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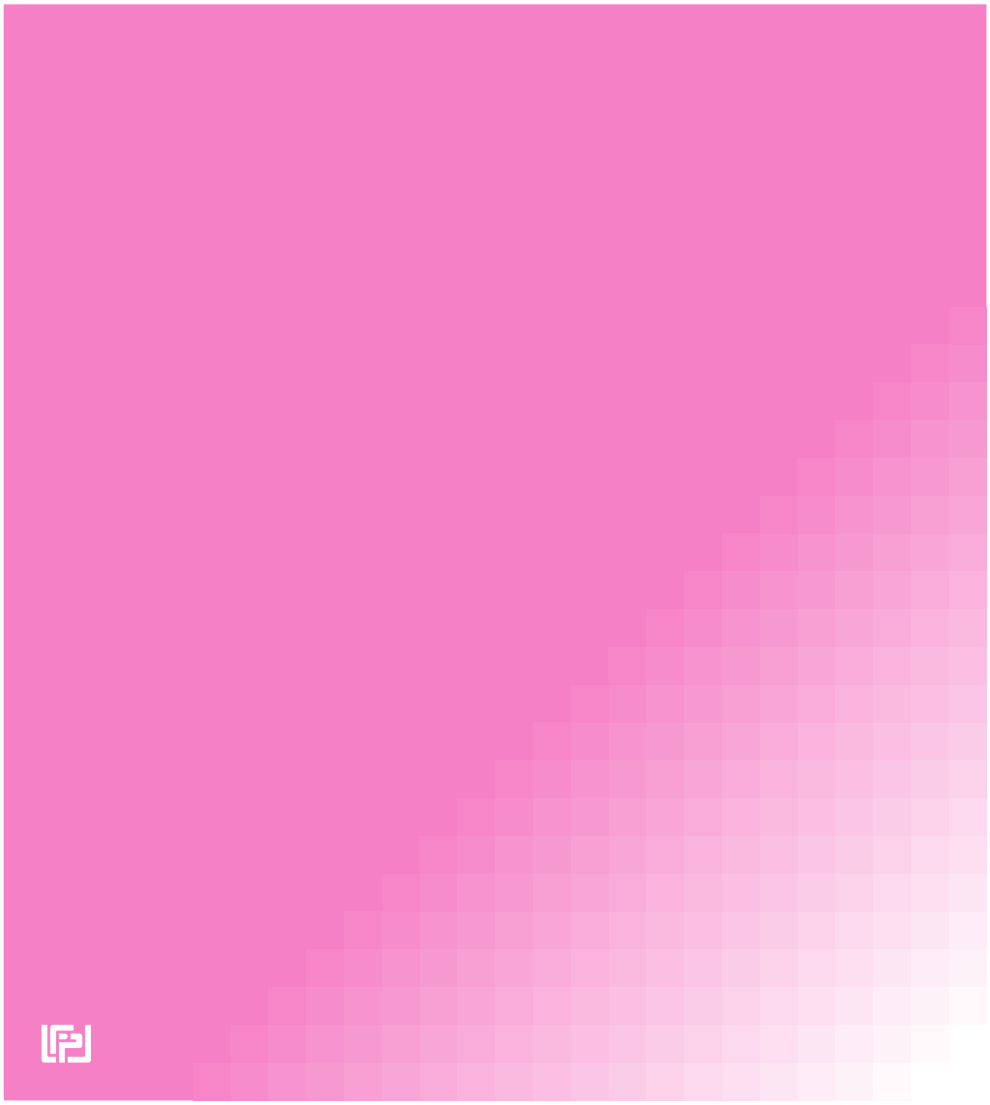

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Generational gaps in school learning: *Digital natives* and *digital immigrants*

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(Translated by Fátima Silva)

Abstract: This article focuses on the generational gaps in school learning. Initially, we have tried to provide the framework in relation to the term *digital native* in order to understand the key aspects of the generation born after the advent and the global use of the Internet. They were found to be "multitasking" people, linked to technology and connectivity, as opposed to *digital immigrants*, born in an earlier period and seeking to adapt to the technological world. We also present some reflections on the use of these students' strategic capabilities in recreational tasks.

