goals for 2021” by the OIS (Organization of Ibero-American States), profound inequalities persist regarding ICT. These inequalities were deemed an “internal gap” or unequal starting conditions, referring to inequalities between the different Latin-American countries in what concerns access to connectivity between countries, differences regarding income and geographical location (e.g. rural, urban).

Countries such as Argentina, Colombia and Uruguay are the reflection of an advanced stage of integration, despite the limited practical results since these countries lack sufficient technological infrastructures, teacher training programs, among others. On the other hand, countries like Costa Rica, Chile, Brazil, and Mexico evidence a larger transformation of their classes, not only at a technological level but also in the implementation of a new pedagogical model that addresses the transformation of the teaching process. This new process is more centered on the student and takes diversity into account, promoting a new inclusive learning model that is also active, autonomous, constructive and collaborative.

Nonetheless, “the majority of the teachers do not change, in a significant way, their teaching methods when integrating technology in the classroom. They rather adjust technology to their current practice” (Calderón, Ruiz & Sánchez, 2016: page 42). In fact, this report also concludes that countries such as Colombia still employ memoristic and expositive learning techniques, in which collaborative and research work with ICT is absent. This is mainly due to the insecurity and unfamiliarity felt by the teacher, which highlights the importance of raising awareness and providing training to teachers through digital and didactic training programmes.

Here lies, thus, the primary basis in which an actual integration of technological tools in the classroom must take place. It requires an inclusive vision and a methodological transformation, in which the teacher assumes new roles as a guide and supervision in all the teaching process, with an increased involvement. In fact, the teacher is now able to promote “processes that improve the communication, participation and empowerment of minorities or marginalized groups” (Aparicio & Silva, 2008: page 19).

This is, precisely, one of the factors with greater impact in the decreasing of inequality. Moreover, it creates a vicious circle since the concentration of wealth in a small part of the population leaves the poorest without an opportunity to grow and in risk of becoming marginalized. Nonetheless, improvements in the quality of life of the population have been observed, mostly in what concerns life expectancy at birth and child mortality (UNESCO, 2008; Economic Commission for Latin America and the Caribbean, 2015, 2016).

Thus, the risk factors that may prevent all children from having the opportunity to access education should be mitigated, through an effort facing problems such as the distance between rural areas and the educational center, poverty, malnutrition or child labor. Education should evolve towards quality, inclusiveness and multiculturalism, fostering diversity and values for a democratic and participatory citizenship.

Diversity must also be taken into consideration, with each country having their indigenous and African descendants, with the visibility of these groups on the rise. It is necessary to consider their demands and needs, which is beneficial in the path to reach equality, especially in the access to education and the design of bilingual inter-cultural education (Poggi, 2010, 2014; UNESCO, 2015).

Together with all this, ICT has gained special relevance as a resource, tool and support to attend to the diversity that can be found in the educational system. Latin America became a very proactive part of the world in what concerns the integration of ICT and the democratization and social-educational inclusion of its systems. This had repercussions on the plans and programs of most countries (Lugo & Brito, 2015), which initiated during the 90's, when ICT policies began to target educational sectors, for example: Red Escolar (México), Red Enlaces (Chile), Proinfo (Brazil) (Lugo, Kelly & Schurmann, 2015).

One of the didactical-pedagogical models based on ICT established in schools was the “laboratory model”, which consists in the individual use of computers in specific classes, which revealed to be a beneficial model.

Through an evolution and reformulation of the politics, a new class model was created in which classes are equipped with computers so that they are available for all students and teachers. Nonetheless, the low number of computers creates limitations in the access for learners.

The third model, more innovative and modern, is the so-called 1:1 model: each student and each teacher have access to one computer. Paraguay pioneered the implementation of a program that provided each student with a computer, through the so-called “Ceibal Plan”. From this moment on, countries like Colombia, Argentina, Brazil or Peru started adopting similar measures, with their own specifications and differences (IPE-UNESCO, 2008, 2012; Lugo et al., 2015; UNESCO, 2008).

It is a fact that two indicators of inclusion or risk of social exclusion in a Society of Information and Knowledge are internet access and owning a personal computer at home. In its last study on computer access at home, the Economic Commission for Latin America and the Caribbean (2013) concludes that 40.8% of Latin-American citizens have computer access at home while 33.3% have the possibility to access internet at home (Figure 1).

