

# **Some guidelines for a smart and suitable design of applications for the social inclusion of functional illiterates**

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## **Abstract**

*This article investigates the design of application interfaces and the development of activities based on the principles of active methodologies that focus on the social inclusion of a population with low linguistic proficiency in the Portuguese language spoken in Brazil. The focus is on the inclusive, smart and suitable design of activities for learning and improving the writing and reading levels of these individuals, who are classified as functional illiterates, as defined by the National Indicator of Functional Literacy (INAF). They feel the direct impact of access to new technologies mainly because they cannot read written documents and interpret visual language. The people on whom this study focuses are keen to improve their native language skills but should also be guided and helped by an inclusive design in technological applications. They use WhatsApp to produce communications and exchange content, whether through audio messages or pictures, but they avoid writing or reading text. In this paper, we propose an inclusive smart design for an application to expand the possibilities of linguistic communication.*

**Keywords:** functional illiteracy, app interfaces, smart design, social inclusion, educational apps.

## **1. Introduction**

This study has the general objective of deepening the theoretical and practical research of the Research Group "Hybrid Education, Methodologies and Digital Learning Objects in Mobility Environments", based at the International University Center (UNINTER), Brazil, on inclusive designs for functional illiterates. A design thinking approach is used to materialize the ideas of constructing an application directed at functional illiterates. This type of thinking covers different phases of work for collaborative construction and opens itself to creative contributions from all the researchers involved, namely, a professor (the research coordinator), Master's students and a scientific initiation student. In addition to involving research and design issues, this study intends to expand the scope of the area. It aims to involve content from the literacy and digital literacy spheres, with issues emerging in today's society forming one of its theoretical and empirical supports.

The problem faced by functional illiterates is not a recent one, and it is necessary to outline more consistent paths for their inclusion into society by incorporating technologies in more practical and

effective ways. These people are viewed as invisible in their society as if they did not exist because of their difficulties in reading and writing, and they appear to reinforce statistics on obstacles that impede the social, cultural, and economic development of their country.

The decisive fact that favors the justification of this research is that the functional illiterate shows diversified fluencies and personalized forms of digital literacy when using smartphones in their day to day lives. Data provided by ANATEL (The National Telecommunications Agency) in February 2019 indicates that there are 229 million cell phones and a density of 109 cell phones per 100 inhabitants in Brazil.

Access to data from the Brazilian Institute of Geography and Statistics (IBGE) shows that, as of April 2019, Brazil has a population of 202,768,562 inhabitants. In Brazil, there are consequently more cell phones than people in the total its population; the difference is 27 million more cell phones than inhabitants.

Brazilian functional illiterates are frequent users of social networks. Among them, 86% use WhatsApp, 72% are fans of Facebook, and 31% have an Instagram account (Fajardo, 2018). It is possible to identify some common behaviors of the functional illiterates through their use of smartphones. For example, there is a predominance of Internet access through smartphones, and they make constant use of social networks due to their ease of communication and the influence of their social circle. Moreover, even if they are restricted in terms of written content, access to free Wi-Fi networks has made it possible to include such people in the digital world (Conceição, 2016).

Thus, by proposing the design of more inclusive learning objects, we can reveal new ways of promoting social inclusion and the democratization of knowledge, as well as improving the condition of the person who becomes a citizen in the digital context.

This study uses the foundations built by authors such as Freire (2010), Castells (2013), Garcia (2017), Marcuschi (2004), Burd (2010), and Ferreiro (1983), all of whom emphasize several aspects about digital literacy/illiteracy, design, and mobile issues for the focal audience. In general, it can be inferred that digital literate is not a mere reader. They can become a critical individual with social action and with the cognitive capacity to influence and expand the cultural production that they have access to. Therefore, in this study, we aim to highlight aspects of digital inclusion as well as distinctions and convergences between concepts of literacy and illiteracy in order to incorporate them into the design of the interface of this application.

The objective is to have the necessary theoretical foundations for the construction of a "humanized" design according to the referred phases of design thinking in order to reach a model of smart pedagogy (Filatro & Cavalcanti, 2016).

