

# ICTs and Education: a Brazilian contextual approach

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*Abstract: It is known that the use of various existing technologies has been growing in the whole world, and that access to such technologies has become more and more intense. In this context, the present paper is intended to introduce new technologies and lay out their uses as methodological tools in the historical context of education in Brazil. Another subject to be discussed is the conditions of technological access for each individual, taking into consideration regional conditions and the distribution of technological resources in different parts of the country. Thus we will analyze data provided by CETIC (in Portuguese, Information and Communication Technologies Study Center), through the means of a study carried out by the Brazilian Internet Steering Committee, about the current technological and educational environment for the Brazilian population, in order to gather information about the general state of affairs. It is also necessary to consider certain facets brought about by the use of ICTs; in this case, we will approach points that involve both the organization and the simulation employed to optimize the learning for the individual. On occasion, we will also consider the use of learning and teaching technologies, with the goal of discussing possible informational distortions caused by the use of methodological tools by different audiences: the audience and the educator. This study is justified under the condition that we must consider, democratically, the individual's technological access as a whole, observing variations in his or her condition as a formally educated citizen, providing better access to information and possibly better educational conditions in the environment in which he or she lives.*

*Key-Words: - Education, Knowledge Management, Innovation, Democratization, ICTs*

## 1. Introduction

The use of Information and Communication Technologies (ICTs) has been growing daily. Managing the use of those technologies is of extreme importance for them to be employed effectively. For this reason, there is an increasing need for a better understanding of how those technologies fit the Brazilian educational context.

Initially, this paper aims to analyze ICTs and their extensive relation to the Brazilian social context, as well as their educational influences both in the past and in the present. It will also present recent data concerning those technologies within the Brazilian territory, divided by region and major uses, taking their various functional aspects into consideration.

Throughout this paper, we will also approach the need for ICT democratization as a determining factor in the individual's upbringing and integration in society. For this purpose, we will emphasize the importance of those tools as a new methodology within the Brazilian educational context

## 2. New Technologies Have Always Existed

To start this paper, I will rely on a statement conceived after a few structural readings of this study: new technologies have always existed; it is only the times that change. Burke (2000, p. 7), referring to Thomas Kuhn, states that:

*... As for Kuhn, he shocked or stimulated his colleagues by his claim that scientific revolutions recur in history and that they have a similar 'structure' or cycle development, originating in dissatisfaction with an orthodox theory or 'paradigm' and ending by the invention of a new paradigm which comes to be viewed as 'normal science' until another generation of researchers in its turn becomes dissatisfied with this conventional wisdom.*

To better grasp the relevance of the sentence above, we only need to think over the importance of all creations or original ideas in the human evolutionary context.

If we were to systematically assess the biography of various "inventors", we would find all kinds of information or opinions about their inventions; and, whatever those opinions might have been, one thing is certain: the context always changes.

Once it is part of our culture, a new piece of information cannot be denied; there is no way to deny what is already known. What we must do is make good use of any new information that surfaces.

When it comes to the development of new technologies, things are no different. The more developed they become, the larger are the possibilities of assistance within society. According to Balestrini (2009, translation mine), in reference to Simon:

*For Simon, computers are the most important technology invented since the steam engine, possibly even since writing. He emphasizes that all computer scientists must uphold the responsibility of thinking over the implications of this technology, as well as the resources it provides to society as a whole.*

He also states:

*Due to an increase in computational resources (hardware and software), Simon makes use of AI systems, both to gain a better understanding and to augment our thinking capacities – to expand the frontiers of our bounded rationality<sup>1</sup>.*

No matter their degree of development, human beings have the ability of adapting. As such, the more flexible they are, the larger is their access to general knowledge, which is capable of being developed throughout their lives, according to their need for change. Vecchiatti (2008 p. 59, translation mine), when discussing the importance of social development, asserts:

*Here I wish to reinforce the concepts of rights and duties of a citizen. Of social evolution. The development of electronic commerce brings more information to individuals and allows them to greatly optimize their potential. When they receive their professional training, making use of Information Technologies through the means of computers, those individuals understand, experiment, learn. And grasp the advantages they can attain through the use of those tools, not only in their professions, but also in their lives as a whole.*

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<sup>1</sup> The model of Bounded Rationality presupposes that the decision maker does not search for more rational, complete or perfect models; quite the contrary, he or she accepts satisfactory and reasonable solutions, often setting minimally acceptable criteria of performance. When rational agents find a solution that meets those minimum criteria, they make the decision and implement it.

