

**Tree Bark framework: competences and mindset rearrangements  
for Digital and Technology Literacy in times of exponential rate of  
changes.**

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Esta é a versão original da dissertação elaborada pelo  
candidato Camila Fernandez Achutti, tal como  
submetida à Comissão Julgadora.

A ship in port is safe; but that is  
not what ships are built for.

---

Grace Murray Hopper





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# Resumo

ACHUTTI, C. F. **Framework Cascas de Árvore: rearranjos nas competências e mentalidade para a Alfabetização Digital e Tecnológica em tempos de taxas exponenciais de mudança.** 2017. 213 f. Tese - Instituto de Matemática e Estatística, Universidade de São Paulo, São Paulo, 2016.

A sociedade do conhecimento, compreendida como o resultado do desenvolvimento das tecnologias digitais, cria novas possibilidades de percepção do mundo, cujas representações podem ter as mais diversas formas. Além da multiplicidade de formas, a sociedade atual está mudando em taxas exponenciais devido a esses avanços tecnológicos que marcam este século.

O acesso à informação transforma o nosso status quo. E esse processo foi ainda mais reforçado pela revolução digital, a ponto de dividir o mundo entre os imigrantes e nativos digitais. No dias de hoje, um momento de transição é vivido, ambos os grupos têm o desafio de entender e reformular seus papéis e identidades no mundo. Ambos são obrigados a criar conhecimento para o contínuo desenvolvimento humano, enquanto aprendem a se apropriar do ciberespaço tirando partido das suas potencialidades. Cada um no seu nível e tempo.

A era digital deu origem a múltiplas formas de alfabetização: literacia digital, tecnológica, mídia, entre outros. Eles se interconectam, se sobrepõem e convergem, aumentando seu poder em um processo dinâmico. Este processo representa uma mudança de paradigma fundamental para os educadores - a maioria deles, imigrantes digitais.

Como é que eles podem superar suas limitações técnicas e preconceitos relativos a estas novas ferramentas? Como é que eles podem se sentir confortáveis se movendo através de múltiplas interfaces de mídia? Como é que eles adquirem literacia digital e pensamento computacional, a fim de explorar novas experiências de aprendizagem para o benefício de seus alunos? Em quais ferramentas e framework se baseiam?

Considerando este contexto, o objetivo desta pesquisa é criar um novo framework de desenvolvimento de novas competências para o século 21 com foco em pensamento computacional e programação. Para validação do framework proposto, criou-se um currículo enxuto como instância do mesmo. Desta forma, educadores, independente do conhecimento na área, podem se valer rapidamente da produção científica deste trabalho no desenvolvimento de literacia digital e tecnológica de maneira escalável.

**Palavras-chave:** literacia digital, literacia tecnológica, pensamento computacional, programação.



# Abstract

ACHUTTI, C. F. **Tree Bark framework: competences and mindset rearrangements for Digital and Technology Literacy in times of exponential rate changes.** 2017. 213 p. Thesis - Institute of Mathematics and Statistics, University of Sao Paulo, Sao Paulo, 2016.

The knowledge society, comprehended as the result of the development of digital technologies, creates possibilities for new understandings of the world, whose representations take a myriad of multiple forms. In addition to the multiplicity of forms, current society is changing at exponential rates due to these technological advances that remark this century.

Access to information transforms our status quo. But this process was enhanced by the digital revolution until the point of world division between digital immigrants and digital natives. In a time of transition experienced these days, both groups have the challenge to understand and reframe their roles and identities. Both are challenged to build knowledge for the continuous development of the humanity, while learning to appropriate the cyberspace and take advantage of its potentialities.

The Digital Age gave birth to multiple forms of literacy: digital literacy, technology literacy and media literacy, among others. They interconnect, overlap and converge into and within each other, increasing their unique power in a dynamic process. This process represents a fundamental paradigm shift to educators - most of them, digital immigrants.

How do they overcome their technical limitations and prejudices concerning these new tools? How do they become comfortable moving through multiple media interfaces? How do they acquire digital literacy and computational thinking in order to explore new learning experiences for the benefit of their students? In which tools and frameworks are they using to teach?

Considering this context, the objective of this research is to create a new framework for the development of new 21st century competences, focusing on computational thinking and programming. In order to validate the proposed framework a lean curriculum has been developed on the basis of which. Thus, educators with knowledge or not can, quickly, take advantage of this scientific production for the scalable development of digital and technological literacy

**Keywords:** digital literacy, technology literacy, computational thinking, programming.



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**Bibliography**



# Lists of Abbreviations

CS	Computer Science
IBGE	The Brazilian Institute of Geography and Statistics
IC3	The Internet and Computing Core Certification
ICT	Information and Communication Technologies
IME	Institute of Mathematics and Statistics
JISC	Joint Information Systems Committee
MIT	Massachussets Institute of Technology
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment
UNESCO	United Nations Educational, Scientific and Cultural Organization
USP	University of Sao Paulo



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# Chapter 1

## Introduction

The World is living a transforming experience seeing fast advances on digital technology, especially after the 1980s. We are in the hyperconnected era where more and more people live their routines in cyberspaces. The Internet, mainly after the 3G connection, and the varied options of access platforms, as smartphones, tablets, notebooks, and netbooks permeates the routine of at least 107.7 million Brazilians <sup>1</sup> for example.

Already in the 1960s, Marshall McLuhan coined the term *Global Village* to reference to what the humanity would experience in the Network Society [Cas05], or Era of Globalization or Post-Industrial Society [Har92] [Gid91] [Jen09] [Lyo98]; among others. Di Felice [Fel10] stated that this plurality of communication architectures and access to information have created a new rationality in which the intelligence of nature and the human intelligence are not anymore in opposite sides. In the same way, the educational system is forced to deal with recent cultural phenomenons such as the collective intelligence [Pie07] and the connected intelligence [KR98], that has been made indispensable to develop digital literacy and innovation. [GG97] [PA10] [FM14]. More than an adaptation, the educational system needs to provide this knowledge to their students: the *digital natives*.

The generation born in the *Internet era* - called *digital natives* [PRE12] - have facility to deal with all this technology and multiple platforms. They use digital devices as extensions of their own bodies [dK09] and they have developed specific skills to be able to work on a set of different devices simultaneously. However, most people in this generation of digital natives did not develop critical thinking about such technological tools, or even acquired a basic technical skills to effectively using them. Many of the digital natives have just adopted digital devices influenced by the mass media and marketing. The digital and technological knowledge seems outdone, due to the fact that this generation have ability to adapt to the Web and to the new devices. However, most of them are just users with no native capability to innovate. Digital and Technology literacy aims to close this gap.

Digital and technology literacy are more than just the ability to use software or a digital device. It requires different complex skills such as cognitive, motoric, sociological, and emotional abilities that users need to have in order to be fluent and take part in the digital environments. More than this, it provides knowledge to put users in a more active position: users became producers. To supply people with the necessary skills for the future, the educational system must suggest and prioritize programs that develop critical thinking and promote information literacy [AAH04]. The curriculum, frameworks and training should focus on this kind of literacy.

### 1.1 The Existing Problem

In a context of the exponential technology era and digital natives, humanity need to understand transliteracy processes with attention for real digital and technological knowledge. Skills and

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<sup>1</sup>IBGE/2013.

competencies on the transliteracy concepts and applications have become potentially determinant of citizen empowerment in the contemporary life. In spite of that, the necessary knowledge for this new way of living, permeated by hyperconnected routines and collective intelligence, are not widely disseminated in the today's classrooms. Instead, only a few schools are focusing on helping students to develop themselves as creative thinkers. They are learning to solve specific types of problems. So, even students who perform well in school are often unprepared for the real, both professional and personal, life challenges. They are not learning how to adapt and improvise in response to the unexpected situations that inevitably arise in today's fast-changing world. Students must learn the 21st-century learning skills: think creatively, plan systematically, analyze critically, work collaboratively, communicate clearly, design iteratively, and learn continuously [Res08].

The deepest level of this lack of knowledge problem can be traced back to the scribes time. The only difference is that now they are digital. Just a small part of the society knows how to use and produce with technology, while the majority remains unaware even about the technology and digital world possibilities. Technology should not be "magic", because "the first tenet of this new culture is that all of reality including humans is one big information system [Lan10]". Programming skills is one of the key abilities of these scribes that should be spread to the population. Besides the sociological aspect of this problem, there is an economic one: is it impossible to support exponential rate of technology advancements and production with the current amount of designers, engineers, programmers and inventors? In order to keep innovation or unless to keep the world "up working", it is mandatory to provide influx technology and digital related workforce.

A similar situation happens to most of the contemporary teaching practices. Independent from the educational level, teaching practices are still far from the necessary reflection that the reticular network society requires more computational thinking and capacity of innovation. The confrontation of teachers and students in the classroom, mainly because generational aspects, create even more complex scenarios. The educational institution with all its traditional personas has lack of ability and knowledge to teach the skills necessary for life in our current society. This mismatch [Cit00] between the teacher's didactics and the student's expectations repels the identification process required for learning. Students associate schools to a monotonous and repetitive place. Unidirectional conceptions of education undertake the interactive dialog process. The educational system keeps using the same references, frameworks and examples to teach students in a different context. An unusual tripod is the base of educational system worldwide: students born in 21st century, teachers from the 20th century and an educational system using methodologies from the 19th century. Then, the education workforce has difficulties and/or resistance to innovate and use technology in the traditional classrooms. Students are requiring another kind of classes to be motivated, while the society is requiring different skills to keep people up to date. We need to produce theories, practices, curricula, frameworks and anything else paying attention about how to engage the digital native students using the workforce that is already in the system to facilitate the acquisition of the 21st century skills.

In this scenario it is almost a consensus that digital and technology literacy needs to cover the world uniformly and fast. Many issues arise with this mismatch of students, teachers and educational system: how to distribute computer science knowledge in a scalable way? How to teach digital and technology literacy in the basic education could help the development of the humanity? How to change the teaching approach to encompass the exponential rate of changes? The questions, doubts and challenges about this subject are infinite and complex. In the present research, we focus on ways to contribute to disseminate the necessity of digital and technology literacy, that is intimately connected with 21st century skill.

## 1.2 How to Solve it?

The society now is more knowledge driven, because it produces knowledge in real time, due to the advent of social networks. We need to understand that all knowledge, every statement are continuously changing and the frameworks, tools, curricula and educators mindset must be flexi-

ble and iterative. Asynchronous environments - based on constructivist theory, a student-centered approach that emphasizes the importance of peer-to-peer interactions - have gained space to complement classroom lessons. However, they become less efficient when take a long period of time and lectures are centered on teachers and textbooks.

Join dialogical practices, where both, students and teachers participate as learners, is one of the possible solutions. In this scenario, teachers assume the role of mediators or coaches and must be transversely trained to keep updated with this complex reality and to learn how to conduct the real project-based learning experiences. In this new kind of environment, the engagement of the digital native students is higher and the teacher does not need to assume the paper of expert. These features promote a sustainable, scalable and efficient way to facilitate the acquisition of 21st century skills [Tar02] [Mor07] [Dem92].

Our society needs to understand that first and foremost the technological revolution is about memory, data storage, on increasingly mobile devices and virtual supports. An inconceivable number of data have been stored. This fact allows us to release our intelligence for thought, creativity and invention. Thus, the question to be answered is: Are we prepared to develop these skills? Do we know how to teach and build an educational system in this context? It is necessary to admit that this info media has changed. There is an expectation that in a few years the access to information through the network will be absolutely democratized. The contents that are now charged to human memory, mainly during the basic school time, will be fully accessible to anyone at any time and place. Information by information does not transform, what transforms the person is the work that is done with that information.

Consequently, teachers, coaches or mediators - the name doesn't matter - must be able to exchange experiences and learn from their students since basic education. Even being digital immigrants, they need assistance to be able to leader this revolution. The concept of *knowledge network* will take form [Cas05]. One aspect to be considered by this twenty-first century teacher or the twenty-first century school is that the students, regardless of socioeconomic status, experience a connected living. The onlife term, coined by Floridi [Flo15], represents the new paradigm of human experience, which transcends the concept of life online and offline. At a time of hyperconnection, there is no possible separation between being connected and disconnected from digital networks, a fact that changes our relationship with ourselves, with others, with our education, with the world.

There are some examples around the world where new technologies are being used in education, but the technologies are used simply as machines where it is possible to get information, reinforcing passive approaches to learning. They are much more than this: they are a new way that people can create and express through. Conclusion: Information and Communications Technologies (ICTs) make a learning revolution possible, but they certainly do not guarantee it. As Mitchel Resnick concerns: "We are missing the revolutionary potential of the new technology for transforming learning and education" [Res02]. It is vital to understand and differentiate Educational Technologies and Technology Education. The first one is about platform and systems that can help students and schools to solve specific problems. The second, this research object of study, means the study of how to teach and empower everybody to acquire digital and technology literacy.

However, discussions about the way of using ICTs, typically focused on access to computers and devices, are no longer enough, because the costs of hardware are declining exponentially [HR13]. Though, the equal distribution is not a reality, people everywhere will gain better access to digital technologies with time and investment. The key problem is about fluency. In some years, the "access gap" will be overcome, but a serious "fluency gap" could remain if we did not start the educational revolution [Res02]. If nothing scalable is done, just a small handful will be able to use the technologies properly, what is not sustainable for the future development. Scientific research needs to create and test ways to change educational system mindset. It is necessary to develop tools to help the digital and technology literacy. The humanity need to dedicate more time for this new literacy for the wellness of them.

### 1.3 Goals and Proposed Solution

The main goal is to frame and catalyse the digital and technology knowledge development mainly for digital natives, because the required skills to succeed and the speed of change is dramatically increasing in the last few years. To make it possible a mindset shift was necessary. A research about the available frameworks, methodologies and curriculums was done and there were no artefacts to support this generalized change of mindset. Due to this scenario, a new arrangement to think Digital and Technology Literacy is proposed. This new framework is based on other ones to not disrupt all the educational system.

The main intention is to provide a way to achieve this new literacies and not to collapse. It is a non-linear approach to see education and development of knowledge in a context of transliteracies and exponential changes to shift educational system mindset as whole and empower it to cause the necessary impact for the worldwide development of digital and technology literacy. To achieve this, we propose a framework to accomplish Digital and Technology Literacy based on incremental learning layers. In this approach, each layer is self contained to develop a new ability, and we are always building on previous knowledge without losing the previous one. To illustrate a practical use of the framework, we also provide suggestion for contents that make sense in each one of the layers, based on the complexity to acquire them.

In this research, a new vision about knowledge construction and assessment is also presented and explained. We argue that this new learning structure, based on digital and technology literacy, is more flexible and better adapted to the this new exponential style of life. Due to this potential flexibility a knowledge representation proposal more adapted to the new digital era is produced, mainly to brace on-demand expertise development. To validate the framework in a practical way a curriculum to stimulate the critical view of students about the digital world and provide basic programming skills to produce new digital applications was built as an instance of the framework. Since we aim at providing digital and technology literacy globally and equally, the main challenges of the proposed curriculum are to:

- make possible short-term curriculums and activities due to the digital native participants expectation and any possible context restriction;
- consider low technology budget contexts flexible, like developing countries and rural schools;
- cover the digital and technology literacy concepts and their applications to develop students skills on producing digital products as mobile apps without putting more pressure at the educators, mainly because of the exponential rate of changes;
- empower technical and non-technical teacher to provide this knowledge, since the framework must be widely disseminated and it is not expect a high-technical skills of teachers;
- apply teaching practices in which teachers and students are active actors to solve real problems and enhance the learning experience and the final result;
- find a way to minimize the implementation costs and require a minimum infra-structure building a more flexible and dynamic framework.

One of the major contributions of this research is to make the new generation able to see themselves as creators, innovators, designers and programmers. It is to help these next generation to solve problems, create things and express themselves with technology and digital media. It is the first step to prepare them to become full participants in today's digital society.

## 1.4 Methodology

### 1.4.1 General characterization

Regarding the nature of a scientific research, it can be considered as: descriptive or exploratory [Gil02]. This project is characterized as an exploratory research, because it is seeking to understand a recent phenomena that is still not converging towards their empirical findings, and it seeks to clarify concepts.

Now, defined the nature of research, we can establish the approaches of it. Opting for a qualitative or quantitative approach. Martins and Theophilo [MT09] state that one of the characteristics of qualitative research is being focused on understanding and description of human behavior through a framework with a more subjective perspective of the data. The quantitative research is concerned with checking with getting results through more controlled measurements, organized and treated statistically.

The qualitative approach is a possibility for exploratory studies, since it does not seek to test what is already known, but "base their findings on empirical data". It should be highlighted that the qualitative research allows the understanding of the research object in their real context and the observation of practices and subject interactions. All this aspects are great values to this type of approach ([Fli09]).

This project uses three different ways for collecting data: literature review, participatory research and interviews with potential user of the framework. All this procedures highlighted by Gil [Gil02] as appropriate in the case of a qualitative research. Each one were used in a different phase of this research.

### 1.4.2 Research Structure

The survey of the current research was divided into three distinct and subsequent phases:

- Phase 1: Secondary data collection using literature review procedure. Other curriculums and assessment methods of digital literacy were analyzed to provide theoretical basis to propose a rearrangement of the Four Pillars of Education for the digital and technology literacy development in times of exponential rates of changes.
- Phase 2: Conducting a participatory research with empirical instance of the framework proposed.
- Phase 3: Validation of the findings in Phase 2 and obtaining primary data through interviews with potential users of the framework.

Figure 1.1 presents the methodology with emphasis on the phases of the research that will result in the empirical findings of this work. The phases are not chronological, but conceptual.



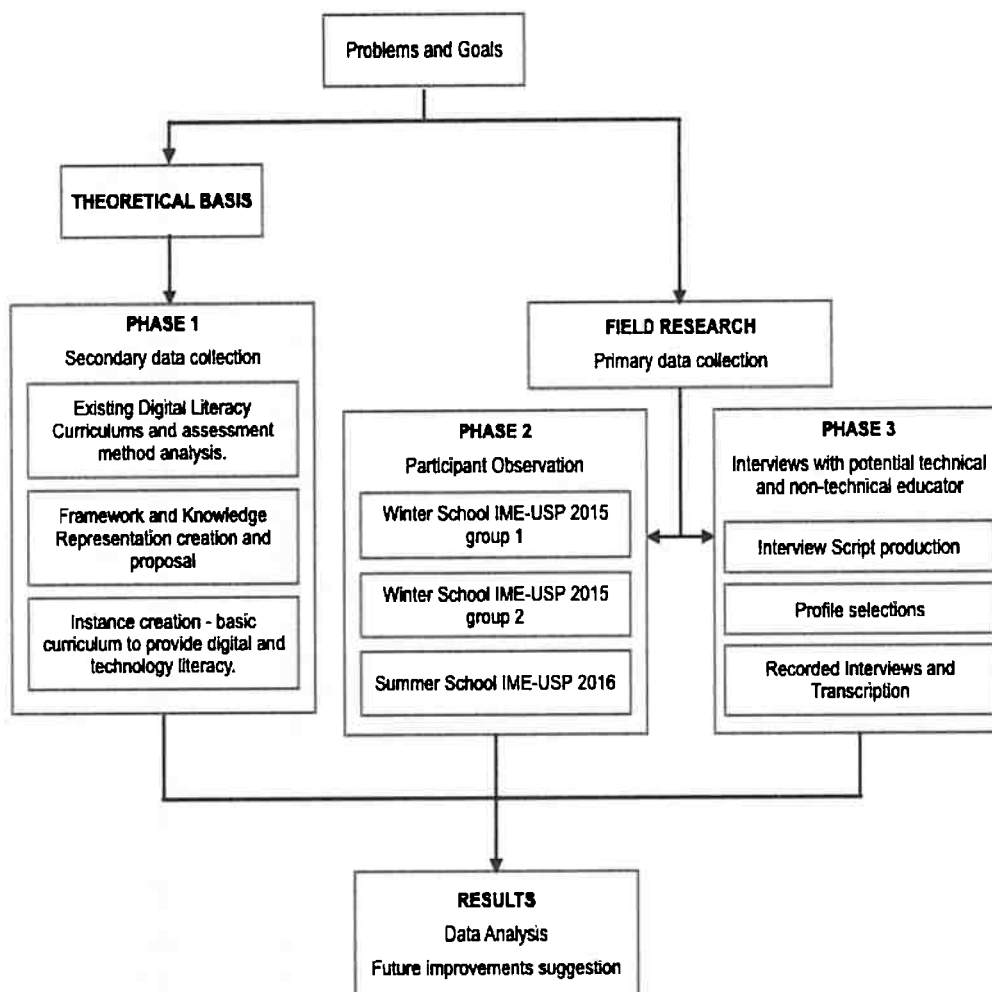


Figure 1.1: Methodology Structure

## 1.5 Chapters Organization

The rest of this document is organized as follows:

- Chapter 2: study of Digital and Technology literacy acquisition and evaluation as a tool to achieve the 21st century skills;
- Chapter 3: Tree Bark Framework detailed proposal;
- Chapter 4: Presentation of first practical framework instance. Other existing curriculum analysis are also described at this chapter to enable the comparison and validation of the proposed framework and knowledge representation;
- Chapter 5: presentations of the results and conclusions for the research. Composed by phase 1, phase 2 and phase 3 results (Figure 1.1);
- Chapter 6: final considerations about the development of this work. Pointing the highlights and the potential future directions.

## Chapter 2

# Background

To understand the new layers of knowledge approach some concepts and definitions are required. Here, we introduce the concepts of 21st century skill and digital and technology literacy. To understand more about the new generation, the digital natives and the role of teachers in the new educational world are also discussed.

### 2.1 Digital Literacy and Digital Divide

Digital literacy as a concept was introduced by Paul Gilster in his book also called Digital Literacy [GG97]. Gilster defines it as "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers". Gilster's definition is still useful because the wide approach adopted, but now sounds a little dated. This definition was proposed before the emergence of Web 2.0 technologies. Now, with many other options like smartphones and tablets "distinctions such as between producer and consumer, writer and reader blur or virtually disappear as new syntheses emerge" [GB10]. This technological change and its social consequences are reflected in more recent definitions of digital literacy.

Thus, digital literacy involves more than the ability to use software or a digital device, what seems that digital natives are habitual with [Pre01]. It includes a large variety of complex technical [SBDMCD02], cognitive, critical, motor, sociological and emotional [GG97] [Pap96] [Tap98] skills. It is about knowing how technology and media affect the ways in which we communicate and gain knowledge and understanding. And it also means understanding how technologies and media can shape and influence the future [HW09]. Without this knowledge we miss opportunities to innovate, learn and teach because we are just user and not prosumer, when the role of producers and consumers would begin to blur and merge [Tof81].

Mainly in the information society, Digital literacy represents certain skill sets, that are beyond computers. This skill are interdisciplinary and abstract. Warschauer and Matuchniak [WM10] list three skill sets that people, as part of the society, need to develop and achieve in order to be digitally literate:

- Information, Media, and Technology: competency in information literacy, media literacy and ICT (Information Communicative Technologies), which means to be able to use digital devices properly.
- Learning and Innovation skills: ability to exercise their creativity and innovation developing high critical thinking and problem solving skills. Above all this competencies, develop communication and collaboration skills.
- Life and Career skills: necessity to exercise flexibility and adaptability to be active in exponential times. Social and cross-cultural skills to understand and produce in a Global Village., Initiative, self-direction, productivity, accountability, leadership and responsibility are important for any career in any area because they are all affected by the digital revolution.

JISC (the Joint Information Systems Committee) defines digital literacy in a similar way as "those capabilities which fit an individual for living, learning and working in a digital society", whereas the European Commission has preferred the term *digital competence* using it to describe one of the eight key competences for Lifelong Learning in the European Union:

"Digital Competence can be broadly defined as the confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society." (European Commission 2003)

The tasks required in all this digital literacy context include, for example, *reading* and *writing* relevant graphical displays in user interfaces; using digital reproduction and technology to create new, meaningful materials; constructing knowledge from a nonlinear, hyper textual navigation; evaluating the quality and validity of information; having a mature and realistic understanding of the "rules" that prevail in the cyberspace; having a minimum idea about how to build a digital product like a mobile application or a website.

As stated Passareli,

"[...] We already have a generation of digital natives, and, therefore, the main concern is no longer learning the basic navigation tools on the Web, to focus on different forms of ownership of knowledge on the Web. [PA10]"

The importance of carrying emerging literacies is vital in order to instrument individuals to be protagonists and actors of their stories, prepared to not only consume, but also produce information and technology effectively and creatively. There is no remaining doubt that Digital literacy and digital access have become increasingly important competitive differentiators for individuals, companies and nations. Besides, economic and development indicators, digital literacy and access for people of information and communications technology (ICT) revolutions are a large measure of increasing. This is the reason of a Digital Division of the globe.

The digital divide was large discussed already in the 1990s [Boy14]. The digital divide was used to discuss the differences between the digital accessibility of groups, mainly the impacts of this differentiation could cause for low-income groups. Jessamyn C. West defines the digital divide "as the gap between individuals who can and cannot easily access technology. The digital divide highlights the privileges individuals have in accessing technology" [Wes11]. Howard Besser argues in a more broad vision of the division. For him, "digital divide encompasses aspects such as information literacy, appropriateness of content, and access to content" [Bes02]. A digital divide exists between those who have the ability to apply critical thinking to technology and the digital world. Between the digital literates and the digital illiterates. Between digital content creator and the consumers.