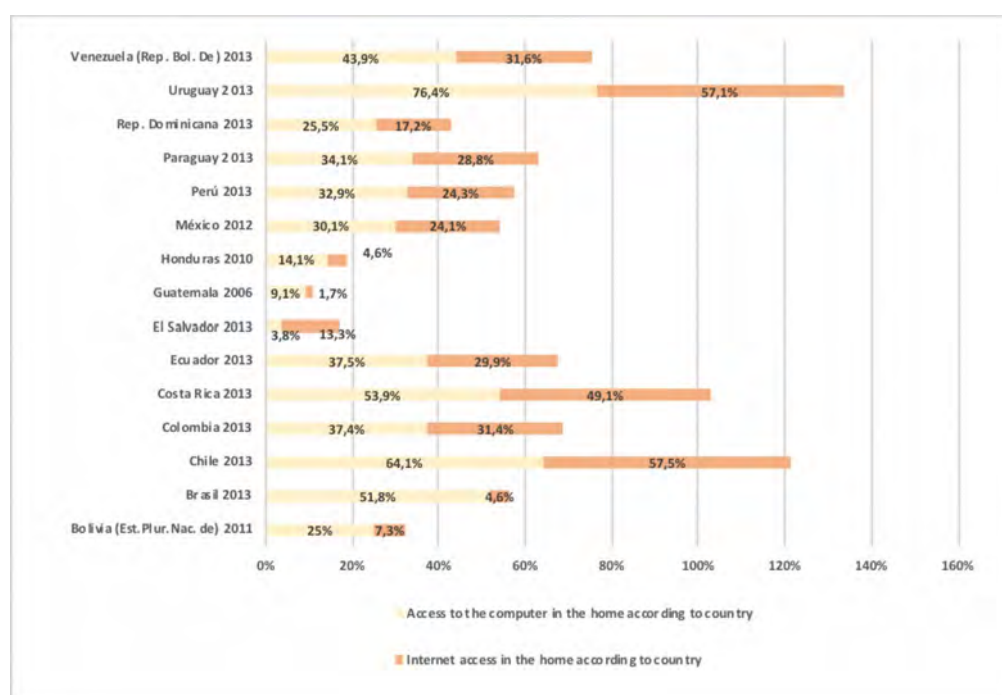


Figure 1. Access to computer and internet at home (CEPAL-OIE, 2013)

Nonetheless, owning (or not) a computer or having (or not) internet access are not the only relevant aspects in this domain. According to a report by OECD (2015) based on the PISA results, the use of computers in the classroom has not improved students' academic performance. Therefore, in order to achieve an effective integration of ICT in an undertaking aimed at reducing inequalities, it is necessary that these technologies become part of a pedagogical model in which the components that were identified as crucial for breaking social determinism are assumed by the processes that push technologies (Tedesco, 2005: page 14).

Thus, educational practices undoubtedly require a sensible agenda in order to achieve educational and integrative ICT policies, aimed at inclusive education.

1.1.1. The Colombian Context: Current State in San Juan Girón (Santander, Colombia)

In recent years there has been a change in what concerns politics, economics, migratory movements and labor market, revealing a world in which differences are more evident than ever. Inclusive education was erected as a banner to fight against the screening of students and competitiveness. As previously mentioned, inclusion stems from participation and dialogue, which implies that the student body is schooled in any educational center, eliminating gender, ethnicity or religious segregation, thus decreasing the risk of cultural exclusion (Sunkel, 2016).

In addition to what has been already exposed, a great percentage of economic resources aimed at social investment in youth, almost the 60%, are addressed to the financing of the educative area (Economic Commission for Latin America and the Caribbean (2014), Social overview of Latin America). For the case of Colombia, it is detected this percentage is not encouraging at all if it is compared to Latin America as far as both the percentage of social spending and the percentage of gross domestic product are inferior, what allows to infer the low percentage of economic resources intended for the development and implementation of alternatives to favor the integration of ICT with regards to educative inclusion (Figure 2).

It cannot be ignored that curricular design is one of the factors that influence educational quality. Skills should focus towards curriculum cohesion through level objectives, general or curricular, and specific to each program and didactic unit. The selection of content should, in turn, satisfy the demands and needs of society, with flexible and enabling methodologies towards the quality of training by and for all (Arnáiz, 2012; Casanova, 2012).

There are several programs that facilitate and support the goal of achieving an inclusive quality education: School Feeding Program, Educational Gratuity Program, National Literacy Program, Rural Education Project, School Transportation, Care for Vulnerable Population, among others.

