# DIGITAL COMPETENCE MODEL OF DISTANCE LEARNING STUDENTS

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## ABSTRACT

This article presents the development of a digital competency model of Distance Learning (DL) students in Brazil called CompDigAl_EAD. The following topics were addressed in this study: Educational Competences, Digital Competences, and Distance Learning students. The model was developed between 2015 and 2016 and is being validated in 2017. It was created based on theoretical references and the mapping of competences in two classes, one a strictly distance learning undergraduate course and another a hybrid graduate course, to list the digital competences of students in this modality. As a result, a set of competences was obtained. It was analyzed by the DL students and specialists. Based on the results, the model was composed of seven general competences: 1. Computer use, 2. Internet and online communication, 3. Communication, 4. Information Management, 5. Creation and development of digital content, 6. Virtual profile management and, 7. Online Attendance. Currently, this model is in the final validation phase. The aim is that research results will support both the students and professors in the construction of digital competences in the DL modality.

## 1. INTRODUCTION

Distance Learning in Brazil has increased considerably in recent years, incorporating Information and Communication Technologies (ICT) through new instruments and criteria. However, the high levels of ICT use in distance learning requires students to continuously learn about different resources. In order to deal with these transformations, the concept of digital competences has been used as an alternative so that subjects have the chance to study more holistically through technology. However, studies specifically focused on digital competences for this profile are still incipient. Thus, this article aims to present the construction of a digital competence model for DL students. A model is seen as a way of establishing an analogous relationship with a simplified form of reality, a figurative system, according to Behar (2009). Thus, this proposal focuses on the construction of a digital competence model for DL students called CompDigAl_EAD.

Existing models of digital competences were analyzed through a bibliographical survey to inform this model, understand the profile of the distance learning student, and to map the competences that appear in the theoretical references. It became clear that many efforts have been made to define and create standards for digital competences. Being that the majority are from abroad, they translate a subject profile and educational level that does not align with this project. However, research in Brazil has been limited and there are no definitions or models focused on the DL student, which makes international studies the main theoretical basis for the present study. Thus, it was necessary to map the distance learning students, in order to have the resources to build a model focused on this subject profile.

Thus, this article presents the steps taken between from 2015 to 2017. It begins by mapping these competences, first based on the theoretical references and then with DL students. Subsequently, it examines the construction of the CompDigAL_EAD model and its validation, which is occurring presently . The work is therefore divided into sections that address digital competences, the profile of the student in the distance learning context, the construction of the digital competence model, CompDigAL_EAD, and lastly, the final considerations.

## 2. DIGITAL COMPETENCES

According to UNESCO reports (2006), digital competence is one of the eight core competences for lifelong development. However, there are few national and international studies available for understanding and developing this competence in education. Moreover, there is little research focused on DL. Most studies have come from international institutions, such as the European Commission (2003), Unesco (2006), and OECD (2005), and they generally define a list of digital competences for user profiles of these technologies that do not fit the needs of the DL student.

The definition of digital competences is interpreted in different ways in official and academic documents, which produces multiple meanings and a range of nomenclatures. A vast bibliography conceptualizing the term can be found, generating different definitions, some similar, some different, and many of them redundant. In fact, all descriptions seek to refer to how people should deal with ICT in different areas of life. Hence, the concept of digital competences has transformed as technologies have provoked transformations in society.

This study understands Digital Competences according to Ferrari (2012), as a "set of knowledge, skills, and attitudes, strategies and awareness that is needed when using ICT and digital media." Therefore, it is the mobilization of knowledge, skills, and attitudes (KSA) in a given context with the support of digital resources and technological tools. Yet, a DL student must also know about technology and its possibilities. Paloff and Pratt (2015) argue that there is not a single online learner profile, but a composition of subjects ranging from youth to adults. Thus it is necessary to go beyond the characteristics of the new generations and to focus on what it means to be a DL student. Rather than drawing generalizations based on generational differences, this entails taking into account that there are young people with less ICT skills than others, as well as different cultural, social, and economic contexts.

