

ARTIGO

## SMARTPHONES IN HIGHER EDUCATION CLASSROOMS: MOTIVATIONS, RULES, AND CONSEQUENCES

PAULO BOA SORTE<sup>1</sup>

ORCID: <https://orcid.org/0000-0002-0785-5998>

NAYARA STEFANIE MANDARINO SILVA<sup>2</sup>

ORCID: <https://orcid.org/0000-0002-4713-6242>

CAROLINE BARBOSA DE CARVALHO<sup>3</sup>

ORCID: <https://orcid.org/0000-0001-8926-9281>

**ABSTRACT:** The growth in the use of smartphones is remarkable and reaches countless spheres of social life, one of them being the university. Nagumo (2014) and Selwyn (2014) highlight that there are few researches focused on understanding how technological devices like cellphones are used in teaching institutions; in addition to that, the Federal University of Sergipe (UFS) has recently implemented the international Internet network eduroam. In this context, this research aims to discover motivations to the use of smartphones by the students of the Departments of Vernacular Language (DLEV) and Modern Languages (DLES), as well as to analyze possible rules and consequences of using smartphones during classes at UFS. The methodology is qualitative - analytical-interpretative – and follows the procedures Freeman (1998) proposes, which include naming, grouping, finding relationship, and displaying. This research's results and conclusions indicate that most students who participated in the research use smartphones to meet academic and entertainment aims. The rules and consequences in the classroom, however, diminish the use of the devices for being related to punishments. Similarly, eduroam discourages the use of smartphones because it presents barriers to the access of Internet.

**Keywords:** Smartphones, Higher Education, rules, consequences, motivation.

## SMARTPHONES NAS SALAS DE AULA DA GRADUAÇÃO: MOTIVAÇÕES, REGRAS E CONSEQUÊNCIAS

**RESUMO:** O crescimento no uso de smartphones ou celulares inteligentes é notável e atinge inúmeras esferas da vida social, uma delas é a universidade. Nagumo (2014) e Selwyn (2014) apontam que há poucas pesquisas voltadas a entender como dispositivos tecnológicos, como os celulares, são utilizados nas instituições de ensino; acrescenta-se a isso, a recente implementação da rede internacional de acesso à internet, eduroam, na Universidade Federal de Sergipe (UFS). Nesse contexto, a pesquisa à qual este resumo se refere tem como objetivos conhecer as motivações de uso de smartphones por parte de discentes do Departamento de Letras Vernáculas (DLEV) e Letras Estrangeiras (DLES), e analisar possíveis regras e consequências de uso dos smartphones durante as aulas na UFS. A metodologia qualitativa de cunho analítico-interpretativo seguiu o procedimento proposto por Freeman (1998) que

<sup>1</sup> Professor at the Department of Modern Languages and Graduate School of Education at the Federal University of Sergipe (UFS). São Cristóvão, SE, Brazil. <pauloboasorte@academico.ufs.br>

<sup>2</sup> Undergraduate Research Assistant at the Federal University of Sergipe (UFS). São Cristóvão, SE, Brazil. <nayaramandarino@hotmail.com>

<sup>3</sup> Undergraduate Research Assistant at the Federal University of Sergipe (UFS). São Cristóvão, SE, Brazil. <carolbcarv13@hotmail.com >

inclui codificar, agrupar, estabelecer relações e exibição dos dados (displaying). Trata-se de uma pesquisa cujos resultados e conclusões indicam que a maior parte dos alunos pesquisados utiliza smartphones tanto para fins acadêmicos, quanto para entretenimento. As regras e consequências da sala de aula, porém, desmotivam o uso dos dispositivos por estarem relacionadas a punições. Similarmente, a rede eduroam desestimula o uso dos aparelhos, por apresentar barreiras para a conexão à internet.

**Palavras-chave:** Smartphones, Ensino Superior, regras, consequências, motivação.

## **SMARTPHONES EN AULAS DE GRADO: MOTIVACIONES, NORMAS Y CONSECUENCIAS**

**RESÚMEN:** El crecimiento en el uso de smartphones o teléfonos inteligentes es notable y alcanza numerosas esferas de la vida social, una de ellas es la universidad. Nagumo (2014) y Selwyn (2014) señalan que hay poca investigación dirigida a comprender cómo los dispositivos tecnológicos, como los teléfonos celulares, se utilizan en las instituciones educativas; Además, la reciente implementación de la red internacional de acceso a internet, eduroam, en la Universidad Federal de Sergipe (UFS). En este contexto, la investigación a la que se refiere este resumen tiene como objetivo conocer las motivaciones del uso de smartphones por parte de los estudiantes del Departamento de Letras Vernáculas (DLEV) y Letras Extranjeras (DLES), y analizar las posibles reglas y consecuencias del uso de smartphones durante las clases en UFS. La metodología es cualitativa de naturaleza analítica-interpretativa y siguió el procedimiento propuesto por Freeman (1998) que incluye codificación, agrupación, establecimiento de relaciones y visualización de datos (displaying). Esta es una encuesta cuyos resultados y conclusiones indican que la mayoría de los estudiantes encuestados usan teléfonos inteligentes con fines académicos y de entretenimiento. Sin embargo, las reglas y las consecuencias del aula desalientan el uso de dispositivos porque están relacionados con prohibiciones y castigos. Del mismo modo, la red eduroam desalienta el uso de los dispositivos, ya que presenta barreras para la conexión a Internet.

**Palabras clave:** Smartphones, Enseñanza Superior, reglas, consecuencias, motivación.

## **FIRST WORDS**

From 2005, in Brazil, there has been a meaningful growth in the use of mobile devices, especially among young people between the ages 16 to 24. However, it was in 2010 that the utilization of these technological artifacts obtained its greatest growth rate, propelled by the National Broadband Program (PBNL), which had the goal of increasing the access to Internet to about 88% of Brazilians, according to Santaella (2013). In the following year, the use of cellphones to establish connection with the Internet widened by 340% (SANTAELLA, 2013). Smartphones stand out not only due to the large number of users, but because they allow media convergence in one single device (JENKINS, 2009) and enable ubiquity. This is defined by Santaella (2013) as the opportunity to engage in online environments anytime, anywhere. Among the implications of the adherence to the use of these devices, we can mention the changes in individuals' cognitive profile, meaning-making, and learning processes.