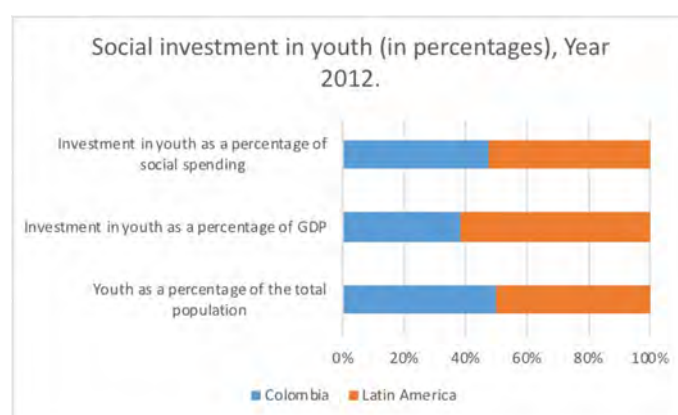


Figure 2. Social investment in youth (in percentages), Year 2012
(Economic Commission for Latin America and the Caribbean, 2014)

Nonetheless, the latest data of the Economic Commission for Latin America and the Caribbean stresses that the rate of individuals aged between 15 and 19 with complete primary studies amounts to 91.8% in urban areas and to 86.5% in rural areas (Economic Commission for Latin America and the Caribbean, 2016). In the specific case of Colombia, the indicators reveal an illiteracy rate of 5.9%, lower in women (5.5%) than in men (6.1%), as Figure 3 points out.

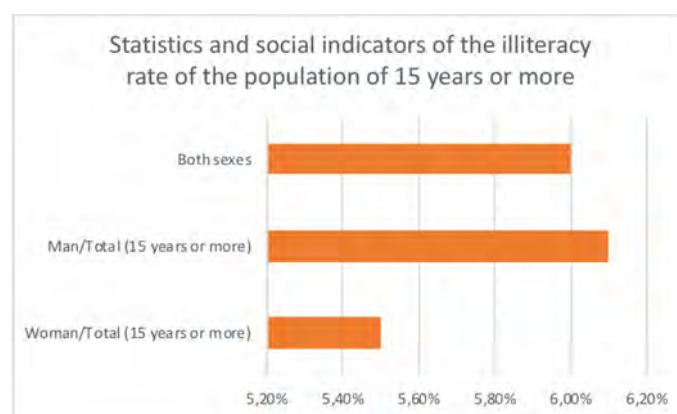


Figure 3. Statistics and social indicators of the illiteracy rate of the population of 15 years or more (Economic Commission for Latin America and the Caribbean, CEPAL, 2014)

Undoubtedly, the challenge of integrating ICT in teaching processes brings along the planning and application of changes at a methodological level, which positively affect the development of academic contents and teaching strategies (Raso, Aznar & Cáceres, 2014; Calderón et al., 2016). This is the context in which several digital tools emerge, known in some cases as 2.0 tools.

These tools allow teachers to explore the thematic topics that are addressed in their classes with increased depth. On the other hand, they allow students, who are in most of the cases digital natives (people who were born after the wide spread of digital technology), to use them as a fundamental tool to interact more easily in learning networks, complementing the contents and topics addressed in the classroom.

This will facilitate interventions that include all the student body. Indeed, ICT significantly facilitate the teaching-learning process, while also making it more flexible.

When the aim is to include ICT as a pedagogical tool in the classroom in order to generate new learning opportunities in students, one of the most important aspects to consider is the training of the teacher. The Government and the Ministry of Education of the municipality of San Juan Girón, in Santander, Colombia, have been applying strategies originating from the Ministry of Information and Communication Technologies (MiNTIC) that are inclined towards the use, massification and integration of ICT in public institutional classrooms.

Nonetheless, these strategies and programs consist solely of equipping some educational institutions with technological devices (e.g. desktops, laptops, tablets, digital whiteboards), neglecting the training of teachers in what concerns the pedagogical use of the devices in the classroom. This results in institutions in which the delivered technological elements are not used due to the lack of a teaching training model that supports educators in making an adequate use of technology and in initiating a process of articulation between pedagogical processes in ICT in the classroom.

1.2. Educational Implications of ICT

The integration of ICT implies the implementation of new didactical strategies and pedagogical models, that are more inclusive and participative, coinciding with several previous studies, by way of background, with this series of planning. Most of these studies focus on higher education, possibly because this educational stage is more dedicated to comply with international plans (e.g. Bologna Process, European

Higher Education Area) in what concerns educational policy, where innovation and teacher improvement are promoted and positively valued.

One of these studies was conducted by Riascos-Erazo, Quintero-Calvache and Ávila-Fajardo in the year of 2009. The authors conducted an analysis of the teacher's perceptions regarding the use of ICT in the classroom, in different Colombian universities. Some of the study's most relevant conclusions highlight the differences between the traditional methodology and the characteristics that an ICT-based learning environment requires, as summarized in Figure 3.