In this case, it is important to reinforce the use of ICTs as access tools to conditions the individual has not previously experienced, thus causing an increase in access to information, as well as in new neural connections formed from the novel use of technology. According to Arruda (2004, p. 82, translation mine), "Learning with new media brings new meanings to our brains, a new reading of the world."

### **3. We Are What We Know**

We are inserted in a social environment from birth, surrounded by procedures and rules imposed by it. We immerse ourselves in a pool of knowledge through which we gradually receive information and, automatically, access more information based on what we have previously learned. All this information, implicit or explicit, with its details and subtleties, is aggregated to our "database." This information will be as comprehensive as our access to it, and we as individuals will be as comprehensive as our access to such information. For Charlot (2000, p. 59), "To be born is to enter a world where we are submitted to the obligation of learning. No one can escape this obligation, for the subject can only come into his own inasmuch as he makes the world his own."

The relationship established in the previous paragraph makes it possible for us to notice two important points: the first, evident from the very beginning, deals with information itself and its reflection on the individual. The second deals with the way we organize information. Our understanding goes as far as we can process information. A great wealth of data is of no use without organization.

According to Senge (1998, p.82 as cited in Carvalho 2003, p. 41), a person may even receive more information thanks to technology, but if he or she does not possess the necessary skills to make use of it, information is useless. Keeping that in mind, we can highlight technology as an educational tool to be used in the seizing, storing, distribution and organization of information. In this way, ICTs are considered important access tools.

The product of information, termed intellectual capital, demands management, thus information can benefit from artificial organizational resources. The use of ICTs is, without a doubt, a valuable set of tools in the management of this process.

#### 4. Education Then and Now

Historically, education in Brazil and in the rest of the world has had various moments and influences that left different imprints according to the prevalent ideas of the time.

To better explain the subject, we can cite two marked trends: political and religious. In Arruda (2004 p. 28, translation mine), we can find the following assertion:

*Historically, the function of the teacher was linked to the Church in the Middle Ages – the only institution, up until the bourgeois revolutions, that was capable of maintaining an organized and centralized structure in that period's society.*

All these relations were directly reflected in both learning and teaching, marked by the trends of each age, which ended up becoming a reference point, as we can see in Hypolito (as cited in Arruda 2004 p. 28, translation mine) when he states that "teaching was linked to religious conceptions of work, such as vocation<sup>2</sup> or priesthood." For a long time education leaned on conservative ideas and practices in religious environments.

As we have seen in this paper, evolution is not only necessary: it is inevitable. Therefore, along with natural population growth and revolutions, new conceptions began to be incorporated to new forms of labor, namely capitalist ones.

We can notice, in this case, a paradigm shift. With new trends and tendencies, new premises became part of a new educational paradigm.

The old mindset based on religion no longer met the new demand for a more public, modern and democratic version of education. As we can see in Arruda (2004 p. 28, translation mine),

*Hypolito (1994, p. 26) believes that the idea of the teacher encouraged by the Church was opposed to the modern liberal conception, based on professionalism, secularity, and on the democratic and public spirit of education.*

Based on an evolutionary process inherent to human beings, there was also an evolution of methods as well as their results. Changes throughout various ages have influenced humankind greatly; for example, the Industrial Revolution, a period considered to be of

great technological expansion and influence on human behavior, made it possible for the production of goods to meet a higher demand. The organization of knowledge also began to be performed in a more rigorous manner, and technical innovation abounded.

What was once stumbled upon instinctively now demands years of directed research, even in the simplest of studies. A whole philosophical revision took place in relation to the search for information, and an attitude change was made necessary in face of new information – a paradigm shift.

Nowadays we can speak of another phenomenon: globalization. No less important than any others, this phenomenon is responsible for removing barriers in several ways that influence humankind.

This process, which opened and expanded access to several nations, is directly related to knowledge. In regard to knowledge, Charlot (2000, p. 78, translation mine) states:

*The relationship with knowledge is one of a subject with the world, himself and others. It is a relationship with the world as a set of meanings, but also as a place for activities which is etched in time.*

Encompassed by what is understood as globalization, new technologies are yet another factor responsible for the way we conceive our relationship with education. As a cornerstone of a process of educational transition, ICTs perform an important role in transforming education today.

For an individual to make better use of information and understand it, it is necessary for him or her to be kept constantly up to date.