Smartphones, considering that they facilitate mobility, are used in different environments, including education. Not only do students use them, but there is also incentive from education institutions to digital technologies utilization. In universities and federal institutes, for instance, a big part of the academic activities take place in digital environments such as SIGAA (Integrated Management System of Academic Activities). To ease the access to these virtual spaces, the Federal University of Sergipe (UFS) adhered to eduroam (acronym of education roaming), an international network of roaming services that allows access to the Internet, focused on higher education. This access happens through the credentials that enable signing into the management system adopted by the university one is associated with. Students and Professors can use the Internet that eduroam provides in their own university, as well as in other higher education institutions that also adopted the system. It is in this context that this research is embedded; its goal is to discover what motivates the use of smartphones by

students of the Departments of Modern and Vernacular Languages – (henceforth DLES and DLEV), respectively – at UFS and to analyze rules and consequences to the use of these devices in classes linked to the above-mentioned departments.

In order to achieve the proposed objectives, we gathered data through an online questionnaire and analyzed it based on Freeman's (1998) methodological frame, which involves naming, grouping, finding relations, and displaying. This research is qualitative, characterized as an analytical-interpretative case study (YIN, 2010).

## SMARTPHONES AND THEIR POSSIBILITIES

### DIGITAL REVOLUTION: THREE ERAS

Santaella (2013), based on Lafuente (2011), discusses the digital revolution and comments on its three eras: the microcomputer era, the World Wide Web (WWW) era, and the semantic Web era.

Within the first one, there is the desktop, which goes from 1980 to 1990, with its file systems, email, servers, databases. This era includes, from 1990 to 2000, the Web 1.0 and its supplements: http, HTML, teamwork, intranets, Java, portals. Then, from 2000 to 2010, we went through the WWW era, with the Web 2.0, social media, blogs and wikis, XML/J2EE. Close to the third, the semantic Web's, from 2010 to 2020, cloud computing, Web with database, intelligent personal agents and the Rule Interchange Linked Data (format to language and data interchange) start to show up (SANTAELLA, 2013, p. 40)<sup>4</sup>

The author also states that many critics do not accept the terms “Web 1.0, 2.0, and 3.0”, due to the fact that nomenclature “Web 2.0” does not designate technical innovations. Despite that, these terms are widely used, indicating changes in the ways through which users interact and participate in online spaces with the advances in digital technologies. Santaella (2013) defends that the effects of these technological changes in social relations – the Web state of art – are more important than the Web division into phases. Regarding interaction, Fawkes and Gregory (2000) argue that the internet can be distinguished from other means to interact due to three main factors: the access does not depend on location, it is possible to get in contact with different parts of the world; it does not rely on real time, users can be connected anytime; and it allows interactivity in ways that have never been possible before.

In this context, according to the authors, communication can take place in three manners: one-to-one, one-to-many and many-to-many. The first one involves two entities. In the second, an author or group creates content for many people. This is the type of interaction that prevailed in Web 1.0 where users were consumers of content, not producers. In this sense, the Web 1.0 is similar to television in which a small group of producers creates content for thousands of people, with little or no participation from the audience. Therefore, the environment was dominated by content producers whose consumers were the users. The Web 2.0 succeeds the Web 1.0 and is marked by the advent of social media, like Orkut and Facebook. Henceforth collective participation growth begins: users start producing content; from mere consumers, they become producers, which affects content producer-consumer power relations (JENKINS, 2009). Interactions, consequently, are many-to-many, the third way of communication Fawkes and Gregory (2000) discuss, because they allow a lot of people to create and consume content in a more participative form.

In compliance with Santaella (2013), in both Web 1.0 and Web 2.0, searches take place through words, which are used in Internet pages (hashtags, keywords). This characterizes these Webs as syntactic. Differently, in the semantic Web that encompasses Web 3.0, the search for information happens through meanings (concepts, ideas), hence its name “semantic”. In the third era, there is the personalization of spaces in the Web based on the user's profile, built from the content he or she accesses. This trait is widely used for commercial ends; for instance, when a user looks for a product in a search tool, when accessing social media, he or she will come across advertisements for the product.

---

<sup>4</sup> This quote was translated from Portuguese to English. All translations of quotes in this paper are the authors' responsibility.

We highlight that much of what has been discussed on the semantic Web is based on predictions, considering that it is contemporary. Santaella (2013, p. 53) adds that it might evolve to a pragmatic Web, where the access to pages occurs through meanings, but also through its usage; the author mentions as examples “the features of social and political groups of which the user is part, or the academic research profile to which he belongs”. There is also a tendency towards the sophistication of cellphone devices that can take over the role of connectors between individuals and society. These gadgets stand out among digital technologies and are used by an increasing number of people.

It was in the period that corresponds to the microcomputer era that the cellphone emerged. With technological changes, it was adapted and recreated until it became a smartphone, which enables media convergence. In the following subtopic, we will discuss the expansion of mobile telephony in chronological order. We will also address the concepts of convergence and ubiquity, considering that they are related to smartphones, the device highlighted in this research.

## TECHNOLOGICAL EXPANSION AND ITS IMPLICATIONS: FROM DUMB PHONES TO SMARTPHONES

According to Hanini (2017, p. 42), in 1970, there was an emergence of the “technological paradigm of microelectronic base”. In this context, the first generation (1G) of technological changes in telecommunication arises. This generation used an analogical system of communication that started operating in 1983, in the United States, and it transmitted only voice. That was the function of cellphones – subsequently entitled dumb phones due to the fact that they performed very basic tasks, such as make voice calls. Other features of these devices were its heavy weight and big sizes. The author adds that cellphones, in this time, were used primarily by governments, police officers, and soldiers.

The first mobile phone – car phone transportable – emerged in 1956. It was launched by Ericsson Company. Ericsson MTA (Mobile Telephony A) was considered a mobile simply because it could be used only in cars. Hanini (2017) also explains that in 1973 a prototype of a really mobile cellphone, one that could be carried around, Motorola DynaTAC, was launched by another company, Motorola. The biggest contribution of this device was to demonstrate that it was possible to use a mobile phone without connecting it to a vehicle. However, the first cellphone marketed was Motorola DynaTAC 8000X, but with no big technical innovations. The significant changes concern devices’ design and appearance – they became lighter and smaller – from 1989, with Motorola MicroTAC 9800x.