Another, relevant concept is the categorization of digital visitors and residents by David S. White [WL11]. "Visitors leave no online social trace whereas residents live a portion of their lives online". Individuals demonstrate both visitor and residential behaviors in different contexts and ages. Media theorist Henry Jenkins coined the term participation gap [JPW<sup>+</sup>09] and distinguished the participation gap from the digital divide as well. According to Henry Jenkins, the participation gap describes "the gap in skills that emerge when individuals have different levels of access to technology".

In the contemporary world, technology is the new totem, now occupying a central space, creating new parameters to define human being. This idea was articulated by the sociologist Derrick de Kerckhove in his technocentrism theory. To Kerckhove [dK09], for the current technological society, the concept of technocentrism is the presence of a continuum between the human mind and the machine, which results in a deep and decisive change in ways we and the machines are constituted. It's mandatory to build new identities, sociability skills and sensibilities to individuals today.

As a conclusion, the development of a more clear-cut conceptual framework and a set of experiences to represent the possibilities may improve the understanding of the skills embedded by the term digital literacy, and provide resource for the creation of digital environments with more precise guidelines for effective planning of learner-oriented digital work environments [AAH04].



## 2.2 Technology Literacy

Looking back to early 1990s, almost all the platform and digital devices daily used for the humanity even were created. The smartphone of today was a huge cell phone with one hour battery. All this convenience was available just with an unbelievable cost. Movies were available on DVD just in 1997. Google was born as an academic homework in 1998 and YouTube was launched just in 2005.

World is being transformed at an alarming rate but the majority of the humanity are alienated from it. As technology advances, the definition of technology literacy changes. In 1995 for example it meant knowing how to work basic tools like word processing and spreadsheets. It was enough. In current time, it is necessary to develop a new language, a new literacy, in order to both understand the brave new world, and learn how to live a meaningful existence in it [Dak06]. Now the definition of technology literacy is much richer and more complex because there is more information available than ever before. And the tools for finding, using and creating information are rapidly becoming more diverse and sophisticated.

A definition of technology literacy should begin with a definition of technology. Technology consists of all the modifications humans have made in the natural environment for their own purposes, needs and wants [Dug01], like to live longer or to have more productive lives. Such a broad definition of technology includes artifacts from the age-old to the high-tech (computers, multimedia, biotechnologies). However, the common sense of technology is in terms of its tangible products like computers and software. But the knowledge and processes used to create and operate these products are equally important, that's why technology also includes the infrastructure necessary for the design, manufacture, operation, and repair of technological artifacts [Cus99].

Based on the concept of technology described above, technology literacy is a general understanding of technology. This understanding must be developed enough so that a person can function effectively in this technology-dependent society [dK09]. Rather than a standard amount of content to be covered, technology literacy occurs along a continuum. Just varying according to the age and needs of the specific community. Technology literacy is similar to the more familiar concepts of scientific literacy, mathematical literacy, historical literacy and digital literacy cited above. Technological literacy is more a capacity to understanding the broader technological world than it is the ability to work with specific pieces of it.

Gagel [Gag97] suggested common elements of technology literacy that summarize the key features in this field. They are: knowledge about the details of individual technologies and about the process of technology development. Gagel also suggest that this type of literacy should include a holistic understanding of the historical and cultural context of technology and adaptability based on initiative and resourceful thinking. Finally, technology literacy would include four generalized competencies:

- accommodate and compete with rapid and continuous technological changes;
- generate creative and innovative solutions for technological problems;
- act through technological knowledge both effectively and efficiently; and
- assess technology and its involvement with the human lifeworld.

In 2007, International Society for Technology in Education's (ISTE) rearrange the standards for Technology Literacy, mainly to differentiate Educational Technologies from Technology Education. They arrived at five standards analogue to the Gagel common elements, but objectively categorized:

- *Creativity and innovation*: to demonstrate creative thinking and construct knowledge to develop innovative products and processes using technology;
- *Communication and collaboration*: to use digital media and environments to communicate and work collaboratively in different contexts. To support individual learning and contribute to the learning of others;

- *Research and information fluency*: to apply digital tools to gather, evaluate and use information;
- *Critical thinking, problem-solving and decision-making*: to use appropriate digital tools and resources to solve problems and make informed decisions using with critical-thinking skills;
- *Digital citizenship*: to understand issues related to technology in a diverse spectrum, like ethical behavior in digital social networks;
- *Technology operations and concepts*: to understand technology concepts, systems and operations.

Achieving technology literacy helps individuals to be active in the world they live in. It is a required knowledge to become a better decision-maker, which is required before any economic argument. Learning how to get advantage of technology enables people to access reliable real time information regarding their whole world, but also their safety. Although, it is necessary to understand not only how and where to get this information. This is the easier skill to be developed. They also need to know how to discern whether sources are reliable or not. If it exhibits bias or not. Moreover, an ability to access and use technology helps to decrease the digital divide, with people better able to access information.

With the consensus of the technology literacy development, the first try is to integrate the topic on the basic curriculum. It seems the easier way to achieve high levels of literacy. However, barriers to integrating technology literacy into classrooms are huge. Some of them are listed following:

- Education System does not understand which use of technology means and the potential of this;
- Lack of accessible computers and digital tools that support teaching and learning;
- Lack of leadership and expertise to spearhead needed changes, mainly among the teachers;
- Teachers lack of time and expertise to explore and understand available software;

As a conclusion, Technology Illiteracy is not simply a matter of the lack of understanding technology topics, like programming. It was not to have the understanding about what technology does to the society as a whole being a result of the complex interactions of everyday. People need technology literacy skills now. Their success depends on it. The humanity development depends on it. But, technology literacy development is resource-intensive. It requires more flexibility than traditional educational system schedules and culture tend to allow. It requires more study about strategies. It requires, above all this: change of mindset. People need to collaborate to discover, to test, to propose the kinds of 21st-century skills tools and frameworks the humanity needs.

## 2.3 Digital and Technology literacy acquisition

### 2.3.1 The importance for personal and professional development

Modern personal and professional life skills requires an intricate system of knowledge, skills, abilities and motivational factors that must be developed according to the needs of their specific domains [And11]. We are a new kind of population that are the result of this newly emerging concept of digital and technology literacy. These literacies are now being used to measure the quality of learners and worker independently of your career choice. We have being evaluated based on our digital life and skills, but there is no structured course to teach our new generation how this is being done. They are not thinking critically, as it is required by society and market.

For example, how are we teaching communication skills? Engaging in effective discourse and debate is a necessary skill that many all of us learned in school via class discussions, group activities, classroom debates or in class presentations. Our parents and teachers were worried about this and

developed a set of situations where we could develop these abilities. Although, in our emerging digital world, a new medium of exchange has developed: online engagement, especially via social media. Effectively engaging online requires a myriad of skills that we strive to foster in school - effective written communication, brevity and civility. These components need to be highlighted in a digital literacy course, because in tradition-bound K12<sup>1</sup> education, it is often deride social media as trite or ineffective.

Students don't need just to know how to use and produce with social media for example. Students need to create and the projects become digital. The revised Bloom's Taxonomy [Kra02], show that creation is at the highest order of learning. Teachers recognize this; it's why we give students various projects and assignments: a science experiment or a research essay. In the new times with new technologies, students need to develop the ability to create dynamic, multi-media, technological projects quickly and easily.

Another really important aspect for personal development is that current students are digital natives, that are wired to learn digitally and they know a lot about, but we need to teach them to become responsible digital citizens as well as discerning users of everything the internet has to offer in our globally collaborative world.

Pamela Ann Kirst states in a November 2013 Zanesville Times Recorder article:

"Accessing information takes a nanosecond; the assimilation of that information, the interpretation and application of it, are the skills we need today. Anyone with Internet skills can find the data; it's the finder who can tell us why it's important that gets recognized."

It shows that technology ignites opportunities for learning, engages today's students as active learners and participants in decision-making on their own educational futures and prepares our nation for the demands of a global society in the 21st century. [UNE12].

Digital and technology literacy skills have always been important for students, though they are particularly important in our information based economy. When most workers held jobs in industry, the key skills were knowing a trade, following directions, getting along with others, working hard, and being professional efficient, prompt, honest, and fair. Schools have done an excellent job of teaching these skills, and students still need them. To hold information age jobs, though, students also need to think deeply about issues, solve problems creatively, work in teams, communicate clearly in many media, learn ever changing technologies, and deal with a flood of information.

The rapid changes in our world require students to be flexible, to take the initiative and lead when necessary, and to produce something new and useful. If nothing changes in our education system our whole society will face a time with not enough technical workforce to develop the innovation we need.

### 2.3.2 21st Century Skills

The 21st century skills are high-demanded abilities that everyone need to develop in order to succeed in the information century. The Partnership for 21st Century Skills lists three types: Learning Skills (Critical Thinking, Creative Thinking, Collaborating, Communicating); Literacy Skills (Information Literacy, Media Literacy, Technology Literacy); and Life Skills ( Flexibility, Initiative, Social Skills, Productivity, Leadership).

The Framework for 21st Century Learning stated, "We believe schools must move beyond a focus on basic competency in core subjects to promoting understanding of academic content at much higher levels by weaving 21st century interdisciplinary themes into core subjects" (2007). 21st century skills bridge the knowledge, skills, and dispositions of students from the core academic areas to real life application. For this reason, digital literacy is a crucial skill that educators must foster and encourage in the classrooms (and administrators must support in the broader curriculum).

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<sup>1</sup>a term used in education and educational technology in the United States, Canada, and possibly other countries, is a short form for the publicly-supported school grades prior to college. These grades are kindergarten (K) and the 1st through the 12th grade (1-12).

This evidences demonstrate how 21st century skills require additional attention and new courses development, tools revision and frameworks creation. The next generation needs to be digitally fluent in all the 21st century aspects. Consider the analogy with learning a foreign language. To be fluent in a foreign language, you must be able to explain a complex idea or tell an intelligible story. Which means, you must be able to *be and make things* with this language. Then the conclusion is: being digitally fluent and know about technology involves more than just know how to use tools, but also knowing how to construct things of significance with those. [PR95].

As a conclusion, the 21st century educational system is charged with educating students to be successful in a complex and interconnected world. This responsibility requires schools to prepare students for technological, cultural, economic and informational changes. The 21st century skills set "is the ticket to economic upward mobility in the new economy" [Gew07]. Despite this fact, the majority of teachers are non technical (they don't have a good digital and technology literacy level), but they need to find ways to integrate digital literacy into everyday learning and they need to shift a traditional curriculum to a more innovative one. Educators as well as students must thoughtfully determine which tools are essential to their digital and technology literacy tool kit. Although with no information it is hard to do this curation.

## 2.4 Education and Technology

Nowadays, technology has been incorporated into a good number of curriculum even those that do not belong to the specific area of technology and computer classes. But, the main concern is that students make use of computers in really superficial ways to come up just with presentations or to make use of the internet to carry out a research [Dre09].

The digital natives, the current students, are not learning how to produce this technology and how all this revolution happened. According to Alvin Toffler: "The illiterate of 21st century will not be those who can not read or write but those who can not learn ,unlearn and relearn" [Tof81].

Technology used in the classroom is very beneficial in helping the students understand and absorb what they are being taught [HW09]. For this the superficial use it is enough. Today, there is a number of very good software and educational tools that can be used to complement the class curriculum. This kind of programs make available anywhere to students tests, activities, documents and references that could help the students continue with the learning process anytime, anywhere. This possibility was unbelievable years ago, but at current times this kind of use is not enough anymore.

For example, understand how this educational technologies are built, seeing computer programming as an extension of writing changes completely the mindset and doesn't matter the level of the knowledge about programming. It is the way to talk with the computer and create new types of things. Besides this important aspect, we want to teach code for the students because they can learn a lot of other things [Res13]:

"[...] in the process of learning to code, people learn many other things. They are not just learning to code, they are coding to learn. In addition to learning mathematical and computational ideas (such as variables and conditionals), they are also learning strategies for solving problems, designing projects, and communicating ideas. These skills useful not just for computer scientists but for everyone, regardless of age, interests, or occupation."

### 2.4.1 Coach versus Expert Digital Immigrant Teacher

Lengel [Len13] categorizes Education into three types: Education 1.0, 2.0 and 3.0, according to the peculiarities of each era, as well as the learning needs of the members of each community. Education 1.0, set in a static society based on pastoral life (agriculture, handicrafts and weaving), was the prevalent practice until the century XIX, characterized by learning real-world tasks. The



variety of tools were small, the groups mixed (age and gender), and the collective works were held in small groups.

After the Industrial Revolution in the nineteenth century and the reinvention of the mass production process (Taylorism and Fordism patterns) in the early twentieth century, the Industrial Society was reinvented by creating a production model based on the use of specific tools, repetitive tasks, homogeneous groups and profit maximization, which created the subsidies to Education 2.0, that is established in the production line molds.

Today, with the globalization, changes propagate really fast. We have already exceeded the limits of the mass media with digital media, which allow the participation of people in the communication process, adding value and building a new meaning to information. In this interactive model, anyone can receive and send information, produce, collaborate and participate in an active way, for we are all prosumers, according Toffler [Tof81]. This is the context of the Education 3.0.

The third millennium dawns with new perspectives and pedagogical constructs with the advent of Information and Communication Technologies (ICT), offering possibilities for new teaching architectures based on consumption and production of digital content, making prosumers authors and co-authors of own content.

The digital culture and new literacies, sons of the technological revolution occurred in this millennium, transform the reality we are living and our status quo, whether the immigrant or digital native [Pre01]. It is clear, the need to learn to learn and the need to take ownership of Web 2.0 in order to reframe the(s) identity(s) of individuals and social groups to which we belong and the world we live in, with the purpose of inclusion in the new lifeworlds [Gee96].

By offering new proposals for re-readings of the world, ICT emerge as revolution in the school context. However, whenever technological innovations perturbs the school premises occurs, according to Jacquinet Delaunay [JD09], a first moment of frustration of their capabilities and expectations before the daily life lived by these social groups. Followed by attempts of adaptation and integration of these technologies to those existing in a mutual complementarity process until a new equilibrium is reached.

The Digital Culture [Gee96] [Pre01] [Kar09] [Thi98], with its new ways to exploit the information and build knowledge collectively, creates the need to learn new literacies that intertwine, adding new pedagogical practices that include new orders relational communication and power.

Due this scenario the role of a coach emerges and it is different from of a teacher's role. The mission of the first one is to be a guide, motivator, encourager, and supporter, never an expert. A coach is less focused on telling or showing how to do anything. It is more focused on asking questions to figure out what needs to be done and how to do it. The coach will never evaluate or take the pressure to make everything all right by the first time. It's all about the journey to find the best answer.

Although, the terms teaching and coaching are often used interchangeably to imply the transference of knowledge of a subject from one person (the 'teacher' or 'coach') to another (the 'student'). However, the two terms have very different meanings. In summary the differences between teaching and coaching is mainly in the depth of knowledge transfer and the focus of that. [Hun06].

A teacher explains tools, techniques and give definitions, prompts their students to use them and makes corrections. A coach encourages the student to find the solutions for given problems that will guide them for the expected learning journey. A coach keep challenging and encouraging the group in equal measure, but also willing to confront behavior they perceive. A coach isn't just there to explain something, he is there to set goals, encourage the student to reach beyond their current grasp. A coach still teaches when necessary, helping to implement skills and behavior change. A teacher can do all these things. But generally teachers are encouraged to teach the syllabus, and not the person. [Neu13]

Being coached is more challenging because it's not information that you're trying to learn, it's not concepts that you're trying to grasp, it's changes to skills, belief and behavior - which requires the student to be ready to change. The coach makes interventions, guides, challenges, pushes, reminds, inspires and motivates. The coach will not do it for the student. Thus, to be a coach is

really challenge as well, because it requires a constant preparation for the unknown. It's mandatory to be used to not have all the answers.

However, the main similarities lie in the fact that teaching and coaching are both essentially other part-centred and excellent communication and planning skills are need for both [Hun06]. These differences are essential for this work and for the development of the standard educational system adopted mainly for the in development countries.

As a conclusion, to have more teacher as coaches is the only way for non technical teacher help their students to acquire digital and technology literacy and scale the acquisition of this urgent knowledge. Doesn't matter the available resources about the subject if digital immigrant teachers doesn't see themselves as digital natives coaches and stop seeing themselves as experts.

## 2.5 Current technological scenario

Millennials are the first generation for which internet use is nearly universal. In every nation, especially in emerging economies, people ages 18-34 are more likely to have internet access and own a mobile device compared with people ages +35. Additionally, people with more education and higher incomes are more likely to be technology users in any nation. An obvious fact is that richer countries tend to have higher rates of internet connection or smartphone ownership <sup>2</sup>.

As a way to keep updated with all this development, the emerging markets have skipped a number of steps when it comes to technology usage. Unlike the developed nations, developing countries are moving straight to new technologies, including wireless, mobile and smartphone applications. Most emerging markets bypassed landlines, desktops and dial-up Internet, and moved straight to mobile devices and apps. The spread smartphone penetration and higher mobile consumerism will take place in the emerging markets in the near future, this another attention point for the necessity of investments in digital and technology literacy in this countries.

Technology impacts on various areas of the in development economy such as growth and job creation. The following sections discuss some aspects that have influenced society and economy today: more access to internet connection, decreasing hardware costs, high technical workforce demand and mobile revolution. For example in Asia, Africa and Latin America, there are \$50 smartphones creating a huge demand for Internet services, apps, games, and Internet connectivity, accelerating all the previous ones and challenging the whole world to support the next 5 billion smartphone users with connection and apps. It doesn't matter the place, technology is changing the way organizations interact with people and the people themselves, producers or consumers, are rethinking a new norm of interaction in which they are the central piece.

### 2.5.1 Connectivity

Emerging markets are a paradox of the knowledge society. Around 4.5 billion people remain disconnected living in areas covered by 2G or 3G mobile access. Which means the mobile broadband is the key to getting people online. In the same hand, greater mobile penetration depends on devices costs, that are in charge of communications and network enterprises.

In developed markets, most enterprise communications can already accommodated 3G and 4G networks or optical fibre connections. But, in the majority of developing markets, where these connections may not exist another methods needs to be used to fill the connection gaps. They are satellite connectivity for example. Although satellite is not a new technology it is still often the best technology for connecting the most remote or unconnected areas, because of simplicity and easier implementation which is important to solve the problem in short-term.

Another important aspect to be discussed is how the emerging countries use this connectivity. Juniper Networks (NYSE: JNPR), one of the industry leader in network innovation, which reports

<sup>2</sup>Spring2015 Global Attitudes Survey Q70 & Q72. Data from GDP per capita (PPP) for IMF World Economic Outlook database. October 2015, accessed Dec, 27, 2016

every year the differences between how people use mobile Internet connectivity both in their day-to-day lives at work and at home. This reports reveals a transformative impact of connectivity in the human life. In emerging markets, 97% percent of people reported fundamental life changes due to connectivity, because of the transformation in the way they with this can do day by day tasks, like banking, engaging in civic life and order food.

In developing countries the connected devices are a tool for personal advancement, like taking online courses and e-books, while in the developed world, the focus is to gain productivity and efficiency. The proportion of this different use is also a important aspect, twice as many people in developing countries regularly use connected devices for educational purposes as those in developed markets. When the professional development is the focus, 46 percent of respondents in developing countries use connected devices versus 27 percent in developed markets. The conclusion is that, in developed nations people use connected devices for practical day-to-day activities like banking (51 percent), shopping (41 percent) and searching for local information (42 percent).

Specializing the discussion to mobile connection The Juniper Networks Global Bandwidth Index found that this connectivity has had a deep impact on how people communicate, work, learn and play around the world. And this transformation will keep happening as new technologies are developed, network speeds increase and millions of people gain access to the Internet.

There is a strong social argument for bringing more people, mainly in emerging countries, online: economic development. The index has found that, in emerging markets, when 10 percentage points of internet penetration happens, it adds 1.2 percentage points to per capita GDP growth. Which means and economic development that justify high investments in this kind of development mainly for emergent nation. Another fact reveled is that each additional 10 percentage points of broadband penetration adds 1.38 percentage points of per capita GDP growth. Investing in internet connection, doesn't matter the technology choice, is an investment is economic development for nations because emerging market consumers are embracing the web to improve their well-being, intellect and earning ability.

Increasing the amount of connected devices and people it is not enough to solve the problem for in development countries because this markets have its unique characteristics which are totally different from those facing the developed world. For example, severe differences of education and infrastructure between wealthy urban centres and rural districts. Another common problem is the need for local language digital services to support equally the population of the country.

The challenges are huge, but, nowadays, emerging markets have the opportunity to adopt new and in many ways more versatile technology. They can skip the investment in innovation development cycle, just adopting the cutting edge technology without having to support legacy infrastructures. It is not necessary to follow the path of the US and Europe, the lack of existing infrastructure allows operators to adopt and implement the technologies that suit their markets, like using directly 4G mobile connection, which can accelerate development of emerging markets. Focus on new technologies that address infrastructure needs is mandatory for the digital service sectors and digital economies.

### 2.5.2 Hardware Costs

Common sense says that the cost to buy computer, tablets and smartphones decrease each day. Functional technology is essential, the emerging economies are striking a balance between lowest cost and solid, reliable hardwares. Technology that cannot be locally maintained, supported, and repaired is not sustainable. This is the reality of in developing countries. Transportation for repair, maintenance, and support is expensive, in emerging economies is even more expensive.

Computer technology for developing areas is often through the donation, but doesn't matter to have equipment without access to electricity or resources for maintenance. At our times, the marjority of for-profit companies, government and even NGOS, require technology investments and development often involving hardware or software design. Tha is why there is a complex network for coordination of donors, distributors, and deployers to make this advance happens.

For public economics, it is necessary to consider the entire cost of school computing solutions

for example, or the creation of a information and internet center in a public space. It is not enough to sum up just the costs of the hardware. A total cost must takes into account recurrent and hidden costs such as maintenance of the equipment, teacher training, support and the cost of replacing hardware over the period, around the life cycle of computers is five years. The conclusion: affordable and durable hardware and software decisions is critical success factor., such as IT ecosystems and platform stability

One of the most discussed topics in the hardware decisions for governments in the are of digital and technology literacy is the investment in the development of low-cost and ultra low-cost computers. This categories have focused the discussion about computers in the education environment on the acquisition of hardware cost [CGH09]. This focus is a misunderstood, because this initial hardware investment represents less than 28% of the total cost for a center implementation. In the case of ultra low-cost computers, the initial hardware investment is only 13% of the five-year total cost. While the initial hardware purchase seems to be a very significant cost, teacher training and support are higher, relatively fixed, and recur throughout the five year period.

These kind of costs with technology must consider the 3 categories described above:

- Initial costs: costs for acquisition and installation;
- Recurrent costs: ongoing costs, like maintenance and training incurred over the lifetime of the equipment;
- Hidden costs: unpredictable or underestimated one-time charges after the initial purchase.

With this scenario presented, the total investment required to find affordable computing decision, but the potencial benefits is substantially higher than the price of acquisition. Another aspect is the understanding that labor-related costs are higher than hardware and software costs. Moreover, these labor-related costs are totally related with to the choice of computer type and operating platform.

Other two aspect that affects dramatically local costs and that could have a huge impact on total cost is: electricity and connectivity. In developed countries, electricity usage is a small portion of the total cost, what is not a reality for emergent markets, where power considerations can be critical because of the scenario in developing country scenarios where electricity have high prices and the availability is volatile. If the decision of a school with electricity costs of US\$0.80 per kilowatt hour, which is the tipical cost for in development nation, would have electricity costs around US\$4,000 dollars over a five-year period. Which put the electricity costs as one of the top cost, being almost equal to the initial purchase price if the choice was ultra low-cost computers. Similarly, in areas that depends on satellites technology to Internet connectivity, costs with connectivity can represent a huge impact in the total cost. The estimation is around US\$60,000 dollars over five years, which represents more than the double amount of the total cost in almost all the scenarios and choices.

Another high cost, but essential is the training for teachers and technicals. A greater amount of training is required for primary school teachers mainly to get then in charge of the facilitation of the use. And a even more expensive training for teacher if they are in charge of creating activities and develop digital and technology literacy during their own classes.

The discussion around return on investment on technology for the education centers is essential and full of different variables for each scenario. Governments focused in maximize the impact of this kind of computing initiatives, should consider that investments in secondary schools have a more immediate impact on a country's workforce than investments in primary school students.

A summary of the recent key points about the hardware and implementation costs produced by the literature is following [ZL09] :

- Support and training are recurrent costs. That represents two of largest costs in the total cost, being greater than acquisition hardware costs and software fees.
- Ultra-low Linux-based computers costs are relatively equal if compared to traditional hardware and proprietary software solutions because they require higher investments in labor and replacement over a five year period.



- The total cost for different computer models and brands and software platforms is consistent.

### 2.5.3 Lack of Technical Workforce

Workplaces were covered by computers. They are all connected. Technology in the workplace will become even more pervasive in the future and the functions executed by computers will increase exponentially. But the influence of technology goes beyond new devices and tools, as work and skills will be redefined creating new high-skilled jobs.

Between 1993 and 2001, more than 19 million new jobs have been created just in United States, in a rate of growth more than twice that of the previous decade. One million of them were generated by high-technology industries. And this exponential growth is now happening in emergent market, like Brazil. According to a study by Softex, the Brazilian market of Information Technology for example will have a shortfall of 400,000 IT professionals by 2022. Currently, according to the Brazilian Association of Information Technology and Communication Companies (Brasscom), the domestic market employs 1.3 million workers. The Association projects a growth of 30% of that number by the end of 2016.