## 3. THE DISTANCE LEARNING STUDENT

Distance Learning using ICT resources redefines itself through virtual learning environments and new tools, creating an impact on the student profile of this new generation. In Brazil, Law 9.394 / 96 - Law of National Educational Guidelines and Foundations was introduced in 1996. It proposed Distance Learning as a new national educational modality. Years later guidelines for DL were created, which encouraged public institutions of higher education to create and develop courses. Moreover, the Open University System (UAB) and the Quality References for Distance Higher Education were also instituted in 2007, making the student the center of the educational process. In the DL quality references (BRASIL, 2007) the concept of DL proposes that all the subjects involved are responsible for their own development, considering their capacity for independent and autonomous learning, through interaction, organized and guided mediation, and with clearly defined evaluation criteria. Thus, the use of technologies in education must be supported by a philosophy of learning that provides students with opportunities for interaction and primarily the construction of knowledge (BRASIL, 2007).

According to the latest 2015 Brazilian DL Census (EAD.Br 2015), there were a total of 5,048,912 students enrolled in distance learning classes and the student profile was defined as subjects who primarily worked and studied and were between 21 and 30 years of age. In other words, they tend to be older than students in the traditional classroom. From this perspective, it is possible to note the development of DL in Brazil and its potential to democratize and elevate the quality standard of education. At the same time, student dropout rates have been shown to be one of the main obstacles faced by institutions with an average of 26% to 50% in 2015. According to the survey, the main factors that led students to dropout were lack of time to study and complete course activities, financial concerns, and the methodology applied by the institutions. Paloff and Pratt (2004, p. 112-113) argue that it is "the very elements that lead students to online education - the reality of restrictive working hours, the possibility of continuing to meet familial demands - interfere when it comes to staying in the course." Here the discussion of digital competences and their contribution to DL becomes quite apparent. Yet, according to Paloff and Pratt (2015), online learners range from younger students who have grown up with technology to older adults who are returning to college and looking for the convenience of online learning. Behar and Silva (2013) argue that students who seek distance learning need to develop a virtual student identity, which occurs through daily interactions with technology,

where students will progressively appropriate the tools. Yet, there are three fundamental points that are be necessary to do so: 1. Student's strategic performance: time management, forms of communication, disposition, motivation related to the subject, etc.; 2. Understanding the characteristics of the group, the tasks, the objectives of the course, and the overall context; and, finally, 3. Technological abilities, which refer to the student's Internet connection, use of tools, and familiarity with technology. Students understanding regarding these points favors the development of their unique way of behaving in the DL context.

According to Gòmez (2015), the everyday life of the new generations is mediated by virtual social networks, which form new lifestyles, information processing, exchanges, expressions, and actions. Therefore, the characteristics of current students are very different from those of previous decades. According to Esteve, F.M., Duch, J. & Gisbert, M. (2014), the main terms used to define subjects and their relationship with technology are, Digital Natives (Prensky 2001), Generation Net (Tapscott, 1998), and Millennials (Howe and Strauss, 2000). However, according to Kennedy et. al. (2007), although these profiles possess certain ICT skills, they are technological skills that are often linked to social or leisure activities they cannot use to learn. Therefore, it is necessary that their technological confidence and experience is related to the development of digital competences aimed at their learning.

The methodological process carried out to construct the digital competence model of this research is presented in the next section.

## 4. DIGITAL COMPETENCES MODEL FOR DISTANCE LEARNING STUDENTS: COMPDIGAL_EAD

In order to construct the CompDigAl_EAD model, competences were mapped using the theoretical framework and with DL students. This article presents the four steps that have been taken so far. The model is being validated in 2017.

Step 1. Mapping of Digital Competencies from the bibliographic study - MAP 1;
Step 2. Mapping with DL students - MAP 2;
Step 3. Cross-referencing the results of MAP 1 with MAP 2, resulting in MAP 3;
Step 4. Validation of MAP 3 and construction of the CompDigAl_EAD model.
Each of these steps are explained in detail below.

### 4.1 Step 1

The first stage of the project was a bibliographic review related to the areas of knowledge involved. Thus, the themes of Competences in Education, Digital Competences, Distance Learning, and the Profile of the DL Student were further developed. A review of the existing models of digital competences at both the national and international level was also carried out. Fourteen models were selected and studied, as shown below in Table 1.