In this sense, it should be emphasized that, in the knowledge and information society, the learning process must be focused on the preparation of the individual, making him a citizen so that he not only understands texts or performs intellection or even writing, but so that he may be able to go beyond that. Thus, this citizen must legitimately interact with the environment in which he lives, building new connections, acting socially with self-esteem from the domain of written language, and inserting himself in the local culture and going beyond it.

It is hoped that these individuals can achieve a new level of knowledge that will materialize in a more autonomous and authorial way through their handling of information and communication technologies. Consequently, in the present article, since the topic is more general than can be

comprehensively discussed here, considerations regarding the current challenges about the digital literacy of functional illiterates in the face of the adversities and achievements of their daily life and their preparation for the sustenance of their professional life are dealt with. The preliminary results point to the hypothesis that the literacy required for more autonomous use of smart mobile devices by illiterates depends not only on their ability to read and write but also on the establishment and promotion of means that provide a more inclusive interface that gives the necessary conditions for this appropriation, as well as on achieving a social conscience about daily access to this, based on digital technologies.

## **2. Justification and objectives**

This study is a result of the actions developed in the Research Group "Hybrid Education, Methodologies and Digital Learning Objects in Mobility Environments" connected to the Master's degree program in Education and New Technologies at UNINTER, Brazil.

Three out of ten young people and adults aged between 15-64 in the country – about 38 million people – are considered functional illiterates. A study by the Paulo Montenegro Institute has shown that 29% of Brazilians are considered functional illiterates, and 8% are absolute illiterates (those who cannot read words or phrases). 21% are at the level considered to be rudimentary, while the others are at either an elementary level (34%), an intermediate level (25%) or are proficient (12%). However, in the last ten years, the ratios of Brazilians in this situation have been stagnant, as shown by the National Indicator of Functional Literacy (INAF).

For Fajardo (2018), the damage is relevant because it compromises the productivity of the economy and the chances of education contributing to the improvement of people's lives. The life expectancy of people among functional illiterates is minimal. Brazil has decided to opt for quantity rather than quality in education.

For Freire (2001, apud Ferraro, 2002, p. 29),

The best conception of illiteracy is as a "weed" – hence the expression "the eradication of illiteracy" – or as a "disease" that passes from one person to another, almost by contagion, sometimes as a depressing "sore" to be "cured" and whose indices, stamped on the statistics of international organizations, speak ill of the levels of "civilization" of specific societies. Moreover, illiteracy also appears in this naive or cunning view as a manifestation of the "inability" of people, their "lack of intelligence," and their "proverbial laziness."

Therefore, this research is justified by focusing on the design differentials for communication in the interface of applications that can potentially lead to interaction, immersion, engagement, decision-making, playful and motivating aspects and, consequently, learning. In this sense, they must also be compatible with the skills of the target audience.

The general objective of this study is to generate research inputs that can be expanded, highlighting the concept of social inclusion, and it is focused on designs for functional illiterates. The specific objectives are to develop the following: an application access interface that is compatible with the profile of said target

audience; learning activities that can improve the reading and writing conditions of the potential users; a differentiation of gamification and playfulness as a presupposition for the motivation of apprentices; the inclusion of daily references; and working on the potential users' sense of belonging and social inclusion.

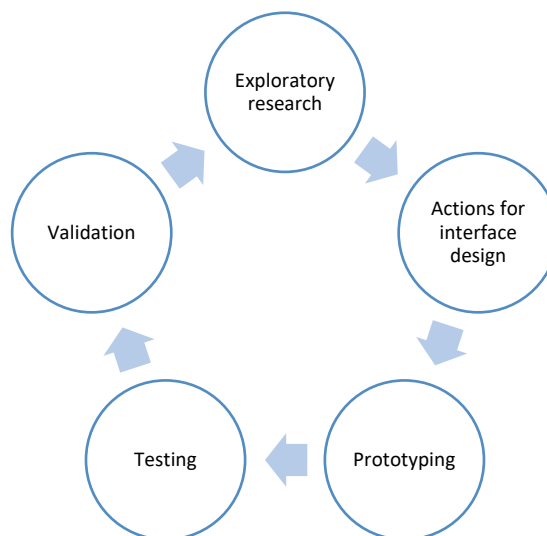
This research is justified by the need to have more optimized and effective combinations of technologies with what is known about how learning works and how the methodologies can be applied for the benefit of learners.