The shortage of professionals in this sector makes companies take up to 70 days to fill their vacancies. This situation should also promote an increase of about 30% in enrollment in technical courses, but this is not enough, which makes que wages in this industries higher than others. Real average wages in the high-tech industries increased 19 percent since 1990, compared with a 5 percent average increase for the private sector as a whole. The average high-tech job pays 78 percent more than the average non-high-tech job. Even for those workers who do not sit in front of a computer or program a robot, more and better technology can mean higher productivity and higher wages. In the information-based, skills-intensive economy of the twenty-first century, one thing is clear: knowing means growing [Win94].

In fact, the idea of mandating computer science classes during basic education and further, like in any course in a university are already a consensus. But, beyond the the hardware and infrastructure there is a huge workforce gap. "I can say pretty confidently there are multiple challenges, but the biggest by far is the lack of teachers," Code.org's Partovi said. Training is required for most of the situations which is a challenge for many schools and organizations. If you train, the problem later is to keep teachers who develop technical skills. To make up this shortage, many students turn to mentors or peer instruction is the way to make it happen. Many times outside the classroom. They assist each other projects, since building personal websites until complex mobile applications.

The lack of teachers is not just about the quantity of them, but also the quality. The high qualified programmer can earn more than 3 times in the market than in the educational system. There is no advantage to get out of the market to give classes. The comparison is even unfair in emerging economies, like Brazil, where a teacher earn on average R\$18,00 reais (Brazilian currency) per hour and a programmer on average earn R\$45,00 reais per hour.

By 2020, computer-related employment is expected to rise by 22 percent. Understanding, that one of the mission of education is the prepare students to join the workforce and develop the economics, that means students must have polished technological skills, but with this gap on the number of teachers to prepare this next generation tt is required to find ways to prepare this youth using the current workforce in the educational system [Han10].

### 2.5.4 Mobile Revolution

"The rapid pace of innovation in mobile technologies and cloud computing is fundamentally changing the ways in which individuals, businesses, and governments relate to each other-changes which have already been shown to have economic and social benefits", said Carol Bothwell, Chief Learning Officer of Catholic Relief Services (CRS), a non-profit international relief and development organization to serve impoverished and disadvantage people in 100 countries around the world teaching IT. This quote represents a fact that everybody is aware but it is also a attention point for many organizations.

The cost of smart devices certainly dropped exponentially in the last years, but remains an issue as well. Most of the manufacturers put a lot of effort to bring less expensive smartphones and tablets to market. A lot of people just got a device, but the prices for 3G and 4G have remained too high. Many new devices with people without their full potential to chance this people lives. The connection cost remains high for a totally reasonable aspect: to boost additional demand for data services in many emerging markets. Conclusion, the mobile technology helps to decrease the cost of acquisition, which make possible the distribution of this kind of hardware, but the total cost to have this device connected remain high.

More scalable, flexible data retailing should lead to better pricing, increasing affordability for new customer segments. With this, better tools for developing engagement will drive the companies to a better profitability. The problem of this chain: time. This is a long run, that the companies are not convinced to go through. The key takeaway from emerging markets is that the business model innovation for devices, services and connectivity products is still crawling, but the developed market is already sustainable and profitable which slow down the innovation and flexibility impetus.

There is an important question to be answered: How big is the impact will the smartphone growth in BRIC countries? The answer for this question have influenced the global innovation as a whole. The lack of market understanding, data collection and analysis and sometimes the typical consolidated market arrogance, might shift in the next few years the mobile innovation hub from Silicon Valley to Asia. This shift is not new for the history. A similar shift happened from Northern Europe to Silicon Valley some years ago. North American Internet companies are global companies if we take on count products, revenues and customers. But with exponential changes, their leadership and development structures will need to learn a lot and get closer to emerging market reality, to keep up the pace of innovation now accelerating in these markets. Something that is already a reality in Asia mobile industry.

These are not technology questions. These one are on the same pace. They are exponential. The key questions are about market leadership and willingness to change. They are about how operators embraces the future opportunities rather than trying to preserve their legacy and consolidated developed countries business models.

Operators and Internet service companies are both important pieces in connecting the next 5 billion customers thought smartphone and tablets or any other new mobile device that is going to be created. At the same time, they are struggling to find a lean ways to produce the right customer experience, which contains the price, services and usability aspects composed. Thus, these companies have this difficult homework of future growth researching for new technologies and business models, but a huge compasation: the power to shape user behavior for the future.

In this hand, a bigger mobile revolution aspect to be analysed is cultural. Smartphone users in in developed countries have been influenced by the services they were exposed. They don't care about data or storage. In contrast, new smartphone customers in emerging markets are very often digital immigrants, who are not used to internet connection. In these emerging markets, the barriers to smartphone and Internet growth are about price and affordability, but also about understanding cultural differences.

As a conclusion, the change has just started, and it is about enabling the next 5 billion of smartphone consumers.

## 2.6 Background Summary

But besides all this cost explanation, what seems to be missing is not hardware, but a specific focus on literacy in education that incorporates information and communication technology. The focus should be in fluency and empowerment of current educators. Doesn't matter if they are digital immigrants, the mindset revolution for exponential change rates development is vital.

## Chapter 3

# Tree Bark Framework Proposal

A framework to represent the required mindset for digital and technology literacy development was needed for current exponential rates of changes and technological advancements. This chapter presents a search to find resources and guidelines to build this framework. The presented proposal pursue the goal of clarify the levels and goals for technical and non-technical educators, parents and any other educational system influencer about how to develop digital and technological literacy in their context. It pretends to be a useful tool to guide any person that want to develop these vital literacies.

Visually, this chapter will present the first and theoretical part of the phase 1 at the research structure, as the Figure 3.1 represents. The main goal at this phase is to obtain secondary data thought the analysis of the available tools for educational system to develop digital and technology literacy to choose the appropriate ones to compose these new tool.

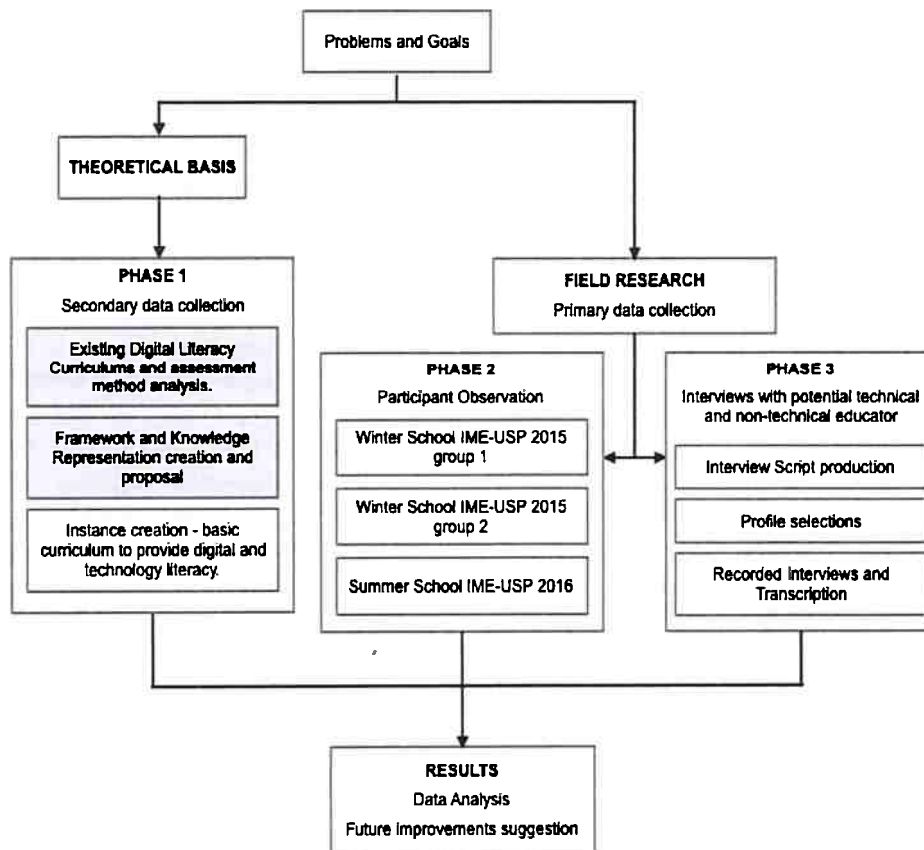


Figure 3.1: Chapter 3 relevance in the research structure

### 3.1 Tools and Methodologies for new literacies analysis

There is a rapidly growing interest in mapping the subjects, tools and frameworks that contribute to digital and technology literacy. For this reason, academic scientific community works on this issue to find out a potential solutions. The private initiative is implementing and distributing resources to develop this area faster as well. A concrete consequence of this fact, for example, are many certifications that have been created in the last few years. These tests are not only at the student level but also for professional. For instance, The Internet and Computing Core Certification (IC3), that covers computing knowledge and skills, like computing fundamentals, key applications, and living online, that proves competency in digital literacy applied in the corporate world. This kind of tool is more than just a exam. It frame the ecosystem that base their curriculums and studies at the suggested topics at these certifications.

Computer supported tests are also a trend in this area. This strategy is more sophisticated and expensive but flexible way to assess digital and technology literacy [JF06]. In 2006, the OECD Programme for International Student Assessment (PISA) developed computer-based assessment methods in its Science Survey. Results showed that this kind of assessment is an equivalent alternative to paper based methods. However, the results are incomparably easier to analyse, and data can reach the society and the main actor of the educational system more quickly. In developing countries scenario, efficient computer-based testing is a chance to them to be part of the analysis, because it provides a more economical alternative to paper-based tests, that involves logistics and transport that is always a pain point for emergent economies.

This kind of national assessment projects that introduce new large-scale, like PISA, also call attention on the importance of digital and technology literacy skills holding a essential tools for the mindset shift of the educational system. Another important aspect of this kind of program is the coverage. With this data is possible to compare and explain a variety of aspects of different world societies and cultures. One of the biggest challenges in this area is to develop a standard measure and vision for assessing digital and technology literacy to keep the development of the humanity. There is no worldwide concept of how to organize or develop tools, like curriculums at this field of technology and digital literacy. Each country, association or foundation look around for their own contexts and build their own proprietary guidelines for this kind of literacy development. For The Association for Talent Development, for example <sup>1</sup> defends that there are three areas of primary concern. The main guide for them is: what is important for employers? Which are the main skill to guarantee work opportunities to the youth? The Association for Talent Development arrived at the following items:

- *The law and ethics:* everybody is producer, which means all of them have the power to represent and be a brand in their social networks. Which they as posting is directly related with their professional functions and personal characteristics. Another point is the fast and uncontrolled dispersion of the information. To keep intellectual property, to hold trade secrets, to maintain proper levels of confidentiality, to ensure privacy are almost impossible missions in this liquid times. These responsibilities apply not only to workers digital engagements while on the office, but also can extend to their personal activities. It is true for teens and kids while they are sharing any funny video on their social networks as well.
- *Communication and collaboration:* the main goal for any organization in these times of exponential rate of changes is to function efficiently and effectively. To achieve the ability to collaborate with others using digital technology to communicate is critical. They need to communicate well internally and externally. All these organizations are made of people, which means people in this century need to develop communications and collaboration skills like never before.
- *Cybersecurity:* individuals represent the weakest link in protecting an organization in cyberspace, that is why make all the workers understanding the risks of living is a cyberspace

<sup>1</sup>More information can be found at the official website of the Association - <https://www.td.org/About>

and engaging them in the right behaviors creates a strong first line of defense against the common security problems like hackers and viruses.

Another vision about the content to be covered is from UNESCO [UU11], where digital and technology literacy content is divided in four hierarchical components . The first three focus on basic knowledge used in organizational and individual applications. The fourth component brings the ability to leverage digital technology effectively. The components are listed below [UU11]:

- Digital era concepts: Focuses primarily on job-related communication and collaboration, such as platforms, channels, content creation and curatorship, crowd sourcing, cloud computing, and cybersecurity.
- Tools, systems and programming: digital tools include email, instant messaging, Microsoft Office suite of products (or equivalent), photo and video editors and more. Systems include software applications developed for specific purposes, such as accounting, business intelligence, and learning management that need to be customized by the users using specific programming languages.
- Social technology features, platforms, and tools: social technology features include blogs, dashboards, portals, forums, media sharing features, user-generated profiles, and wikis. Platforms and tools include the big public networks like LinkedIn, Twitter, Facebook and YouTube, but also tools for socialization in the corporate intranets.
- Digital engagement skills and tactics: focuses on the skills and the necessary judgment required to use social and digital technologies efficiently. For example, to know the right channel to use, to use email productively, to create and engage productively in discussion threads and forums, to curate and validate content, to contribute to a wiki, and understanding HTML basics.

Besides the content discussion, the method and the arrangement used should also receive a lot of attention in the process of digital and technology literacy large scale development. A variety of methodologies combined with different sets of competences and contents make the task of developing these new literacies activities and curriculums confusing and complex, specially for non-technical people. This is one of the main motivator for the creation of frameworks that can be easily adopted and distributed. There is nowadays a lot of frameworks and instances of them, which keeps the mission of choose the best one for your context difficult. In the educationa system scenario, where there is lack of technical people to support this process another kind of support should be provided. To provide this support is one of the missions of this research.

To clarify the current situation, the main current ideological tool for Education - The Four Pillars of Education - developed by Jacques Delors and some of the most important frameworks for Digital and Technology Literacy development are analyzed following. All of them were already created with the mission to impact the sistem in the context of 21st century advancements. The educational system believe in the Four Pillar of Education and it is trying to use these frameworks as well, which makes the deep understand of all this artifacts required. To propose any other tools to support this system without breaking completely with the current rules and guides should dialogue with these resources.

### 3.1.1 The Four Pillars of Education

Jaques Delors presented a report titled "LEARNING: THE TREASURE WITHIN" to UNESCO in 1996 in which the emphasis was the need of VALUE EDUCATION. To help make it true, he wrote about four pillars, that after was endorsed by UNESCO. These four pillars of learning became the fundamental principles for reshaping education and they are listed following:

- Learning to know: to provide a solid foundation for future and continuous learning. It is also to provide the required cognitive tools to comprehend the current complex world;



- Learning to do: to care the skills that would be required to individuals to effectively participate in the global economy and knowledge society;
- Learning to be: to contribute for self analytical and social skills to prepare individuals to be able to develop to their fullest potential psycho-socially. This contribute is also for physical development. This is the only way the individuals can contribute back for the world development;
- Learning to live together: to expose individuals to the values like human rights, intercultural understanding and respect, democratic principles and peace. To enable individuals and societies to live in peace and harmony to create a appropriate ecosystem for human development.

The first of them is Learning to know, that implies learning how to learn by developing one's concentration, memory skills and ability to think. Every individual has talents such as memory, reasoning, imagination, physical ability, aesthetic sense, aptitude to communicate but all of them need to be developed and adapted for the digital times [Yad99].

These pillars (Figure 3.2) are illustrated as separated areas of skills to support the whole human development:

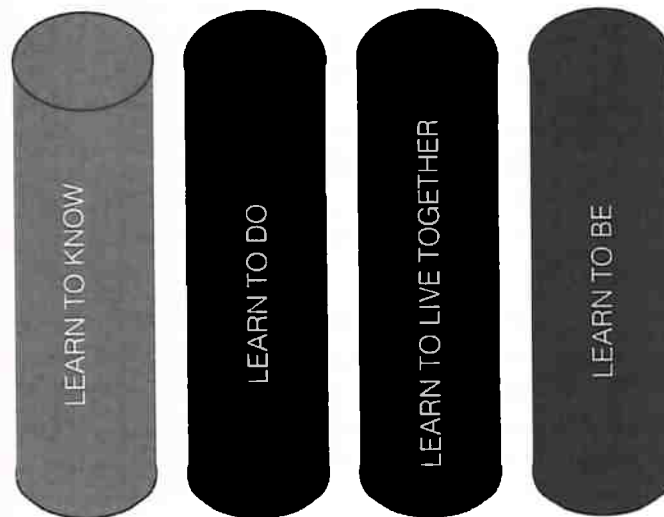


Figure 3.2: *Four Pillars for Education*

Today, specific knowledge changes constantly and does so at an exponential speed. It is no longer valuable for students to store a single knowledge and competence for the rest of their life. The digital native has to be a lifelong learner. The necessity of the pillar is pretty clear, but they need to be more interconnected in the actual panorama. To be active part of the knowledge society the learnings should be self contained so they can apply this ability in a scenario of exponential rate of changes. In the same hand acquire really specific knowledge is not anymore enough because for this kind of information You can just google it. The broad, interconnected and interdisciplinary knowledge is more valuable in this digital era. Separated pillars give the idea of independent development which can block the required mindset for technology and digital literacy development mainly when the proposal is guided by digital immigrants educators.

Programming could be an important part on this kind of learning. Algorithmic thinking is becoming as fundamental as mathematical thinking. For example, Dennett [Den08] convincingly argues that the best way to understand Darwin's theory of evolution is by thinking of it as an algorithm. In this hand, to combine deductive and inductive reasoning is a better approach for the complex subjects and scenarios we have at our times. While one kind of reasoning may be more appropriate than the other, depending on the subjects being taught, it is generally impossible to

pursue a logical train of thought without combining the two. But, the common sense in educational system often claimed to be opposing processes. This mindset hold the humanity development back.

The second pillar is Learning to Do. This question is closely associated with the issue of occupational training: how do we mold education so that it can prepare people to do the work needed in the future? Learning journey should transform certified skills into personal competence the help people to be able to be active part of workforce. It is assessed by looking at a mix of skills and talents, social behavior, personal initiative and a willingness to work. These are often referred to as interpersonal skills or peoples' skills by employers. Knowledge about technology with other qualities like communication, team building and problem solving skills will be the most demanded profile for the future.

The last two pillars are drastically effected by technology, because we need to relearn how we are represented in the digital world and how we should live together in the information era. As cited above, according to Alvin Toffler: "The illiterate of 21st century will not be those who cannot read or write but those who could not learn, unlearn and relearn" [Tof81].

Another important concept for the understand of the context is: *digital natives*. This was introduced by Mark Prensky [Pre01]. They are the first generation to grow up with these new technologies and new ways of communication. They were born in the middle of this technological acceleration, of the Internet and its networks. Because they are frequently exposed to this new environment, they can quickly respond to technology changes and new digital devices. However, these abilities and competences to deal with technological artifacts do not make them technology experts, inventors, designers or developers. They are digital super-users and that is it.

Students have changed radically and, accordingly, we must find new ways to teach what is appropriate for the new generation. We cannot just apply the education of 19th century to the students of 21st century. The school structure today hardly fits with digital natives. The organization, management, pedagogy, evaluation and the relationship between students and teachers established in schools today do not promote the digital era. Integrating quite many new technologies to classrooms is not enough to make students being digital and responding collectively at an exponential decay time.

Digital natives need an empirical approach to learn, because they through "hypertext" approaches which access knowledge in a random way. But, our current school is organized with a linear access to knowledge, a demonstrative reasoning, and a logical sequence of reasoning. Besides that, digital natives prefer learning through visual and graphics rather than reading texts. They are used to learning through interactivity and games. They have to be permanently connected, since knowledge is in the connectivity. Avoiding smartphone in the classroom is avoiding this connectivity. Another mistake of the current society is to force teachers to be digital fluent as fast as digital natives. They need to see themselves as a knowledge mediator. They have a crucial role, mediated by technology.

In addition to this complex scenario, the new generation faces the fact that school is no longer the only place to acquire knowledge to support their development. For this reason another approach to measure knowledge is dramatically necessary.

### 3.1.2 Available Frameworks around the World

From concept development to learning outcomes there is a long way to pursue. This is the one of the reasons for the development of lots of frameworks for digital and technology literacy. They are even more important in this area because lack information about these fields. A point of attention is the meaning of the term "framework". It has been understood as any organized conceptualization or structured set of competences which aim to enhance the digital and technological literacy of a group of people.

The goal of this analysis is to find the best practices and observe it they are adapted for the current times, being flexible and scalable. Most of them organize digital and technology content, but using traditional methods and tools, like liner knowledge building and test based assessment.

The analysis was focused on dimensions of competence and levels categorization. The first part of the data collection comprehend a more concrete decisions analysis of these frameworks summarized in three topics: Application-oriented, to check if they required or base the whole curriculum in a specific application or software; Certification-based, to check if the assessment suggested is an exam or a certification kind of test; and Technical Skill Focused, to check if there is no subject discussion about technology use consequences for example or any soft skill development.

The second part of the analysis is developed to check if these frameworks are prepared for the exponential times, presenting flexibility and scalability for this. The three analyzed topics are: Linear Levels Approach, to check if there is a mandatory path to achieve any level of digital and technology literacy; Unique level for all subjects, to check if there is any flexibility for the students context adaptation; and Technical leader required, to check if the context of educational system was taken as an aspect to think about scalability.

The selected frameworks were: CML MediaLit Kit [Cen86], DigEuLit [MG06], ECDL [Fou98], IC3 Internet and Computer Core Certification [CER], iSkills [ETS] and UNESCO ICT Competency Framework [UNE11]. They were selected because they are referenced by UNESCO and they are focused in digital or/and technology literacy, which make sense for the approach of the new proposed framework in this research. The analyses performed with these frameworks are summarized in Table 3.1 and Table 3.2:

Framework Name	Age Target	Application-oriented	Certification-based	Technical Skill focused
CML MediaLit Kit	preK to college	NO	YES	NO
DigEuLit	no distinction	YES	NO	NO
ECDL	students teachers	NO	YES	YES
IC3	no distinction	NO	YES	NO
iSkills	no distinction	NO	YES	NO
UNESCO ICT	educators	YES	NO	NO

Table 3.1: Available Universal Framework analysis - Part I

Framework Name	Linear Levels approach	Unique level for all subjects	Technical leader required
CML MediaLit Kit	YES	YES	NO
DigEuLit	YES	YES	YES
ECDL	YES	YES	NO
IC3	YES	YES	NO
iSkills	YES	YES	NO
UNESCO ICT	YES	YES	NO

Table 3.2: Available Universal Framework analysis - Part 2

Looking to these tables, it is possible to see two forgotten aspects for these frameworks: 1. none of them made a nonlinear proposal to measure digital and; 2. technology literacy and none of them believes that levels can be different in each knowledge area, like data privacy and web. There is just one level to represent the overall knowledge which doesn't make sense when you have changes in these area everyday and tons of different knowledge areas. Therefore we need to change the representation for education in 21st century.

One common consequence for linear approaches of education and knowledge building is the application of a test to give a certification kind recognition. Certification mode of recognition is obsolete [Sha71]. Besides this, most of this tests focus on the ability to use a specific set of applications or tools, despite they declare to agree that the ability to use specific tools or applications is just one of the several competences that need to be developed by users in order to function in



the current digital environment. Living in times of exponential rate of changes this is not enough anymore.

The analysis shown that different frameworks do not necessarily map the same competence area into the same learning outcomes. As a matter of fact, a huge difference can be found between cognitive approaches and application-oriented frameworks. Several frameworks tend to apply operational skills to each area. As part of this standard, the majority of the frameworks competence areas are already the mapped and expected ones, there is no space for new advancements and topics. In our proposal, it is suggested a balanced approach, where each of these competence areas can be developed as the context of the student demands. In our proposal we focused on cognitive approaches applied independently to specific subjects and competence areas.

Another dimension that was analyzed was the levels of digital and technology literacy. All frameworks propose a division into levels. Taking a look on the levels proposed highlights three main criteria for definition were identified: 1) age of target group; 2) width or depth of the application-related content; and 3) cognitive complexity. All these criteria were used for all areas of competences and the progress on them needs to be in all competences together, one holding another back. Another aspect is the graded three step proposal (know > use > create) was built on the hypothesis that knowledge is mandatory for use and that production is the highest achievable cognitive output. This is the basis for the majority of the frameworks produced and analyzed.

A relevant aspect for frameworks where the main difference criterion is age also use cognitive complexity as a variable for the description of the level. Thus, the problem in this cases is the assumption that the older the child is more complex task are possible. This misunderstanding shows that frameworks had been developed without taking count of application to a real-life context. The digital natives start managing devices in early life with a lot of fluency to use, but without understand the context of that. Finally, the majority of frameworks develop a three level model: basic, intermediate and advanced. The competence areas and the levels are not disconnected, which is to say that a general advanced level of competence means an advanced level in all the areas or sub-competences described in the framework. In other terms, a learner can not develop and acquire very high levels of competence in one area and an intermediate level in another, for a variety of reasons. This approach does not take into account the fact that, usually, proficiency levels vary according to content.

### 3.2 Pillars and Frameworks Analysis summary

After a large work studying curriculums around the world about Digital and Technology Literacy and prior experience building other technology related curriculums (more details in Appendix E), the main finding was that none of them were giving the whole perspective about Computer Science. None of them cover the related content since the beginning of digital revolution until how to build new stuff using all the available tools. They are not helping people to learn to learn technology which is essential in exponential rate of changes time. Some of them focus on context, just explaining what things mean, but not teaching how to use or building on this. Other ones just show the techniques without context or impact explanation. Another problems is the levels and categorization, most of them is based on graded three step proposal (know > use > create), that is not anymore a truth in current times.

The main 3 key attention points, to fill the gaps of the available tools:

- Be the guide for the education system mindset shift and not disrupt with it;
- Be flexibility for the exponential rate of changes and advancements context;
- Be scalable by being non-technical people friendly;
- Be realist to reflect the current society and not theoretical to show the desire of a ideal society.