In the Mexican context, Escamilla conducted a study in the Universidad Autónoma of Querétaro, in 2010, with the aim to identify the variables that are linked to the use of ICT as a strategy of teaching-learning. Some of his contributions highlight the importance of training teachers and overcoming a series of challenges towards an integration and effective use of ICT: lack of coordination, monitoring and evaluation by the institutions involved; improvisation; lack of budgets; inadequate schedules; teaching overload; and lack of trainers and consultants.

Hence, it is proposed a continuous training process in didactic and digital competence, so that the potential of the new educational resources is known and teachers know how to adequately use them in the classroom. In order for this process to succeed, an adequate infrastructure and resources are needed.

Likewise, Sanabria & Hernández (2012), in a study carried involving professors and students of the Universidad de La Laguna (Spain) concerning their perceptions about ICT in university teaching, also point out the training of the teacher as a fundamental axis in this transformative process.

Nevertheless, there are different data concerning professors and students. While teachers consider that the use of ICT requires a significant effort that goes beyond a simple change in their role, students claim that this change in role is not taking place. In their opinion, the teachers' didactical model is limited in their use of ICT, adapting them to their teaching practice, without incorporating changes, as transmitter of knowledge. In this sense, the idea that a change requires not only effort but also attitude and willingness has special relevance. Hence, the importance of raising teachers' awareness, regarding this matter.

Strengthening previous conclusions regarding the necessity and importance of teacher training towards the use of ICT, other studies must also be mentioned that support this position. For example, Capilla, Ortiz, Trujillo & Raso (2015), study the perceptions of students regarding the integration of technological tools in the Universidad de Granada (Spain). The authors conclude that it is necessary to improve training of both teachers and students, concerning technological competences. Likewise, Barberá & Fuentes (2012) analyse the perceptions of students in the inclusion of ICT through a SWOT analysis (strengths, weaknesses, opportunities, and threats). Although this study was conducted in secondary schools, the results hold the same considerations: a marked insufficiency of teacher training in ICT or the persistency of an instrumental vision of ICT against its true pedagogical integration.

Traditional learning environment	New learning environments
Training provided by the teacher	Training focused on the student
Progress through a single path	Progress through multiple paths
A single communication means	Multiple communication means
Individual work	Collaborative work
Linear transmission of information	Interchange of information takes place
Passive learning	Active and exploratory learning, based on research
Factual learning, based on experience	Critical thinking, informed decision-making

Table 1. Differences between traditional and new learning environments
(Riascos-Erazo, Quintero-Calvache, Ávila-Fajardo, 2009)

All these considerations and previous studies have been taken into account in the present research work, which aims to analyse the use, integration and educational implications of ICT in the diverse context of the Colombian municipality of San Juan de Girón.

2. Methodology

2.1. Participants

The sample of this study comprised 208 students, with age groups as follows: 25% between 12 and 14, 48.6% between 15 and 16, 24.5% between 17 and 18 and 1.9% older than 18. 59% of the sample was of the female gender and 41% were male. Students aged between 12 and 14 attended, mostly, the 9th grade, representing 74.3% of all students in this grade. In the 10th grade, the larger representation is that of students aged between 15 and 16 years (100%). Finally, in the 11th grade there is a 20.3% of student representation aged between 15 and 16, 73.9% between 17 and 18 and 5.8% older than 18.

The selection of the population was obtained through simple random sampling, with students of the final grade of Secondary School and the two grades of Middle School, which concludes with the award of the Bachelor's Degree. These educational levels were selected since they can contribute with a better understanding of the object of study, given their experience in the implementation of innovative actions involving ICT in the Colombian public educational centers for some time now.

2.2. Method

A descriptive quantitative methodology was applied, whose main aim was to determine the state, characteristics, factors and procedures present in events that happen naturally.

A questionnaire was designed *ad hoc* to act as the instrument for data collection. After validation of the instrument it was printed on paper to be distributed to the target population. This decision was motivated by the fact that in most of the institutions studied, the access to internet and data networks is neither constant nor continuous, which hinders access to information.

With the support of the Ministry of Education of the San Juan de Girón Municipality, meetings were arranged with the population to acquaint them with the instruments, the main goals of the study and the approval of the different permissions concerning the participation of educational institutions. After the identification of the participants in the study, each of the participating educational institutions was visited to apply the instrument to their students and obtain the data from the population.

The time to apply the instrument to each of the studied populations was of approximately 7 months as it was necessary to obtain the required authorizations and negotiate agreements concerning spaces and times for the participation that would not interfere with academic activities and institutional planning. During this time, the responses of each group of participants were stored in a secure place for its posterior classification and statistical study.