For Arruda (2004, p. 16, translation mine):

*The pressure for individuals to be proficient in the use of new technologies in our society makes it important for us to analyze the implications of those technologies to teaching. As Silva (1996) warns us, there is an implicit and close relationship between education and the job market, that is, there is a return to the assumptions of the Human Capital Theory (HCT). According to this line of thought, when we begin to think of students as future workers, we establish a relationship between their training and education.*

Today's world is more dynamic and under a constant process of updating, which requires a greater

<sup>2</sup>Inclination towards religious life.

organization on the part of the whole population - individuals of all ages, without any distinctions based on ethnicity or belief. According to Morin (1999, p. 31),

*Globalization as the present state of the planetary era means, in the first place, as the geographer Jacques Lévy so well expressed it, 'the emergence of a new object, the world as such' But the more we are grasped by the world the more difficult it is for us to grasp it. In these times of telecommunications, computers, Internet, we are submerged by the world's complexity and bombarded with countless bits of information about the world that drown out the possibilities of intelligibility.*

Education is, by necessity, directly inserted in this process. Is it possible to think of education today without considering the world at large?

## 5. New Technologies and Education

Education has gone through a series of changes over the years. Initially, it was based on the ideas exposed by a single source, the teacher. This was possibly due to the fact that teachers used to be the only ones with good access to information. On the other hand, today we have teachers who, aware of the modern educational process, know that they are more of an organizer than an information channel in itself.

The technologies initially used in this process probably followed the same general lines. Those tools promoted a narrowing of focus on the main channel of knowledge at the time, the teacher; thus the devices employed to aid the organization of knowledge were compatible with that style of teaching. Nowadays, as we have mentioned, we have new content and a new audience. We need to pay close attention to those variables so that the educational process agrees with the socioeconomic and cultural reality of the country, enabling us to adopt a new way of teaching that is more appropriate to the existing demand.

In Landry (2002, p. 120 as cited in Arruda 2004, p. 82, translation mine), we find the following claim:

*For over a century, the model of a "class" built around the teacher's lesson has been the canonical model for educational devices. Given its good adaptation to the Taylorist organization of labor, it has so far resisted the technical invasions that have transformed society with some success.*

As for the audience, not long ago students still inscribed information on stone, made of a single page on which they wrote whatever was relevant, and then erased it so that another piece of information could be written - the blackboard.

Blackboard and chalk were an integral part of knowledge transmission, complemented by the teacher's lecture, which even today is mostly focused on his or her point of view. From the 19th century onwards, schools have not presented any other kinds of organization of classroom space, and they have not gone much further beyond the technologies of the blackboard and chalk. (ARRUDA, 2004, p. 70).

Today, methodological tools have a wider approach, which translates into more openness to information. The audience participates more actively in all stages of the creation of information, gaining more autonomy to deal with the knowledge it acquires. According to Levy (2006, p. 40, translation mine), "The more active people are when acquiring knowledge, the better they will integrate and retain that which they learn." Based on this assertion, it is relevant and necessary for us to gain a wider outlook on the educational process, so that we can make the audience more active in the production of knowledge. This will cause the decentralization of knowledge and the emancipation of the individual. All of this is, of course, related to the technologies we employ. In order to accomplish this goal, it is necessary for us to adopt an "active pedagogy" in which individuals construe their knowledge instead of just repeating what they have heard.

According to Maximiliano (2005, as cited in Miranda 2006, p. 49, translation mine), "not to use the potential of IT in education is to compromise both the quality of the subject matter and the methodology."

In respect to primary education, young people have been increasingly accessing information from many different sources; in that way, they acquire much knowledge outside the confines of school. They are auto-integrated in this new societal paradigm, preferring the warm comfort of home, where they have all technologies at their disposal, to a school which is still obsolete. It is important for both schools and teachers to adapt themselves to this new kind of individual, who is in tune with technological novelties.