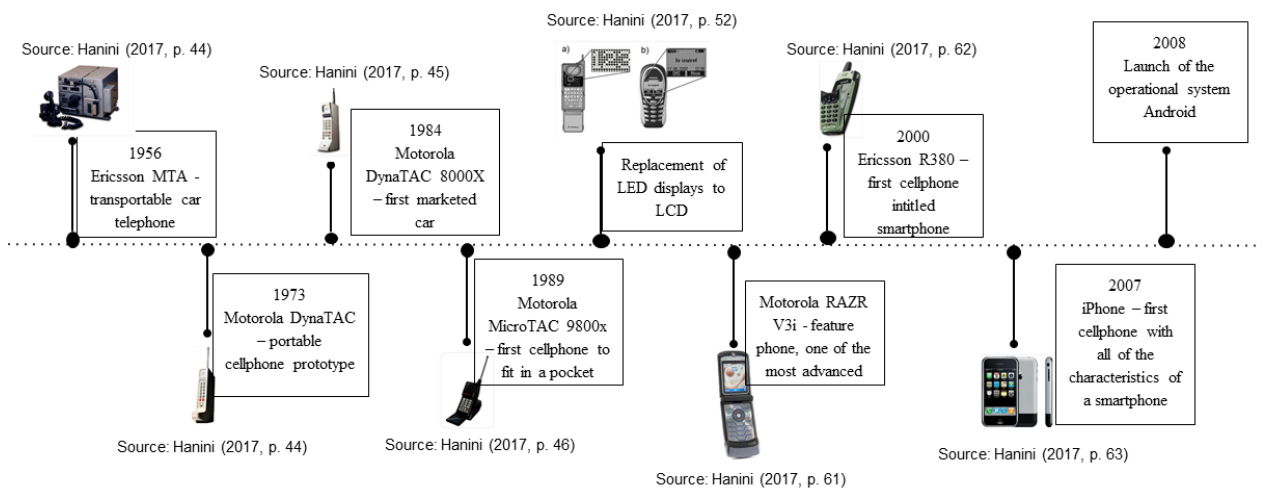
Hanini (2017, p. 48) explains that the second generation (2G) was marked by the implementation of digital systems. In this moment, “in addition to the traditional voice service, the capacity of data service with low transmission speed was implemented.” Transition systems to 3G also emerged – some authors call it second generation and a half (HANINI, 2017, p. 50) – which allowed “sending and getting short messages (SMS) and multimedia (MMS), as well as rudimentary access to the Internet”, due to the use of Wireless Application Protocol (WAP) services. Cellphones, therefore, have their functions amplified and go beyond just performing voice calls. The feature phones became even smaller and lighter than the dumb phones; they also executed some applications and introduced displays in LCD, in lieu of LED. Motorola RAZR V3i is one example of feature phone considered as one of the most advanced for its camera, connectivity via Bluetooth and mini USB.

The third generation (3G), on the other hand, is characterized mainly for its digital system with access to high speed Internet. It was during this time that Wireless Fidelity (Wi-Fi) and smartphones emerged. The smartphone, although there is no consensus among theorists, can be defined as:

a cellphone with advanced features which executes an identifiable operational system that allows users to amplify its functionality with applications from third-parties available in an application repository. According to this definition, smartphones must include a sophisticated hardware with: a) advanced processing resources (for instance, modern CPUs, sensors), b) capacities of multiple and fast connectivity (for instance, Wi-Fi, HSDPA), and c) screen size properly limited. Besides, its operational system must be clearly identifiable, such as Android, Blackberry, Windows Phone, Apple iOS, etc. Finally, the operational system has to allow the installation of third-party applications from application repositories (“application markets”) (THEOHARIDOU; MYLONAS; GRITZALDIS, 2012 apud HANINI, 2017, p. 60).

In 2000, the first cellphone entitled smartphone was marketed. It was Ericsson R380 that, even though it allowed the installation of external applications, it could not connect with the Internet efficiently. The first cellphone with all of the features of a smartphone, according to Hanini (2017), was released in 2007 by Apple – the iPhone. A year later, Google introduced the operational system Android, which was not restricted to only one company, in the market. Below, we present a timeline with remarkable facts in the development of dumb phones to smartphones. We also include images that illustrate the devices discussed in this subtopic.

Figure 1: cellphone expansion



Source: authors' elaboration

Smartphones, as we have mentioned, enable media convergence, but not in the sense that they gather different functionalities in only one device. Jenkins (2009, p. 29) is contrary to this argument, and defends that convergence actually represents a cultural transformation, “where old and new media collide.” This means that new and old media keep interacting in increasingly complex ways; this is the new paradigm of convergence. The author highlights that this is, however, an old concept that is going through resignifications – many have understood it as the replacement from old media to new ones. The replacement process, according to Jenkins (2009), refers to technology of distribution (tapes, CDs, etc.), not to media itself. Therefore, in its new meaning, convergence is also divergence. Radio, for instance, was a service transmitted by a single mean, now it can be delivered through different physical forms, not necessarily connected to one mean of transmission. Hence, “the one-to-one relationship that used to exist between a medium and its use is eroding” (JENKINS, 2009, p. 37). That is, media functions are being transformed with the emergence of new technologies. Jenkins (2009, p. 29) defends a convergence culture, referring to

the flow of content across multiple media platforms, the cooperation between multiple media industries, and the migratory behavior of media audiences who will go almost anywhere in search of the kinds of entertainment experiences they want. Convergence is a word that manages to describe technological, industrial, cultural, and social changes depending on who's speaking and what they think they are talking about.

Jenkins (2009, p. 45) discusses yet another aspect of convergence, participatory culture – addressed in the subtopic that refers to the digital revolution – in which, from the Web 2.0, content is not created only by a small group of producers but also by users, who become more participative. The author argues that convergence “also occurs when people take media in their own hands”, because the daily activities we perform “flow across media channels”, the contents that circulate in media platforms do not regard only entertainment, but our social and personal relations as well.