2.3. Instrument

According to Alvira (2011) a survey “is essentially a technique for collecting information with an underlying philosophy, which makes it a method, assuming different research designs. The survey presents two basic characteristics which distinguish it from the remaining methods of data collection: it collects information provided verbally or through writing by a respondent by means of a structured questionnaire and it uses samples of the population that is being object of study.”

Given the descriptive nature of this study, the instrument used to support its quantitative aspects is a survey that allows establishing several aspects of significant importance, in order to accomplish the goals of this research.

Once the survey was designed, it was submitted to a process of revisions, suggestions and validation, undertaken by national and international experts in the fields of education and ICT. In its final form, it is composed of 61 questions organized in 4 sections, coinciding with the different perceptions expressed by the students:

- Section A – Educational and Personal Profile. It assesses aspects such as the educational level of the student, the current course or the qualifications.
- Section B – Degree of Application of ICT (integration). This section of the survey evaluates available spaces for ICT at school, technological equipment and the facilities made available by the educational administration. Some of these items include: “The educational institution has enough spaces for the use of ICT”; “The educational institution has software and/or technological applications specialized in the field of education”; “The educational institution has access to knowledge networks”; or “The amount of IT equipment is sufficient to meet the needs of teachers and students”.
- Section C – Usage of ICT in the classroom (use). This section analyzes the kind of technological tools that are available in the classroom, the use of these tools and the knowledge that students possess. It includes, for example: “The use of ICT allows to improve the teaching and learning process”; “ICT are included in practical tasks”; “The institution uses technological tools for the management of educational contents”; or “I have carried out online collaborative work”.
- Section D – Strategies for Teaching and Learning (educational implications). It details the activities and methodologies used by the teacher in the classroom, the enrichment of learning, among other issues. Some items include: “In order to support the teaching-learning process, the teacher uses a traditional expositive methodology”; “Do you find it necessary to change the currently used teaching-learning methodology in order to incorporate ICT in the classroom?”; etc.

In order to answer each question, the participant uses a 4-point Likert scale: 1 – Agree strongly, 2 – Agree, 3 – Agree slightly, 4 – Strongly Disagree.

Table 2 shows the relationship between age range and the grade of the students surveyed in this study. It shows that there are 70 students in the 9th grade, 69 students in the 10th, all of them aged between 15 and 16. There are also 69 students in the 11th grade, of which 20.3% (51 individuals) are between 17 and 18 years old and, finally, 4 students (5.8%) are more than 18 years old.

The participants’ personal and educational profile thus shows four groups or classes determined by age: 25% (corresponding to 52 students) between 12 and 14 years old; between 15 and 16 we find the highest frequency (48%) which amounts to 101 students; the group with ages between 17 and 18 follows, which amounts to 24.5% (51 individuals); finally, the group of more than 18 which includes 1.9% of the individuals. The sample is composed of a certain feminine predominance, with 59% of the respondent being women against 41% males.

Table 3 shows information about whether students have knowledge of the existence of technological tools that support their role as students in educational institutions. It is observed that 37.5% of the students surveyed show they agree knowing this type of tools. But it is also detected not only the 25% of the population analyzed expresses “always”. All these arguments allow concluding saying the population surveyed shows knowledge about the existence of these tools; however, it is not a high or significant percentage.

			Student Grade			Total
Age Range			9 th Grade	10 th Grade	11 th Grade	
	12 to 14	Count	52	0	0	52
		% inside the student's grade	74.3%	0	0	25.0%
	15 to 16	Count	18	69	14	101
		% inside the student's grade	25.7%	100%	20.03%	48.6%
	17 to 18	Count	0	0	51	51
% inside the student's grade		0	0	73.9%	24.5%	
Over 18	Count	0	0	4	4	
	% inside the student's grade	0	0	5.8%	1.9%	
Total		Count	70	69	69	208
		% inside the student's grade	100.0%	100.0%	100.0%	1.0%

Table 2. Contingency table, age-range students

		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	Agree Strongly	52	25	25	100
	Agree	78	37.5	37.5	75
	Agree Slightly	59	28.4	28.4	37.5
	Disagree Strongly	19	9.1	9.1	9.1

Table 3. They have knowledge of the existence of technological tools that support their role as students in educational institutions

3. Results and Discussion

The analysis of the collected data shows significant and interesting results. Regarding whether students consider that the use of the computer in the classroom is important, 98.56% agree that it is, while 1.44% do not consider it important. It was also observed that 73.36% of the students, corresponding to 157 individuals, have a computer at home, which means that 26.64% do not.