The proposed framework get advantage of the Four Pillars of Education that is already a known concept for the educational system and to fill the seen gaps, in our approach the necessity to keep all competences flush was not the best way to achieve the desirable level of digital and technology literacy and in order to allow learners to work at different levels for each competence area according to their needs. This is the main reason for the visual adaptation of the pillars as a tree bark. The levels might vary between competence areas as well, therefore any learner should be allowed and encouraged to work at different levels according to each competence area. This kind of categorization does not help non-technical people. This is not representative of what can be done with each knowledge level.

For tree bark approach, the graded three step categorization reproduces a theoretical understanding of learning rather than reflecting how learning technology actually takes place in the real life. When we observe how users appropriate technology, mainly the digital native ones, we see a different sequence of events: first we learn how to use the new tool, most of the times by ourselves, and then we look for more information to learn something else about it. This hierarchical approach does not work anymore for technology and digital literacy. At Tree Bark framework another important decision was to use more explicit names for each category or level to facilitate the understanding mainly for non-technical people.

### 3.3 Tree Barks Framework proposal

Rethink the levels and goals of digital and technological literacy is urgent. The need for the continuous learning to take part of a collective and innovative environment makes the Delors' four pillars of learning [Del96] essential to prepare individuals to the new world. However, building knowledge as separate pillars of knowledge is not appropriate to the technological and digital education. Instead, they must be all in a connected and concentric shape. Living in an exponential rate of changes context and facing generational shock make it even more complex and necessary. This is the main motivation of suggesting a new approach of knowledge levels and competence areas for these literacies. Using the technology literacy competences and inspired by the four pillar for education proposed by Delors, a new framework is proposed, based in tree bark layers, illustrated in Fig. 3.3.

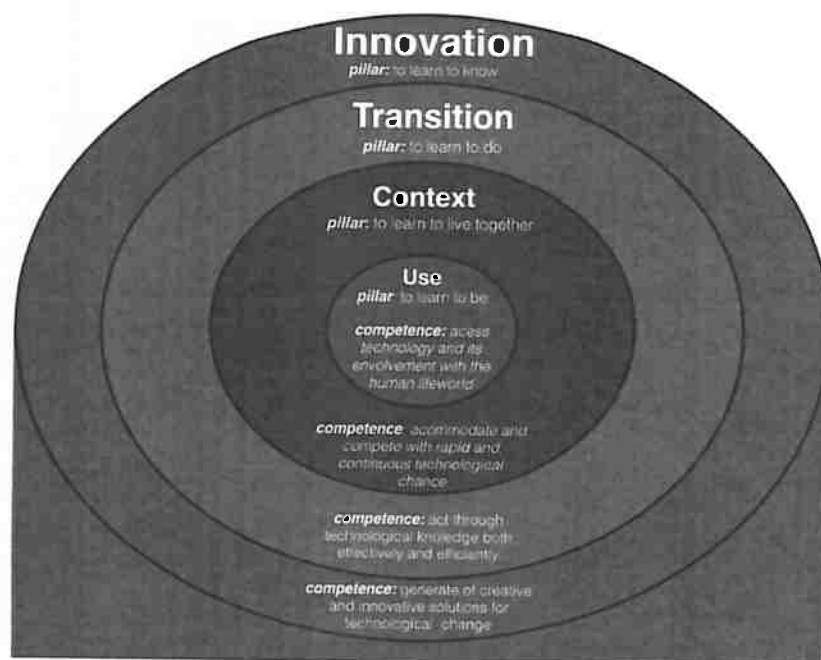


Figure 3.3: Tree Bark Knowledge Layers Digital and Technology Approach

Looking at this image, there are four layers represented as tree bark because they are concentric. The whole idea of using layers is to give the incremental perspective when digital and technology literacy is the main goal. All the knowledge or interest starts with an use or connection with some device or experience. The start point is to be aware about that knowledge. This layers can be overcome with a hands-on experience or day by day usual usage. The society is connected and for the digital natives this first contact occurs during the daily life and not in the school or specific course. That is why this layer is already part of all digital natives base knowledge, but for the teacher this is not the case. It is not enough to give context if they are not using or conscious about the relevance of that digital or technological artifact for example. Looking back to the traditional pillars representation, it is possible to see that they are contained in the new proposal. Their content and mission are covered, but now seen as a concentric huge pillar for each one of the areas. In this way we can keep more integrated framework to better keep in track with the exponential rate of changes. Changing the rate of evolution of digital and technological artifacts a more incremental approach should be available. Besides this aspect, the existence of a lot of topics to be covered and each one could follow the framework and the knowledge can be restricted in that field.

Thus, the use of technology without knowledge or moderation is dangerous, and making users aware of this context is essential. This is the first step for a digital native audience: understanding the context and creation motivation of creating of each tool they actually use. With this new approach proposed it is possible to get this aspect represented. It was missing in the traditional pillars representation. A broader sense of the abstraction and cognitive capabilities of individuals is necessary and it should be evaluated.

Four layers to be considered independently are summarized following:

- **USE LAYER:** usual contact with technology or the digital artifact is essential to proceed for the other layers. Doesn't matter if it is a artificial use, but it needs to happens until familiarity. This is required to have a sense of importance and improvements that digital or technology knowledge can represent. It gives motivation and empathy to keep learning and curiosity.
- **CONTEXT LAYER:** understand the definitions and possibilities of technologies, like what Internet is and how it works, covering the last of four generalized competencies of technology literacy – assess technology and its involvement with human lifeworld.
- **TRANSITION LAYER:** be productive with technologies and digital channels to build a bridge to a more abstract use of technology, providing the ability of acting through technological knowledge both effectively and efficiently. Work well with flexibility as digital and technology requires.
- **INNOVATION LAYER:** create new uses and applications for and with technology in order to make people being able to accommodate and compete with rapid and continuous technological change. Generate creative and innovative solutions for technological problems closing the coverage of the four competences for technological literacy. After achieving this level people acquire autonomy, as an expected outcome, and able to create and innovate with technology and keep learning as it is required.

Each level has a set of skills required to the person that is iterating his knowledge to progress. This skill should guide any curriculum or class. The digital and Technology literacy are more a capacity to understand the broader digital technological world than it is the ability to work with specific pieces of some tools. Familiarity with at least a few technologies will be useful, like tools to build mobile applications, however, as a concrete basis for thinking about technology is the core skill.

In the forthcoming sections, the set of skills required for each level will be presented as well as a suggested set of contents to be covered to develop the cited abilities and achieve the presented literacy level. As a complement to make it scalable a content framework for learning experiences is exposed as well.

### 3.3.1 Use Layer

Skills to be developed and acquired at this layer are simple as to see the relevance of a technological or digital artifact for the society thought the personal use and access somehow as the competence and the pillar contained here. The competence described is pretty straightforward: access technology and its involvement with the human lifeworld. Although, the pillar is complex: to learn to be. When this pillars belong to the central part of the structure it shows the need for empathy to develop any knowledge about anything, mainly when we are trying to give context to something that is already part of everybody daily life.

This layer is essential to minimize the digital division of the generations and the world. Understanding that the use is the first step make the digital and technology literacy more tangible , helping mainly the digital immigrants to be ore used to devices and applications. They feel more comfortable after this first touch point to overcome their limitation ans seeing the relevance of the discussion.

### 3.3.2 Context Layer

Skills to be developed and acquired at this layer:

- Recognize technology in its many forms;
- Understand basic concepts and terms, such as systems, constraints, and trade offs that are important to technology, students illustrate an understanding of technological systems and concepts;
- Recognize that society shapes technology as much as technology shapes society, acquiring a critical sense about human-computer interfaces and user experiences;
- Research and information fluency, make responsible choices and locating and sharing materials and comprehending information and ideas to access information and acquire knowledge;
- Digital citizenship, students understand what it means to be a citizen in the digital world and practice ethical behavior when they use technology.

With this set of skills, clearly a person can live better in the connected society, which is the enclosed pillar for this layer. This person will be part of the evolution of the humanity and not anymore passive actor of the new times. This happens because now they acquire the competence to accommodate and understand the changes and evolutions of this new era of exponential advances. This layer just make sense if you already had the practical use or connection with the subject which means you had already passed by this layer.

On this hand, the beginning of the digital and technology literacy development journey should be in areas that people already had use experiences like Internet and mobile devices. Another important achievement for this layer is the acquisition of critical thinking for technology and digital issues and subjects, that is essential before other learning. This is vital for the life in society and the safety of the humanity, that is why the pillar represented by this layer is to learn to live together.

*Suggested Contents:* how computers think; digital life pros and cons debate; understanding and evaluating information, the Internet and the WWW, social network dynamic, the power and possibilities of technology.

### 3.3.3 Transition Layer

Skills to be developed and acquired at this layer:

- Know the limitations of the engineering design process;
- Recognize that the development and use of technology involve trade offs and a balance of costs and benefits.

- Be able to apply basic quantitative reasoning skills to make informed judgments about technological risks and benefits, mathematical skills related to probability, scale, and estimation;
- Possess a range of hands-on skills in using everyday technologies;
- Participate responsibly in debates or discussions about technological matters.
- Seek information about particular new technologies;
- Use technology and digital tools to be more productive and effective;
- Create content in a variety of forms, making use of language, images, sound, and new digital tools and technologies.

Incrementing this layers, people take advantage of all the previous acquired knowledge. It is possible to start doing their tasks with all the digital and technological artifacts that now they know how to adapt for their necessities and desires. They learn to do and to act as the changes as the contained pillar and competences required at this layer.

This pillar contained at this layer is to learn to do, which means that to achieve this layer concrete changes in you life, like productivity, should be seen. Besides the complete understand of the flexibility of technology you will be able to take advantage of it learning how to choose and adapt for your own necessity and desires as cited above.

*Suggested Contents:* productivity tools and tips, privacy and security discussion and resources, programming introduction, interface and user experience understanding and analysis.

### 3.3.4 Innovation Layer

Skills to be developed and acquired at this layer:

- Identify problems and potential solutions, question assumptions, recognize opportunities for change and improvement
- Be adaptable and flexible, mainly when challenging ideas, seeking solutions, and solving problems;
- Rethink the way things are done;
- Approach challenges creatively;
- Evaluate solutions, to make recommendations or decisions;
- Set realistic goals and priorities;
- Use the right tools and technologies to complete a task, project, or assignment;
- Accept feedback and learn from mistakes;
- Take social action, to share knowledge and solve problems in the family, workplace and community, and by participating as a member of a community.

In this layer individuals can generate new knowledge. There is enough level of abstraction to innovate and learn to know as the cited pillar suggests. It is where all the cutting edge happened with their inventor. For this reason, this is not a required layer for all subjects. Actually this is impossible because of the time required to develop these skills. Besides this the exponential rate of changes produce new knowledge in a much more fast rate than our learning curve for all the areas. This layer for example should inspire people to learn how to program, some of the individuals will keep learning and probably will work with this as a professional, which does not mean everybody should trace this same path.



The maximum number of people should achieve this layer to start solving problems that are not being solved. The fourth pillar and the more complex competence for digital and technology literacy belong to this layer. Another important aspect is that this layer has no end, because it is responsible to keep producing knowledge that will be important for other people to achieve digital and technology literacy.

*Suggested Contents:* ideation design thinking experiences, validation basics, mobile interfaces development, paper prototyping, mobile Programming with AppInventor, good presentations and pitches tips.

### 3.4 Knowledge Representation as a Tree

The selection of the contents to cover in a journey of digital and technology literacy journey are one of the biggest challenges, mainly for non-technical people. As the framework suggests, this topics selection should be based on the context of students are inserted and it should be relevant for society development, where the root of all technology development should be planted. Give any rule for this selection break the flexibility statement of the framework, it needs to me built in the community that is delivering the learning journey, but a visual guide could help and support this task. The most appropriate representation is a tree. Which is convergent with the whole essence of the proposed framework and give the idea of ramifications with no rules for relations and no limits for growth.

The representation of a tree is iconic, because shows the power of technology to invent new areas and give attention of specific ones depending on the time. A new branch can be created and explored from another one. Another details of this representation that make it important is the possibility of different sizes and thickness of each bark. Exploring one specific subject may be interesting for a chosen community context. At this topic make sense to develop all the layers until innovation bark, but for another one. Just the use followed by a thin layer of the context is enough. The biggest challenge is to choose the main trunks to sustain the whole tree. These topics should be the more relevant ones for the participants as a way to keep them engaged.

The base of the tree should be composed by the most relevant subjects, the most used ones to create the first connection. All the other subjects will be branches of these ones and the knowledge will grow in an emphatic way. The Figure 3.4 shows the subject A as the root of the knowledge tree. Subject B and C will be explored starting from A. Branches starting from any of the subjects are possible and there are infinite possibilities like subject D starting from C and E starting from B.

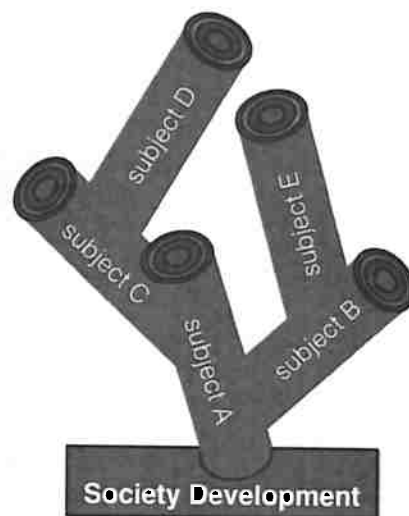


Figure 3.4: Knowledge Tree Example

With all this way trod, any person that is interest in developing a curriculum for technological and digital literacy can use this approach reflecting what are the main subjects and contents to be covered in the specific scenario. And this structure can be changed any time if the scenario changed, that is why it is important to keep it simple and visual.

### 3.5 Chapter Summary

The new proposed framework have the flexibility as one of the main characteristics of it. That is also the main required characteristic for any artifact that wants to be useful in the current times where the rate of changes is exponential. The layers approach for a non-linear knowledge development bring it to the framework. These new layers representation make more clear the necessity to disassociate levels of knowledge for each specific subject, making it as a unique self contained artifact, because of current times of fast advancements.

Another important aspect is the clarity of the journey to develop digital and technology literacy, because now the framework was built based on the society and not as a theoretical instruments that the society should try to follow. This is clear when the usage is placed before the knowledge. This new representation put the use in the center as well. This action was latent to represent the current times where technology is everywhere as devices, apps and software. Technology usage is a reality. Besides this, the digital natives are majority in the educational system. They are superusers and they should have a big influence on any educational tool. This new framework is a real portrait of the current times.

The Knowledge Tree representation suggestion is also relevant for the education system mindset shift. This visual resource help to bring the idea of Digital competence and Technology Knowledge should be a subject for a lifelong learning and that they are beyond current super user perspective. There is no limits of branches and growth for a tree, as well as for the the Digital and Technology literacy development.





## Chapter 4

# Proof of Concept: A Curriculum based on Tree Bark framework

The Tree Bark framework presented in Chapter 3 is an abstract artifact. The goal of this chapter is to find curriculum that fit is convergent with this new framework to present a possible concrete consequence of this new tool. The analysis of the curriculums will be presented, but there was no one sufficiently convergent. As a way to represent and validate the framework, a short-term curriculum for digital and technology literacy was developed covering the bases of computer science and digital life following the arrangement proposed for the Tree Bark Framework

At this chapter will be presented a curriculum that follows the proposed framework. The first step to reach this goal at the research structure was to understand and analyze the available curriculums and find a final curriculum to go to phase 2 to collect primary data. Figure 4.1 show this first step.

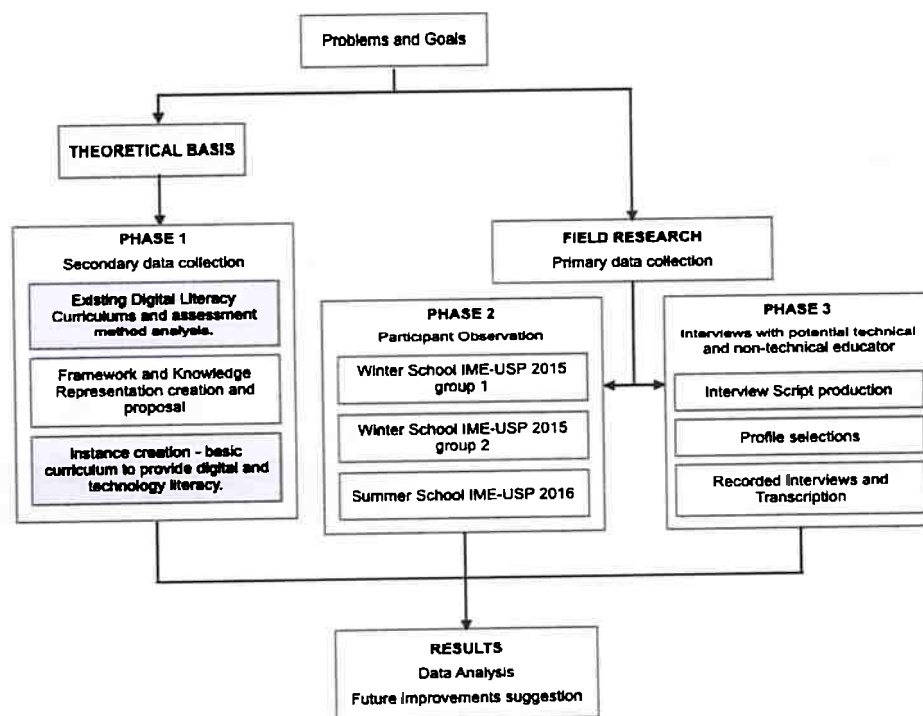


Figure 4.1: Chapter 4 relevance in the research structure

## 4.1 Existing Digital and Technology Literacy Curriculums

The main goal of this existing Digital and Technology Literacy Curriculums analysis is to understand how the world is interpreting the levels and competences required in the new literacy era to check if they are convergent to the Tree Bark framework. Comprehend how they are adapting and improving this kind of resource for exponential rate of changes times is essential. Another aspect is to see which kind of pedagogical vision they are using. Are they using the traditional linear levels interpretation? Are they preparing this material to be generic enough for the changes? Are they developing other 21st skills? Are they just providing content resource?

After a large work studying and building (personal reasons detailed at Appendix E) curriculums around the world about Digital and Technology Literacy and after developing the proposed framework at this research, a protocol to analyze the curriculums was produced. The protocol used to analyze observes: if they used project based learning, if they require a technical teacher, if they cover the context of the subject they are teaching, what was the main target audience, the technical content they cover and in which languages it is available. These aspects provide the portrait to diagnose if these curriculums are adapted or not for the new times, consequently fit with the new framework proposed.

One of the criteria to select the curriculums were geographic distribution to have the real perspective about the production country influence, mainly in the language and goal. The other one was the relevance of the educational institution that propose the resource.

The analyzed curriculums were: CSUnplugged [BWF10], *Maratona de Aplicativos* (App Marathon) [Bar14], Technovation Challenge [Lea10], Gifted and Talented Stanford Programm [Sta90], Progy [Pro13], Codecademy [Sim11], Techie Club [Tec13], ExploringComputerScience [Mar12], CSFirst [Goo14], Khan Academy (Computing Subject) [Kha13]. Here is the result of the analyses:

- CSUnplugged

<b>Name</b>	Computer Science Unplugged		
<b>Institution</b>	University of Canterbury, NZ		
<b>Cost</b>	paid	free	
<b>Project based learning</b>	NO	YES	
<b>Main target audience (age/gender/knowledge)</b>	K12 with no knowledge.		
<b>Main goal</b>	exploration	introduction	professional
<b>Content covered</b>	Data: Representing Information, Algorithms: Putting Computers to Work, Procedures: Telling Computers What to Do, Intractability: Really Hard Problems, Cryptography: Sharing Secrets, The Human Face of Computing: Interacting with Computers		
<b>Languages availability</b>	English, Arabic, Chinese, Dutch, French, German, Greek, Hebrew, Hungarian, Italian, Japanese, Korean, Lithuanian, Polish, Portuguese, Russian, Serbo-Croatian, Slovenian, Spanish, Swedish, Turkish		
<b>Technical teacher required</b>	NO	YES	

Table 4.1: CSUnplugged curriculum analysis.

CSUnplugged is one of the most flexible curriculums available, because there is no minimum infra structure requirement and it is free and open. The main problem is that the content is technical and not friendly for non-technical teachers, one of the main gaps that the new frame is filling. That is why to use this resource it is required a technical background. There is no clear path to develop the basis of digital and technology literacy, just a lot of cool activities not ordered by level, which keep the educational system far from this kind of amazing tool to develop the hard skills for digital and technology literacy.

- *Maratona de Aplicativos* (App Marathon)

<b>Name</b>	Maradona de Aplicativos		
<b>Institution</b>	FIAP and Google		
<b>Cost</b>	paid	free	
<b>Project based learning</b>	NO	YES	
<b>Main target audience (age/gender/knowledge)</b>	High School Students. No knowledge required.		
<b>Main goal</b>	exploration	introduction	professional
<b>Content covered</b>	Ideation, Validation, Design Thinking, App Prototyping		
<b>Languages availability</b>	Portuguese		
<b>Technical teacher required</b>	NO	YES	

Table 4.2: *Maratona de Aplicativos (App Marathon) curriculum analysis.*

Maratona de Aplicativos (App Marathon) is a good example of methodology, but it is limited for mainly mobile programming, not covering security, Internet operation or Productivity. It is also limited by the language because it is just available in Portuguese and requires internet connection to see the content and complete the project. This curriculum is failing in one of the main aspects of the proposed curriculum: the possibility to explore different levels and contents producing a knowledge tree and not just a block. It should explore other digital and technology subjects in their context of education and mobile programming.

- Technovation Challenge

<b>Name</b>	Technovation Challenge		
<b>Institution</b>	Iridescent Learning		
<b>Cost</b>	paid	free	
<b>Project based learning</b>	NO	YES	
<b>Main target audience (age/gender/knowledge)</b>	K12 girls.		
<b>Main goal</b>	exploration	introduction	professional
<b>Content covered</b>	Ideation, Validation, Business Model Canvas, Marketing and Financial planning, Design Thinking, App Prototyping		
<b>Languages availability</b>	English, Portuguese, Spanish, French, German.		
<b>Technical teacher required</b>	NO	YES	

Table 4.3: *Technovation Challenge curriculum analysis.*

Technovation Challenge Curriculum is available in multiple languages and for free, which make it a great resource. One of the main attention points is the not discussion of other aspects of digital and technology literacy. This curriculum also does not focus in shift the educational system mindset, it already focus on digital natives.

- Gifted and Talented Stanford Program

<b>Name</b>	Gifted and Talented Stanford Programm - (Technology Courses)		
<b>Institution</b>	Stanford University		
<b>Cost</b>	paid	free	
<b>Project based learning</b>	NO	YES	
<b>Main target audience (age/gender/knowledge)</b>	American K12 Students		
<b>Main goal</b>	exploration	introduction	professional
<b>Content covered</b>	C programming (Intro and Advanced), Java Programming Intro, Compound Data Types and Advanced Topics in C.		
<b>Languages availability</b>	English		
<b>Technical teacher required</b>	NO	YES	

Table 4.4: *Gifted and Talented Stanford Program curriculum analysis.*

Paid and just in English. These two characteristics take away a lot of people on the earth that should be able to learn and acquire digital and technology literacy. Another important aspect is the exploration only of specific tools and languages, this curriculum is focused in teaching digital natives how to use the most common languages and apps without discussing the meaning of all this.

- Proggy

<b>Name</b>	Proggy Beta		
<b>Institution</b>	Proggy		
<b>Cost</b>	paid	free	
<b>Project based learning</b>	NO	YES	
<b>Main target audience (age/gender/knowledge)</b>	Brazilian K8 students		
<b>Main goal</b>	exploration	introduction	professional
<b>Content covered</b>	Introduction to Scratch.		
<b>Languages availability</b>	Portuguese		
<b>Technical teacher required</b>	NO	YES	

Table 4.5: *Proggy curriculum analysis.*

Superficial, which mean not exploring the proposed flow at the framework: use, context, transition and innovation. This curriculum is no flexible enough to support time of exponential rate of changes. This curriculum is also limited by the only on language. Another problem is that there is no option for non linear development of knowledge. There is just one path and one "right" way to finish the proposed task.

- Codecademy

<b>Name</b>	Codecademy		
<b>Institution</b>	Codecademy		
<b>Cost</b>	paid	free	
<b>Project based learning</b>	NO	YES	
<b>Main target audience (age/gender/knowledge)</b>	Anyone that want to learn code.		
<b>Main goal</b>	exploration	introduction	professional
<b>Content covered</b>	Make a Website, Make an Interactive Website, Learn Rails, Learn Angular-JS, Ruby on Rails Authentication, Learn the Command Line, Learn SQL, Learn Java, Learn Git, HTML & CSS, JavaScript, jQuery, PHP, Python, Ruby, Learn APIs		
<b>Languages availability</b>	English, Portuguese, French, Spanish (not all the content in all languages)		
<b>Technical teacher required</b>	NO	YES	

Table 4.6: Codecademy curriculum analysis.

Codecademy is the most popular curriculum. It is flexible and scalable, but cover a lot of specific tools and languages aspects. It is totally language oriented, which means there is no discussion about the importance and relevance of all that learning and this is one of the main points for the new framework

- Techie Club

<b>Name</b>	Techie Clubs		
<b>Institution</b>	Tech Corps		
<b>Cost</b>	paid	free	
<b>Project based learning</b>	NO	YES	
<b>Main target audience (age/gender/knowledge)</b>	K12 on site (USA)		
<b>Main goal</b>	exploration	introduction	professional
<b>Content covered</b>	Coding, App Development, 3D Printing, Robotics, Game Design, Web Development, Digital Media.		
<b>Languages availability</b>	English		
<b>Technical teacher required</b>	NO	YES	

Table 4.7: Techie Club curriculum analysis.