We will also discuss the changes occurring in these new students who, thanks to technology and information resources, have made the school institution adapt to them. These changes have also made teachers alter traditional teaching and encouraged them to modify their methods with the construction of educational content in ICT in the form of learning objects, as a new form of education or a complement of education and a way to instil self-learning.

Keywords: Digital Natives and Immigrants, Neuroplasticity, School, Technology

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1. Introduction

The world is undergoing a revolutionary period, predominantly a technological revolution causing significant changes in society. According to Toffler (2001), we are living the advent of the civilisational *era* of information, in which our choice of technologies decisively shapes our future cultural styles, and, thus, requires an individual who is ready, has the capacity to think and is able to be creative/innovative.

We are increasingly witnessing the rise of the digital gap between the younger and older people. Prensky (2001a) argues that children represent the digital natives, while their parents are the so-called digital immigrants.

The computer as a post-industrial instrument assumes increasing importance for today's man (technological). Its use is spreading in schools, through educational software, and is more widely available although some still regard these resources with some degree of reluctance.

The aim of this work, hence, is to analyse how the young generation reacts to the new information society and how schools and teachers react to these new paradigms, and how the emergence of a new being, "Digital Homo Sapiens", will change the way we work.

2. Description and characteristics of the concept "Digital Native"

The term "digital natives" was first used by Mark Prensky, in 2001, in an article entitled "Digital Natives, Digital Immigrants". In that article, Prensky argues that while digital immigrants are those who come later on into Information and Communication Technologies (ICT), the natives are those already born in the digital age and who are frequent users of these technologies.

However, according to Piscitelli (2009), there must be a certain care in generalising the concept of digital natives. He states that the digital natives are not a generational divide. Some adults might be considered natives, although there are not many, and some young people might be considered immigrants. The distinction is a matter of cultural and symbolic capital linked to other values and competencies. We are undergoing a temporal transition in terms of literacy and cultural values within a profound cultural struggle.

The main feature of these digital natives is technophilia, they are constantly attracted by everything that is related to the new technologies. These are vehicles that provide fun, entertainment, communication, information and sometimes training.

These new users face work, learning and games differently, they absorb multimedia information of images and videos more quickly than information from texts, and they

consume data simultaneously from multiple sources.

They use hypertext rather than linear text, functioning best when networking and they prefer play to serious work. They are always connected, expect immediate responses, and they are also content builders. There is no doubt that their relations with technology shape their concepts of what communication, knowledge, study/learning and even their personal values are.

They are part of a generation that grew up around the New Technologies, surrounded by all kinds of devices and services that have transformed them into living beings capable of performing a wide range of tasks at the same time, which Mark Prensky (2001a) called multitasking.

They stand out in the immediacy of their actions and in their decision-making. As today's children are different kinds of learners, an effort should be made to discover new ways of teaching them.

The concept of neuroplasticity (Sousa, 2001), (...) the brain's capacity to transform through childhood and adulthood depending on individual experiences, is related to brain development; thus, we may be witnessing a neural shift, brain neuroplasticity caused by this technological bombardment. According to Prensky (2001b), as it is known that the brain is highly plastic and adapts continuously to the stimuli that it receives, it is quite possible that the brains of those who interact with technology is continuously re-structured by this interaction. Healy (1998) argues that the brain grows as it actively responds to its environment and is shaped by this environment.

The brain has the capacity to learn in many different ways and for long periods of time, contrary to what was previously believed. It can be inferred that the human brain is projected to continue to grow and adapt to its environment. Thus, the brain of today's child is really constructed differently from the brain of a child of previous generations. Marc Prensky (2001a) speculates that the human brain responds differently to information being presented in the environment of the traditional classroom and that this environment should thus be altered to accommodate today's children.