The combination of technology and pedagogy can promote the development of an inclusive society and reduce social exclusion by implementing learning technologies in the learning process (Conceição, 2016; Fajardo, 2018; Bacich & Moran, 2018).

### 3. Methodology

The methodology applied in this study is based on a collection of familiar elements of this target population's lives, in which verbal communication needs are evidenced and dealt with in forms of interaction in the application design. Other authors have provided theoretical support for the concepts of gamification, instructional design, cognition, and learning mediated by mobile interfaces, among others, such as Conceição (2016), Santana et al. (2012) and Garcia (2016). The development process of this application is based on design thinking, the methodology of which is based on the following phases: 1) the definition of a problem and exploratory research; 2) the presentation of a solution and actions for the interface design of the application; 3) prototyping; and 4) testing and conceptualizing this process. At the current moment of our research, we are in the design phase of the activities and concepts that revolve around this prototype, which implies modeling the concepts that support the interactive activities and interfaces of the application.

The expectation is that the subjects who constitute the target audience can perform gamified activities in mobile interfaces and use the proposed application to extend both their interpretation conditions and their written comprehension of verbal codes. This design is represented in the 5 Design Thinking Phases model (Figure 1).



**Figure 1 – 5 Design Thinking Phases**

The steps involved in five stages of the methodology depicted in Figure 1 are as follows:

Exploratory research: This was conducted with a spontaneous focus group, who had previously been identified as encompassed as functional illiterates. The objective was to uncover the personal narratives and the difficulties faced by these people due to their lack of mastery of their mother language in the aspects of reading and writing.

Actions for interface design: This is the study of the smart pedagogical approaches allied to gamified aspects to support the created activities, and aims to promote the interactivity of these users of the smartphone interface.

Prototyping: This involves putting the collaborative ideals on paper and choosing a tool<sup>1</sup> To realize a prototype that allows collaborative work. One must reflect if the interface is helpful to the target audience of functional illiterates; if it is, the user can learn to improve his level of the written and spoken language.

Test: The same exploratory research group is used to test the application's features and evaluate the created activities and gamification. A survey was used to cover the following topics of importance to this study: if the user was able to interact while learning; if the user applied his intuition to navigate through the interface; if the user understood the proposals of the exercises; and finally, if he/she would recommend the application to other people from his/her social environment.

Validation: This is the incorporation of the test phase evaluations and the disclosure of the existence of the application to a larger number of users.

At present, we still have to carry out the prototyping, test, and validation phases for this project.

#### **4. Functional Illiterates and the Use of Smartphones**

The reflection and practice of this study are based on digital technologies. Studies indicate that functional illiterates use smartphones and social networks like Facebook, WhatsApp, and Messenger. This promotes a series of experiences in different contexts that demand different forms of reading and language domains (Conceição, 2016).

According to the INAF, there are approximately 14 million absolute illiterates and just over 35 million functional illiterates in Brazil. As a result, there are substantial repercussions in the daily lives of these individuals that prevent them from performing everyday actions such as getting on a bus, paying for a bill at an ATM, recognizing addresses for their commute, making simple calculations on purchases, or controlling the frequency and doses of their medications.

Recent research has indicated that the reading deficits of the Brazilian population have increasingly reinforced social, cultural, and work inequalities. When analyzed in a school environment, these deficiencies increase the difficulties in learning content from critical subjects and present challenges on how to prepare citizens to seek employability and on their productive sustainability in global knowledge societies (Mauch et al., 2016).

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<sup>1</sup>. A strong option is to use the InVision application. This is a prototyping tool that runs on the web and allows one to have collaborative and interactive prototypes and receive feedback from colleagues. It is suitable for education projects and accepts uploads of PNG, JPG, GIF, AI and PSD files.