Techie Club does not agree with project based learning which is totally the opposite of the purposed approach, mainly because with exponential rate of changes, there is no example or content that will be meaningful forever. Another aspect is the fact that it is not interest in changing the educational system to cause the mindset change, it is focused on people that already have knowledge and professional orientation for technology and digital production.

- ExploringComputerScience

<b>Name</b>	ExploringCS	
<b>Institution</b>	National Science Foundation	
<b>Cost</b>	paid	free
<b>Project based learning</b>	NO	YES
<b>Main target audience (age/gender/knowledge)</b>	Los Angeles K-12 students	
<b>Main goal</b>	exploration	introduction professional
<b>Content covered</b>	Human Computer Interaction, Problem Solving, Web Design, Programming, Computing and Data Analysis, Robotics.	
<b>Languages availability</b>	English	
<b>Technical teacher required</b>	NO	YES

Table 4.8: *ExploringComputerScience curriculum analysis.*

ExploringComputerScience is a good resource to develop digital and technology literacy, but it requires technical teachers and it is not interested in changing the educational system, just to develop the programming skills mainly in their students, which is not the proposed mission of the new framework.

- CSFirst

<b>Name</b>	CSFirst	
<b>Institution</b>	Google	
<b>Cost</b>	paid	free
<b>Project based learning</b>	NO	YES
<b>Main target audience (age/gender/knowledge)</b>	grades 4th-8th (ages 9-14)	
<b>Main goal</b>	exploration	introduction professional
<b>Content covered</b>	Storytelling; Programming and Logics; technology applied at Fashion & Desing, at Art, at Sports and at Music; Social Media; Game Desing; Anima-tion.	
<b>Languages availability</b>	English	
<b>Technical teacher re-quired</b>	NO	YES

Table 4.9: *CSFirst curriculum analysis.*

CSFirst is available just in English. This fact is already limiting, but the main dissonance is ht superficial approach of the digital and technology literacy topics. The curriculum does not develop the innovation layer in the proposed content, they are just explored with use and context vision. A important point of this resource is the goal of help the educational system to change as a whole rethink methods and contents.



- Khan Computing Curriculum

<b>Name</b>	Khan Academy - Subject: Computing/ Hour of Code		
<b>Institution</b>	Kan Academy		
<b>Cost</b>	paid	free	
<b>Project based learning</b>	NO	YES	
<b>Main target audience (age/gender/knowledge)</b>	Anyone that want to learn about computing.		
<b>Main goal</b>	exploration	introduction	professional
<b>Content covered</b>	Intro to JS, Intro to HTML/CSS, Intro to SQL, Advanced JS, Advanced HTML/JS, Algorithms, Cryptograph, Information Theory, Databases		
<b>Languages availability</b>	English, Spanish, Portuguese, French, Turkish, Norwegian.		
<b>Technical teacher required</b>	NO	YES	

Table 4.10: *Khan Computing curriculum analysis.*

Khan academy is one of the most popular resources to develop technology knowledge, but it is based on specific tools and languages. The fact is that there is no discussion about use or context of all this technology learning., which is not aligned with the new framework.

#### 4.1.1 General Findings

The main finding was that none of them were complete giving the whole perspective about CS, covering since the context until how to build new stuff with this new knowledge using project based learning focused in youth. Another key finding was that just one of them were written in Portuguese adapted for Brazilian reality, *Maratona de Aplicativos* (App Marathon), but this curriculum has no discussion about networks or security.

Most of the exposed curriculums focus just on the techniques and languages, like Khan Academy, Codecademy and Gifted and Talented Stanford Programm. They are not giving the context of computing basis and impact. For example, they discuss about what is Social Media, but not how can you start a movement with this, or the size of the impact of one single post. They are not focusing either on how to innovate on this. For example, just programming.

On the other hand most of them agreed that project based learning is the way to go and they already realized about the volunteer workforce power. Almost all of them recruit technical volunteer to help teacher applying the content and to spread the message about the need of computer science, mainly for young people, which is not scalable and show the necessity of a technical person to conduct the curriculum. In the same perspective, none of them expose use and impact to start the planned content. For them, there is no digital division of the world, which seems a superficial understanding of technology and digital literacy.

In conclusion, we realize that the mindset is still fragmented and they rely on traditional pedagogical frames for the production of this content even when they are focused on digital natives in the context of our connected society. That is why we have had a low efficacy. It is not enough to produce more content for this area without first rethinking the frames and methodologies we are using. It is vital a deep mindset change. People are complex, life is complex, reasoning can not be linear, opposing right and wrong, beautiful and ugly. We do not learn the complexity. We learn and act in pieces and blocks. We are always losing sight of the whole. Nowadays, technology and life are interwoven [Gad00].

## 4.2 A Curriculum based on Tree Bark Framework

The present work proposes a new conceptual layers knowledge framework for digital and technology literacy, defining 4 levels of literacy: (a) USE: become minimally comfortable with the use of a device or software; (b) CONTEXT: understand the definitions and uses of technologies, like what is Internet and how it works; (c) TRANSITION: build thing and be productive with technologies and digital channels to be a transition for a more abstract use of technology; (d) INNOVATION: create new uses and applications for and with technology.

Each module covers the following content categorized into 4 possible types of content: human-computer interface [HCI], problem solving and programming [PSP], web design [WD] and innovation [INN] . One content can be in more than one category.

- *Mod. 1: USE and CONTEXT [Using and Understanding technology and its power]*

HCI : How computers think!

HCI and INN: Digital life

HCI : Understanding and Evaluating

HCI and PSP: The internet and the WWW

HCI : Social Network

PSP : The power of technology

- *Mod. 2: TRANSITION [Being productive and effective with technology]*

HCI : Productivity

HCI and PSP: Privacy and Security

PSP : Programming

WD : Interface and User Experience

- *Mod. 3: INNOVATION [Creating with technology]*

INN and PSP: Ideation

INN : Validation

WD and PSP: Mobile Interfaces

WD and PSP: Prototyping

PSP : Mobile Programming with AppInventor

– DemoDay - Presentations and Debrief

Looking for the proposed curriculum is important to highlight the main influences of the new framework. The content were organized based on the layers to make the evolution clear for non-technical teacher. This resource also help to catalyze the educational mindset shift for non-linear learning experiences where each individual make it happens based on their context and necessity. Another important aspect is the space for reflexive discussions on some topics like privacy in the proposed curriculum. As a reflection of the new framework the specific tools and languages importance is not nigger than the understanding of the consequences of all this learning.

Project based learning is also another strategy used at the curriculum that is aligned with the new educational tool proposed, because with exponential rate of changes and technology advancements break rapidly any proposed example or process. This is presented at the framework putting the use layer as the center of the framework. It is important to bring personal experience and base the knowledge at projects to create empathy.

On the same hand and with the baggage of Reviewing of the produced literature and the observation of people at work, classrooms and social networks, as well as many years of experience



in planning workshops and courses to teach children, teens and adults about the power of technology and the fundamentals of computing technology, in both industry and academia, indicates that these levels can be generalized for all ages. Accordingly, this conceptual framework may enhance the understanding of how no-technical teacher can provide digital and technology literacy for people, that are the main focus of this work. Each layer have a set of skills required to be accessed. Not an extensive one. Someone who knows about basic technological and digital life principles but who has no hands-on capabilities with even the most common technologies can already have some level of literacy, but cannot be consider as technologically literate as someone who already can take advantages of this tools.

On other hand, to have specific technical skills do not guarantee technological or digital literacy. It is not true that because somebody can fix a computer or find a bug in a software this person have a sense of the risks, and benefits associated with technological developments. This person may be not prepared to make choices about other kind of digital experience that affect their lives. That is why does not make sense to have a linear approach for the literacy levels for technology and digital life. We do need a more global sense of the abstraction and cognitive capabilities of a person.

### 4.3 Class Structure for the Proposed Curriculum

Due the current thesis research question, after the trusteeship of the subjects that are in the curriculum a proposed framework for the classes were developed. The main goal of this framework was to develop as many as possible 21st century skills just by following the classes structure. That's why this framework can be followed by any kind of teacher or subject. Another reason to develop this framework was to maximize the chance of the coach style class without any training. The proposed curriculum will be detailed by class.

The Table 4.11 shows the name of the stage, the description of the stage, the percentage that it represents in the total time and the 21st set of skills develop during the stage:

Detailed Name [NAME]	Description	Time representation (%)	Mainly 21st century skills developed
Remote activity presentation [PRE-SENTATION]	really fast and objective volunteer presentation of the remote activity	15%	Leadership, Social Skills and Initiative
Lecture about the subjects of the class [LECTURE]	coach exposition about the subject of the class. Focused where to find trustful information and general concepts	20%	All Literacy Skills
Practical Activity about the subject [HANDS-ON]	Hands-on activitiy to learn and see all the important concepts.	40%	Creative Thinking, Collaboration, Communication, Leadership and Flexibility
Learning Significance Debrief [DEBRIEF]	Open discussion about the activity and their learnings	15%	Critical Thinking, Media Literacy, Technology Literacy, Communication and Initiative
Wiki personal report [WIKI]	registration of the individual learning and feelings about the specific class online or of-line.	5%	Critical Thinking, Media Literacy and Technology Literacy
Next remote activity discussion [HOMEWORK]	quick explanation about the remote activity to be delivered in the next class	5%	Productivity and Creative Thinking

Table 4.11: Proposed Framework by Stage

The 21st century skills were largely explored to develop this framework. All the students are exposed to all of these skills, although the level of significance and improvement for each one is

different. This curriculum is formatted for 10 classes of 2 hours.

#### 4.4 Class by Class

The proposed curriculum was divided by class to fit in a 20 hours course, slipped in 10 classes of two hours. The main issue to spread the subjects thought the calendar was to make each class self contained to stimulate the students to see their knowledge growing while they were able to deliver a project. So, all the classes should have enough content to start a project and make them really motivated to return to next class. Other concern was not to put a lot of content that none of the students feel they are not capable to learn everything. The division by content is the following Table 4.12:

Class	Content covered
#1	How computers think & Internet & WWW
#2	Digital life + Understanding and Evaluating
#3	Social Network & the power of technology
#4	Productivity, Privacy and Security
#5	Programming
#6	Interface & User Experience
#7	Ideation and Business Plan
#8	Prototyping
#9	Final Adjusts & Pitch
#10	DEMO DAY

Table 4.12: *Class by Class.*

All the classes and experiences were planned to be possible in all following scenarios:

- A. Stable Internet connection, computers (PCs or notebooks) and Android mobile devices (Smartphones or Tablets);
- B. Internet connection but just mobile devices;
- C. No Internet connection.

The following descriptions will remark any change due to these scenarios limitations using the A, B, C identification.

#### 4.4.1 CLASS #1: How computers think & Internet & WWW

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	There is no activity to present, because is the first day, so they will pitch about themselves for 30 seconds. The coach will be the first one to encourage them. Tell something curious about yourself.
LECTURE	Material available at Appendix C pages 90 - 94.
HANDS-ON	Observation Activity 1 and 2 B. For scenario C, let them write and discuss without additional resource. By the end of the activity distribute a content summary about the discussed subjects.
DEBRIEF	Open discussion about the relevance of digital and technology literacy due to the use of the Internet for example without knowing the risks and possibilities.
WIKI	Write about the learnings and the surprises of the class. Focusing on their expectations for the course. For scenario B and C give the offline diary option.
HOMEWORK	Interview people from different generations about how the use Internet and what they know about that. Do they have any idea about how Internet works?

Table 4.13: SIMPLIFIED CLASS 1 APPLIED FRAMEWORK

#### 4.4.2 CLASS #2: Digital life and Understanding and Evaluating

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	3 volunteers for 3 minutes presentation about what they realize about the knowledge about Internet. Open discussion about the main findings. Give them sometime to reflect and share some thought in their Wiki, mainly for that ones that didn't interview anyone
LECTURE	Material available at Appendix C pages 95 - 99..
HANDS-ON	Divide the class in two teams. One of them will surf on the Internet to find information about how the technology and the digital life can bring problems to real life. The other group will find arguments to defend the current digital life. They will spend 10 minutes surfing on the Internet and discussion to build the group argumentation. Then, each group will present their arguments for 5 minutes. After both groups argumentation, each one will hold 3 minutes of defense.
DEBRIEF	Open discussion about the debate. Which team are each one doesn't matter anymore. They will decide who is the winner. Take care of the presented data resources.
WIKI	The main reflection here is how their behavior will change in social networks and how they will take care of their digital life.
HOMEWORK	Build a questionnaire to find some information about your friends social network behavior. For scenario C, the questionnaire can be offline, like an interview, but ask for them to build charts and analyze the collected data.

Table 4.14: SIMPLIFIED CLASS 2 APPLIED FRAMEWORK

#### 4.4.3 CLASS #3: Social Network & the power of technology

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	Let them share their findings about the social networks usage. Focus on data visualization to help find information.
LECTURE	Material available at Appendix C pages 100 - 110.
HANDS-ON	List the pros and cons of Social Networks in post its. Give them 10 minutes to do this. After let them cluster the post its and find actions to protect themselves from any bad practice and how they can use it even better.
DEBRIEF	Discussion about the changes that happened in the last 10 years (Artificial Intelligence, Internet of Things, Wearables, Virtual Reality, 3D printing).
WIKI	Let them reflect and write how they imagine the world in 10 years. Ask them to explain their thoughts. It's not about scientific fiction.
HOMEWORK	Redo the Observation Activity 2 available at B

Table 4.15: SIMPLIFIED CLASS 3 APPLIED FRAMEWORK

#### 4.4.4 CLASS #4: Productivity, Privacy and Security

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	After these 4 classes, did your observation activity 2 change? What kind of changes did you made? Are you going to take care of this details in your future life?
LECTURE and HANDS-ON	Material available at Appendix C pages 111 - 126
DEBRIEF	Will you be more careful with your documents, informations and productivity?
WIKI	Write about one thing that you will change for sure in your life regarding productivity or privacy. Explain with are you going to.
HOMEWORK	Discover more 3 HTML tags. Bring an example of use to explain tomorrow. For scenario C, print a simple code for each one to show people and explains how HTML works. Bring the reflection about the most common difficulties.

Table 4.16: SIMPLIFIED CLASS 4 APPLIED FRAMEWORK

#### 4.4.5 CLASS #5: Programming

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	Teach the chosen tags for the other classmates. For scenario C discuss which tags was the most difficult to explain
LECTURE and HANDS-ON	Material available at Appendix C pages 127 - 135.
DEBRIEF	Look how much possibilities do we have. Do you think all the problems are already solved?
WIKI	Which problems do you want to solve with technology?
HOMEWORK	Show the app for people to get feedback. For scenario C, talk with people to discover what kind of problems they think technology could solve.

Table 4.17: SIMPLIFIED CLASS 5 APPLIED FRAMEWORK

#### 4.4.6 CLASS #6: Interface & User Experience

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	Discuss about the insights they got from the interviews about the app and the power of technology.
LECTURE and HANDS-ON	Material available at Appendix C pages 136 - 142.
DEBRIEF	Look at POP, Snapchat, Whatsapp and this famous apps. How they look like? What about their usability?
WIKI	Choose an app that you know a lot to reflect about their UX and Usability and understand what you like and what could be better.
HOMEWORK	What are the 3 top problems for people in your community?

**Table 4.18: SIMPLIFIED CLASS 6 APPLIED FRAMEWORK**

#### 4.4.7 CLASS #7: Ideation and Business Plan

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	Top 3 problems for their communities and based on this group the participants (3 to 5 participants groups)
LECTURE and HANDS-ON	Material available at Appendix C pages 143 - 151
DEBRIEF	Open discussion about what part is the most difficult to build an app. Focus on the idea. The programming is the easy part.
WIKI	Write in at most three lines about you app. You should answer the basic question: What problem am I solving? How am I solving it? What is the size of this problem?
HOMEWORK	Talk with people about work app! Listen! Don't tell them how good is your app. Let them help you to make it better.

**Table 4.19: SIMPLIFIED CLASS 7 APPLIED FRAMEWORK**

#### 4.4.8 CLASS #8: Prototyping

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	Did you talk with people about your app? Do you think people are open to give feedback? Or they have problems to criticize to other ones ideas?
LECTURE AND HANDS-ON	Material available at Appendix C pages 152 - 157
DEBRIEF	What are my main difficulties with programming? And with AppInventor specifically?
WIKI	Write about the process of learning how to code and "talk" with computers.
HOMEWORK	Search about the topics you are having problems. If you find a way to solve it, bring resources to share with your classmates.

**Table 4.20: SIMPLIFIED CLASS 8 APPLIED FRAMEWORK**

#### 4.4.9 CLASS #9: Final Adjusts & Pitch

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	Did you find information on the web? Did you reflect about your app? Any modification? Let's pitch about the current version, what does not mean is the final one.
LECTURE and HANDS-ON	Material available at Appendix C pages 158 - 169.
DEBRIEF	Is it possible right? And you had just a very few hours to program/prototype.
WIKI	Reflect and write about the experience.
HOMEWORK	Work on the prototype! Find a way to work collaboratively and remote.

Table 4.21: SIMPLIFIED CLASS 9 APPLIED FRAMEWORK

#### 4.4.10 CLASS #10: DEMO DAY

<i>Stage</i>	<i>Description of application</i>
PRESENTATION	There is no presentation because it will be done during the hands-on session.
LECTURE	How to publish an app material available at Appendix C pages 170 - 183
HANDS-ON	Presentation of their apps. Guests are welcome.
DEBRIEF	Open discussion, including the guests, about how their community would be if their technology exists. Let them talk about the power of technology in their lives
WIKI	Reflect and write about the course. Is your mindset different? Do you feel you can work with technology? Will you change the way you use the Internet?
HOMEWORK	Motivational message for them to keep doing amazing things with technology. Let's change the world.

Table 4.22: SIMPLIFIED CLASS 10 APPLIED FRAMEWORK

#### 4.4.11 Knowledge Tree Representation for present curriculum

As shown at previous chapter, the tree format was the better one to represent the knowledge development. The key point to build it for specific context is to choose the most important topics focusing in the relevance of it for the context of the participants. At this present example of curriculum the key subjects are: WWW & Internet and Applications. They represent the bigger percentage of technology use in the current times. Other important topics like privacy and devices were distributed and contextualized around these two.

The distribution of the topics were done to represent the context of the current Brazilian society, the scenario of the courses. Which means it does not make sense to use high technology and discuss cutting edge innovation in because Brazil is a emergent country with commodities exportation as the base of economy.

The topics suggested to cover a complete digital and technology literacy overview in this 20 hours curriculum is represented in the Figure 4.2.





Figure 4.2: Technical Topics

## 4.5 Metrics and Proposed Assessment

The whole evaluation process consists of an initial questionnaire, two observation activities and auxiliary questionnaires and a final project. During the course, one strategy used is to give the same activities again after an experience to measure the impact. A questionnaire was given at the final session to see how they saw their own learnings. We gave the same activities and survey to all groups regardless of age, gender or knowledge.

The initial questionnaire consisted of 2 part. The first section aims to understand the profile of the population, like gender, age and information access. This first part help us to understand the conditions of learning and maturity that our test population have. The second part including school background and their knowledge of programming. Another important aspect of this portion was to understand the motivations to join the course and how they imagine it was to work with technology. The complete questionnaire is attached on Appendix A.

The observation activities had three goals: get the level of digital and technology literacy they already had, measure their leadership and observe their ability to work in groups (collaboration capabilities). The first one was designed focusing to understand how they manage to find information using technology, them get an idea of their digital literacy levels. If they just copy and paste or if they put some effort to create an answer. The mission was individual and it was given 10 minutes for them. It is the following:

Does anyone know what is digital literacy? No?! So let's find out.  
Using your computer and not talk to anyone I want you to answer  
the following questions:

Questions:

- What is literacy?
- What is digital literacy?
- How can we improve the digital literacy level for high school students from Brazil?

The second activity was designed to measure their leadership and ability to work in groups, always trying to understand their digital and technology literacy level. The activity was the following and they had fifteen minutes to complete without talking in the common ways, but they had a big restriction: they had to use the technology to communicate with their pairs.

You have 5 minutes to form groups and find a way to communicate with your partner. You can use the tools we have in the room, but you can't lift chair and you can not speak during those 5 minutes. You'll have to find a way!

The mission:

Teacher Camila wants to take everyone to walk around USP campus, but she has a problem: how to get out with 30 underage students around campus that is so big? What are the main points that they want to know? How to discover it? And she needs to control all the students and keep them safe. Develop an activity that solve the Camila's problems.

This proposal should be collaborative, huh !? Everyone should participate.

When you finished, one of the students will send the file with the following name: Activity 2 - [groupname]. The file must contain the name of all members of the group.

After building this whole idea about the students, we run the course and proposed again the same observation activities to measure the improvements comparing them and the following 5 other tools to collect data:

- One big questionnaire about digital life and social medias;
- One big survey about productivity;
- One essay about how they imagine the future;
- Wiki during the whole course;
- One questionnaire about the course evolution;

Another strong consistent assessment tool is the final projects that consisted in a social mobile app to solve a community problem. They start listing the problems on an ideation dynamic, they learn more about brainstorm to think about possible solutions and they prototype and develop the application using AppInventor, an educational platform developed by MIT.

Another really important tool is the Wiki they produce along the course to expose the difficulties and comment about the whole experience of learning in a different way. This Wiki has the same role of a journal to keep record of their improvements and feelings.



## Chapter 5

# Proof of Concept Results and Field Research Findings

This chapter will present the findings of participant observations as well as the interviews insights. As the curriculum is a proof of concept, primary data was collected to validate if the framework goal was achieved. Does it catalyze the digital and technology literacy development facilitated by technical and non-technical people? Does it provide a mindset shift for educational system components? Does it provide a more appropriate digital and technology literacy acquisition? All these findings and conclusions will be discussed.

### 5.1 Field research adopted methodology

This chapter will present the path taken in the field to obtain primary data that would help understanding the problem under study, representing the phase 2 and 3 of methodological procedure and the data analysis, as the Figure 5.1 clarify:

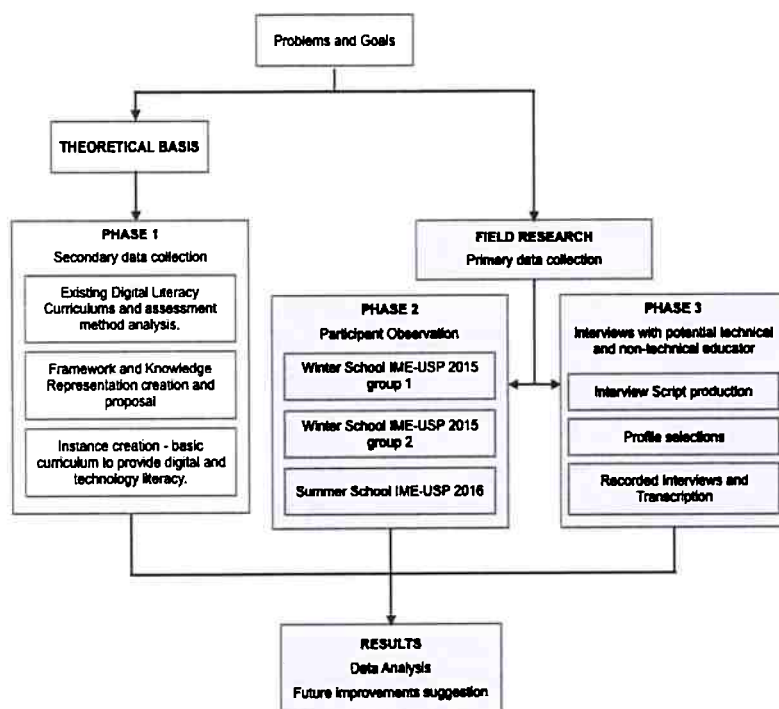


Figure 5.1: Chapter 5 relevance in the research structure

### 5.1.1 Participant Observation

In participant observation the data is collected through questionnaires and observation in which the researcher participates in the whole process getting results with methodological rigor and analyzes skeptically [Gil10]. It was developed in the 20s by the Chicago School and it received rave reviews at the time, being rescued in the 90s because of its importance in social applied researches in which the observation of the theory in practice is fundamental. Based on the principles of phenomenology, participant observation seeks to understand the common sense to test theories, proposals or pre-established models [QVVO07].

As the definitions above, [Min08] propose a similar coherent definition where participant observation is explained as a process in which the observer is present in the social situation in order to conduct scientific research, collecting data and making part of the context for observation. Allows more proximity to the researcher with researched, enabling even the occurrence of changes in reality.

Participant observation can be structured in a few steps: (1) integration of the researcher in the social environment; (2) data collection and record, keeping in the field journal; and (3) systematization, organization and analysis of data obtained. There is no time limit for participants of this kind of work and this number will be determined "by the very aim of the study and the data saturation" [QVVO07].

The proposed framework and vision validation is directly related with the produced curriculum success. To get this metric it is necessary to assess the significance of learning, which was made following the work of Tomita [Tom09]: (1) removal of the student profile; (2) survey on prior knowledge through an individual questionnaire; (3) passing the basic concept that will be supported for the cognitive process; (4) application of differentiated activities; and (5) comparison of results. To investigate the significant learning, phase 2 of the field research was structured as follows:

- Insert researcher in the social environment;
- Student profile and prior knowledge survey ( A );
- Application of the proposed curriculum presented in Chapter 4;
- Registration of the information in the field diary (the used format was the production of a Wiki) and answer of the final questionnaire.
- Systematization and analysis of the data by comparing the results achieved, using content analysis.