In the chart below, we can observe that most of the public who makes use of computers, a fundamental Information and Communication Technology device, is composed of individuals from

10 to 24 years old. Another important fact is that they are students, from primary school to university.

| Percentual (%)<br>Percentage (%)   | Sim<br>Yes | Não<br>No |
|--|------------|-----------|
| <b>TOTAL</b>   | <b>53</b>  | <b>47</b> |
| <b>REGIÕES DO PAÍS REGION</b>  |            |           |
| Sudeste<br><i>Southeast</i>  | 56         | 44        |
| Nordeste<br><i>Northeast</i>   | 44         | 56        |
| Sul<br><i>South</i>  | 56         | 44        |
| Norte<br><i>North</i>  | 48         | 52        |
| Centro-Oeste<br><i>Center-West</i>   | 58         | 42        |
| <b>SEXO GENDER</b>   |            |           |
| Masculino<br><i>Male</i>   | 55         | 45        |
| Feminino<br><i>Female</i>  | 51         | 49        |
| <b>GRAU DE INSTRUÇÃO SCHOOLING</b>   |            |           |
| Analfabeto / Educação infantil<br><i>Illiterate / Kindergarten</i>           | 16         | 84        |
| Fundamental<br><i>Elementary</i>   | 51         | 49        |
| Médio<br><i>High School</i>  | 77         | 23        |
| Superior<br><i>University</i>  | 94         | 6         |
| <b>FAIXA ETÁRIA AGE</b>  |            |           |
| 10 - 15  | 80         | 20        |
| 16 - 24  | 82         | 18        |
| 25 - 34  | 67         | 33        |
| 35 - 44  | 44         | 56        |
| 45 - 59  | 24         | 76        |
| 60 +   | 7          | 93        |
| <b>RENDA FAMILIAR INCOME</b>   |            |           |
| < R\$ 380,00   | 28         | 72        |
| R\$ 381,00 - R\$ 760,00  | 41         | 59        |
| R\$ 761,00 - R\$ 1.140,00  | 58         | 42        |
| R\$ 1.141,00 - R\$ 1.900,00  | 67         | 33        |
| R\$ 1.901,00 - R\$ 3.800,00  | 82         | 18        |
| R\$ 3.801,00 +   | 87         | 13        |
| <b>CLASSE SOCIAL SOCIAL CLASS</b>  |            |           |
| A  | 95         | 5         |
| B  | 82         | 18        |
| C  | 61         | 39        |
| DE   | 28         | 72        |
| <b>SITUAÇÃO DE EMPREGO EMPLOYMENT STATUS</b>                                 |            |           |
| Trabalhador<br><i>Worker</i>   | 55         | 45        |
| Desempregado<br><i>Unemployed</i>  | 54         | 46        |
| Não integra a população ativa<br><i>Is not part of the active population</i> | 49         | 51        |

Table 1 Proportion of individuals who have used a computer  
Source: Pesquisa sobre o uso das TCIs no Brasil, 2007, p.146

Based on all the information presented in this paper, it is pertinent to raise the following questions: how was technology used and developed in education in the past? And how are those activities being developed today?

Those questions are part of a series of questions relevant to the subject, and they are intended to provide a new way of thinking about education in the world today, even because today's students are not the same as yesterday's. And what is our own place, educators, who were born before them?

Another consideration to be made is that the individual who produces an internal argument and, consequently, adopts a more active attitude towards learning becomes more responsible for the educational

process as a whole, and thus gains a better position to influence his or her own social environment productively. For this reason, it is important for us to know how to conduct the educational process with the intention of qualifying critical thinkers and opinion makers in our society.

## 6. ICTs and The Teacher

We have discussed the differences between education today and in the past, and those differences aren't any less pronounced when we deal with the figure of the teacher.

Today, teachers have a powerful methodological arsenal at their disposal to aid them in the practice of formal education, but it is necessary for them to be capable of making use of it. This does not take place as a meaningless technological showcase, but as a necessity that initially involves two fundamental aspects.

First of all, it is necessary that teachers, whose role is based first and foremost on information, keep such knowledge up to date. To do this, it is important for them to be proficient with technologies that involve the management of personal knowledge.

Another important aspect for us to notice is the connection between the teacher's knowledge and the student's knowledge. Teachers who are not adapted to their audience can compromise the way they organize knowledge and conduct their teaching. According to Mercado (1999, p.14 as cited in Arruda 2004, p.32, translation mine):

*Training teachers in the use of new technologies is linked to a new vision of the student, one who is more concerned about the process than the final product, and is prepared to make decisions and choose his or her own study path.*

If the training of the teacher is related to this new kind of student, the most important thing for us to know is that the student's education will depend on a new vision of the teacher. Arruda (2004, p. 32, translation mine) asserts: "This 'new' kind of educator, as it has been mentioned, creates a more 'independent' student, master of himself in a system of uneven social relations."

The rights and duties of a citizen can only be truly exercised by someone who is a citizen in all senses of the word. Thus it is imperative that we reflect more on the way educators update their

knowledge and skills. The whole process is extremely relevant when it comes to highlighting the importance of having well-educated individuals in society.