#### *4.1 The Use of Mobile Devices*

In Brazil, the survey published by *We Are Social* (2017) shows that 89% of the country's adult population uses a cell phone, with 62% being users of smartphones. This data demonstrates the potential use of this device for learning, allowing the development of applications that exploit literacy in an interactive way that mitigates functional illiteracy. Considering that mobile devices are becoming smaller and smaller, people are now able to carry them throughout their day. Besides, they can connect them to other devices, which enables them to incorporate their various daily activities with the physical world (Santana et al., 2012, p. 446).

Mobile technology presents itself as an instrument to support educational practices and not as an end on itself. Through portable devices, quick access, and low-cost initiatives, its use can help the literacy of the functional illiterate population that is immersed in the technological environment.

Educational mobile resources expand the learning context, as it is then not just limited to classroom environments, encompassing formal as well as informal education environments, and makes learning a continuous process. UNESCO (2013) point out that, thanks to the technological improvement of mobile devices, they will be able to translate spoken and written languages with great fluidity and precision, which will enable the inclusion of new educational interactions for this illiterate population.

The planning of the learning process of functional adult illiterates should consider the anchoring of new information that is already part of the repertoire of the literate individual. Vygotsky (1991) provides fundamental concepts on constructing knowledge from social interaction; that is, the interchange of an individual with other people and objects. In today's culture, individuals are interacting with each other using mobile technological objects as robust learning tools.

As a result of these interactions, mobile devices can promote different forms of social inclusion, whether for the disabled, the visually or audibly impaired, or people with low fluency in their mother tongue who need to improve their abilities.

#### *4.2 The Social Aspect of Mobile Devices*

For Barbosa (2017), Brazil has a social stratification composed of classes A1, A2, B1, B2, C1, C2, D, and E; the highest income families are classified in class A1, and families with the lowest income are classified in class E (this classification is used by the Brazilian Institute of Geography and Statistics – IBGE<sup>2</sup>).

For people in segments C, D, and E, the smartphone is their means of social inclusion because it is the only form of access to the Internet for specific individuals. People of lower social classes rely on smartphones for different reasons, as they do not own other devices such as desktops, laptops, or tablets.

Akharas mentions the fact that inclusion systems in the information society must be supported by learning communities:

Social inclusion systems involve processes of participation, mediation and interaction in which cognition and learning are situated in broader sociocultural contexts, and the notion of learning community

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<sup>2</sup> The division of the Brazilian population into socioeconomic classes is based on the Brazilian Economic Classification Criterion. In practice, items that a family owns are worth points and define the class it belongs to. In Brazil, the primary materials evaluated are bath products in the house, color televisions, radios, DVDs, refrigerators and freezers, cars, washing machines and the use of a maid.



becomes central. According to an information society perspective, such systems may encompass the use of media technologies, such as learning portals or social networks, and the development of models and methods for the orchestration of learning communities. (Akharas, 2011, p. 25)

Mobile applications, such as personal platforms, can access digital universes and, in a sense, build new bridges for all types of people. With their massive use, they have been able to penetrate the most varied social segments, and that is why they are associated with inclusive processes with a focus on education. According to Candello (2013), the profile of the user, typology, background colors, and content distribution can affect the proposed design forms for the target audience.

## **5. Procedures**

A group of 35 people, formed by professionals who declared that they had had little schooling, performed a preliminary test on their mother tongue to determine if they were functional illiterates. After the test, 14 people were classified as functional illiterates.

A multiple-choice test was carried out, and respondents had to choose their answers based on their understanding and interpretation of the questions. This preliminary test included questions on phrases and short texts in Portuguese referring to everyday topics, such as short messages (of the WhatsApp type), news, and small ads.

Following the test, individuals were categorized into one of two groups:

Individuals who answered 70% of the questions correctly formed a group of people with sufficient knowledge of the mother tongue because they could read the written materials presented;

Individuals who answered 30% of the questions correctly formed a group of people without sufficient knowledge because they had difficulty reading the materials presented.