The final questionnaire questions were:

- Do I learn where to find information?
- Do I feel able to learn and produce technology?
- Do I find this course relevant?
- What can be improved?

For the content analysis, the concept of Bardin [CM06] will be used, in which the process takes place in three stages: (1) Preliminary analysis was carried out to organize the material collected by reading, selection and classification of the material; (2) Exploration of the material with the analytical description by encoding the material categories (Table 5.1); and (3) treatment of results, inference and interpretation through reflective analysis.

The understanding of the significant learning occurred in assessing the student and his activities before and after the experience with the curriculum. It was applied in three 3 different groups. First of them was during the 2015 Winter School at IME-USP <sup>1</sup> and two more interaction during the

<sup>1</sup> <http://www.ime.usp.br/inverno> - IME-USP held the first edition of the Winter School in 2015 with the theme of Digital Inclusion [July 20th until July 31st].

MATERIAL	CATEGORY	DESCRIPTION	INDICATORS
<b>observation activities</b>	completion	student completed the activity in accordance to what was requested	Yes/No
	subject discussion	student searched for references and relevant aspects of the lived experience were registered.	Yes/No
	improvement	from one activity to another, the student showed more fluency with the subject.	Satisfactory presence/ Presence/Absence
	significance	student shows new ways or other possibilities for a different context	Satisfactory presence/ Presence/Absence
	creativity	student brought new elements beyond the requested	Satisfactory presence/ Presence/Absence
<b>questionnaires</b>	completion	student completed the activity in accordance to what was requested	Yes/No
	involvement	student was willing to seek more information and agrees to do it by judging what is important to their future.	Satisfactory presence/ Presence/Absence
<b>wiki/diary</b>	subject discussion	student searched for references and relevant aspects of the lived experience were registered. The student did more than requested.	Yes/No
	improvement	from one reflection to another, the student showed a better literacy level.	Satisfactory presence/ Presence/Absence
	significance	student shows new ways or other possibilities for a different context	Satisfactory presence/ Presence/Absence
	creativity	student brought new elements beyond the requested, mainly on visual aspect	Satisfactory presence/ Presence/Absence

Table 5.1: *Considered categories for content analysis.*

2016 Summer School at IME-USP <sup>2</sup>. All experiences in all iterations were conducted by the current researcher.

To maintain the confidentiality guaranteed at the time of the questionnaires distribution we didn't present students names in order to protect the privacy of students participating. Therefore, codes were assigned to the moment of the course - W for Winter course and S for Summer course. The code distributed was numbered with the letter representing the moment of the course + class number + number corresponding to the student. The general description of the classes can be seen in Table 5.2.

Class code in the thesis	Total student enrollment	Total participating students
W1	45	41
S1	27	23
S2	22	17

Table 5.2: *Overview of investigated classes.*

<sup>2</sup> <http://www.ime.usp.br/verao/index.php/> - IME-USP held the XLV Summer School in 2016. The Summer School offers Cultural Diffusion courses and Postgraduate courses for all interested.

### 5.1.2 Interviews

To validate the data obtained in phase 2 and to obtain additional primary data in phase 3, interviews were planned with educators who are characterized as potential digital and technology literacy coaches because of their recent work or the context and regional placement. Some of them had no knowledge in the area of Digital and Technology literacy, which was planned to have representatives of technical and non-technical components of education system.

It will be developed two research instruments: a qualifier questionnaire, in order to verify the adequacy of the person to the purpose of the research and the interview guide. Aligned with the objectives of the current project, the script (Appendix D) was organized so that the researcher will: (1) assess how comfortable non-technical professionals would be using the proposed curriculum; (2) discuss the results achieved with the proposal empirically tested in phase 2 and; (3) analyze the feasibility in different environments. Following the guidelines of Flick [Fli09], the steps for data collection will be:

- Distribute qualifier questionnaire in order to verify that it meets the needs of the study;
- Personal interviews;
- Interviews Transcriptions;
- Validation of findings with the interviewee, if necessary;

Data will be analyzed using discourse analysis, described by Flick [Fli09] as a possibility for qualitative research, especially when the collection is carried out through semi-structured interviews. The steps suggested by the author for this type of analysis are: (1) careful reading of the transcripts, (2) encoding the material, and (3) do the discourse analysis.

## 5.2 Participant Observation Findings

To deliver a Participant Observation the first step is the selection of the group to be submitted to this experiment. For this reason the first section of this chapter is the explanation of the selection method for the application of the produced instance and the final profile configuration that we got. Following the findings of this experiments will be detailed and compared with secondary data collected to theoretical background to validate the hypothesis.

### 5.2.1 Selection Method and Final Profile Portrait

The understanding of the results just will be complete if the selected group is known, that is why the selection criteria and bureaucracies to compose the testing groups are following exposed. The framework instance was created for a 20 hours course distributed over 10 days. For two weeks the participants had meetings from 9AM to 11AM in one of the CEC (Computer education center) laboratories in the Institute of Mathematics and Statistics (IME) of the University of Sao Paulo. Few hours of dedication outside the laboratory were required, as these activities were informal exploratory activities, conversations with other people and some observations of the reality

Three courses were offered and they were held as part of the 2015 IME Winter School (during July/15) and as part of the 2016 IME Summer School (Jan / 2016). With these scenarios three different groups were composed, two of them during the Winter School and another one for Summer School. The divulgation were by offerings the course in the Institute website and printed banners around the university. Which means participation was spontaneous and participant-centered. By analysing a description of the activity they get interested or not.

Following, it is the translated description adopted to promote the tree editions of the course (the original version in Portuguese is at Appendix F):

*Title:* Digital Literacy - understand, produce and create with technology.

*Required Skills:* None

*Course Syllabus:*

- Module 1: Context / Understanding technology
  1. Human-Computer Interaction: Basic Computing
  2. Human-Computer Interaction: Digital Life
  3. Programming and Problem solving: Understanding and Evaluating
  4. Human-Computer Interaction: The Internet and the WWW
  5. Human-Computer Interaction: Social Networking
  6. Programming and Problem solving: The power of technology
- Module 2: Transition / Producing with Technology
  1. Human-Computer Interaction: Productivity
  2. Human-Computer Interaction: Privacy and Security
  3. Programming and Problem solving: Programming
  4. Web Design: Interface and User Experience
- Module 3: Innovation / Creating technology
  1. Business and Problem solving: Ideation
  2. Business and Problem solving: Business Plan
  3. Web Design: Mobile Interfaces
  4. Web Design and Programming: Prototyping
  5. Programming: Mobile Programming (AppInventor)
  6. DemoDay

*Methodology:* The activities developed will be composed by 30% of theory and 70% of practical activities with pre and post class activities. The curriculum developed use the methodology of project-based learning and challenge-based learning, where participants should create to learn and consequently, learn to solve problems.

*Goal:* With an innovative language aligned with the thinking of the interactive generation will now be able to gain digital literacy - effective use of technology, such as computers, networks and smartphones. For this, they need to understand the potential of technology and the digital world, so that they can become active players in the construction of their own world. More than teaching how to program, let's teach them how to live and get the most out of the digital and technological world. Empowering them to transform their own communities with technology.

*Total course workload:* 20hs.

In order to the registration to be performed a symbolic fee was charged during the subscription for maintaining the space and certificates printing was imposed by the Institute, but this fee was also important to serve as the first validation of participant real interest. The rate was twenty Brazilian reais. The possibility of fee acquittance was offered by the Institute in case of insufficient funds proof.

Given these selection method, the group that was formed for each of the 3 iterations of the course was composed of engaged people, who were willing to undertake the course without any knowledge or age limitation being imposed. In this hand, the groups formed were composed of participants from completely different backgrounds and a disparity of related knowledge quite different. Some

were digital natives and other digital immigrants. Some of them were already teaching about the subject and others had not been exposed to a properly computer, but all had already used digital devices and somehow had a sense of need for more knowledge of technology and digital life, which already qualified them for this present research.

The detailed profiles are shown in the following table (Tables 5.3, 5.4)

Group	Total	Gender		Age			Programming experience	
		M	F	12 - 18	19 - 30	+31	Yes	No
W1	41	17	24	19	13	9	8	33
W2	23	12	11	12	7	4	3	20
S1	17	7	10	8	6	3	3	14

**Table 5.3:** Profile of participating students, by class

Group	Total	Wifi at home		Smartphone		Computer/Laptop	
		Yes	No	Yes	No	Yes	No
W1	41	38	3	40	1	5	36
W2	23	21	2	23	0	6	17
S2	17	16	1	17	0	4	13

**Table 5.4:** Home infra structure of participating students, by class

### 5.2.2 Relevant groups observed characteristics

At this section, important aspects of the final composed group and the development of them during the proof of concept curriculum application will be discussed. This discussion is important because it provides ways to understand the results and learn the consequences of this kind of educational experience.

#### Higher Girls Interest

Girls and women had tremendous gains in education and in labor market in the past 30 years. However, all this progress has been invisible for certain field that remain overwhelmingly male. This is the case of most all STEM (Science, Technology, Engineering and Mathematics) fields. According to the National Science Foundation, women earn 57% of bachelor's degrees in 2010, but only 12% of computer science degrees were given to them. In the opposite side of the statistics this course had a female majority, 55% of the participants were women (58% in group A, 47% in group B, 59% in group C). No specific advertisement or divulgation was done. The main difference was the name and the description of the course that reflect the positioning of technology as a tool and not as a reason to go.

The decision for the name was based on simplicity. The main goal was to pass the idea of literacy, the second idea was to choose a less scary complement term among technology and digital. The final decision was Digital Literacy which makes more friendly for any person without knowledge. The inspiration to take care of the offering name was inspired by Berkeley Computer Science Introductory courses.

In the 2014 spring, Berkeley saw an introductory computer science course, for the first time in history with female majority (106 women versus 104 men). This number was not a reflect of a real world generalized change. Berkeley is the exception. This scenario of disparity is not recent as well. The decreasing in number of female technology students is happening since 1991, when the female participation was 29.6% (NSF).

The responsible for the amazing achievement at Berkley was Professor Dan Garcia, who was also the teacher of the Computer Science introductory courses. His argumentation for the changes was the "attribution for gender flip to a drastic transformation in the curriculum, including team-based



project learning, opened-sourced materials, and opportunities to become teaching assistants". For him, the curriculum and structure that have been used for technology does not capture the "Beauty and Joy" of computing and innovation.

A lot of universities and courses that used the same strategy of Dan Garcia have seen an increase in the number of female computer science, including this presented curriculum. They have re-imagined their digital and technology literacy classes, especially at the computer science introductory level.

Women are still largely not attracted to careers in computer science in the knowledge society, due to a lack of female role models in the field, as well as because of misconceptions about the field. STEM fields are very stereotyped. Two points that were also addressed in the proposed course. A woman was the facilitator which reinforces a woman as a role model for the students. In parallel, the main strategy to oppose the misconceptions was to encourage all people that any previous knowledge was required avoiding words like, games and problem solving, because a study by the Association for Computing Machinery (2008) found that while boys equated words like "interesting," "video games," and "solving problems" with computing, girls associated words like "typing," "math," and "boredom."

Concluding, the three simple principles adopted have an amazing result by eliminating gender bias. They were:

- simplicity on the offering name without any specific field related term;
- to find a way to give a female role model for the girls;
- eliminate misconceptions about the field, mainly avoiding some common sense words that reinforce stereotypes.

Another important point to be discussed is the reasons to put a lot of effort on bringing girls to the STEM field. There are two main reasons:

- pay equity
- increasing innovation

Attracting and retaining more women in the STEM workforce should be a global effort and mission, not just because all humans deserve the same opportunities, but because it will maximize innovation, creativity, and competitiveness around the world [CB91]. Main goal of scientists and engineers is to solve some of the most complex challenges of this era, like find cancer cure, understand the universe, tackle global warming. During this journey they design many of the things we use daily. They solve the problems they think are the priority for the humans and using the resources they know. When women are not involved in this process is not complete and equal. Needs and desires of women may be overlooked. There are some typical cases of failure because of gender disparity in STEM field like, as Ashton Applewhite, describes:

"some early voice-recognition systems were calibrated to typical male voices. As a result, women's voices were literally unheard. Similar cases are found in many other industries. For instance, a predominantly male group of engineers tailored the first generation of automotive airbags to adult male bodies, resulting in avoidable deaths for women and children [App02]".

With a more diverse workforce in the market and in the academia, products, services, and solutions will be better designed and they will represent all users. Following this equality some problems will start being solved.

Another reason to put a lot of effort on diversity is pay equity. The opportunity to find and pursue a career in STEM is also a way to reach gender pay equity, because occupational segregation is one of the heavier factors in the wage gender gap. Although, women still earn less than men earn in



science, technology, engineering and math fields, as they do in the overall workforce on average. Women in science and engineering tend to earn more than women earn in other sectors [Ame00]. As a whole, workers in these fields tend to be better paid and enjoy better stability than do other fields workers. Besides, the favorable current scenario, workforce projections for 2018 by the U.S. Department of Labor "show that nine of the 10 fastest-growing occupations that require at least a bachelor's degree will require significant scientific or mathematical training" [LW09], for example. This projection means STEM-related skill will be even more important for pay equity. Besides this, many science, technology and engineering occupations are predicted to grow faster than the average rate, and some of the largest increases will be in computer-related occupations in which women currently hold just around one-quarter or fewer positions.

To offer them the opportunity to pay equity and the achieve high levels of innovation we should put a lot of effort to make them interested in an STEM occupation. Digital and Technology literacy for girls is crucial for the development of the world. The girls need to see the possibility to pursue STEM career. The lack of interest is influenced by many factors, including a belief that you can personally not succeed in that occupation. Girls beliefs their mathematical ability are naturally lower than do boys, even if compared with boys with equivalent past mathematical achievement. Meanwhile, girls hold themselves to a higher standard in math and in all subjects where boys are considered to excel. By reason of this, girls are less likely to believe they have capabilities to succeed in a science, technology, engineering or math field, whatever make them not to express interest in a STEM career [Par83, RC04, EW02]. Actually, the most flagrant failure of educational practice is this intolerable disparity of educational possibilities afforded to men and women. The differences are particularly worrisome in emergent economies, but nowhere in the world do women receive treatment as favorable as that given to men, whether in education or in other areas [DO05].

Biases do change as soon as possible, because it is holding back a whole generation that aims for innovation. Currently with a lot of work, "the fields viewed as stereotypically male have narrowed considerably compared with even 30 years ago". However, social and health sciences are still considered feminine fields, while hard sciences and engineering fields seems more appropriated for men [FJ99]. But technology is around everything, we need to take care to change the stereotype and work to develop equally the 21st century skills for both genders, like this proposed course is doing.

### Mobile era

Looking to the profile data, a perception is clear: almost none of the attendees have computers. Most of them just have a smartphone and in some cases a tablet as well. This mobile alternative is already a reality in the whole world and the participants profile are just a portrait of this. The majority of the access to the Internet is now done using mobile devices, because of the price of the hardware and the development of the 3G connection. Thee whole industry is changing because of this mobile revolution. The education and the Digital and Technology curriculum and frameworks should change as well. The proposed framework and instance is totally flexibility and adapted to develop along this mobile wave and gain scale with this new devices.

Smartphones are near to be the Internet access preferred device. Actually, 70% of adults worldwide now use a smartphone. This is the most used device for accessing social media and the preferred device for the majority of online activities. Mobile phones also have become the media device chosen by people, overtaking the television set. For the digital natives, this choice is even easier and bigger [Chm15].

The more impressive effect of this mobile revolution is happening in emergent nations. Smartphones access and easier distribution dramatic effect people in developing countries, because electricity supplies may be expensive or discontinuous in these economies, and the cost of a desktop is prohibitive. With mobile devices, everyone had the acquisition of a connected device facilitated, because this devices only needs charging once a day, which means less electricity consumption and cost than a PC. This fact, combined with affordable prices around \$50 for some smartphones, people who have never before been able to afford a computing device now own one. That is why for those in





Observation Activity	Category	Criteria	W1	S1	S2	TOTAL	AVG
#1	Completion	Yes	33	19	15	67	84%
		No	8	4	2	14	16%
	Subject Discussion	Yes	19	10	9	38	48%
		No	22	13	8	43	52%
	Improvement	Satisfactory	24	7	12	43	53%
		Presence	15	10	4	29	35%
		Absence	2	6	1	9	12%
	Significance	Satisfactory	22	12	14	48	63%
		Presence	17	8	1	26	27%
		Absence	2	3	2	7	10%
	Creativity	Satisfactory	8	2	0	10	10%
		Presence	22	12	11	45	58%
Absence		10	8	6	24	32%	
#2	Completion	Yes	41	21	15	77	93%
		No	0	2	2	4	7%
	Subject Discussion	Yes	39	19	17	75	93%
		No	2	4	0	6	7%
	Improvement	Satisfactory	32	19	8	59	70%
		Presence	7	1	5	13	17%
		Absence	2	2	4	8	12%
	Significance	Satisfactory	36	13	12	61	72%
		Presence	2	8	5	15	23%
		Absence	3	2	0	5	5%
	Creativity	Satisfactory	11	9	4	24	30%
		Presence	17	8	8	33	41%
Absence		13	6	5	24	29%	

Table 5.5: Final Observation Activities Result

FINAL QUESTIONNAIRE						
Category	Criteria	W1	S1	S2	TOTAL	AVG
Completion	Yes	36	19	15	70	86%
	No	5	4	2	11	14%
Involvement	Satisfactory	29	14	13	56	69%
	Presence	5	4	2	11	14%
	Absence	7	5	2	14	17%

Table 5.6: Final Questionnaire Result

Looking for the Final Observation Activities Analysis (Table 5.5), the numbers for the first observation activity reflect a common issue for educational system: copy and paste. This behavior is particularly common among digital natives, because they had less experience collecting information and searching using offline methods. The numbers shows that 84% of participants complete the task, but less than half were able to discuss properly the subject, which means that the majority of the students complete the activity without producing any authorial content or mentioning the source of information during the answer writing. They just found a possible answer and pasted without any judgment about the quality or completeness considering enough for the task.



		WIKI				
Category	Criteria	W1	S1	S2	TOTAL	AVG
Subject Discussion	Yes	32	17	12	61	74%
	No	9	6	5	20	26%
Improvement	Satisfactory Presence	35	17	12	64	77%
	Presence	4	3	3	10	13%
	Absence	2	3	2	7	10%
Significance	Satisfactory Presence	23	13	14	50	65%
	Presence	15	6	2	23	25%
	Absence	3	4	1	8	10%
Creativity	Satisfactory Presence	11	9	8	28	38%
	Presence	27	9	6	42	47%
	Absence	3	5	3	11	16%

Table 5.7: Field Diary (Wiki) Result

This scenario is also impacted by some of other categories. If there is no authorial production the significance of the activity tend to be lower. In consequence, learning may not happen properly. The creativity perception is also sensible to it, because there was no necessity to exercise this skill, that is one of the 21st century most required ability. Even worst than not use creativity, they just copy related part of the found content without not even evaluate the quality of the source which put the quality of the learning in risk.

The final category to be observed is the improvement one where 88% of the students have shown presence in some level in the improvement category in the first activity. This number means that the majority of the course's participants, after a brief discussion they were able to present significant improvement. They were just not aware or maybe had no knowledge about concrete consequences, like plagiarism accusation, and they had not even notion about the damage caused for their learning process.

The second Observation Activity was open ended collaborative proposal construction. This kind of activity makes it impossible to copy ready-made answers available on the Internet. Resources found online may help just by serving as inspiration, but for the completeness of the task, authorial content needs to be built. As expected, the percentage of individuals who presented significant and creative production was considerably higher than that of the first activity. In the second activity the unless satisfactory improvements was perceived in 87% of the individuals.

With this parallel, comparing the two different results among the activities is possible to observe the characteristics of each one. With the exponential rate of changes and advancements and the intensive use of technology in all spectrum of life, activities about definitions and categorizations are not significant mainly for digital natives students. Prefer the collaborative open ended activities had shown better learning results. If the definitions are required, the produced framework should be applied to set the right mindset. The attempt should be to move forward and position the activity on a more external layer. Merely punctual use of digital devices and resources mean that technology does not help in the process as it should. When we move towards understanding of the context or even when there is a tentative to move towards transition and concrete construction, the impact is higher, as demonstrated in the results of the present research. These numbers and conclusions mean that the mission of the curriculum were successfully accomplished because a significant part of the students presented improvements.

As a result of field diary (wiki) content analysis, it is possible to find mention of self improvement recognition in 77% of the written diaries which is relevant because of the high level of significance and subject discussion found on them (presence above 80% in both of them). The same involvement relevance was found in the final questionnaire completion that was evenly high. The majority of

the mentions were done at the final questionnaire about the course. As part of the assessment, the strategy of self evaluation and peer overall evolution perception was used. Looking with this perspective for the final questionnaire question and the field diary, it is possible to see that all of the students had the improvements perception. Individuals finished the course feeling themselves more able to find information and to produce technology. All of them discover that they need to study more because there is a lot of knowledge about technology that can help them in their own lives. For the improvements, almost all of them feel that in person training is better, that why the course should last more hours. Which is an expected behaviour because of your culture and our educational system. This reinforces the argumentation that they acquired digital and technological literacy. Some of the content found in the Observation Activities, Field Diary (Wiki) and Final Questionnaire are highlighted and translated following:

- Comment 1:

PT "Posso dizer que depois deste curso, me sinto capaz de produzir tecnologia, me sinto muito mais apto a buscar informações confiáveis e que tenham embasamento científico, aprendi bastante sobre programação, criação de aplicativos."

EN I can say that after this course, I feel able to produce technology. I feel much more able to seek reliable information that have a scientific background in the internet. I learned a lot about programming and mobile applications development.

- Comment 2:

PT "Minha visão sobre tecnologia mudou totalmente, principalmente na questão que se qualquer alguém quiser aprender, ele pode. Vou com certeza estudar e possivelmente me especializar no assunto."

EN My point of view about technology has changed totally, especially on the issue that if anyone wants to learn, he can. I'm definitely going to study and possibly specialize in the subject.

- Comment 3:

PT "(...) a linguagem utilizada no curso encoraja as pessoas no aprendizado de tecnologia, desmistificando e descomplicando várias etapas que a princípio podem afastar aqueles que desejam aprender e se aprofundar em tecnologia. Em outras palavras, a simplicidade do curso é o ponto chave, que leva as pessoas a progredirem num espaço muito curto de tempo e terem conhecimento disso."

EN (...) the language used in the course encourages people to learn about technology. Demystifying and making several steps simpler to not drive away those who wish to learn and deepen in technology. In other words, the simplicity of the course is the key point that makes people progress in a very short space of time and to be aware of it.

- Comment 4:

PT "(...) durante o período de curso a professora passou links de sites, vídeos e outros que ajudam muito. E agora que entendo mais sobre o assunto (tecnologia) é mais fácil achar informações."

EN (...) during the course, the teacher shared some links of videos and other sites that helped a lot. And now that I understand more about it (technology), it's easier to find information.

With this asserts it is possible to conclude that we had a successful curriculum that achieves the main goal: give the basis for digital and technology literacy in a small amount of time changing the mindset of the participants given to more than computational thinking, but computational

participation. Another significant part of the students mentioned about keep in the journey of learning, which means the impact of the curriculum will rest for the individuals lifelong. The course is short and just provide the basis to make them engaged in the mission of learning and thinking critically about technology and digital world.

Another important contribution of the framework validation was the mobile applications development as final projects, they represent game changer ideas for the society that without digital and technology literacy development for everybody may had never become reality. The final project shows the impact of this kind of literacy development. Twenty two mobile applications were developed to solve problems that the participants found in their own communities. Each one of the individuals discover his own power to start solving problems by himself. The designed applications are enumerated below. They show the twenty two issues that had been explored by them. The description was done by the group at the field diary and fully copied in Portuguese and translated to English after. The groups were made by 3 to 5 participants.