When we speak of educational innovation, we are also speaking of a better preparation for the job market. It is in the hands of educational institutions and educators to instill in the individual the notion that there is now a different kind of demand for workers, based on recent market developments and globalization.

Green and Bigum (1993, p. 121-2), speaking of young people, assert:

*Whereas once youth might be comfortably regarded as something one eventually grew out of, as an interim stage in the movement towards normality, to be incorporated into the (w)hol(i)ness of adulthood, now this orderly passage has become fraught with hazardous uncertainty. Increasingly alienated, in the classical sense, young people are also increasingly alien, alienated others, differently motivated, designed, constructed. And the awful possibility presents itself, insistently: they aren't simply visiting us, after which they'll simply go away; rather, they are here to stay, and they're taking over*

Taking the assertion above into consideration, it becomes relevant to ask the following question: are we, educators and institutions, prepared to meet this demand?

## 7. Conclusion

This paper has allowed us to obtain a wider perspective on the use of ICTs in Brazil, as well as understand the need of having open access to them.

It was possible to realize the necessity of an educational process that is more adequate to this reality, so that we can have a more efficient and contextualized educational system.

In conclusion, it is essential that we broaden the horizons of information in all its aspects, so that we can gaze further into the future.

## 8. Works Cited

[1] AFONSO, Carlos; SOARES, Luiz Fernando G. Desenvolvimento humano e a apropriação das TICs. *Pesquisa sobre o uso das Tecnologias da Informação e da Comunicação no Brasil: TIC*

- Domicílios e TIC Empresas 2005*. São Paulo: Comitê Gestor da Internet no Brasil, 2006.
- [2] ARRUDA, Eucídio Pimenta. *Ciberprofessor: novas tecnologias, ensino e trabalho docente*. Belo Horizonte: Autêntica, 2004.
- [3] BALESTRINI, Alsones: Uma análise da contribuição de Herbert Simon às teorias organizacionais. Disponível em: [http://www.rits.org.br/acervo-d/herbert\\_simon.pdf](http://www.rits.org.br/acervo-d/herbert_simon.pdf). Accessed on: 11/03/2009
- [4] BURKE, Peter. *A Social History of Knowledge: From Gutenberg to Diderot*. Cambridge: Polity, 2000.
- [5] CHARLOT, Bernard. *Da relação com o saber: elementos para uma teoria*; trad. Bruno Magne. Porto Alegre: Artmed, 2000.
- [6] GREEN, B. and BIGUM, C. Aliens in the Classroom. *Australian Journal of Education*, v. 37, n. 2, p. 119-141, 1993.
- [7] LÉVY, Pierre. *Cibercultura*. Trad. Carlos Irineu da Costa. Rio de Janeiro: Ed. 34, 1999.
- [8] \_\_\_\_\_, Pierre. *As tecnologias da inteligência: o futuro do pensamento na era da informática*. Trad. Carlos Irineu da Costa. Rio de Janeiro: Ed. 34, 2006.
- [9] \_\_\_\_\_, Pierre. *O que é Virtual*. Trad. Paulo Neves. São Paulo: Ed. 34, 1996.
- [10] MIRANDA, André Luiz Pires de, *Avaliação da habilidade em tecnologia da informação e sua importância : um estudo com futuros administradores*. 2005. 160 f. Tecnologia da informação, Ensino superior, Inovações tecnológicas - Fundação Cultural Dr. Pedro Leopoldo, Pedro Leopoldo, 2005.
- [11] MORIN, Edgar. *Seven Complex Lessons in Education for the Future*; transl. Nidra Poller. 11. ed. Paris: Unesco, 1999. Available at: [http://www.unesco.org/education/tlsf/TLSF/theme\\_a/mod03/img/sevenlessons.pdf](http://www.unesco.org/education/tlsf/TLSF/theme_a/mod03/img/sevenlessons.pdf). Accessed on: 16/09/2009
- [12] SORJ, Bernardo. *brasil@povo.com: a luta contra a desigualdade na sociedade da informação*. Rio de Janeiro: Jorge Zahar Ed.; Brasília, DF: Unesco, 2003.
- [13] VECCHIATTI, Cássio. A evolução do cidadão e o comércio eletrônico. *Pesquisa sobre o uso das Tecnologias da Informação e da Comunicação no Brasil : TIC Domicílios e TIC Empresas 2007*, São Paulo: Comitê Gestor da Internet no Brasil, 2008.