Besides enabling convergence, smartphones also allow what Santaella (2013, p. 16) calls ubiquitous communication, defined as “the ability to communicate anytime and anywhere through

electronical devices spread in the environment [...], wireless technology provides greater ubiquity.” Thus, using smartphones – or other mobile devices, like tablet and laptop – and wireless Internet results in ubiquity, which allows immediate access to the cyberspace, the limited space of communication enabled by computers interconnection. According to the author, in this context, a new type of reader emerges, one that reads more than just written texts, he or she deals with images, videos, etc. This new type of reader, which Santaella (2013) calls ubiquitous, transits in the cyberspace and has the ability to react multiply to different stimuli. This is a multitask reader. Therefore, technology can affect users’ cognition, which challenges learning processes. These are discussed by Santaella (2013, p. 289), who talks about ubiquitous learning, the “means to learn mediated by mobile devices.” In this context that involves problem-solving in-group in a collaborative way, open learning processes emerge; they occur spontaneously, but they are unsystematic. The open learning processes are due to mobile devices, like smartphones, which make the access to contents possible anytime, anywhere.

As far as technological revolution started to become increasingly personalized, centered in the user, mobile, in network, ubiquitous, and durable, learning also became more individualized, focused on the learner, situated, collaborative and ubiquitous [...]. Because it allows a type of learning that is open, individual or group, that can be obtained under any circumstances, the mobility era inaugurated this entirely new phenomenon: ubiquitous learning (SANTAELLA, 2013, p. 292-293).

The technological advances have also contributed to the emergence of educational models. Santaella (2013) addresses four of them: processes based on the technology of the book – transmission of sequential pragmatic contents; distance education – educational model of massive media, like radio; e-learning and learning in virtual environments; and m-learning or mobile learning – which can take place anywhere, but is planned, like an extension of the classroom, different from ubiquitous learning that is chaotic and spontaneous.

Smartphones are potentialities to be explored in teaching-learning processes and, along with other mobile devices, affect educational models and users’ cognitive profiles. Nonetheless, they are not autonomous gadgets, in the sense that they depend on how they are used to achieve certain goals, as put by Bottentuit Jr., Menez & Wunsch (2018). In this context, this research investigates how students of DLES and DLEV use smartphones, considering the implementation of the eduroam network. It started to be developed in Europe, in 2003, but nowadays it is used in more than 100 countries, according to information available in the network website ([www.eduroam.org](http://www.eduroam.org)). In Brazil, specifically, data gathered by the Teaching and Research National Network (RNP) shows that there are more than 2300 hotspots<sup>5</sup>. Its creation is due to the acknowledgement of the increasing number of mobile technology users (such as laptops and cellphones) and to the need for a safe way of connecting to the Internet that could contribute to international research and with teaching institutions (CABALLERO et al., 2016). Even though eduroam has been implemented in many Brazilian universities, we have noted, after consulting CAPES/MEC periodicals portal, that there is little research about the network. Most studies we have found were conducted in other countries, such as Spain (CABALLERO et al., 2016; SÁNCHEZ et al., 2009) and regards technical matters, like the network authentication system (LÓPEZ et al., 2008; MURUGANANTAM et al., 2005; PÉREZ-MÉNDEZ et al., 2012) and mobility (RAISCHEL et al., 2014; CRUZ et al., 2013). The context of the research, which considers the implementation of eduroam, is addressed in the following topic, as well as the research methodology.

## RESEARCH METHODOLOGY

This research methodology is considered qualitative because it deals with negotiations and motivations for the use of smartphones, which can hardly be quantified. Although we present numerical data, they do not make this research quantitative, for, different from our proposal, it “intends to take the exact measure of human phenomena and of what explains them” (LAVILLE, DIONNE, 1999, p. 43).

---

<sup>5</sup> Data available on <<https://www.rnp.br/servicos/servicos-avancados/eduroam>>

The research is also characterized as an analytical-interpretative case study, according to Yin's definition (2010, p. 32), because it refers to the investigation of a contemporary phenomenon – the use of smartphones in classrooms; it is part of a real life context – the classes of Professors linked to DLES and DLEV, at UFS; and “the limits between the phenomenon [use of smartphones] and its context [UFS classrooms] are not defined clearly.”

Regarding data collection<sup>6</sup>, we developed a questionnaire based on Nagumo (2014), with questions that vary between choosing alternatives and writing answers. Data was collected through an online form (Google Forms), counting with the participation of students from both DLES and DLEV. We analyzed the data in compliance with Freeman (1998) proposal that includes four steps, namely: naming, grouping, finding relations, and displaying. In the first step, data can be separated and named stemming from one of three possible sources: categories external to the data; the data itself (which is the source we have chosen for this research); or created by the researchers. Therefore, the data we have gathered through open questions were codified, using the participants' own words. Subsequently, the emerging codes were put in groups that could emerge from data itself (grounded) or external to data (a priori). Nonetheless, some codes, entitled outliers, did not fit in the established groups, staying out of the analysis. They were important, however, because they showed where the interpretation under construction was inconsistent. In this step, two groups emerged a priori, based on the research goals: motivations to use and rules and consequences of the use in the classroom. A third group, the role of eduroam in (dis/en)couraging the use of smartphones, which characterizes it as grounded.

The next step, finding relations, involved the identification of constant patterns among the groups. Finally, in the displaying step, it was possible to see the emerging set of the interpretation; how the parts were connected, forming a whole. Therefore, according to Freeman (1998), data can be (re)interpreted more fully. In the next topic, we present data analysis more deeply.

