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CELL PHONES IN EDUCATION: NAVIGATING THE CHALLENGES AND OPPORTUNITIES IN BRAZIL

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Abstract

The widespread adoption of cell phones among the Brazilian population has created a significant impact on various aspects of society. This study aims to explore the use of cell phones as an educational resource, particularly in the context of schools where teachers and students belong to different generations with distinct digital skills. The research acknowledges the increasing accessibility of smartphones and the fact that a majority of the population, especially those aged 10 years and above, utilize them to access the internet. However, despite their prevalence, integrating cell phones into educational settings remains a significant challenge for teachers. This challenge arises from the presence of two distinct generations: digital natives, who possess digital technology skills and were born after 1980, and digital immigrants, who adopted technology later in life. These generational differences result in conflicts regarding the use of mobile devices in teaching and learning environments.

To address this conflict, this study investigates how cell phones can be effectively used as educational resources. It examines the current state of cell phone usage in Brazil, explores the existing legislation regarding their use in classrooms, reviews previous research on their integration in educational settings, and proposes potential applications in continuing education and the teaching-learning process. By exploring these aspects, the study aims to provide insights into harnessing the potential of cell phones to enhance the educational experience.

1. Introduction

Currently, there has been an expansion in the use of cell phones by the Brazilian population. This phenomenon is evident when we observe that in 2017 the contingent of people aged 10 years or over who had a mobile phone for personal use was 139.1 million, which corresponded to 78.2% of the country's population in this age group age, in correlation with 2005, this contingent increased by 147.2%, that is, 82.8 million people (IBGE, 2016). When observing the purpose of cell phone use, it is identified that 84.5% was to access the internet. Another important point is that 98.5% of the population aged 10 years and over use cell phones as a resource to access the

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internet. In view of this scenario, it is observed that new technologies have given the majority of the population access to instruments such as smartphones, making people increasingly connected. These devices have been used in different areas and for different purposes. Despite this capillarity of possibilities, its use is still a major barrier to overcome in school spaces, especially by teachers. This challenging reality is motivated in the school context, due to the two generations present. The first generation known as the digital natives who, according to Palfrey and Gasser (Santos, Alex, & Pink, 2016) are those born after 1980 and who have the skills to use digital technologies. And the second generation, called digital immigrants, that is, those who were not born in the digital world, but who, at some point in their lives, adopted the use of new technologies (PRENSKY, 2001). The generation of digital natives is largely made up of students. The one for digital immigrants is made up of teachers. This, consequently, leads to clashes regarding the use of mobile devices in the teaching and learning process. With the objective of providing, although in part, the overcoming of this conflict, this study aims to answer the problem: how can the use of the cell phone be made as an educational resource? Having this question as a guiding question, we present research on the use of cell phones in Brazil, legislation on its use in the classroom, research on its use in the classroom and finally we propose possibilities for its use in continuing education and in teaching-learning process.

2. Research on the Use of Cellular Phones in Brazil

When observing researches that bring as results the use of cell phones by the Brazilian population, we note that this phenomenon is expanding. To reinforce this position, we bring in this article what was exposed in two surveys, the one carried out by the Brazilian Institute of Geography and Statistics – IBGE: Internet access and television and possession of a cell phone for personal use (IBGE, 2016); and the second, conducted by Fundação Getúlio Vargas – FGV: 29th Annual Survey on Administration and Use of Information Technology. Both studies point to the significant increase in cell phone use in Brazil (FGV, 2019).

2.1. IBGE Survey Results

Although the research carried out by the IBGE also exposes access to the internet and television, we will only bring the results linked to cell phone use, as this is the focus of our article. Thus, they will be presented within the time frame observed in the IBGE survey, which runs from 2005 to 2015, and analyzes the population aged 10 or over.

In 2015, the number of people aged 10 or over who had a mobile phone for personal use was 139.1 million, which corresponded to 78.3% of the country's population in this age group. Compared to 2005, this contingent increased by 147.2% (82.8 million people) (IBGE, 2016). We can see this reality by macro-region in Brazil, as shown in Figure 1.