Table 1. Summary of Models studied

| Year | Model Name | Location | Reference |
|------|-----------|----------|-----------|
| 1996 | ECDL/ICDL | Spain | www.ecdl.org |
| 2002 | ICT – Literacy Framework | United States | Somerville et al. 2008 https://www.ets.org/ |
| 2003 | DeSeCo – Competences | Europe | European Commission (2003) |
| 2004 | Digital Literacy | Israel | Eshet-Alkalai (2004 & 2009) |
| 2005 | DigEuLit | Europe | Martin (2005) |
| 2006 | E-Competences | Europe | http://www.ecompetences.eu/ |
| 2006 | Key Competences for Lifelong Learning | Europe | http://eur-lex.europa.eu/ |
| 2007 | NETs-S | United States | ISTE (2007) |

| 2008 | California ICT Digital Literacy Framework | United States | CEFT (2008 & 2010) |
|------|------|------|------|
| 2009 | ACTIC e COMPETIC | Catalonia | Department of Governmental Publications  (2009) |
| 2011 | SIMCE-TIC | Chile | Enlaces (2011) |
| 2012 | Digital Competence | Spain | Larraz (2012) |
| 2013 | DIGICOMP | Europe | Ferrari (2013) |
| 2013 | Basic Competences for the digital environment | Catalonia | De. d`Ensenyame nt (2013) |

Source: Created by the authors (2017)

These revealed a great diversity and lack of uniformity among the standards, which made the organization of an initial mapping quite difficult. Most only address knowledge related to digital literacy, limiting the results by not including skills and attitudes. In addition, the models tried to group the competences, but they have done so in many different ways with different names, such as domains, dimensions, categories, and areas. Another relevant point analyzed was proficiency, also called degrees or stages of development of digital competences. Therefore, all of the selected elements were arranged in a map and then in a single table, including their domains or categories, which resulted in 85 components. Subsequently, this was refined, combining those that were similar and distributing them in the identified competences, which were: Digital Literacy, Digital Fluency, Communication, and Teamwork. The following domains were found: Digital Security, Informational Literacy, Content Creation and Development. This first mapping is MAP 1. It clearly demonstrated the importance of mapping these elements focusing on DL students.

## 4.2 Step 2

In the second step, mapping of the digital competences with DL students was carried out, based on Leme (2012) and Torrezzan's (2014) methodologies. Two groups were used in 2015. One was a graduate course with 24 students between 25 and 50 years of age with different backgrounds, from experts to postdocs. The other was an undergraduate teaching course with a total of 10 students between 18 and 25 years old. A Learning Object (LO) developed about Digital Competences for DL students was used. In both classes the concept of digital competences and the DL student profile were initially discussed, referring to the first module of the LO as well as the challenges proposed in the LO. Then, in the second module, there was an orientation regarding the mapping of digital competences, where the students did the required readings and activities in groups. Both were given 20 hours to do the mapping, after having already discussed the concepts of DL, competences, and the profiles of DL subjects. The graduate group identified a list with 74 elements based on the activities, divided into knowledge, skills, and digital attitudes. These included basic issues such as turning the computer on and off, saving data, creating folders, knowing how to use e-mail, accessing the Virtual Learning Environment (VLE) on a regular basis, interacting with colleagues, meeting deadlines, responding to requests from the professor, as well as time management, as can be seen in Figure 1. The undergraduates identified 83 elements, highlighting the use of cellular phones and social networks to interact with groups, exchange ideas, and solve problems. They also emphasized creating websites, blogs, and games to broaden the ways of reading, thinking, and acting using technology, according to Figure 2.
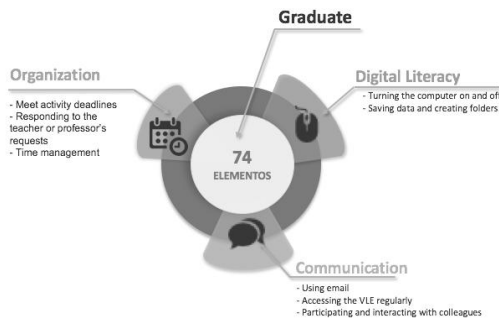
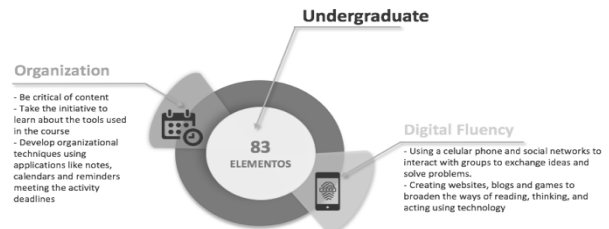Figure 1. Main Competences for Graduate students