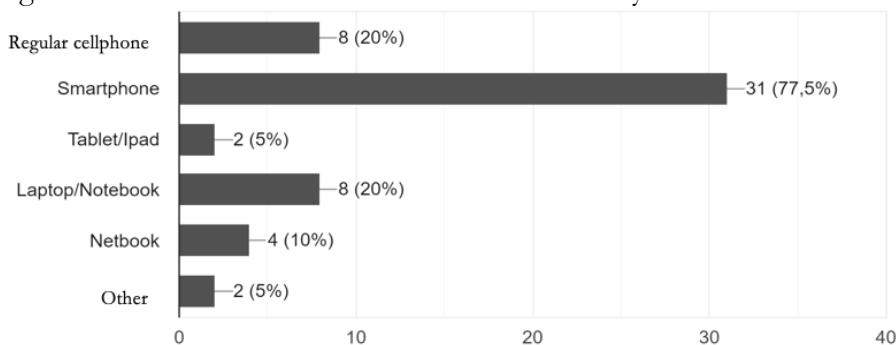
## SMARTPHONES IN DLEV CLASSROOMS

Initially, we displayed the numerical data so that both the participants and the context of the research are clear; then, we analyzed the answers from the open questions, following the procedures proposed by Freeman (1998), which were explained in the previous topic.

In total, 40 students linked to the DLEV contributed to the research. 92,5% of them do not have previous undergraduate degrees and their ages vary from 18 to 47 years old. Concerning the academic semester they were in when data was collected, the majority of the students (37,5%) was in the fourth semester, followed by sixth (30%); the least frequent semesters mentioned were the eighth (12,5%), the seventh (7,5%), the first (2,5%), and the irregular students (2,5%).

When asked about which technological devices they usually bring to the university, 77,5% of the students answered “smartphone”. “Regular cellphone” (20%) and “Laptop” (20%) were equally the second most answered options, as seen in the figure below:

Figure 2: Devices that students take to the university

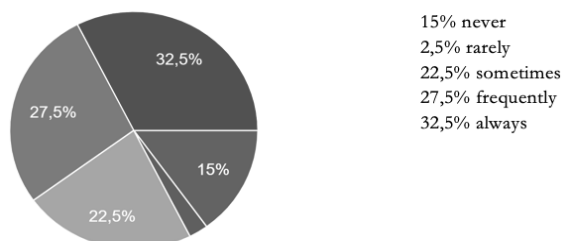


Source: data collected by the authors

<sup>6</sup>Data collection procedures were assessed and approved by the Institutional Review Board (IRB) of the Federal University of Sergipe – statement number 2.917.873/ 2018.

Therefore, smartphones are utilized by most of the students, which reinforces what is stated by Santaella (2013) concerning the increase in the number of smartphones users. The number of students that access internet through eduroam is even bigger, reaching 80%, given that it is possible to connect to the network through other devices; however, the frequency of access to the network system shows different results and includes students who had never had access to the network or rarely do it.

Figure 3: usage frequency of the eduroam network

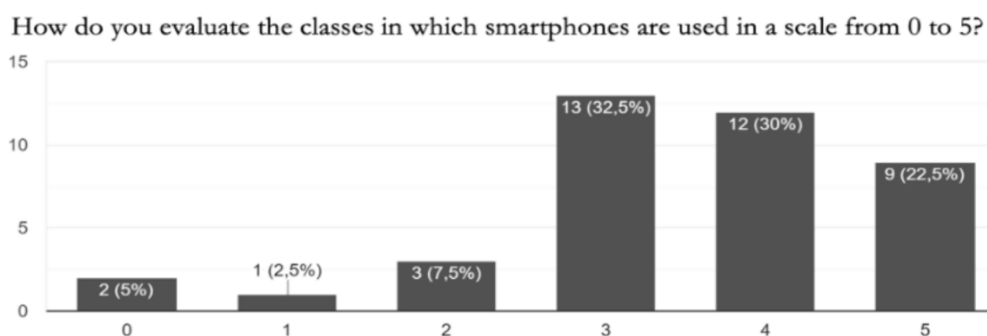


Source: data collected by the author

The rating average of eduroam is 2,45, in a scale that goes from 0 to 5. The most frequently mentioned reasons are the slow Internet connection and the fact that students cannot access the network in several places at the university. It is due to this matter that 59% of the students use mobile data as an alternative to eduroam. The most popular websites and apps among the participants are SIGAA (67,5%), instant messages apps (60%), Google (55%), and social media (37,5%). Thus, we see that electronic devices are used for both academic (SIGAA and Google searches) and entertainment purposes (social media and texting).

Regarding the use of smartphones in the classroom, specifically, we can observe in the graphs below how students rate classes in which the devices are or are not used (figures 4 and 5 henceforth). In the scale, 0 means extremely negative, while 5 means extremely positive.

Figure 4: rating of classes in which smartphones are used



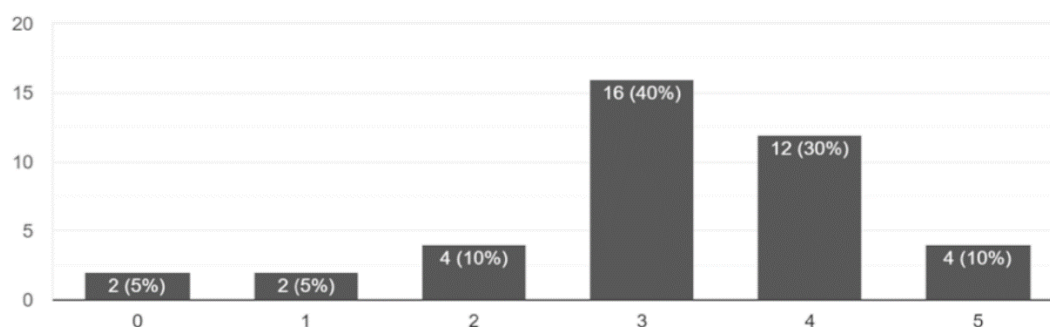
Source: data collected by the author

The rating average of classes in which smartphones are used is 3,48, as opposed to 3,15 attributed to the non-use of the devices. The difference is not significant, which shows that, in general, students do not see a big difference in classes in which the gadget is incorporated. Digital technologies should not be seen as responsible for changes in teaching-learning practices, given that, according to Selwyn (2014, p. vii) “the educational use of digital technology has no one ‘true’ meaning or inherent ‘potential’ that some people are more able to see than others. Instead, the educational use of digital technology needs to be seen as an ideologically driven concern.” Therefore, it is the way devices are used that can provoke changes in classes, not only their use.



Figure 5: rating of classes in which smartphones are not used

How do you evaluate the classes in which smartphones are **not** used in a scale from 0 to 5?