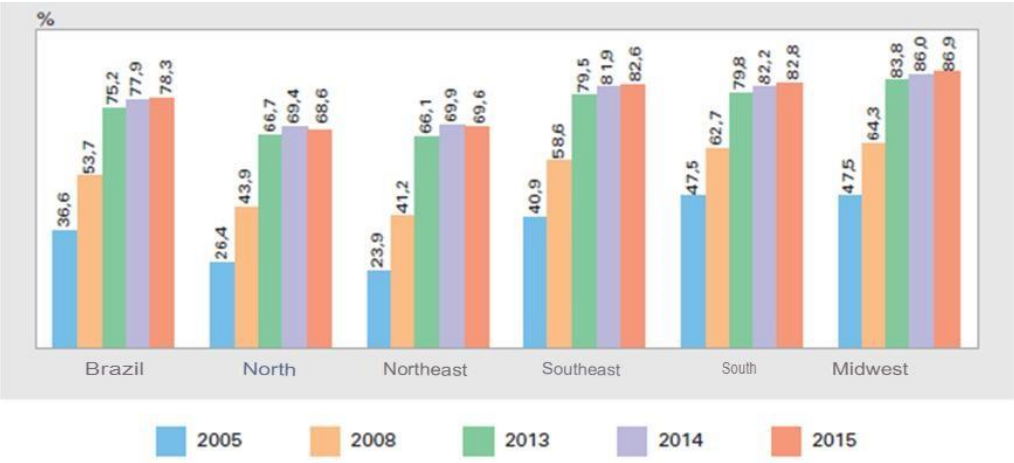

Figure-1.

Percentage of people who had mobile cellular phones for use in the people 10 years old and over, by major regions – 2005/2015.

Source: IBGE (2016).

Another very important aspect to be exposed is about internet access using cell phones, which as of 2014 became the most common way for Brazilians, as shown in Figure 2, which is divided by large regions in Figure 3 and by state in Figure 4.

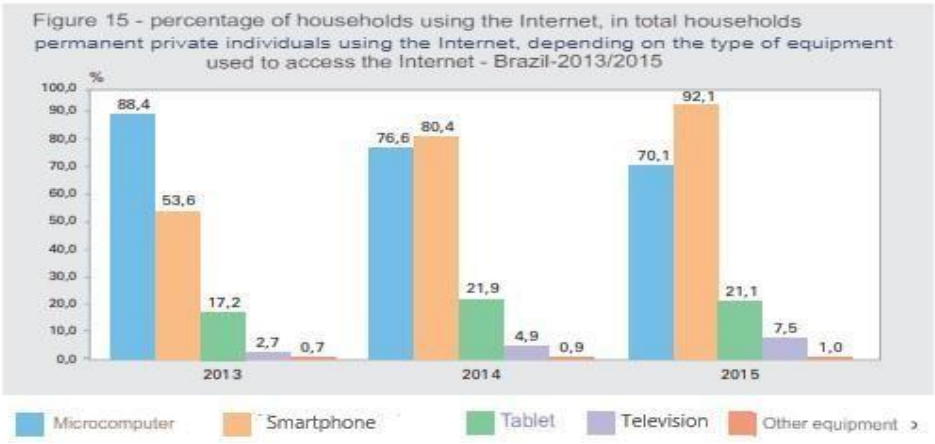

Figure-2.
Percentage of households using the internet, according to the equipment used - 20013/2015.
Source: IBGE (2016).