Figure 2. Main Competences for undergraduates

Source: Created by the authors (2017)

The elements listed in both groups were related to the competences: Digital Literacy, Digital Fluency, Organization, Communication, and Teamwork.

## 4.3 Step 3

The objective of the third step was to compare the competences identified in MAP 1 (theoretical references) with those of MAP 2 (mapping with the DL students). This was carried out through the four steps described below:

1. First, the results of the Digital Competence mapping activities from each class were organized in a table.

2. Then, the elements of the graduate and undergraduate mappings were combined separately by skills and attitudes in a new table. This was then refined by combining common points.

3. After combining the mappings in a single table with skills and attitudes, titled MAP 2, an analysis of similarities in MAP1 was performed, inserting knowledge and possible skills.

4. Finally, the elements were arranged by competencies and KSA, removing duplicate components and improving the writing. This final table was named MAP 3.

Although almost the same competences have been listed, the difference lies in the elements. While the theoretical framework presents an overview of these competences, the mapping with the DL students focuses on the student profile in the distance learning modality. Hence, when the elements were combined, the names of those that presented contributions to the subject profile were used, because it is the main objective of this research.

Step 4 corresponds to the validation of the mapping of digital competences with distance learning students.

## 4.4 Step 4

This step involves the validation of MAP 3, in order to transform it into a model containing the competences, KSA, and an evaluation of both focused on the DL student, or CompDigAL_EAD. This step took place in 2016/1 in the graduate class and 2016/2 with specialists. In the course, three classes were used for validation, this the group had already studied the concept of DL, Profiles, and Competences. The students were asked to reflect on MAP 3 through activities where the objective was to provoke ideas about what is needed in a digital competence model focused on distance learning and for the student profile. This was also done with experts, however in this case through an online questionnaire. From the results of this stage, the model could be organized as a list of competences that are directly linked to the student profile and their learning process in the distance learning modality. Therefore, the model had competences and KSA related to the technological domain which were: Functional Digital Literacy, Critical Digital Literacy, Digital Fluency, Communication, Information Management, Online Attendance, Creation and development of Digital content, and Virtual profile management.

According to Behar (2009), the technological domain consists of competences related to the use of technological resources in DL, such as virtual learning environments, learning objects, and tools in general. Thus, an analysis of the mappings carried out with the students was performed in conjunction with the bibliographic survey to adapt the elements to each competence. It became clear that for DL students to be digitally proficient, they need to develop a degree of Digital Fluency. Digital Fluency, therefore, becomes a central concept in this model. According to Machado et. al. (2016) there is a correlation between funcional and critical digital literacy and digital fluency. That is, in order for a student to reach the level of digital fluency, they must first have a level of literacy.

Therefore when analyzing the concepts of Functional and Critical Digital Literacy, and Digital Fluency, the complexity at each of these levels becomes clear, see Table 2.

Table 2. Conceptual Frameworks

| | |
|---|---|
| Functional Digital Literacy | Equates the need to functionally master the technologies, reading, and writing to have access to digital and virtual knowledge (Coll, Illera, 2010). Functional Digital literacy is made up of competences related to the basic use of the computer and the Internet. |
| Critical Digital Literacy | Related to research, evaluation, reflection, and critical understanding of the information available on the Internet, as well as the use of digital tools for communication. Composed by a set of literacies, which are: informational, multimedia, communicational, and computational. (Ribeiro, 2013). Critical Digital Literacy is composed of competences such as Communication and Information Management in the network. |
| Digital Fluency | Linked to the use of technology in a way that the subject feels like a digitally active participant in technological advances. Fluency enables not only the use, but also the creation and production of content/materials. (Behar et al., 2009). |