Source: data collected by the author

When it comes to the open questions, after the data was codified, it was gathered in three groups, namely: motivations to use, rules and consequences of the use in the classroom, and the role of eduroam in (dis/en)couraging the use of smartphones. A thorough analysis of them will be carried out below.

In the first group, motivations to use, students stated they used smartphones for communication with friends or to get urgent information, and for entertainment goals, such as access to social media. Nonetheless, the most frequent motivations are related to the use of devices for pedagogical purposes. The majority of the answers refer to researches and reading texts in PDF (Portable Document Format), which helps students not to spend money on physical books and xerox copies.

S1 : Using [smartphones] to have access to the subjects through PDF files and even to research additional content during the classes.

S2: I don't oppose [to the use of smartphones], because it reduces the expenses with xerox copies.

S3: I particularly only use it [smartphone] for researches in the classroom when professors ask me to.

S4: In order to do a linguistic research, I had to do some statistics, which was easier to do with my cellphone. (Excerpts from students' answers)

Another motivation to use stated by the participants concerns the media convergence (JENKINS, 2009) that smartphones allow, as we can see in S5's answer: "I think it's valid [the use of smartphones] since nowadays cellphones have several utilities, such as downloading materials from SIGAA, checking emails and avoiding expenses with xerox copies."

In the second group, rules and consequences of the use in the classroom, students mention implied rules, such as muting cellphones and using them only a few times. For participants, the use of smartphones in classes leads to deconcentrating and lack of attention of many.

S6: We hardly ever see a student without a smartphone, sometimes I catch myself inappropriately using it, but I also use it to check books and papers used in classes, so it depends a lot on how it is used, but most of the times the use is related to social media, so generally I believe it can really get in the way of students (Excerpt from S6's answer).

The student realizes the use of digital technology is more important than the potential of how it can be utilized. This way, she speaks about how cellphones are used in practice as well as how they can be used to optimize learning skills. The punitive perspective shown by the student concerning the use of devices in the classroom should also be emphasized, since, for her, the use means drifting the educational practice away and therefore undermining the learning process.

Students associate the use of cellphones to the Professors' permission, thus, if there is consent, the use is acceptable. However, not only do most Professors seem to go against it, but they also react to it by asking students to put the smartphones away and even to leave the classroom. S8 also mentioned that some Professors are indifferent to the use. They are mentioned by other students.

- S5: A professor asked a student to leave the classroom because she was using her cellphone all the time and not paying attention to the class.  
 S7: A professor interrupted my seminar presentation to ask a student to put their earphones away or leave the classroom.  
 S8: Some professors ask [students] to leave, others do not mind. (Excerpts from students' answers).

The last group, the role of eduroam in (dis/en)couraging the use of smartphones, includes enthusiastic answers concerning the network which is placed as a help to the Internet access and as an enabler in the execution of tasks through technological devices. However, complaints were more iterant.

- S9: [the network] doesn't work and it is too slow.  
 S10: Due to reach problems and quality of the connection, I can't seem to have access in some places at UFS.  
 S11: The network varies a lot and does not connect in some places, including the ones that it is supposed to cover, such as BICEN . (Excerpts from students' answers)

The network, therefore, seems to act by discouraging the access, since it presents technical and coverage problems that prevent students from connecting or being able to surf the Internet and achieve pedagogical or entertainment goals.

Following the next step regarding the research methodology, which is to find relationships (FREEMAN, 1998), we noticed that the most recurrent patterns in the second and third groups refer to limitations to the use of smartphones, which also appear in the first group, in moments in which the permission and/or motivation from Professors are placed as conditions to the use in the classroom. Therefore, the emergent group of data interpretation – the last phase of the methodological procedure (FREEMAN, 1998) – is that rules and consequences of the use in the classroom (group 2) can contribute to the motivations to use (group 1), when there is motivation and permission from Professors, as well as when they are indifferent or incorporate smartphones in classes, to read PDF files, for example. However, they can discourage the use, which happened more often, when associated with negative consequences, such as Professors' complaints or expulsions. Eduroam (group 3) also reinforces the discouragement to the use because it makes the connection harder, since it usually is oscillating and does not have much coverage, for instance.

## SMARTPHONES IN DLES CLASSROOMS

As performed before in DLEV classrooms, the first step of the analysis consisted of displaying data collected in the forms previously answered by DLES students. Then, codes were created, illustrating the stage Freeman (1998) called naming. In the grouping stage, two groups were established taking the objectives of the work plan into consideration: "Motivations to use" and "Rules and consequences of the use in the classroom", which are exactly the same ones that emerged in DLEV classrooms. The answers that did not fit into any of these categories were moved to the "outliers" group. However, because a significant number of codes present in this group have a direct association with eduroam and its connection, a new group also emerged: "Eduroam: the role of the network in the (dis)courage of its use by students". Finally, relationships among the groups were established; they will be discussed henceforth.

Search engines, PDF readers, social media, texting through WhatsApp, and dictionaries are examples of the most frequent answers related to spontaneous motivations to use smartphones by students. When Professors motivated the use, the results varied. Student 12 shared an example of use that directly connects to what Santaella (2013) states, which was previously discussed in this paper: "Other [professors] have already been bringing interesting ways to use them, like the app Google Classroom, which creates a virtual classroom, providing ubiquity in teaching (Excerpt from S1's answer)".

The phenomenon illustrated by the student is called ubiquity. In ubiquitous learning, according to Santaella (2013), the learning process is situated in students; it is more collaborative and can

take place anytime, anywhere. Through Google Classroom, for example, the student was driven to act spontaneously, but also being aware that there is a pedagogical purpose, which had been previously explained by their Professor. However, we highlight that the Professor directs the learning process, saying what students should do in the platform. This differs from ubiquitous learning, which is chaotic and does not follow class plans. This last characteristic of the use makes it more similar to m-learning or mobile learning, which works as an extension of the physical classroom. In addition to the above-mentioned report, considered positive by participants, others were shared:

S13: They [smartphones] make the access to texts/books easier.

S14: They [smartphones] cooperate with the learning process.

S15: We were having a discussion in the classroom about a certain topic and we had doubts about one piece of information shared, so we did a research on our cellphones to check if it was true. (Excerpts from students' answer).