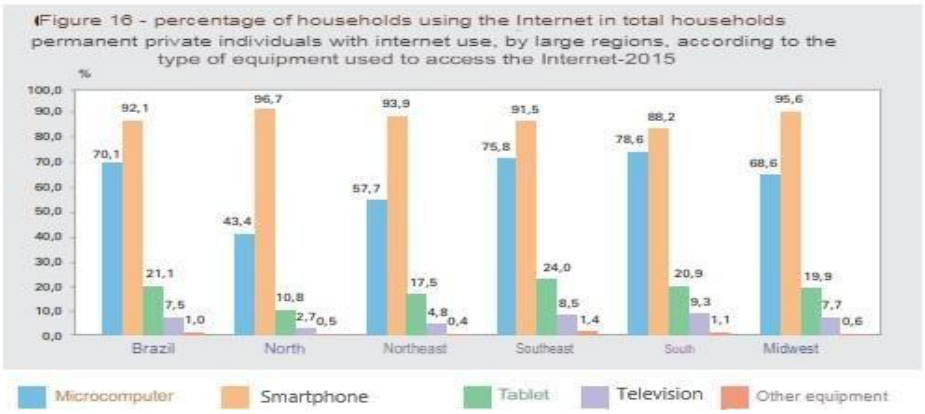

Figure-3.
Percentage of households using the internet by major regions, according to the equipment used – 20013/2015. **Source:** IBGE (2016).

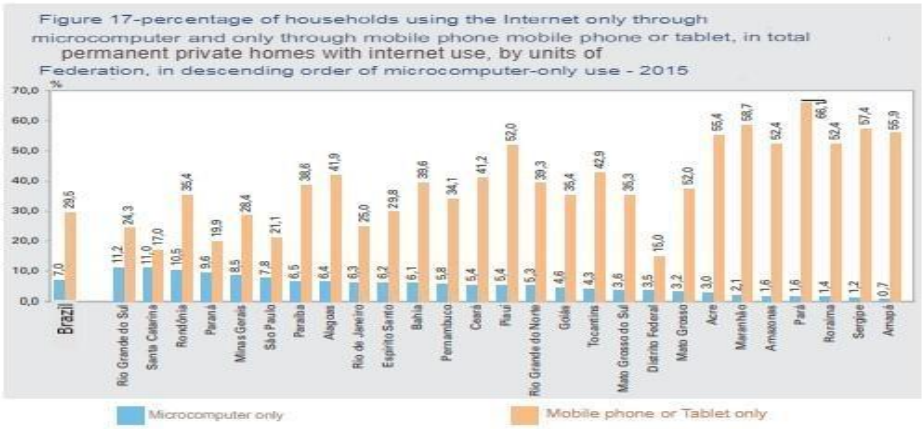

Figure-4.

Percentage of households using the internet by state, according to the equipment used – 2015.
Source: IBGE (2016).

2.2. FGV Research Results

The survey conducted by FGV refers to the use of cell phones in 2018. Strengthening the results presented in the IBGE survey, as it also demonstrates this expansion. Thus, when making a worldwide comparison, the study shows that the use of cell phones in Brazil is above the world average, with 1.06 cell phones per inhabitant, and close to the use in the United States, the nation that leads this ranking, with 1.28 cell phones per inhabitant, Figure 5. In other words, in Brazil and in several countries, the number of cell phones exceeds the number of inhabitants, Table 1. A trend that solidifies in the coming years, as shown in Figure 6.