Interviews with the group who answered 30% of the questions correctly were conducted after the test with the following questions:

What do you do to communicate in your day to day life?

Do you want to learn more about your mother tongue?

Do you know how to use a smartphone?

After analyzing the reports of these interviewed people, three main points were highlighted: 1) the use of communication strategies by functional illiterates; 2) their interest in deepening their knowledge of the language, and 3) their digital fluency for the proposed solution.

### **1) The Use of Communication Strategies**

The results point out that the functional illiterates under study here can be interpreted as people who deal with difficulties in reading everyday things, but find their strategies to deviate from these difficulties, either by using audio for communications on their mobile phone, taking photographs to describe something,

or by using emojis to demonstrate their feelings. This shows a redefinition of the need to use a verbal code for some instances of communication.

These people improve their self-esteem by using their smartphones and communicating with other people with a similar profile who somehow use the same strategies to communicate. Some learn to have such communicative attitudes from others.

However, they can use communicative strategies that are sufficiently adequate for their profile on the subjects they want to communicate about in order to feel that they belong to a social group, especially their family. They complain about the difficulties of not mastering their mother tongue when performing tasks such as grocery shopping, reading product labels, reading information about their medicine intake, and reading and writing messages on WhatsApp.

## 2) Interest in Deepening Their Knowledge of the Language

The results show that they have tacit knowledge of the language and life experiences, but they prefer not to expose such knowledge as they do not want to show their incompetence in this field.

## 3) Digital Fluency for a Solution: Design of the Nine Stages for Smart Pedagogy

Based on this survey, the discussions of the research group and the methodology of design thinking (Filatro & Cavalcanti, 2016), we sought to develop nine stages to produce an inclusive design of an application for functional illiterates. These nine stages cover:

Survey of personal narratives – how they live, what they do, how they work;

Implementation of pedagogical approaches appropriate to the project and smart pedagogy – use the appropriate learning approaches to develop a more autonomous and engaged user;

Use of the user's life knowledge to support their challenges – use the appropriate challenges to explore the activities of the application's interface;

Appreciation of the audience's self-esteem – incorporate the sense of self-esteem from this target audience, from which feelings and the appreciation of the person are rescued;

Playful treatment and construction of challenges – give a playful meaning to activities;

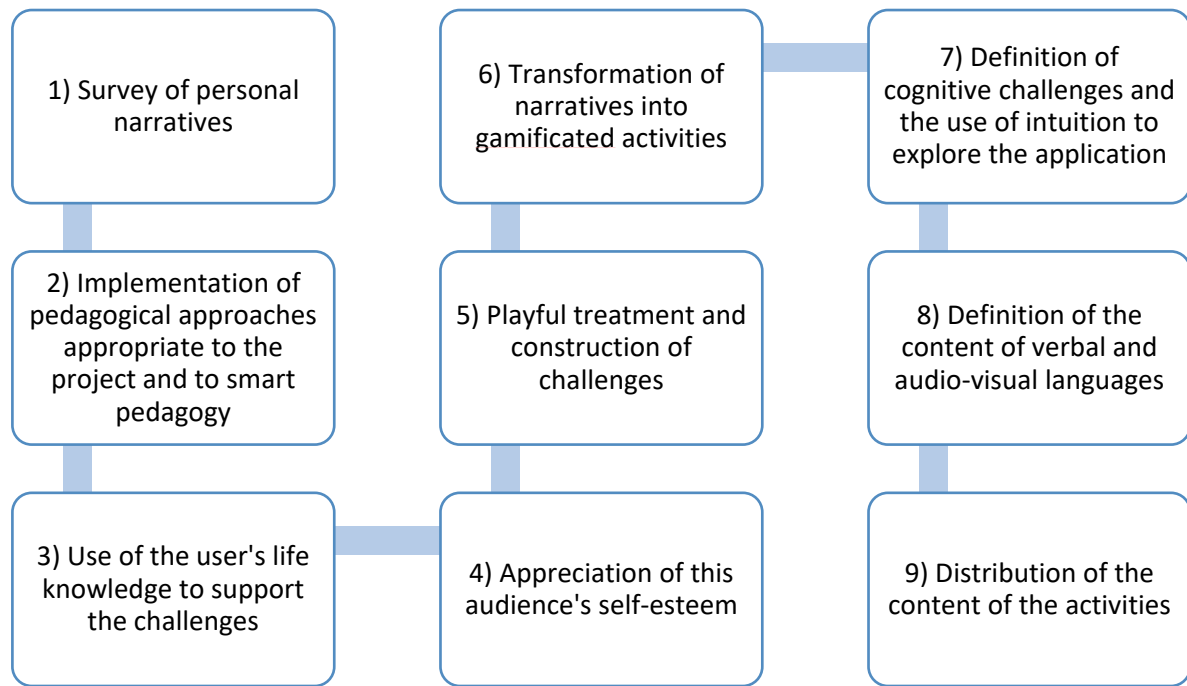
Transformation of narratives into gamified activities – uncover narratives through the use of gamified challenges;