The students attribute the good use of smartphones to learning aims. Specifically, in S15's answer, he describes the device as a means to get to the truth of doubts students might have in class. Santaella affirms that, "the internet has been improving to take us to finding immediate answers for subjects that, a little more than a decade ago, would have stayed elusive for a long time". (SANTAELLA, 2013, p. 45). Therefore, it is easier to find information. We have to highlight, however, S15's understanding of the Internet as a way to find the truth, to clarify doubts. This is to be problematized because, first, information and knowledge are not synonyms. Braga (2013) defends that one must know how to build knowledge from information which is now available in enormous quantities for everyone who has access to the Internet. Second, it is not possible to find the one and only truth about something. In fact, we deal with many truths – plural, not singular – which are socially constructed and permeated by ideologies. Jordão (2007) considers the search of truthful discourses an illusion because everything we classify as lie or fact is results from worldviews.

Regarding the rules and consequences of the use of smartphones in the classroom, from the Professors' perspective, there are two spheres to be analyzed: the rules/negotiations and the punishments. Several positive and negative situations were shared by students, from Professors who strongly support the use of the devices through others who have put students' smartphones away. Participants have shared four different situations:

S16: Once a professor threatened to expel the student from the classroom.

S17: Professors ask us to put our cellphones in the silent mode.

S18: They [smartphones] can be used as long as the main goal is to improve the class.

S19: The professors I've had classes with do not recognize cellphones as enemies and use them very well instead of trying to "fight" technology. (Excerpts from students' answers).

S16 has described an event in which smartphones are understood as devices that cannot add to the academic context positively, distracting students and disturbing the class in all occasions. Directions and negotiations given by the Professors were observed in S17's and S18's statements. Smartphones can be used as long as they do not interfere in the class or if they contribute to learning improvement. S19 states that Professors have acknowledged that smartphones are part of students' lives, but instead of fighting them, they have embraced the devices and explored them to learning purposes.

Most of the answers that were codified and fit in this group, however, represent an indifferent behavior by Professors, who, according to students' answers, do not usually establish rules or punishments. Regarding the last group, which refers to eduroam, statements such as the ones reproduced below were frequent.

S20: It rarely works.

S21: It does not reach all buildings.

S22: It disconnects many times.

S23: It does not have good connection. (excerpts from students' answers).

Students complained about the malfunctioning of eduroam, pointing out the difficulties to establish connection. This type of answer was also common among DLEV students. The good

functioning of eduroam is important, given that smartphones have to be connected to the Internet to allow ubiquity. According to data obtained in the form, most of students (42) consider the network regular or good. Hence, DLES students' rating to the network is higher than DLEV's.

In the final part of the form, students were asked to evaluate the classes in which smartphones are not used, and those in which they are in a scale from 0 to 5 (0 being the worst and 5 the best). In the first case, 16 students answered 2 and 4; 14 voted 3; and 6 chose the option 5. It should be addressed that all options received votes, as 3 students voted 0, and 5 voted 1. Considering the majority of the votes, classes in which smartphones are not used were placed between regular and very good. In the second case, on the other hand, 30 students voted 4 and 25 voted 3. The other 5 votes were distributed in 2 and 3. There were no votes for 0 and 1. Therefore, classes in which smartphones are used were placed between very good and excellent. These classes were better evaluated than the ones in which the device is incorporated, different from DLEV students' evaluation. This might be due to the fact that DLES Professors, according to students, use digital technology to improve learning, instead of facing it as the enemy.

## FURTHER CONSIDERATIONS

According to Nagumo (2014) and Selwyn (2014), there is little research that regard how digital technology is used in educational institutions; the existing ones address devices' potential, putting them, very often, as responsible for changing pedagogical practices. This research contributes to the solution of this issue for it explains how smartphones are used, not how they can be. Even though data analyzed in this research is not representative because it does not make a generalization possible, considering the number of participants, it is significant, for it allows the understanding of the smartphone phenomenon. This research can be amplified to include other departments in the university, which would allow a broader comprehension of the studied object.

We have concluded that, indeed, smartphones are used by most of students in the academic field and this use is mostly combined with the access to the Internet, be it through eduroam or through mobile data. Besides that, motivations for use vary from access to websites and apps for entertainment purposes to pedagogical – such as research – and socioeconomic ones, like saving money by not buying books or xerox copies. Rules and consequences of use during classes, though, collaborate much more with the discontinuity or decline of the use of cellphones in the classroom, since they consist of punishments and prohibitions that are related to the idea that the devices contribute to the lack of participation of students in classes. Eduroam also discourages the use of smartphones because it makes the Internet connection hard; without it, cellphones have less power of attraction for not allowing users to access websites and use many apps – including social media. The problems mentioned in the network can be due to the fact that it is still going through the implementation process, though the system was announced and installed by the Information Technology Center (ITC) in December of 2017, that is, almost three years ago. Solving the problems related to the Internet connection at UFS may also represent an important step to promote social justice (BOA SORTE & VICENTINI, 2020).

Finally, we reinforce that the use of smartphones depends on the users' goals and is ideally moved. For this reason, inserting the device in the classroom does not result in changes in the teaching-learning practices. This statement is supported by the small difference in the evaluation of DLEV students for classes in which the devices are used – for research and to read PDF files – and those in which they are not. What really makes a difference is the way cellphones are used; if placed as replacements of other technologies, such as books, they do not represent new practices. This argument is also valid for DLES students who evaluated with higher ratings classes in which smartphones are used, which happened because, as students mentioned, some Professors use digital technology as a means to improve learning, in ways that do not allow them to be replaced by other technologies, such as the board. One example of that is the use of Google Classroom as an extension of face-to-face classes; it is used to keep discussions happening outside of the physical classroom in the cyberspace where there are limits in time and space.

Students' views of smartphones lead to another conclusion: the use of technology in the classroom is an issue that requires further discussions in the academic environment, given that the

participants of the research are studying to become teachers. Their understandings will impact directly in their teaching practices. To keep seeing smartphones as prejudicial to classes goes against the fact that students will still use it. Therefore, students need to be encouraged to reflect on how they understand digital technology and what is its place in this classroom, so they can think of meaningful ways to incorporate these devices into the learning process and negotiate their use.