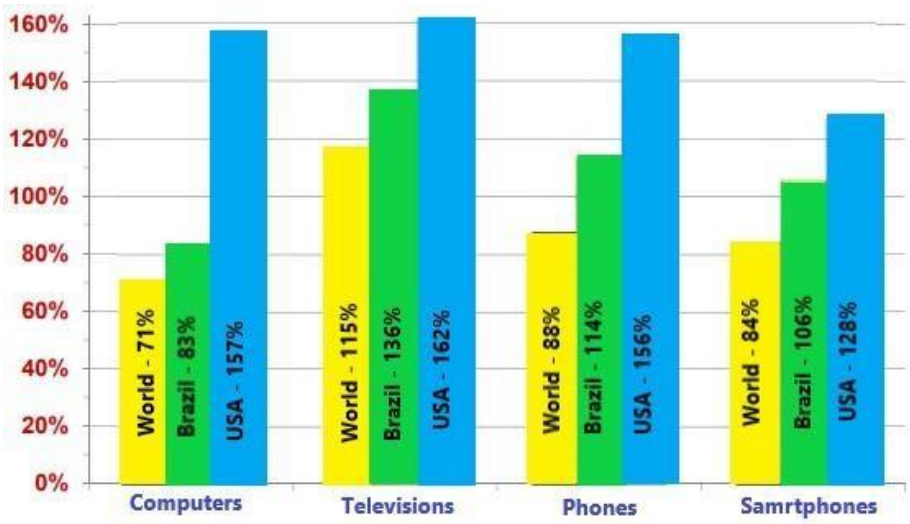

Figure-5.
DEVICES: Computers, TVs and Telephones % per inhabitant (per capita) in May 2018.
Source: FGV (2019).

Table-1.
DEVICES: Computers, Phones, TVs and Smartphones.

May/2018	**Micro**	**Fone**	**TV**	**Micro**	**Fone**	**TV**	**TV/Micro**	
(millions)	Total Active Base			Annual Sale			Total	Annual
Brazil	174	284	238	12	44	10	1,4	0.8
USA	514	530	512	30	24	16	1,0	0.5
World	5.280	8.600	6.560	440	1.800	400	1,2	0.9
	Total Base / Population			% World Base			% Population	
Brazil	83%	136%	114%	3.3%	3.3%	3.6%	2.8%	
USA	157%	162%	156%	9.7%	6.2%	7.8%	4.4%	
World	71%	115%	88%					

Source: FGV (2019).

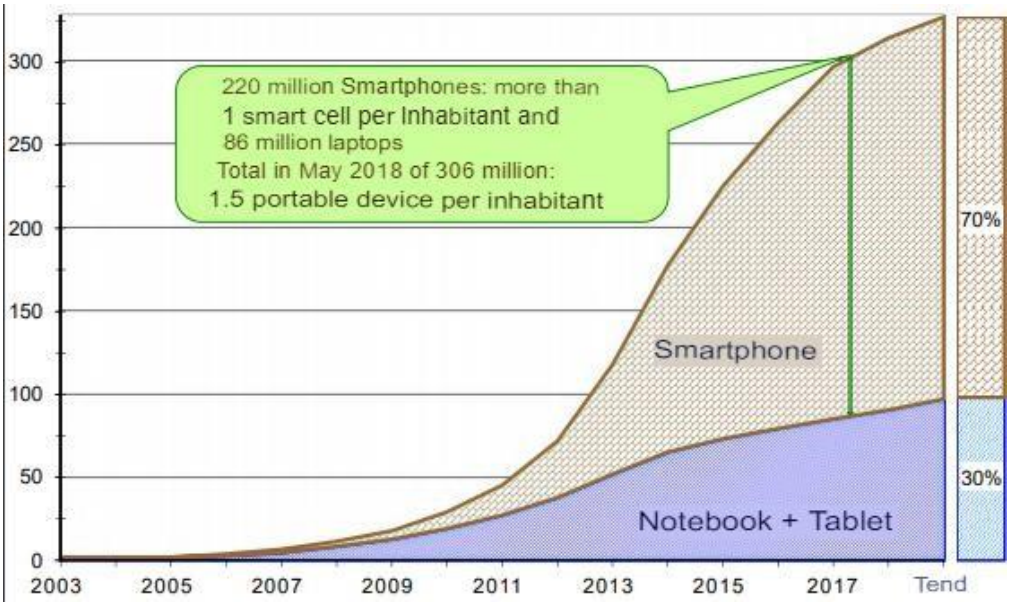

Figure-6.
PORTABLE DEVICES - Internet-connectable mobile devices in use in Brazil (millions in May/2018).
Source: FGV (2019).

Given this trend, where even in 2018, the number of active cell phones will reach more than 350 million, bringing proposals for its use as an educational resource is extremely valuable.