Source: Created by the authors (2017)

There is therefore a degree of complexity at each level which is composed of specific competences. Thus, during the organization of the mapped digital competences aimed at the technological domain, the organization that can be seen in Figure 4 emerged.
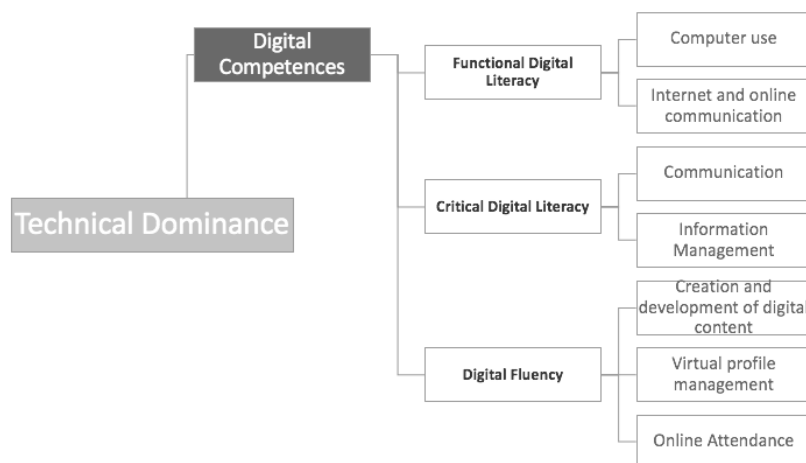


Figure 4. Technical Dominance and Digital Competences
Source: Created by the authors (2017)

Therefore, there is a non-hierarchical structure for the development of the digital competences, an organization of elements to be constructed by the DL students. Many times Critical Digital Literacy is not developed in all its elements, however the subject already has a degree of proficiency with respect to competences that belong to Digital Fluency.

The model, which is now in its final validation phase, consists of general and specific competences through the description of the elements: Knowledge, skills, and attitudes (KSA) and proficiency, basic, intermediate, and advanced levels with examples to illustrate each competence. Table 3 below shows the division of general and specific competences.

Table 3. General Organizational model of CompDigAl_EAD

| Tecnological Domain | | |
|---|---|---|
| Level | General Competences | Specific Competences |
| Functional Digital Literacy | Use of a computer | Basic notions of computers and devices; |
| | | Tools for word processing, making charts, and presentations; |
| | Internet and online communication | Basic notions about Internet use; |
| | | Basic use of E-mail |
| Criticatl Digital Literacy | Communication | Use of interaction and communication tools |
| | | Sharing of information and content |
| | | Internet etiquitte |
| | Information Management | Surfing, searching, and filtering information; |
| | | Evaluating information; |
| | | Saving and finding information; |
| Fluência Digital | Creation and development of digital content | Developing content |
| | | Integrating and expanding content; |
| | | Copyright and licenses; |
| | | Programming; |
| | Virtual Profile Management | Protective devices; |
| | | Protection of personal data |
| | | Protection of physical and mental health |
| | Online Attendance | Virtual identity |
| | | online attendance |

Source: Created by the authors (2017)

It should be emphasized that digital competences must be constructed gradually over time, taking into account that technology is constantly evolving and provoking changes. Hence, this model is dynamic and must be constantly updated according to the needs of the target audience, in this case DL students.

## 5. FINAL CONSIDERATIONS

The main objective of this article was to present the steps taken to develop the digital competences model for DL students. Thus, a discussion of digital competences and the profile of the DL student was presented, in order to address the methodology used for the construction of the CompDigAL_EAD model, which is in its final validation phase.

A model of digital competences should be focused on the profile of the DL student, requiring specific knowledge of technology and its possibilities. One of the main questions therefore was focused on this subject. Research regarding these topics constitute a relatively unexplored territory and, therefore, it becomes a challenge for educational and technological to research.

Finally, the hope is that these results will enable the improvement of DL students' digital competences and can be an important resource for professors and students seeking knowledge about distance learning and digital competences.

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