Regarding the availability of internet access at home, 78.85% of the surveyed students have internet, while 21.15% claim not to have any internet access at home.

Students were also asked whether they agreed that the available computers were fit to be used in the teaching-learning process. A group of 20.2% of the students claimed to agree strongly with the sentence, 43.3% of the students agreed, 26.9% agreed slightly and 9.6% claimed to be in total disagreement. The highest percentage in the frequency table thus corresponds to the students who claimed to agree.

Regarding the development of multimedia material or electronic resources that support learning from and for all students and that take into account the diversity that exists in the educational institution, 45.2% of students claimed to agree. A slice of 30.3% of students stated that they agreed slightly, while 20.2% (which amounts to 42 students) are in total disagreement and 4.3% (equivalent to 9 students) claimed to agree strongly.

When students were asked whether they found it necessary to change the currently established teaching-learning methodology so as to incorporate ICT in the classrooms while also attending diversity (Table 3), 47.1% of the students declared that a change is necessary in all cases (agree strongly). A group of 24% of the surveyed students find a change necessary in some cases (agree slightly) and 19.2% declared that a change in the methodology is necessary in almost all cases (agree). See Table 4.

Finally, the students' opinion regarding ICT as an instrument to support teaching-learning strategies and competencies in the educational institution towards the inclusion of students and as a means to meet the heterogeneity of teachers, it was observed that 56.7% of the surveyed population was in agreement. 16.8% of the surveyed students answered "agree slightly" while 2.8% answered "strong disagreement". From this, it is possible to confirm that more than 50% of the surveyed population considers that ICT are

an instrument that supports teaching-learning methodologies in the educational institution towards the inclusion of all students.

Nonetheless, in practice there are contradictory results concerning this statement. First, more than half the students (nearly 60%) considers that they are not properly trained and able to use ICT in their future classrooms, as detailed in Table 5. For this reason, the need to provide students with training is clear, centered in didactic strategies for the use and integration of ICT in the curriculum. It is thus fundamental to rethink the kind of content and skills that are necessary for the development of digital competences in all students.

Secondly, and as shown in Table 6, besides a lack of specific training for the use of technological tools, more than 60% of the students agree that ICT are not being used in the classroom. From an interpretative standpoint, both results appear to maintain a close relationship, insofar as the limited or null use of technologies in the classroom limits the learning possibilities and potential of students.

Given that this is a crucial aspect for the professional development of the new generations, this kind of studies gains an increased significance in order to know, from the students' perceptions and evaluations, their needs at different levels: resources, methodologies, uses, levels of satisfaction, among others. The identification of these needs allows intervening with the aim to improve the educational theory-practice relationship, starting with the methodological update and renewal that ICT demands, with the added challenges of the context and specific situation of each country and its educational agents.

		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	Agree Strongly	98	47.1	47.1	100.0
	Agree	40	19.2	19.2	52.9
	Agree Slightly	50	24.0	24.0	33.7
	Disagree Strongly	20	9.6	9.6	9.6

Table 4. If deemed necessary the change of teaching-learning methodology applied currently to incorporate ICT in the classroom and catering for diversity

		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	Agree Strongly	27	13.0	13.0	100.0
	Agree	57	27.4	27.4	87.0
	Agree Slightly	88	42.3	42.3	59.6
	Disagree Strongly	36	17.3	17.3	17.3

Table 5. Item. "Are you qualified for using ICT in the classroom?"

		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	Agree Strongly	30	14.4	14.4	100.0
	Agree	52	25.0	25.0	85.6
	Agree Slightly	106	51.0	51.0	60.6
	Disagree Strongly	20	9.6	9.6	9.6

Table 6. Item "Are ICT being used in the classroom?"

4. Conclusions

This study clarifies the importance of planning the integration of ICT, with important insights for the definition of teaching methodologies that take into account the diversity of the Colombian educational context. One of the most relevant problems that have been identified during this work concerns internet and computer access, especially at home. In what concerns the existence of computers in the educational institution, we conclude that the majority of the participants are satisfied. Nonetheless, it must be pointed out that 40% of the students are not included in this group. This is a very high percentage that may be

attributed to aspects such as the geographical situation of the institution, their resources or their infrastructure.

Finally, we also conclude, in line with the initial assumptions drawn from previous studies and research results, that students feel that there should be a change in teaching-learning methodologies so that the goals of a diversity-aware inclusive education can be reached. In order to achieve this, a pedagogical renovation and update is necessary on the part of the teachers, incorporating a continuous training process in technological and didactic competences. This must however be in line with their interests and needs, motivating the need to change: teachers must feel positive about it, feel an intrinsic will to change.