## ACKNOWLEDGMENT

We thank Dr. Neiva C. S. R. Ravagnoli and Emily Strobaugh for their constructive comments and feedback on this article.

## REFERENCES

BOA SORTE, P.; VICENTINI, C. Educating for social justice in a post-digital era. **Práxis Educacional**, v.16, n.39, p.199-2016, 2020.

BOTTENTUIT JR. J. B.; MENEZ, M. R. C. S.; WUNSCH, L. P. Aplicativos móveis para a alfabetização e letramento no contexto do ensino fundamental. **Tempos e Espaços em Educação**, v.11, n. 01, Edição Especial, p. 37-56, 2018.

BRAGA, D. B. **Ambientes digitais**: reflexões teóricas e práticas. São Paulo: Cortez, 2013.

CABALLERO, A. et al. Activity recommendation in intelligent campus environments based on the Eduroam federation. **Journal of Ambient Intelligence and Smart Environments**, p. 35-46, 2016.

CRUZ, N. et al. A mobilidade dos utilizadores da eduroam ao longo dos anos. **Atas do 5º Simpósio de Informática**, 2013.

FAWKES, J.; GREGORY, A. Applying communication theories to the Internet. **Journal of Communication Management**, v. 5, n. 2, p. 109-124, 2000.

FREEMAN, D. **Doing Teacher Research**: from inquiry to understanding. Boston: Heinle Cengage Learning, 1998.

HANINI, R. M. M. E. **A influência do advento dos smartphones na dinâmica de concorrência da indústria de telefonia móvel de 2007 a 2015**. 2017. 80f. Trabalho de Conclusão de Curso (Graduação) - Universidade Federal do Pampa, Sant'Ana do Livramento, 80p. 2017.

JENKINS, H. **Cultura da convergência**. São Paulo: Aleph, 2009.

JORDÃO, C. M. O que todos sabem.... ou não: letramento crítico e questionamento conceitual. **Revista Crop**, p. 21-46, 2007.

LAFUENTE, F. A era do raciocínio artificial. **HSH Management** 86, p. 103-108, 2011.

LAVILLE, C.; DIONNE, J. **A construção do saber**: manual de metodologia da pesquisa em ciências humanas. Porto Alegre: Artmed, 1999.

LÓPEZ, G. et al. A proposal for extending the eduroam infrastructure with authorization mechanisms. **Computer Standards & Interfaces**, p. 418-423, 2008.

- NAGUMO, E. **O uso do aparelho celular dos estudantes na escola**. 111f. Dissertação (Mestrado em Educação). Programa de Pós-Graduação em Educação. Universidade de Brasília-UnB, Brasília-DF, 111p. 2014.
- MURUGANANTAM, D. et al. ESnet authentication services and trust federations. **Journal of Physics: Conference Series**, p. 591-595, 2005.
- PÉREZ-MÉNDEZ, A. et al. A cross-layer SSO solution for federating access to kerberized services in the eduroam/DAMe network. **International Journal of Information Security**, p. 365-388, 2012.
- RAISCHEL, F. et al. From human mobility to renewable energies. **Eur. Phys. J. Special Topics**, p. 2107–2118, 2014.
- SANTAELLA, L. **Comunicação ubíqua: repercussões na cultura e na educação**. São Paulo: Paulus, 2013.
- SÁNCHEZ, M. et al. Performance analysis of a cross-layer SSO mechanism for a roaming infrastructure. **Journal of Network and Computer Applications**, p. 808-823, 2009.
- SELWYN, N. **Distrusting Educational Technology: critical questions for changing times**. New York: Routledge, 2014.
- YIN, R.K. **Estudo de caso: planejamento e métodos**. Tradução de Ana Thorell. 4.ed. Porto Alegre: Bookman, 2010.

## Appendix

### Questionnaire

#### 1. Personal data

Full name: \_\_\_\_\_

Email: \_\_\_\_\_

Age: \_\_\_\_\_

#### 2. Education

Major: \_\_\_\_\_

Semester you are currently in: \_\_\_\_\_

Previous undergraduate degree: \_\_\_\_\_

Starting year: \_\_\_\_\_ Concluding year (expected): \_\_\_\_\_

#### 3. Digital devices

What are the devices that you usually take to the university?

- Regular cellphone
- Smartphone
- Tablet/Ipad
- Laptop
- Netbook
- Other: \_\_\_\_\_

What is your opinion about the use of cellphones in the classroom?

\_\_\_\_\_

\_\_\_\_\_

#### 4. Connection

Do you use eduroam to access the Internet?

- Yes
- No

How often?

- Never
- Rarely
- Sometimes
- Frequently
- Always

How do you evaluate the quality of eduroam, in a scale from 0 to 5 (0 being extremely negative and 5 being extremely positive)?

0            1            2            3            4            5

Why?

\_\_\_\_\_

\_\_\_\_\_

In which places can you access eduroam?

\_\_\_\_\_

\_\_\_\_\_

In which places can you not access eduroam?

---



---

Do you use other ways to access the Internet when you are at the university? Which one(s)? Why?

---



---

Which are the main websites/applications used during the period you are at the university?

---



---

#### 5. Access in the classroom

Do you usually access the internet when you are in the classroom? What for?

---



---

How do your professors stand regarding the use of cellphones by students in the classroom?

---



---

Has any of your professors developed activities that involved the use of cellphones in the class? If so, how?

---



---

Have you ever experienced any *negative* situation while using your cellphone in the classroom? Share it.

---



---

Have you ever experienced any *positive* situation while using your cellphone in the classroom? Share it.

---



---

How do you evaluate your classes in which smartphones are not used/allowed, in a scale from 0 to 5 (0 being extremely negative and 5 being extremely positive)? Why?

0            1            2            3            4            5

How do you evaluate your classes in which smartphones are used/allowed, in a scale from 0 to 5 (0 being extremely negative and 5 being extremely positive)? Why?

0            1            2            3            4            5

Are there negotiations/rules/punishments regarding the use of cellphones in the classroom? Give examples.

---



---

**Submetido:** 29/10/2019

**Aprovado:** 01/06/2020