3. Legislation on the Use of the Phone in the Classroom

Despite this expansion of cell phone use by the Brazilian population, identified since 2005 (IBGE, 2016) this reality is opposed in many aspects, when we focus specifically on the use of cell phones as an educational resource, and especially in the classroom.

Going against the grain, we realize that many legal provisions were published in order to curb the use of cell phones in the classroom, even for pedagogical purposes, such as the National Congress's Bill No. 2.246-A of 2007 which was included in the art. 1: The use of cell phones in public schools is prohibited (Brazil, 2007) and Law No. 12.730, of October 11, 2007 of the state of São Paulo, which prohibited the use of cell phones in state schools during the class schedule (São Paulo, 2007).

It is currently up to the state to decide on the use of cell phones in state schools and the municipality for municipal schools. However, although initially, the enactment of some laws that allow the use of cell phones in the classroom for pedagogical purposes can be seen, such as Law No. 16,567/2017, which amended State Law No. 12,730 of 2007, bringing in its first article: Students are prohibited from using cell phones in state schools during school hours, except for use for educational purposes (São Paulo, 2017). Thus, thinking about ways and methods to develop the pedagogical use of cell phones is essential and fundamental in the Brazilian Educational System.

4. Methodological Procedures

Based on the exposition by Parra and Santos (1998) "whatever the field to be researched, a bibliographical research will always be necessary, in order to have a previous knowledge of the stage in which the subject is found" . Having the same view, Lakatos and Marconi (2001) establish that the “purpose is to put the researcher in direct contact with everything that has been written on a given subject”.

Thus, as Oliveira (2004) puts it “the purpose of bibliographic research is to know the different forms of scientific contribution that have taken place on a given subject or phenomenon”. Thus, we can state that this type of study is based on information and data to justify or not the existence of a certain hypothesis.

Related to this, our research has a bibliographic nature, as the problem and the proposed objectives are based on research already carried out, being possible the dialogue with other sources already published, which are based on three aspects related to the use of the cell phone, in the use general by the Brazilian population; from the perspective of legislation and use in the classroom. And finally, we bring as a result several applications that

configure the cell phone as an educational resource and its use for continuing education and in the teaching-learning process.

5. Results and Discussion

In view of the expansion of the use of cell phones for various purposes and the contemporary emergence of a trend towards its use as an educational resource, in particular with the pedagogical purpose in the classroom, the number of researches that discuss the use of cell phones for educational purposes is still small. Thus, demonstrating the importance of studies that bring this proposal into their scope. In this article, we carry out a survey of researches bringing into their contexts the use of cell phones in the classroom, thus, we highlight three studies.

5.1. Educational Games on Mobile Devices for Teaching Mathematics

The research, by Neto and Fonseca (2013), addresses the use of educational games on mobile devices as a way to encourage the learning of mathematics. The proposal was that sixteen elementary school students and twelve high school students freely used the game developed by the authors that proposed the resolution of mathematical calculations based on the work the man who calculated, by Malba Tahan, on an m-learning platform, with maximum time of two hours, and, after this stage, they answered a questionnaire.

This study pointed to the acceptance and motivation of students when using educational games, which contributes to the teaching-learning process in the classroom, under a new perspective, different from the traditional ones, enabling a constructivist approach to knowledge. This proved to be the successful acceptance of the use of cell phones as an educational resource by students.

5.2. The Use of Applications as a Pedagogical Resource for Teaching Geography

This research developed by Santos et al. (2016), according to a study selected by us, analyzes the level of understanding and facilitation of extracurricular activities, and as its authors argue, its central idea is the incorporation of digital technologies, in particular, the furniture. Titled: "The use of apps as pedagogical resources for teaching geography", this study verified the possibilities of interaction with the Asia app with 9th grade elementary school students, during a school term, to assess the contents covered. in the classroom.