Students must also shift from a passive attitude to an active one, so that they can make an efficient use of ICT and carry out a curricular development in line with their rhythm, methods and qualities. The educational institution transforms itself in the banner of the development of democratic values, where participative and socially empowered citizens are educated, in a society that includes themselves and takes them into account. This must take place especially in Latin-American contexts, such as in Colombia, where the socioeconomic and cultural inequalities of the population represent an added challenge given the limitations in infrastructures. This challenge is especially felt when attempting to adequately integrate technological resources, through an inclusive and participative teaching practice. Hence, it is important to understand how the process is being carried out in order to intervene with coherent improvements that focus directly in the fragilities found.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

References

- Ainscow, M. (2001). *Development of inclusive schools: Ideas, proposals and experiences to improve educational institutions*. Madrid: Narcea Editions.
- Alvira, M.F. (2011). *Survey: a methodological general perspective*. Madrid: Editorial of the Center of Sociological Research.
- Aparicio, P.C., & Silva, M.C. (2008). Education, cultural heterogeneity, and integration of the new generations in a global context. In Aparicio, C. (Ed.), *From diversity to inequality: an inexorable consequence of globalization? Electronic Journal of Educational Theory and Culture in the Information Society*, 9(2). Universidad de Salamanca. Available at: http://campus.usal.es/~teoriaeducacion/rev_numero_09_02/monografico_n9_02.pdf (Accessed: November 2016)
- Area, M. (2009). *Introduction to educational technology*. Universidad de La Laguna. Available at: <https://campusvirtual.ull.es/ocw/file.php/4/ebookte.pdf> (Accessed: November 2016)
- Arnáiz, P. (2012). Effective and inclusive schools: how to promote their development. *Educatio Siglo XXI*, 30(1), 25-44.
- Barberá, J.P., & Fuentes, M. (2012). Case study of perceptions of students about inclusion of ICT in a secondary school. *Teacher Journal*, 16, (3), 285-305.
- Calderón, C., Ruiz, J., & Sánchez, J. (2016). Integration of ICT in a flexible teaching model. The case of the University Center of Valles, Guadalajara, México. *University Training*, 9(5), 37-48.

- Capilla, M., Ortiz, A., Trujillo, J.M., & Raso, F. (2015). College students perceptions regarding the use and introduction of ICT in the educational process of the Faculty of Educational Sciences of Granada. *Innoeduca. International Journal of Technology and Educational Innovation*, 1(2), 57-68.
- Casanova, M.A. (2012). Curricular design as a factor of educational quality. *Iberoamerican Journal on Quality, Efficacy and Change in Education*, 10(4), 20.
- CEPAL-OIE. (2013). *Computer and Internet access in Latin America*. Available at: http://dds.cepal.org/juvelac/indicadores/ficha/query2.php?indicador_id=98 (Accessed: November 2016).
- Economic Commission for Latin America and the Caribbean (2014). *Social overview of Latin America* (LC/G.2635-P), Santiago de Chile.
- Economic Commission for Latin America and the Caribbean (2013). *Illiteracy rate of the population aged 15 or more*. Available at: http://interwp.cepal.org/sisgen/ConsultaIntegradaFlashProc_HTML.asp (Accessed: May 2016)
- Economic Commission for Latin America and the Caribbean. (2015). *Long-range population estimates and projections 1950-2100*. Available at: <http://www.cepal.org/es/estimaciones-proyecciones-poblacion-largo-plazo-1950-2100> (Accessed: May 2016)
- Economic Commission for Latin America and the Caribbean (2015). *Social statistics and indicators, 2015. Education*. Available at: http://interwp.cepal.org/sisgen/ConsultaIntegradaFlashProc_HTML.asp (Accessed: May 2016)
- Escamilla, M. (2010). *Identification and evaluation of variables linked to the use of ICT as a teaching-learning strategy in the Autonomous University of Querétaro, Mexico*. Special reference to the use of Blended Learning. PhD Thesis. University of Salamanca. Inédita.
- Hinojo, F.J., Aznar, I., & Cáceres, M.P. (2009). Students' perceptions regarding blended learning at the University. In Communicate. "New forms of communication: ciberworld and mobile means". *Scientific Journal on Educommunication*, 33, 165-174. University of Huelva.
- IIPPE-UNESCO (2008). *ICT: from the classroom to the political agenda*, 151. Buenos Aires. Available at: http://www.unicef.org/argentina/spanish/IIPPE_Tic_06.pdf (Accessed: November 2016)
- IIPPE-UNESCO (2012). *Webinar 2010: The 1:1 model as a public policy on Education. A regional view*. Buenos Aires, 2012. Available at: <http://www.buenosaires.iippe.unesco.org/publicaciones/el-webinar-2010-el-modelo-11-como-politica-publica-en-educacion-una-mirada-regional> (Accessed: November 2016)
- Lugo, M., & Brito, A. (2015). ICT policies in Latino-American education. An opportunity to settle pending debts. *Archives of the Educational Sciences*, 9(9). Available at: <http://www.archivosdeciencias.fahce.unlp.edu.ar/article/view/Archivos09a03> (Accessed: November 2016)
- Lugo, M., Kelly, V., & Schurmann, S. (2015). ICT policies in education in Latin America: beyond 1:1 model. *Virtual Campuses*, 1(1), 31-42.
- Marín, V., Sampedro, B.E., & Vega, E. (2017). Perceptions of University students of training platform. A case study. *RIED. Iberoamerican Journal of Distance Education*, 20(1), 282-303.
- OECD (2015). *Education at a glance, 2015*. Available at: <http://oecd.org/education/education-at-a-glance-19991487.htm>, <https://doi.org/10.1787/888933284408> (Accessed: November 2016)
- Organization of Iberian-American States (2010). *Goals 2021: the education that we want for the bicentenary generation (Views on Iberian-American Education)*, 283. Madrid: OEI. Available at: <http://www.oeci.es/metast2021/libro.htm> (Accessed: November 2016)