According to Tagnin (2008), our young people did not know a world without video games, email and instant messaging. Several studies confirm that the habits of today's young people are very different from their parents' and teachers'. They transparently and automatically adhere to emerging technologies, while adults, digital immigrants, need to adapt, not without some difficulty, to the new tools and the new ways of doing things.

Schlemmer (cit. in Barros, 2006) states that this generation is the generation represented by the expression "to learn, one has to touch".

Internet, Wikipedia, Google, MSN, Blog and many other tools that have recently been launched into our world did not force the new generations to have any specific or ongoing training course.

Alves (2008) presents the result of a study conducted in 2005 with 25 thousand young Brazilians aged between 18 and 25. When asked about the activities they carry out simultaneously when they are at their computer, they reported listening to music (60% of respondents), doing schoolwork (52%), talking with other people (51%), speaking on the phone (36%), studying (31%), watching TV (27%), reading magazines (23%) and performing other actions different from those rated above (2%).

Monteiro (2009) also states that they are able to watch TV, listen to music, type and use their notebook computer, all at the same time. That is "multitasking". They love to experiment the new applications, easily handle blogs and multiple links, jumping from site to site without getting lost.

Alves (2008) corroborates these statements and adds that the individuals who were born immersed in the digital world interact simultaneously with different technologies, that is, listen to music, play videogames, watch a DVD, chat with friends on instant communication software or by phone, do school activities, all at the same time.

Interactivity and interconnectivity, which are favoured by digital technologies, by the culture of simulation, and are present in virtual communities and electronic games, have also contributed to the establishment of another logic that characterises hypertextual thinking, interacting with various cognitive windows at the same time. Here, there is a concern with the duration of the attention devoted to activities. The important thing is the capacity to multitask, do different things simultaneously (Alves, 2008).

Our students learned all this interactively – asking friends, whether virtual or not, how this or that tool functioned; none of them had *facebook training* or took a diploma in MSN.

Our students are much closer to interactivity in digital environments than those of us who saw this technology emerge, who accompanied the transition from the typewriter to the first – and very limited – computers (Schlemmer cit. in Barros, 2006)

One of the characteristics of the digital natives generation is the use of their very own language and their very own way of knowing and interpreting the world, making any standards of homogeneity, for example, in education, almost impossible to maintain and even, currently, non-existent.

In short, we can say that the digital natives are far from being a passing fashion; they seem a phenomenon spanning a generation and growing ever more firmly.

3. Traditional School and the Challenges Imposed by Digital Natives

In the article "Digital Natives, Digital Immigrants", Marc Prensky (2001a) proposed an interesting reflection on the sociocultural discontinuity which has taken place in recent decades, driven by technology. The author argues that traditional teaching methodology, designed to educate through the assumptions of the past, is no longer viable for more recent generations.

The arrival of digital natives is already perceptible in primary and secondary school education. But, is the education system, directed and designed by elements who were not born into the digital age, Digital Immigrants, prepared to teach individuals who work best when connected to the network (cyberculture), who are used to performing multiple tasks simultaneously and who prefer interactive communication made from graphics and hyperlinks to conventional texts?

We live a reality that many educators and teachers seem to know little of or very vaguely know: messenger, i-pod, email, chat, IM, podcasts, wikis, blogs, SMS, MMS – these are some of the many expressions which relate to the everyday reality of the generation of students who attend lessons in our classrooms. Growing up today in the digital society means radical differences in the way information is processed, how we socialise, interact and learn (Prensky, 2001a). Technology is not something that young people have to get used to, thus, they naturally expect to find it in all areas of their life. School will not evade this rule.

The issue is that today's educators and teachers already belong to the group of digital immigrants, often slipping into a pre-digital language, which includes certain behaviours, attitudes and ways of acting, which are perhaps not within digital natives' understanding.