- PT-W1.1 Voluntário Game: "O aplicativo é sobre um jogo onde quanto mais você faz trabalho voluntário, mais pontos você ganha, passa de nível e ganha prêmios"
- EN-W1.1 Volunteer Game: "The application is about a game to give points for volunteer work. With more points you earn, more high levels you achieve and you take rewards"
- PT-W1.2 Lições: "O app Lições é um sistema de recompensa para alunos que fazem as atividades escolares. Recompensas como visitas em museus, teatros, cinemas e até parques diversão. Com a parceria publica privada sera possivel oferecer esses bônus aos alunos. Ele vai funcionar como um sistema de pontuação que atribui ao estudantes pontos a cada atividade concluida e avaliada pelo professor. Dessa forma o aluno ganha não só pelo bônus desejado, mas pelo crescimento de seu desempenho enquanto aluno e o professor no resultado da sala como um todo"
- EN-W1.2 Lessons: "The Lessons app is a reward system for students who do homework. Rewards is like visits to museums, theaters, movie theaters and parks. It will work as a scoring system that assigns students points to each activity completed and evaluated by the teacher, thereby gaining not only the desired bonus, but the growth of their performance as a student and the teacher in the outcome of the course. Room as a whole "
- PT-W1.3 Biblioteca Fácil: "um app para pesquisa, reserva e renovação de livros, para o sistema Dedalus da Usp como piloto"
- EN-W1.3 Easy Library: "an app for searching, booking and renewing books. Usp's Dedalus system will be used for the pilot"
- PT-W1.4 Gastos: "aplicativo era conscientizar as pessoas sobre os custos, o quanto gastamos, e o quanto poderíamos economizar, mas o que esquecemos ao desenvolvê-lo foi de conscientizar sobre a origem do problema, as causas, o "por quê"
- EN-W1.4 Expenses: "The application was to make people aware of the costs. How much we spend and how much we could save, but what we forgot when developing it was to raise awareness about the origin of the problem, the causes, the "why"



- PT-W1.5 Consumo Consciente: "o app pensado pelo meu grupo visou informar a família brasileira qual é o aparelho responsável por grandes gastos de energia mais recorrente nas residências e como ele(s) afetam na conta de luz, tanto em valores brutos quanto em porcentagem da conta final"
- EN-W1.5 Conscious Consumption: "the app thought by my group aimed to inform the Brazilian families which is the device responsible for large recurrent energy expenditures in the residences and how they affect the electricity bill, both absolute values and percentage of the account"
- PT-W1.6 Musicalizando: "uma rede social para interessados em aprender instrumentos musicais, onde os usuários podem postar vídeos, comentar, criar grupos, fazer pedidos de vídeos, etc"
- EN-W1.6 Musicalizing: "a social network for those interested in learning musical instruments, where users can post videos, comment, create groups, ask for specific videos, etc."
- PT-W1.7 Adote um Talento: "um App que faça uma intermediação entre empresas de TI e escolas de regiões mais desfavorecidas do país. Sabemos que o mercado de TI ainda tem muita demanda, por isso acreditamos que as empresas apoiem essa ideia. Ao mesmo tempo, alunos interessados na área podem ter a oportunidade de ter uma formação e uma experiência profissional, capacitando-o também para ser um agente ativo na sua comunidade. As escolas fariam essa ponte, cadastrando os alunos e divulgando a ideia também"
- EN-W1.7 Adopt a Talent: "an App that connects IT companies and schools in the most disadvantaged regions of the country. We know that the IT market is still in high demand, so we believe that companies support training. At the same time, students interested in the area can have the opportunity to have a professional background and experience, enabling them to be an active agent in their community. Schools would bridge the gap, register the students and spread the idea as well"
- PT-W1.8 OrganizaVirtual: "trata-se de uma agenda virtual, que teria ferramentas para facilitar o estudo. O usuário pode montar seu próprio esquema de aulas e horas de estudo numa agenda, com a ajuda de seu professor dizendo o período ideal de estudo por semana de sua matéria. O diferencial é tudo estar centralizado nesse app: horas de estudo recomendadas, tempo de dedicação para se aperfeiçoar numa atividade (como por exemplo: tocar piano, desenhar, dançar ballet, etc). O app ajuda a atingir objetivos e a pensar no que está precisando fazer, semana após semana. Acabamos encaixando nisso o problema de uso de energia foi padronizando o fundo do app como preto/escuro, conhecido por consumir menos energia do celular e assim podendo economizar"
- EN-W1.8 OrganizaVirtual: "This is a virtual agenda, which would have tools to facilitate the study. You can put together your own schedule of classes and hours of study, with the help of your teacher saying the ideal period of study per week of your subject. The difference is that everything is centralized in this app: recommended study hours, dedication time to improve yourself in an activity (such as playing the piano, drawing, ballet dancing, etc.). Helps us achieve goals and think about what we need to do week after week.
- PT-W1.9 Carona USP: "um APP que organize grupos para os estudantes irem de um instituto a outro ou até o ponto e assim diminuir a ocorrência de roubos e agressões"
- EN-W1.9 Carona USP: "an APP that organizes groups of students to go from one institute to another or to the bus stop, thus reduce the occurrence of robberies and assaults"

- PT-W1.10 Educação Financeira: "um aplicativo para educação financeira, nesse aplicativo vamos ter o total disponível de dinheiro e o tanto gasto durante o mês, podendo ser acompanhado através de gráficos que serão divididos em áreas como lazer, alimentação e transporte para ser possível ver onde o gasto está exagerado. Outra coisa possível é decidir o tanto de dinheiro que será poupado durante o mês"
- EN-W1.10 Financial Education: "an application for financial education, in this application we will have the total available money and the amount spent during the month, and can be accompanied by graphs that will be divided into categories such as leisure and transportation, so you are able to see where the spending is exaggerated. Another possible thing is to decide how much money will be saved during the month "
- PT-W2.1 Fast Bíblia: "é um app que ao sacudir o celular você tem acesso aos provérbios de salomão de forma que a pessoa no meio do dia possa ler a bíblia"
- EN-W2.1 Fast Bible: "It's an app that when you shake the cell phone you have access to Solomon's proverbs so that the person in the middle of the day can read the Bible"
- PT-W2.2 Qual caminho seguir?: "Nosso app era feito para tentar ajudar os vestibulandos a tomar a decisão que talvez seja a maior da sua vida: que carreira seguir? O app era basicamente um sistema que organiza informações da internet, como vídeos de palestras e testes vocacionais. O aluno se inscrevia e era redirecionado para uma tela na qual ele podia escolher entre assistir uma palestra, participar de um fórum ou fazer diversos testes vocacionais. Nos fóruns, o aluno poderia sanar suas dúvidas com professores inscritos no app e até mandar e-mails para ele"
- EN-W2.2 Which way to go?: "Our app was made to help college students make the decision that is perhaps the greatest decision of their life: what is the best career to follow? The app was basically a system that organizes information from the internet, such as talks, videos and vocational tests. The enrolled students are redirected to a screen in which he could choose between attending a lecture, attending a forum, or doing various vocational tests"
- PT-W2.3 ENEM Fácil: "ajudar e muito os alunos tanto na resolução da prova tanto na escolha da carreira depois que passar no ENEM"
- EN-W2.3 ENEM Easy: "to help a lot students both in resolving the test and in the choice of career after passing in ENEM"
- PT-W2.4 Poupe +: "Aplicativo com dicas de reuso de água, onde você vê dicas e posta as suas que podem ganhar prêmios"
- EN-W2.4 Save |: "Application with water reuse tips, where you see tips and post yours that can win prizes"

PT-W2.5 Salve o Tietê: "aplicativo para denunciar a poluição do rio Tietê, principalmente as margens que tem ciclofaixa. Se a gente mostrar pro mundo como sujamos o rio a situação vai melhorar"

EN-W2.5 Save the Tietê: "application to denounce the pollution of the Tietê river, especially the banks that have cycle track. If we show the world how we mess up the river, the situation will improve"

PT-W2.6 Chega de Violência: "A área que escolhemos para criar o aplicativo foi a intolerância e o nosso app tem como objetivo denunciar casos de assédio e violência principalmente contra homossexuais, afrodescendentes e mulheres. A página inicial é um grande botão vermelho, onde se deve clicar quando você sofre algum tipo de assédio ou violência ou quando você vê alguém passar por essa situação, ao clicar nesse botão vermelho, você é levado a um mapa, onde pode clicar no local onde ocorreu esse tipo de abuso, além disso, no canto inferior da tela, temos ícones, um deles nos leva a uma tela onde podemos ver os direitos dos homossexuais, das mulheres e dos negros, que tem como objetivo chamar atenção para como esses direitos são poucos ou não são respeitados, outro ícone leva a um "chat" com várias pessoas, que podem falar com qualquer nome, para manter o anonimato e o outro ícone nos leva a um calendário, onde os usuários podem marcar protestos, eventos ou passeatas. O objetivo geral do app é chamar a atenção para lugares com muitos casos de assédio e aumentar a segurança nesse lugar, além disso o projeto também tem a intenção de mobilizar as pessoas para a criação de novas leis, como a criminalização da homofobia e das cantadas de rua"

EN-W2.6 Enough of Violence: "The problem we chose to create the application was intolerance and our app aims to report cases of harassment and violence mainly against homosexuals, afro-descendants and women. The main feature is a red button where you should click when you suffer some type of harassment or violence or when you see someone go through this situation. When clicking this red button you are taken to a map where you can click where the abuse occurred, in addition, in the lower corner of the screen, we have icons, one of them takes us to a screen where we can see the rights of homosexuals, women and afro-descendants, which aims to call attention to how these rights are few or not respected. Another icon leads to a chat with several people, who can speak by any name, to remain anonymous and the other icon takes us to a calendar, where users can mark protests and events. The general objective of the app is to draw attention to places with many cases of harassment and increase security in this place, in addition the project also intends to mobilize people to create new laws, such as the criminalization of Homophobia "

PT-W2.7 Estuda Bem: "Criamos uma ideia para ajudar os estudantes. A ideia é um sistema de recompensas para tarefas realizadas, com provas supervisionadas via webcam, recompensando os melhores alunos e melhores escolas, através do apoio de patrocinadores do app."

EN-W2.7 Studies Well: "We have created an idea to help students. The idea is a rewards system for tasks performed, with supervised tests via webcam, rewarding the best students and best schools, through the support of app partners"

PT-S1.1 Enconomize: "o objetivo principal de economizar água, que serve como timer e "calculadora" além disso colocamos algumas dicas em si para ajudar no dia a dia para economia"

EN-S1.1 Enconomize: "The main purpose of saving water, which serves as a timer and "calculator ", we also put some tips in itself to help day to day economy"

- PT-S1.2 QueroCursos: "é um aplicativo que reúne e divulga cursos de todo o Brasil, desde que cadastrados em seu banco de dados. O usuário pode escolher a região do curso desejado, além de poder incluir os cursos à distância nos resultados da busca. Usuários cadastrados podem registrar seus cursos que pretendem oferecer na base de dados ou também especificar suas preferências de recebimento de notificações (por exemplo, usuário querendo receber notificações apenas de um determinado curso desejado). O plano de negócios pode se basear no e-commerce dos cursos cadastrados com CNPJ, por exemplo"
- EN-S1.2 QueroCursos: "it is an application that gathers and disseminates courses from all over Brazil, as long as they are registered in its database. The user can choose the region of the desired course, besides being able to include remote courses in your search Registered users can register their courses that they want to offer in the database or also specify their preferences for receiving notifications (for example, the user wanting to receive notifications only from a certain desired course). The business plan is based on e-commerces model."
- PT-S1.3 iChuveiro: "aplicativo com controle do chuveiro para economia de energia"
- EN-S1.3 iChuveiro: "application with shower control for energy saving"
- PT-S1.4 PeruApp: "A aplicação consiste em uma espécie de GPS com comunicação entre os pais e motorista. Na aplicação aos pais contém um mapa com a localização da Van escolar, mesmo que a mesma faça mudanças e uma área de notificações onde o pai pode se comunicar com o motorista e receber notificações de atrasos por exemplo. Na parte destinada ao motorista o mesmo terá um cadastro das crianças, notificações e rotas que podem ser feitas"
- EN-S1.4 PeruApp: "The application consists of a kind of GPS with communication between parents and school van driver. In the application to parents contains a map with the location of the school van, even if the van moves it makes changes at the maps. There are notifications where the parent can communicate with the driver, receive notifications of delays or change of routes"
- PT-S1.5 Solidariedade Eficiente: "Este projeto, voltado ao público deficiente, mas não exclusivo a ele, pretende trazer locomoção e lazer. Pretendemos fazer um cadastro inicial e através dele definir 2 tipos de público: os que "querem ajudar" e os que "precisam de ajuda". A partir disso, o usuário poderá publicar sua oferta ou seu pedido, como também selecionar os que já se encontram e foram cadastrados na página. Sendo assim, o objetivo é incluir os deficientes em mais atividades, facilitar conhecer pessoas novas e ainda beneficiar com diversas atividades, que serão criadas pelos próprios usuários"
- EN-S1.5 Efficient Solidarity: "This project aimed to help public deficient but not exclusive to it. It intends to bring locomotion and leisure. We intend to make an initial registration and through it define 2 types of public: those who "want to help" and those who "need help". With this, the user can publish their offer or request, as well as select the ones that are already registered and those registered on the page, so that the objective is to include the disabled in more activities to facilitate meeting new people and to benefit from various activities that will be created by the users themselves "

The validation of the created framework was achieved. The Tree Bark Framework serves as an important tool for people to rethink digital and technology literacy, showing that it is possible to achieve different levels in each area and promote the acquisition in a valuable way. Another

important goal for the new framework is to change the mindset about these new literacies that are not anymore static, they require space to grow and explore new subjects and topics. During the produced curriculum instance of the framework and the validation interviews the biggest challenge presented was how to keep track of changes in this area, which means the framework occupy an important space in the research area.

### 5.3 Interviews Findings

As first step for the interviews analysis, profiles of chosen interviewees are shown in Table 5.8. The selection of the interviewees followed the standards for this kind of primary data section. Some aspects received special attention:

- equivalent gender distribution
- technical and non-technical people perspective
- geographical distribution to reflect all the different contexts found in a continental in development country like Brazil.
- representatives of public and private educational systems

Interviewees	Gender	Profile	City/State	Experience with Digital and Technology Literacy?
E1	MALE	Entrepreneur and Educator	Curitiba/PR	No
E2	FEMALE	Arts Teacher	MG	No
E3	MALE	Technology Researcher	Sao Paulo/SP	Yes
E4	MALE	Programming teacher for non-programmers	Curitiba/PR	Yes
E5	FEMALE	Elementary School Teacher	Ferraz de Vaconcelos/SP	No
E6	MALE	Technical School Teacher	Irati/PR	Yes
E7	MALE	History High School Teacher	Betim/MG	No
E8	MALE	Middle School Teacher	Sao Paulo/SP	Yes
E9	FEMALE	College Professor	Recife/PE	Yes
E10	FEMALE	Social Entrepreneur	Belem/PA	No

Table 5.8: Interviewees' Profile

As second step, the main premises to be discussed during the interviews were tabulated to show the opinions distribution among the interviewees (Table 5.9).



Assumptions	Interviewees positioning			
	Agree	Disagree	Believe that depends	No thoughts about
Available infrastructure is still an obstacle for digital and technology literacy	E1, E2, E3, E4, E5, E6, E7, E8, E9, E10			
The lack of training and exposure to technology of teachers is a limiting factor for digital and technology literacy	E1, E2, E3, E5, E6, E7, E8, E9, E10		E4	
Being producer / constructors change the way we use technology and digital environment	E1, E2, E3, E4, E5, E6, E7, E8, E9, E10			
Still we prefer to ban cell phone use in schools than to risk the use in the wrong way	E2, E3, E4, E5, E8, E9	E1, E6	E7	E10
The available curriculums and resources for digital and technology literacy development is restricted and they are not prepared for non-technical educators	E1, E3, E5, E7, E8, E9		E4, E8	E2, E6, E10
The mindset of teachers is still of experts and not coaches	E1, E2, E3, E5, E6, E7, E8, E9			E4, E10
The society has difficulties to understand the digital natives	E1, E3, E5, E7, E8, E9	E6	E2, E4	E10
They believe that digital and technology literacy is scalable	E1, E3, E4, E5, E6, E7, E8, E9		E10	E2

Table 5.9: Interviewees' positioning about assumptions

As shown above almost all the interviewees agree that infrastructure is a problem. Mainly when it means for them use the computers and devices that the schools provide for them. The big disruption here for them is the use of the personal smartphone. Almost all the interviewees mentioned that the vast majority of the students have smartphones. This scenario is well represented in the following transcribed patches from the interviews:

- Comment 1:

PT " (...) principalmente na minha área, eu e o pessoal de ciências, geralmente a gente precisa muito desse suporte e a gente não tem. Era muito complicado, as vezes você reserva o material e geralmente a escola tem um ou no máximo dois datashows. Computador pra aluno usar: nenhum. E olha que uma dessas escolas que eu tava é uma escola nova. dentro da sala de aula principalmente com os alunos de oitavo e nono anos muitas vezes a gente até procurava fazer alguma coisa utilizando do celular deles mesmos mesmo em uma escola periférica."

EN (...) especially in my area, me and the science teachers, we usually need support with technology a lot and we do not have it. It is very complicated, sometimes you reserve the material and generally the school has one or at most two datashows. Student computer to use: none. And I is a new school. Inside the classroom mainly with the eighth and ninth grade students often we even tried to do something using their own cell phone even at a peripheral school.

- Comment 2:

PT "Eu vejo que todos os alunos têm smartphone, só que eles não têm acesso a internet pela escola. Porque a escola paga mas não libera a senha. Eu vejo muito laboratório de informática mais em ONGs em comunidades do que nas escolas. Da estrutura das escolas eu vejo que a maioria tem suporte e todos têm smartphone mesmo. E ainda tem um problema de os alunos não poderem por exemplo deixar o celular na sala, porque ainda tem casos de furto."

EN I see that all students have smartphone, only they do not have internet access by the school. Because the school pays but does not release the password. I see a lot of computer lab more in NGOs in communities than in schools. From the structure of the schools I see that most have support and everyone has the same smartphone. And there is still a problem that students can not, for example, leave the cell phone in the room because they still have cases of theft.

- Comment 3:

PT "Não tem material, não tem verba, não tem espaço físico."

EN It has no material, no money, no physical space.

- Comment 4:

PT "A escola que eu trabalho tem um laboratório com 26 computadores. Desses 26, 100% deles está obsoleto, mas ainda tem uns 14 ou 15 que dá pra utilizar. Eu tenho muita vontade de usar, mas não tenho muita habilidade no uso."

EN The school that I work has a lab with 26 computers. Of those 26, 100 % of them are obsolete, but there are still 14 or 15 that you can use. I have a lot of desire to use it, but I do not have much skill in using it.

Another common observation in the interviews was that if you know how to something is done you will make use in a better way, mainly when this is true for abstract knowledge like digital life and technology, that is why teach about technology is so important even for the digital natives that already know how to use.

Some of the interviewees feel this necessity of the digital and technology literacy, but they assume it is impossible for them to help because they have not enough knowledge to evaluate, this is one of the explanation for the diluted positioning about the premise 5.

Similar to this kind of observation, there is a particular difficult to understand the digital native, their vision about the world and their main goals. The whole educational system is trying to keep this new type of student engaged, but most of them are failing because they are using the same old strategies, trying to make them adapt themselves to the old standards. To illustrate the situation described some patches from the interviews were transcribed, extracted and translated. They are the following:

- Comment 1:

PT "Tipicamente eles têm muita prática e pouco conhecimento do que estão fazendo. Nativo digital é aquela pessoa que não passou pelo processo de descoberta das tecnologias que cercam ela. ele simplesmente não tem os bloqueios que a maior parte das pessoas tem. E essas crianças não estão interessadas no papel. Elas estão interessadas no digitar, no virtual, no diferente. "

EN Typically they have a lot of practice and little knowledge of what they are doing. Digital native is that person who has not gone through the process of discovering the technologies that surround her. It simply does not have the blockages that most people have. And



these kids are not interested in the role. They are interested in typing, in the virtual, in the different.

- Comment 2:

PT "Imagino o nativo digital sendo essa geração Z, que são os jovens que já nasceram com internet, com computador em casa. Faz com que pensem nesse modelo de abas, de internet, faz cada vez mais sentido você estar falando de algo, mas já ter um outro assunto e ter um repertório totalmente diversificado, mas ao mesmo tempo superficial. De entender bastante coisa do mundo, mas pouca coisa profundamente."

EN I imagine the digital native being this generation Z, who are the young people who have already been born with internet, with computer at home. It makes you think using this model of tabs, the internet. It makes more and more sense to be talking about something, but already have another subject. It is common to have a repertoire totally diverse, but at the same time superficial. To understand a lot of the world, but not much about each one.

- Comment 3:

PT "Na geração atual eles têm uma capacidade de se expor que é absurda. A vida pra eles já é digital. Para nós existe uma outra vida que é digital."

EN The current generation have an ability to expose themselves that is absurd. Life for them is already digital. For us there is another life that is digital.

Added to this weak understanding of the digital natives, the teacher and educator mindset remain in the past. They are experts and not coaches. They know the truth and not accept the experiences and tests. This posture with digital natives is one of the barriers to be overcome to teach technology and digital literacy in the school.

- Comment 1:

PT "Das escolas que eu estive, vi tipo 10% de facilitador, o resto é tudo professor tradicional. Esses dias eu falei com o diretor da escola que se fosse pra mim ser contaminada por aquele jeito que o restante estava eu sinceramente não me interessaria em ser professora."

EN Of the schools I've been, I've saw just 10 % of the teacher as facilitators, the rest is all traditional teacher. These days I told the school principal that if it were for me to be contaminated by that way, I'm honestly not interested to be a teacher.

- Comment 2:

PT "Eu percebo o receio e o medo que eles têm de utilizar o que eles não conhecem. Eu diria que é um medo infundado, mas eu constato que isso acontece muito. Eles acham que vão perder autoridade sobre a classe se eles demonstrarem que não dominam totalmente uma certa tecnologia."

EN I realize the fear and fear they have of using what they do not know. I would say that it is an unfounded fear, but I notice that this happens a lot. They think they will lose authority over the class if they demonstrate that they do not fully master a certain technology.

- Comment 3:

PT "Toda mudança é difícil, principalmente quando você pensa no tipo de professor que a gente tá formando. Quando você tem uma profissão tão mal-remunerada ela não acaba atraindo os melhores profissionais para a área. Tem professor que acha que se o aluno pegar o celular em sala de aula é porque ele vai brincar."

EN Every change is difficult, especially when you think of the kind of teacher we are education to the system. When you have a poorly paid profession it does not end up attracting the best professionals to the area. Cell phone in the classroom is because it will play.

- Comment 4:

PT O professores mais tradicionais já tem a caixinha pronta que sabe que dá certo, então trabalham sempre com essa caixinha. Só que as pessoas mudam, o perfil muda. De 2000 pra cá as crianças são outras, então o que funcionou pra gente não vai funcionar mais com elas, mas tem professor que ainda insiste em trabalhar com aquele formato. Na cabeça deles, porque aquele formato funcionou em 1800, então vai ter que funcionar hoje também.

EN The more traditional teachers already have the box ready that knows it works, so they always work with this little box. Only people change, the profile changes. From 2000 to here the children are others, so what worked for us will not work with them anymore, but there is a teacher who still insists on working with that format. In this mindset, because that format worked in 1800, so it's going to have to work today as well.

Other point of agreement among the interviews is that the proposed curriculum is scalable because is short and not dependent of a technical person. Another positive aspect is the use of the Hero Journey, where they receive a call, live this journey and they have a final mission to use all the acquired knowledge. In the case of the curriculum is to solve a community problem with mobile technology building an app.

A pointed difficulty is to convince the schools to integrate the proposed curriculum on their terms. Twenty hours is affordable for the classes shift during the afternoon for example, but to be in the mandatory curriculum is too much. They will need to do a lot of arrangements.

Gender was also a recurrent topic in the interviews. For the interviewees the main differences among girls and boys related to technology is the interest. For boys the best part of technology and internet are the games. For girls, are the social networks like Facebook and Instagram. They also, see some differences about the stereotype created for people who like technology. The image, mainly for the girls is the anti-social long hair nerd guy. For the boys, this stereotype is less offensive. That is why change the overall stereotype will help them to live in the current information society, but at the same time will help the technology industry to diversify their workforce and make more girls interested in STEM field.

In the following section each one of the main findings will be discussed with details.

## 5.4 Main Findings Analysis

Many insights have been taking of the interviews and curriculum applications. From these insights, many findings were produced. All of them will be discussed in details.

### 5.4.1 Wrong Self-perception

During the development of the course curriculum using the proposed framework, one of the goal was to help people became producers of technology and make them see the importance of this knowledge (digital and technology literacy) for their lives. To make them interested and not afraid of this, the suggested name for the course was just: Digital Literacy. Our main concern was about the word digital and no doubts about literacy, but people had difficulties, mainly the young ones to face the reality. They was totally uncomfortable to assume themselves as illiterates, some of them said that friend refused to participate because it was impossible to consider them illiterates. The argument for this rejection was they know how to do everything on the phone.

The above fact make sense for digital natives. In their perception they already know everything, because nobody in the school, at home or in the social life just ask them about the why these devices

works. They are never questioned about this. This social behavior makes them believe that they are not illiterate. On the other hand, digital immigrants just get afraid with the idea of anything digital or technological, for them, it was difficult to imagine anything so easy in technology that they would be able to learn.

Digital immigrants usually have just a superficial contact with digital devices. They even had the opportunity to get used to some patterns of commands and each new functionality or task to do with a smartphone or a computer is terrible difficult. Without the use it is harder to reach the context layers where you get aware about the importance of that typical device in our society. The transition and the innovation layers seem impossible to reach for them because they build an imaginary wall for the acquisition of this kind of knowledge. They know they are digital immigrants and they interact with some digital natives, which makes them believe that if they should learn that that should have the same digital natives "ability" to use technology.

Another wrong self-perception is the required supernatural ability with mathematics. For the majority of the participants, without any distinction of age, anything in technology and digital worlds requires a deep knowledge about mathematics to understand and build. They associate daily logic with hard calculation, which makes them give up of the field before they even try to program, for example. This wrong self-perception is a big barrier for the enrollment and interest in technology courses or even the interest in learning more than it is necessary to be a superficial user.

This wrong self-perception in current era is holding back the faster development solutions, mainly for specific problems. Worst than this, lack of knowledge means manipulation. Nobody is aware about data security or the risk they are assuming when they create a social network profile for example. We are living the scribes Era again. Just a small part of the population really know "how to read and write" for computers. While the vast majority just use what society gives to them. The first step is to recognize the situation. Recognize that both, digital natives and immigrants have a wrong self-perception about their knowledge and involvement with technology.

#### 5.4.2 Common Error: transition before use and context

The Participant Observation showed that it is easier to get people interested in learning technology when they already know how to use and the advantages that knowledge can bring to them. If they can imagine the impact they can cause in the world it is easier to let them learn by themselves. This is one of the main problems for the digital immigrants to learn more about technology, they don't use, in consequence they don't think or feel the consequences of this use in the same way of the users.