The researchers obtained the result that “about 90% of the students did very well in the assessments and the others managed to pass the average, something that, according to the teacher, had not happened in that class for some time” (Santos et al., 2016). Thus, demonstrating once again the receptivity of students regarding the use of cell phones as an educational resource and that methodological renovations, based on new technologies, can help the teaching-learning process, making classes and activities at home more dynamic, eye-catching and transformative.

5.3. Use of the E-INST Application to Contribute to the Teaching of Industrial Instrumentation

The choice of the third survey was carried out with technical education students. In the article "Mobile apps for educational purposes: the use of the E-INST app to contribute to the teaching of industrial instrumentation" (Pereira, 2017) a didactic app for use on smartphones and tablets is presented, where it is possible to access information about industrial instruments aimed at measuring and sensing variables such as: pressure, flow, temperature, level and volume. Then, the text exposes the pedagogical experience carried out with students of a technical course in electrotechnics, analyzing how the use of this resource can help in the teaching-learning process.

Finally, these researches demonstrate that the use of applications on mobile phones allows students different ways to interact with content. In this sense, it was found how relevant it is for teachers to use different types of technologies in their didactic-pedagogical practices, not limited to the traditional teaching apparatus, such as handouts, printed books and blackboard (Pereira, 2017)

In order to corroborate the indication of possibilities of using the cell phone as an educational resource, we present four applications: Coursera, which is used in continuing education; Google Classroom, Coggle and PowToon which are proposed to be used in the teaching-learning process.

5.4. Coursera Application

This application allows the realization of free online courses, from more than 100 universities around the world, among them are Harvard, Stanford, University of Jerusalem, USP, among others. These are courses in the most

diverse areas, such as: Entrepreneurship, Business, Leadership, Machine Learning, Gamification, Mathematics, Psychology, among others (Coursera, 2018).

5.5. Google Classroom Application

Google Classroom is an application that allows anyone who has a Google account, create a virtual classroom, where they can enter other users as students, and post teaching materials, activities, videos. Thus, enabling access anytime and anywhere, thus facilitating communication between teachers and students (Google, 2019).

5.6. Coggle Application

It is an app for creating mind maps. Thus, it produces documents structured as a branch tree, which can be shared with other users to work together. In this way, several people can develop ideas together, planning, brainstorming, among other activities. As they build the mind map, it is possible to visualize the ideas in a broad way (Coggle, 2019).

5.7. PowToon Application

PowToon is a visual communication application that allows anyone, from beginner to professional, to create animations involving videos and presentations. After creation, you can share the created videos in different ways, such as: YouTube, WhatsApp, Facebook, among others. Making it very useful for creating animations of the most diverse themes (Powtoon, 2018).

These applications exposed in this study are just a brief example of how the cell phone can be used as an educational resource. However, it is noteworthy that we have available a very large diversity of applications available for educational use, even without causing any cost to the user.

6. Final Considerations

This study demonstrated the use of cell phones as an educational resource, and for this it presented some applications to be used in the teaching-learning process. Thus, building a pedagogical proposal that encompasses this device, providing opportunities for it in school spaces, in the most diverse areas of knowledge and teaching modality.

This proposal shares with the expansion of the use of this device by the Brazilian and world population and, in particular, with the results of the studies presented here, in which students are in favor of the use of cell phones as an educational resource and most of the surveys raised and supported theoretical study, such as that of Crawford and Vahey 2002 and Rodrigues 2007 (Bottentuit, 2012) which was carried out in one hundred and two North American educational institutions, which indicate that 90% of teachers believe that the devices mobile phones can have a positive impact on student learning.

However, despite this majority acceptance of students and teachers, the use of cell phones as an educational resource is still initial and scarce. Therefore, bringing up discussions and proposals like this one, enables the development of studies and didactic proposals that aim to spread and propagate the use and train teachers in the use of mobile devices, as part of the teaching-learning process. With this focus, we emphasize what Moran (2013) says, the digital is not a complementary accessory, but a learning space as important as the traditional classroom.

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