According to Prensky (2001), digital natives are used to receiving information rapidly. They would rather use graphics than text, random and free access to information, and they function well when networked and when there is the promise of a reward, provided it is immediate. Their preference for the game component and recreational environments is also a characteristic of this generation. Educators, digital immigrants often insist on learning procedures that, for themselves, were valid, but which no longer seem to be.

At a time when learning can be so many things, it is up to educators to provide students with an ever-growing development of their self-regulatory capacities which enable them, both throughout their schooling and in all their life-long formative experience, to know how to learn. The development of learning strategies, time management, goal setting, self-evaluation,

self-efficacy and intrinsic interest beliefs are key processes in promoting more self-regulated individuals who are capable of succeeding in the school context and in life (Zimmerman, 2002).

Self-regulatory processes as part of strategic learning that fosters reflection are teachable and are regarded as responsible for the increase of students' levels of motivation and performance (Zimmerman, 2002).

The scientific community has shown that, when playing videogames, today's students implement essential cognitive skills that are very useful in achieving the objectives of these games. A challenge will be to try to make use of these skills, which students develop in a recreational and informal context outside the school context, and transpose them into the classroom.

Luke (1999), in a very interesting approach of childhood contexts over time, stresses that it is not legitimate to ignore the early literacy and recreational experiences of children who have been shaped by technology.

Henderson (2005) also supports the idea that video games have considerable cognitive value. In a study focusing on information processing theory and mediating processes' framework, this author investigated the strategies and cognitive skills of five teenagers over a period of two years while they played an action-adventure video game and concluded that this type of recreational experience can be considered an educational experience, albeit an informal one, as a result of the game's cognitive weight.

Moreover, Carr (2005) refers to the acquisition of interpretative skills by assiduous recreational players, and Facer (2005) argues that many of the games have a strong component of complexity which implies the management of multiple variables, emphasising the issue of problem solving.

Thus, research seems to show unanimous data, considering that the development of recreational excellence in video games requires considerable self-directed practice, which is of crucial importance, and which cannot be disregarded by educational leaders.

Veiga Simon (2005) calls for the training of teachers who are aware of all the students and who do not minimise their previous – increasingly richer and earlier – experiences. Moreover, they must not ignore their students' current context and the technological future they face; they who bear the hallmark of digital natives.

The educational community will increasingly have to maximise and channel all the skills developed in the students' recreational and social context to create strategic and self-regulated learning capacities, which lead them along a differentiated, but not indifferent, path. Calling on their prior informal knowledge to their digital reality

will contribute to increasing their levels of self-efficacy and motivation, as pointed out by Bransford, Brown & Cocking (1999) and, hence, optimise learning.

The use of technology and games in the classroom context may, due to their ever-increasing degree of interactivity, result in the creation of environments that boost learning by discovery, immediate and individualised feedback, and the consequent refinement of knowledge (Bransford, Brown & Cocking, 1999).

4. Digital Natives and the "new" school

Many educators recognise the need for change. According to Kelly (2005, p. 34), schools and universities have made great investments in communications and computers; however, they are still using teaching methods of the 19th century such as reading texts, listening to lectures and participating in laboratory experiments. Today's learners know more about what they like through the use of computers than through their own teacher.

However, opposing the use of technologies in classrooms, other experts recommend that children should be given the opportunity to live life more quietly and not be pushed too early into the adult world of technology. Corroborating this line of thought, we can cite the findings of a study on current technologies which have been extensively analysed by a team of researchers, the Alliance for Childhood (2004), *Tech Tonic: Towards a New Literacy of Technology*. This report analyses the way these technologies (television, videogames, computers, mobile phones) have had a negative impact on our society. The report approaches the theme based on three central arguments: firstly, the world is facing irreversible changes in human biology and ecology. Secondly, children spend more time in front of the screen than interacting with each other and with the outside world. Third, there is little evidence of long-term benefits of the use of new technologies and growing evidence of harm from this lifestyle. After the initial findings of the report, the authors have suggested that the technological tools must be used with common sense so that human relations always appear first, before technology.