Definition of cognitive challenges and the use of intuition to explore the application – value the cognitive element and combine this with intuition during the performance of activities;

Definition of the content of verbal and audio-visual languages – define the different codes of language as forms of communicative contribution;

Distribution of the content of the activities – balance the information in different forms of activities.





**Figure 2 – The Nine Stages of an Inclusive Design for Smart Pedagogy**

Thus, it is possible to develop a smartphone application with an inclusive design focused on cognitive challenges, gamification, playfulness and quality in learning, as shown in the nine stages in Figure 2.

The results were based on the use of the design thinking approach, which elaborates creative solutions for a real problem. In our case, the problem was approached as an issue of reading functional texts, including different ones in smart pedagogy, which drives the changes and actions of designing a mobile application.

## 6. Conclusions

Functional illiterates are not incapable people. They are the opposite. They seek to re-signify their potentialities. In this research, it has been inferred that in order to transform illiterate individuals into proficient literacy students, it is necessary to develop some differentials in communication interfaces in order for them to achieve their capacities and a better fluency for their use. In smart pedagogy, these differentials should include: the use of intuition and cognitive processes that are already present in the young and adults, the possibilities of making inferences and syntheses, associating rules with particular cases, recovering tacit knowledge of the mother tongue, accompanying the narratives and being protagonists as learners, and authorship in the search for solutions to challenges in order to follow the evolutionary sequence of the work, among other aspects.

It must adapt to a more "humanized" design that includes attention to the cognitive profile, as well as the daily, social, and individual experiences of this target audience. Applications of this nature seek to become sources of inputs in which autonomy and self-regulation can create new connections in a more

complex process of using individuals' cognitive capacity for the challenges of gamification presented in its design. Thus, it can be verified that the design of this type of application must:

Consider the possibilities of experiencing new things by the learners from their collection of other informal learning;

Recreate situations that include the use of components of language structure, vocabulary, and interpersonal linguistic communication;

Value narratives that aim at immersion and involvement in the same way that they entertain and teach;

Work on the intuitive aspect, which speaks for itself and does not require explanations, leading the user to improve their communication and learning strategies;

Build microcontainers that are inserted into micro situations, which present problems and challenges with the option of using resources to find solutions;

Find key elements that create an identity between the learner and the interface.

With this, the reflexive process that anchors the design of applications to include people with reading and writing difficulties is created.

Socially inclusive-designed products for mobile applications should also provide more autonomous and personalized processes, requiring attention and objectivity in activities, as well as more collective and spontaneous processes that express communicative forms. The autonomy of the learners is granted by their choices in what they consider essential to seek in order to improve their knowledge of their mother tongue. The design of this application should aim to meet both the demands of informal learning as well as those related to hybrid teaching – face-to-face modeling with distance modality mediated by mobile devices. This design considers: a) exploring the mobile applications of domain knowledge, developing activities so that the user can test their knowledge of writing and reading; b) recognizing the different fluencies: digital; verbal and non-verbal codes; and c) deciphering emotion through using music as a stimulus.

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