- Organization of Iberian-American States (2014). *Progress of the educational goals 2021 (Views on Iberian-American Education)*, 344. Madrid: OEI, 2014. Available at: <http://www.oei.es/noticias/spip.php?article14386> (Accessed: November 2016)
- Poggi, M. (2010). An X-Ray of Latin-American educational systems. Challenges for educational policies. *IberoAmerican Thinking*, 7, 5-25.
- Poggi, M. (2014). *Education in Latin America: achievements and pending challenges*. Basic document. Buenos Aires: Santillana Foundation.
- Riascos-Erazo, S., Quintero-Calvache, D.M., & Ávila-Fajardo, G. (2009). Information Technology in the Classroom: The Views of University Professors. *Educación y Educadores*, 12(3), 133-157.
- Raso, F., Aznar, I. & Cáceres, M.P. (2014). Integration of ICT: evaluative study in the Andalusian rural school (Spain). *Pixel Bit Journal of Resources and Education*, 45, 51-64.
<https://doi.org/10.12795/pixelbit.2014.i45.04>
- Sanabria, A.L., & Hernández, C. (2012). Perception of students and teachers about the use of ICT in the changes processes and innovation at Higher Education. *Aloma, Journal of Psychology, Sciences of Education and Sports*, 29, 273-290.
- Sola, T., López, N., & Cáceres, M.P. (2009). *Special education in its didactical and organizational frame*. Granada: University Editorial Group.
- Sunkel, G. (2016). ICT in education in Latin America: a broad view. In Carneiro, R., Toscano, J., & Díaz, T. (Eds.), *Educational goals 2021. Challenges of ICT for educational change*. Madrid: Santillana.
- Tedesco, J. (2005). ICT and educational inequalities in Latin America, presented at the 3rd seminar on *Information and Communication Technologies and the challenges for learning in the society of knowledge*, Santiago de Chile, CEDI/OCDE Seminar.
- Trujillo, J.M., Aznar, I., & Cáceres, M.P. (2015). Using and involvement analysis of social and collaborative network in learning communities of the University of Granada (Spain) and John Moores from Liverpool (United Kingdom). *Complutense Journal on Education (Madrid)*, 26, special issue, 289-311.
https://doi.org/10.5209/rev_RCED.2015.v26.46380
- UNESCO (2008). *Inclusive education: the path towards the future* (48th meeting), 37. Genève. Available at: http://www.ibe.unesco.org/fileadmin/user_upload/Policy_Dialogue/48th_ICE/CONFINTED_48-3_Spanish.pdf (Accessed: November 2016)
- UNESCO (2015). *Education for all 2000-2015 (Achievements and Challenges)*, 295. Francia: UNESCO. Available at: <http://unesdoc.unesco.org/images/0023/002322/232205e.pdf> (Accessed: November 2016)

Published by OmniaScience (www.omniascience.com)

Journal of Technology and Science Education, 2018 (www.jotse.org)



Article's contents are provided on an Attribution-Non Commercial 4.0 Creative commons International License.

Readers are allowed to copy, distribute and communicate article's contents, provided the author's and JOTSE journal's names are included. It must not be used for commercial purposes. To see the complete licence contents, please visit <https://creativecommons.org/licenses/by-nc/4.0/>.