While many researchers have begun to think differently about education, it is important to consider what has been learned so far, especially with regard to mental development and children's capacity to learn.

It is, thus, logical to state that there is a risk of rupture between the culture of digital natives and what teachers teach. Teachers know less about technology than their students and, consequently, digital natives are being taught in a manner that is not stimulating for them.

The teacher has to update their knowledge and discover the possibilities that technology can bring to their pedagogic practice.

According to Paulo Freire, concrete man must become an instrument with science and technology resources in order to be able to fight for their humanization and freedom (Freire, 1995 apud Guimarães, 2003, p. 58).

Prensky (2001b, 2005) states that today students must have different type of teaching. Schools must adapt to the needs of the new students and not the reverse. Digital natives do not fear technology and expect this to be an integral component of their learning experience. They prefer to have an active role in their learning. These students do not usually trace a dividing line of what is considered work and what is considered play, everything is integrated.

Traditional "analogue" teaching cannot prepare them adequately for the use of these technologies, which is a characteristic that defines them as a generation.

It is difficult to keep them tuned in a traditional classroom, because they feel that this content is available on the internet and that they can exchange it among themselves. In short, they tend to participate actively in the construction of their own knowledge.

In this context, digital immigrants should learn to teach using different and more attractive methods otherwise digital natives will "recede" when trying to adapt their intellectual capacities to that learning environment.

This does not mean simply changing the themes and content in order to create multimedia spaces, but also how to address them, present them and make them more dynamic. We must be open-minded and consider these new languages arising from the use of computers, the internet and video games.

Regarding content, the basic lines of adaptation should be considered and implemented, thus, accomplishing the aim of using collective knowledge. The development and search of collective knowledge is one of the most remarkable achievements of the so-called Web 2.0 and is accomplished through the following actions:

- Content creation by users, access to existing information; reflection and drawing of conclusions in order to translate them into self-produced content (blogs and wikis). Users must register their knowledge and create new information.
- Sharing digital content (videos, photographs, documents, worksheets, ...).
- Gathering information: sort, standardise, comment, value ("rating"), label ("tagging") and update existing digital content.

The use of the computer is thus one of the best means of contact with new technologies, allowing us to execute a wide range of activities that will meet the demands of society today.

According to Begona Gros (2003), there is a gain in digital literacy through the use of the new technologies and the internet in informal play. The author argues that children gain knowledge about the digital world through their play with the tools of the digital world. Gros concludes recommending that there is a need for further research to improve the understanding of the impact that computers have had on the children of this generation.

This massive contribution of information and multitude of available works on the internet means that current students desire to quickly change themes and open the largest number of works, leading to possible dissatisfaction regarding traditional school practices.

5. Conclusion

This article aimed to approach the theme of digital natives and tried to present a comprehensive idea of the evolutionary process catalyzed by technology and cognitive development.

Thus, the technology used for educational purposes must be increasingly present in schools, due to the inevitability of a future that can no longer be seen without it. Those responsible for education need to give serious consideration to the digital natives who fill the classrooms, and who are full of early, mostly recreational, experiences. They have to be given validity, thereby removing the potential of pedagogic appropriation.

Schools and teachers have a crucial role in the way they currently see education and how they will have to adapt to the new demands of the new students. Although it is not known if this is the model to follow, since there are no retrospective studies as yet, the traditional model, as we know it, will face extinction.

The main priorities for the future involve integration with tools and resources, selected transparently and providing resources which are easy to find, understand and use. These tools also need to be well designed and arranged in a logical and intuitive form, accessible to the student; thus ensuring that digital natives achieve greater attention and performance in terms of content, information, and tasks.

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