This insight explains why projects like "One Laptop Per Child" make sense but they are not enough. To give a computer to a child just to use not showing the impact that tool can cause, makes them just turn that in something they already know, and uses just for the tasks they already had, like a technological notebook, that is just to take notes.

As Jacques Delors defends, in the famous report to UNESCO about 21st century education, it is imperative to transform the education towards building higher-order cognitive skills, more inquiry, project focused mode of operation and more collaborative working styles. All these new goals for education are just tangible when you use and apply the learning. This is even more important when technology is the focus of the learning.

Education of technology in exponential rate of changes requires smart learners, mainly, because it is impossible to plan a static curriculum to be used for a long time. The amount of content and knowledge produced at these fields is uncontrollable. IT can play an important role helping in this mission opening access to wealth information, facilitating the inquiry process and engaging, mainly, the digital native learner.

Another current strategy for providing digital and technology literacy that have been used for a lot of schools and institutions is to train a specific teacher in the traditional model, with a lot of our to explain concepts and give hard data for them about just specific topics that they judge are the important ones. After this training a curriculum production, with a detailed plan of classes

is required for this teacher. The wrong aspect of this strategy is timing. Do we need to wait for the teacher to become expert to provide learning experiences for the students? If a coach approach is adopted we can start providing these learning experience faster than any other strategy and it is not necessary to force the use and the context layers fake transit for teachers or any other actor of this educational duet.

### 5.4.3 No age, gender or background limitations

There is a growing recognition that one-size fits all education, like the current mode in most of the nations, does not actually fit everyone, mainly for information society education. Education must be adaptive to the changing needs of children and humanity [RV99]. Hence, the division by age was adopted. For technology and digital literacy development the best criteria may be not this one. For this kind of knowledge development, exposition and intensity of use seems a better strategy.

During the participant observation for the curriculum application no spatial division was adopted. A categorization based on previous exposition categorization was adopted primarily to pair the students for the hands-on activities. Another reason for this informal categorization was the adaptation for the learning checking moments. The measure was always among the previous proper student capability and not among the average of the group. Which also helps to manage the differences of age, gender, backgrounds during the journey.

Open ended activities are crucial components for Digital and Technology literacy, as the framework endorses. There is no end. There is no limit for technology, mainly when you reach the innovation layer and feel confident to create more and more. Open ended mindset helps the flexibility of a class because it is just the interest that count for the student to improve his ability and build knowledge. Meeting ambitious content and inquiry standards is an important boundary to be broken by the educational system as a whole to reach the full potential of the 21st century possibilities. Shift to this mindset is particularly complex because educators and teacher have traditionally seen content and didactic process as priorities. However, these two aspect are important, integrating them in a journey offers the opportunity to increase students' experience achieving deeper content understanding [Ede01].

Peer instruction is an important resource to increase the classes flexibility and to eliminate factors besides interest boundaries. This active learning strategy is more efficient than lecture [Maz13]. This pedagogical method promotes student participation in class and increases student interaction with each other and with the facilitator of the learning journey. Hence, peer instruction and collaborative group activity development enhanced participants performance in this course that is not an exception. A good amount of scientific work was done to prove peer instruction enhanced meaningful learning. All learning experiences seems equivalent if the measures of learning are based on the ability to repeat taught facts. However, quality learning experiences (learning with understanding) can be identified when tests of transfer are used. Thus because peer instruction leads to transfer. These aspects became vital when there is a heterogeneous group of participants. [CCD05, CM01, FCM02, RD00]

Participant observation was conclusive on the framework flexibility for any scenario of application. It doesn't matter the age, gender or previous knowledge or background the framework works. The main attention point to efficiency in any kind of group or even in heterogeneous groups is the crucial Use layer, that is almost always unconscious for digital natives and requires almost no effort to be achieved, but for digital immigrants is not needless. Time and planning is required to be comfortable with some specific topic or device. The relevance of the digital and technology literacy is not a matter of age, gender or background, and so forth learning experiences, frameworks and tools for that should keep this independence.

### 5.4.4 Non-linear assessment approach advantages

Technology and evolution in exponential rates of changes brought important shifts in terms of literacy, mainly over the past two decades. One of the most obvious aspects was the information

acquisition style. There was a move from fixed to fluid texts where "reading and writing paths have become non-linear in contrast to linear historical texts" [Mer07]. Hyperlinks made reading and writing paths non-linear and multimodal [Mer07]. These shifts create new challenges for individuals in evaluating and understanding information and necessitate additional skills for effective literacy: digital and technology literacy [CKLL08].

That is why there is an increasing demand to integrate digital and technology literacy skills and nonlinear thinking styles into curriculum development [LGC08]. Bigger than this, the demand for generic tools to help teacher to develop this kind of non linear curriculum's is even crucial. Spreading online media challenges the learner to organize and compose information in a nonlinear way. User interactivity is essential and allows for control of progress and choice in the manner to construct knowledge [LGC08].

The literature states that nonlinear thinking styles are a necessary skill within the theoretical framework of digital and technological literacy. Currently, there is a lack of integration of nonlinear thinking styles found in educational system as a whole [VGPK07]. Effective thinking and problem solving in today's world requires the inclusion of nonlinear approaches. Furthermore, there is a limited amount of research concerning nonlinear thinking styles and teaching. In consequence, the demand for nonlinear thinking styles, tools and resource in education is higher than ever. The theoretical significance of this kind of research is actually this: create new theoretical frameworks for the development of nonlinear knowledge. Building this kind of generic tool permits educators to design curriculum and developmental approaches that are effective for increasing nonlinear thinking styles, teaching toward the effective use of technology and the comprehension of information through technology [ORT13].

#### 5.4.5 New way of communication: Programming as a tool

Literacy can be defined as a "human facility with a symbolic and infrastructural technology, that can be used for creative and communicative purposes" [Vee13]. It allows people to register and comprehend ideas at a distance immediately, which is essential for human societal style of life. People need literacy to be active in their worlds. Besides this practical meaning, new literacies and pedagogical approaches suggest that the term "literacy" is powerful as a descriptive word that implies urgency. This is the reason, since the 1960s, computer scientists and enthusiasts understand computer programming as literacy, mainly, arguing it is a generalizable skill that should be more widely taught and held.

Some experts on the subject defend this perception, like the computer scientist Alan Perlis. He defends that "all undergraduates should be taught programming, just as they are taught writing in first year composition courses" [Per64]. Another important actor of this movement is the mathematician John Kemeny, that in the 1960s at Dartmouth University, designed the Basic programming language for students and non-specialists. Later, Kemeny wrote: "Someday computer literacy will be a condition for employment, possibly for survival, because the computer illiterate will be cut off from most sources of information" [Kem83]. Nowadays, the main name for this subject is Douglas Rushkoff. He says that learning programming gives people "access to the control panel of civilization" [Rus10] and Marc Prensky argues "programming becomes more important, it will leave the back room and become a key skill and attribute of our top intellectual and social classes, just as reading and writing did in the past [Pre08]."

On this same hand, as computer code and the ability to write it becomes more prevalent, it is becoming an essential skill in professions outside of computer science, like good communications skills. Digital and Technology literacy permeated almost all job description lists, trailing behind it is the need to program computers. Computer code is now the main resource to structure much of our contemporary communication, for example, email and social networking. Beside the tools the formats are also code based like digital video production [BOK16]. As a whole, the mass code literacy, as mass ability to read and write in the past, will produce equally structural changes to society.

There is no certain, but whether or not computer programming will be a mass literacy, code and



computers have become central to our daily lives, programming has certainly become a powerful mode of written communication. Frameworks, tools and resources should be produced to help teachers manage the demand of integrating these new literacy into real world. This literacies are requirement for participation in a digital world. When we acquired text, we didn't just learn how to read, but also how to write and how to use this tool in each moment and so on. Now that we have computers in our daily lives, learning to use them is not enough. Which means digital and technology literacy as a whole should be a requirement for the information society.

#### 5.4.6 Just superusers

Most Digital Natives are just superusers, they have no idea about the context of that common technologies they live around. A large study [RFR10] indicates that while children may make fluent use of the digital devices, they don't necessarily know how to use them creatively or critically. This scenario results in a "dominant paradigm that keeps many children only on the receiving end of corporate media" [Bur12]. Children are spending considerable time "reading" technology, but there is spare and rare "writing" moments with these digital devices they seem making use fluently. There is almost no new imaginatively, critically, and collaboratively production or innovation coming from the digital natives.

Providing digital and technology literacy by introducing children to programming helps demystify the process of technology creation. According to Rushkoff [Rus10] in his book *Program or Be Programmed: Ten Commands for a Digital Age*, coding is the vital new literacy of the 21st century, just as reading and writing. were once the demarcation line between the literate and illiterate, so now is the capacity to code. Another resource to help this mindset shift from superusers to creators is the book *Connected Code: Why Children Need to Learn Programming* [KB14]. The book shows that keeping kids as just superusers puts the whole worlds, mainly the kids who will be living in an even more digital world, at a terrible disadvantage. They spend an increasing amount of their time living a digital life in a digital environments where the rules have been written by others. How can the society help them to navigate in this ocean of uncertainty for the wellness of the humanity? Providing digital and technology literacy would certainly help them during this mission. Digital and technology literacy make people stop accepting the digital buildings, like websites and platforms, like they are simply because they were done like that, and begin to engage critically with them instead. Otherwise, they may as well be at the circus or a magic show.

Finally, digital and technology literacy familiarizes people with the values of a digital society, mainly collaboration. Replacing the industrial age values: secrecy or the hoarding of knowledge [Rus10]. Learning how software is built and how the computer really works helps us understand the new society that all the humanity will be working and living. It is a totally new kind of labor work force or typical activities.

#### 5.4.7 Abstraction difficulties

People struggle to find ways to approach and solve problems. The most important cause to the difficulties many people feel to learn programming is actually their lack of generic problem solving skills [GM07]. Programming demands a high level of abstraction, generalization, transfer and critical thinking, among others. Studies have also show that the problem starts, in general, in the beginning of the learning journey, like recognize and apply control structures, to solve problems. The problem is not to write and create algorithms, it is the inability to approach and solve problems. Problem solving requires multiple abilities that students often don't have [Mos11], explained above:

- Problem understanding: student has difficulties interpreting the problem in text format. To solve a problem without completely understand it is an impossible task.
- Relating knowledge: many students don't establish correct analogies with past strategies used to solve other problems and don't transfer prior knowledge to the new problems. They group the problems by context and not by strategy.

- Reflection about the problem and the solution - students have a tendency to test superficially and they get satisfied when program works with a small data set, without making more extensive testing.
- Lack of persistence: if students don't quickly find a possible solution, they fast give up. Solving programming problems demands effort and persistence. They prefer to ask for help before trying a few times. This is especially important, since learning is more effective when students find the solution by themselves, instead of simply seen the solution.

Besides all the natural human difficulties to develop this kind of abstract ability, there is not enough material about the subject. There is no specific research area that is conquering space in the educational system. There is not even informal resource on the internet. All these abilities are not trivial. Develop them requires a lot of training to become natural mainly. Which means, during the developed 20 hours course based on the new framework, some of the students were not able to become their logic behind programming a natural process. This is not a problem of the course or put in check the validation of the process, they just have not achieved the innovation layers and become fluent. This is a portrait of the main barrier for digital and technology literacy development worldwide This lack of resources and misconceptions about abstraction, logic and programming is one of the big boundaries to be overcame for the development of 21st century skills.

#### 5.4.8 Empowerment thought knowledge

The majority of the students of the three editions of the Digital and Technology literacy based on framework learned more than just programming or how Internet works. They now understand and believe they can be and do whatever they want, they just need to put effort. Be challenged is a fuel for them now. For most of them, a shift happens from fixed mindset to growth mindset. Besides this emotional empowerment, knowing something about programming makes us competitive as individuals, companies and a nation. This is financial empowerment.

People who believe their talents can be developed through hard word and study have a growth mindset. They usually achieve more than those with a fixed mindset, those who believe their talents are innate gifts [Dwe08]. The reason for this is the necessity to seem smart, which make them afraid of challenges or doubt. It is common to confuse a growth mindset with being flexible or open-minded. A growth mindset is not just about effort, it is about how comfortable students are to try new strategies and seek input from others when they're stuck. Two of the most exercised abilities during programming tasks. They need this repertoire of approaches to learn, improve and advance in the given course activities.

Everyone is actually a mix of fixed and growth mindsets. There is no "pure" growth mindset. This mixture tends for the side more developed daily, that is way the kids should be exposed to activities that challenges then and be oriented to try new approaches and reinforce collaboration power. The following question with this fact is: How can we help educators adopt a deeper, true growth mindset? How can we help the digital natives to develop more this kind of mindset? Carol Dweck, the creator of the concept defends: "Let's legitimize the fixed mindset". To make the discussion open increase the sense of humans are a mixture of fixed and growth mindsets. With this fact the pressure to teach everybody how to acquire growth mindset will not make sense and the possibility of this kind of emotional empowerment that was seeing in this present work will increase.

Another clear benefit is the financial empowerment. With this knowledge, the participants can create a product or service, like an app-based startup without having to invest money to hire somebody or a companies to do this. This kind of projects like apps and websites can bring a lot of gains to them. With this knowledge as well, they can also help other to bring ideas that are just in paper to reality, solving problems that are not being solved because there is no enough workforce or no interest, mainly because lack of diversity.

To get a job the advantages are also clear: the average wage for technology field positions, like programmers are higher than the most of the fields. For example, average salaries in the U.S. jumped



to \$96,370 annually, according to Bureau of Labor Statistics <sup>3</sup> . Another characteristics of this field is that tech jobs have been fairly hit during recessions around the world according to Dice annual report <sup>4</sup> . The open opportunities in the technology field are also higher than other fields because of the high demand to keep the pace of innovation. To increase income with technology and digital literacy is more a question of interest than any other factor.

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<sup>3</sup><https://www.bls.gov/news.release/empsit.nr0.htm>

<sup>4</sup>[www.dice.com/salary](http://www.dice.com/salary)



## Chapter 6

# Final Considerations

Humanity is living just the first years of digital revolution, mainly in education. The technology will deeply change the school, the educational system structure, the classrooms, because it have already changed the society. Although our everyday life increasingly depends on technology, most people are not prepared to make decisions or to think critically about technology. Law, psychology, economics and most of the traditional areas are understanding how to work and manage technology. Instead of science and technology field focus on creating and optimizing machines and software for our problems and limitations, we are optimizing ourselves for machinery nowadays. Technology is optimizing humans to machinery [Rus10]. Why? Adults and children have an insufficient understanding of the fundamentals characteristics of technology, but they change their way of communicate, collaborate and work. All these facts are not clear for society because current generation is fluent user of gadgets and applications; just users, or superusers at most.

Actually, they are called digital natives, but they are not even fully aware of the technologies they use every day. In summary, as a society we are definitely not digital and technologically literate. Technology has become so user friendly that it is largely invisible. And digital life is not anymore an option for young people. Technology redraws the limits of solitude and intimacy. Think about SMS, email, text, Twitter and Facebook. Young people are among the first generation to grow up with an expectation of continuous connection: always on, and always on them. Although, many people use technology or embark in a cyberspace with minimal comprehension of how it works, the implications of its use, or even where it comes from. Instead of learning about our technology, a small group of people that detains knowledge and power opt for a world which our technology learns about us.

Thus, the research base related to technological literacy must be strengthened. There is a lack of reliable information about what people know and think about technology. Another gap of information and research are about the cognitive steps that people use in constructing knowledge about technology. As far as we are aware, no study about non-linear levels of digital and technology literacy has been conducted. These studies gaps or just lack of information represent obstacles to foster technological and digital literacy. Curriculum developers struggle to design teaching strategies, mainly for non-technical teachers. Policymakers have difficulties to enact programs. This is the scenario that motivate the production of the framework to rearrange the bases of education society is already used to. This is the way to show the required change in the current education system mindset to success in the digital and technology literacy development. The findings must be incorporated into teaching materials and techniques and into formal and informal education settings. We must produce not just curriculum and resource for these literacies developments, but write policies to make it a reality in the whole world.

One of the main achievements of this work is the possibility to be generalized for all ages, contexts and backgrounds. Reviewing the produced literature this is a huge step for the produced framework. This big step is also important because it can enhance the understanding of how non-technical teacher can provide digital and technology literacy for people, that are aligned with on of the main focus of this work: to scale the digital and technology literacy development. Because

without an influx of new programmers capable of maintaining the code and fixing bugs, much less upgrading and innovation new technologies, the society cannot keep its operation at mission readiness. Someone who knows about basic technological and digital life principles but who has no hands-on capabilities with even the most common technologies, can already have some level of literacy, but can not be considered as technologically literate as someone who already can take advantages of these tools. On the other hand, to work with digital immigrants, the first step might be different. First of all, you need to make them use and get used to the technology and just after this first user experience give them the context, if you do in the other sense, it turns in another subject or tutorial, not knowledge. This is the reason why we are failing on engaging the educational system workforce in the digital and technological revolution, we are skipping the use and context layers to go directly to transition where we produce with technology and digital tools.

Currently, all the humans need to be a lifelong learner to be active part of the knowledge society. To acquire really specific knowledge is not anymore enough. The necessity of pillars is pretty clear, but they need to be more interconnected in the actual panorama. They need to be rearranged in order to represent the reality of technology education. This is what tree bark layers knowledge framework is about. In the same hand, there is no one-size solution or tool. Empiricism is one of the main skills needed by digital natives. It is only through it that one can acquire mastery and mastery of an environment characterized by complexity and speed. Creativity and critical thinking are another essential skills for the digital age, and not only for young people and students, but also for teachers and educators, that is why the framework is just a proposal. Flexible and mutable proposal. In this way, detachment from traditional models and the status quo, willingness to embrace and experience the new, the initiative and the collaboration are characteristics that have led to digital and technology literacy.

As important as the framework is the idea of understanding computer programming as a literacy. It leads the way forward towards a more comprehensive knowledge society. It is vital to spread access to programming due of its power and diversity of applications. Programming cannot be relegated exclusively to computer science domain. It is a tool, not the main goal. It is a vital knowledge to be active in current society. Actually, just a few will become professional programmers, but everybody should understand how programmers make decisions and how those decisions influence the ways the software and its users functions. With this mindset, the mystery of computers became science of programming and many other mysteries seemed to be vanished as well. Programming in current times (digital age and knowledge society) means deciding the codes and rules of the future. Since technologies will build the future.

If a person reaches adulthood and cannot read or write, it is generally identified as a collective societal failure. As current society is based on digital technology, bytes and computers, people need to be able to read, understand and produce code, or at least the information contained in it. Additionally, they need to be able to write code information if they so choose. Coding enables people to communicate, socialize, and engage in literacy practices needed in their future careers as global citizens [BOK16]. Instead of teaching programming, most schools with digital and technology literacy curriculums teach programs. Kids learn how to use popular spreadsheet for example. These basic skills may make them more employable today but they will not help them adapt to the technologies of tomorrow. The main reason for this is that their entire orientation to computing will be from the perspective of users. Digital technologies are different, they are not just objects, but systems embedded with purpose. They act with intention. Current developing technologies and networks that have the potential to reshape our economy, our ecology and our society more profoundly and intentionally than ever before in our collective history.

These steps are only a starting point. Numerous other actions, both large and small, also will be needed across society. Mindful use of technology may stand alongside reading and mathematics as one of the essential skill for a successful life, as Jacques Delors defends. The case for technological and digital literacy must be made consistently and on an ongoing basis. It is not enough to put a lot of effort on educational technologies, if we are not discussing education of technology. As the final remark for this dissertation. The main focus is to scale on teacher empowerment giving more

broad idea of the literacy levels and new frameworks for new learning experiences. In time, leaders, academia, and even business will recognize the importance of digital and technological literacy to their personal well-being and the development of the nation. Achieving this goal will slow. This is a challenging journey with a lot of possible ends, but absolutely worth to take on board.

## 6.1 Research Highlights

- Four Pillars for Education rethought for exponential rate changes society
- Non-linear proposal to measure digital and technology literacy
- Assessment framework proposal based on tree bark layers
- Knowledge tree representation proposal more adapted to the new digital era
- Knowledge representation proposal streamlined to brace on-demand expertise development
- Non-technical educator friendly resource for technology literacy development
- Scalable framework and instances of this

## 6.2 Research limitations

Every research has methodological and context limitations that must, if seen, be expressed by the researcher. The very nature of qualitative research brings with it a limitation with respect to the generalization of the findings that the current thesis refer only to the context researched. [Fli09] reflects on this issue commenting that several searches are limited to time and space and, therefore, such a feature is not only studies that have qualitative approach.

The interviewee must not fall into a qualitative research in the logic of randomness, which, although part of the kind of research and care in the selection of the participants from interviews, may cause bias. To reduce this issue, it will be not only selected people for convenience, but, after conducting a survey in various channels. However, despite this care, there is no absolute guarantee that the selection, because it is not random, has not generated a methodological bias.

Another important issue to be mentioned concerning the empirical application is that the proposed experiments will be applied at different times and classes so that there was direct interference with specific issues relating to day-to-day, from both sides, the researcher and student. Since it will be hold by the author of the research, it can bring the feeling of complete mastery of the studied object and it may difficult the perception of some different nuance.

The comparison was made with different students and despite the care that exist in the personality quirks of each student, it may influence the results, which is hardly a specific limitation of the current empirical research, but to qualitative research in general. This is one of the main aspects to see the limitation of the proposed framework and built curriculum. Analyzing this topic specifically it is important to consider the speed of changes in our exponential era, which rises the possibility of all research become outdated before we even imagine.

The educational system also represents a boundaries that brings limitations for the framework and the curriculum application and expansion. Each country built a structure and, consequently, developed a mindset that is spread out teachers, students, secretaries, coordinators and influencers. The framework represents a agnostic tool to help to frame the digital and technology literacy development agenda, but there is not guarantee about the viability and application for all scenarios around the world.

### 6.3 Future work and Directions

Future work regarding this research comprises the study the total and deep usability of the framework in many aspects like: for other educator, for other countries, other contexts of learning.

Another important step for this work is to measure the impact of the framework in the life of the people. The hypothesis is that it can bring a development for the society as a whole, but for each persons. How does the framework help them to rise his children? How does the framework help them to lead the transformation they want to see in the world? How does the framework help them to find a job in practical ways? This kind of question with the use and spread of the framework can be answered.

One important abstraction to be done in the future is the effectiveness of the framework for other subjects and not just for digital and technology literacy. Some conclusions shows that the generation had changed, so it doesn't matter the subject, the way to learn is totally different and this kind of framework could help the required adaptations to other subjects.

A mandatory direction to keep this research alive is to build a community to collaborate and produce content to help the network. To help this ecosystem to be built an online community would be a good tool. The website of the framework and the fist curriculum is already online, available at <https://linux.ime.usp.br/~cachutti/mestrado/literacia3.0/> and it is a start.



## Appendix A

# Questionnaires

### Alfabetização digital - Questionário inicial

Leia com atenção cada uma das questões e responda da maneira mais exata possível.

Lembrando que neste questionário, não há respostas "certas" ou "erradas". Suas respostas deverão ser as que você considerar mais apropriadas ao seu contexto.

Você poderá pedir ajuda, caso não entenda algo ou não tenha certeza de como responder a uma questão.

Suas respostas serão associadas com as de outros alunos, portanto nenhum aluno específico poderá ser identificado. Todas as respostas são confidenciais.

\*Obrigatório

**Nome completo \***

**Idade \***

**Nome da escola \***

**Sexo \***

- Masculino
- Feminino
- Prefiro não declarar

**Você repetiu algum ano? \***

(marque apenas uma opção em cada linha)

	Não, nunca	Sim, uma vez	Sim, mais de uma
No Fund. I (1º ao 5º ano)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No Fund. II (6º ao 9º ano)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No Ensino Médio	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Qual a atividade profissional da sua mãe? \***

(ex.: professora, trabalha em casa, secretária, engenheira, vendedora...)

**Qual a atividade profissional do seu pai? \***

(ex.: professor, trabalha em casa, cabelereiro, engenheiro...)

**Quais dos seguintes itens você possui em casa?**

(marque apenas uma opção por linha)

	SIM	NÃO
uma escrivaninha ou mesa para estudar	<input type="radio"/>	<input type="radio"/>
seu próprio quarto	<input type="radio"/>	<input type="radio"/>
um computador próprio que você pode usar para trabalhos escolares	<input type="radio"/>	<input type="radio"/>
acesso à internet	<input type="radio"/>	<input type="radio"/>
livros diversos	<input type="radio"/>	<input type="radio"/>
enciclopédia (livros para ajudar em trabalhos escolares)	<input type="radio"/>	<input type="radio"/>
um dicionário	<input type="radio"/>	<input type="radio"/>
tv à cabo	<input type="radio"/>	<input type="radio"/>
video game	<input type="radio"/>	<input type="radio"/>
um celular próprio	<input type="radio"/>	<input type="radio"/>
um tablet	<input type="radio"/>	<input type="radio"/>

**Dos itens abaixo quantos existem na sua casa? \***

	Nenhum	1	2	3 ou mais
celular	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
televisão	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
computador	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Em geral, quantas horas por semana você tem aulas sobre as matérias indicadas abaixo? \***

Essas são aulas de matérias que você está aprendendo na escola, mas às quais você dedica tempo extra fora do horário normal da escola. Estime o tempo total dedicado para elas: horas de aula na escola + horas que se dedica em casa fazendo tarefa por exemplo.

	Menos de 2hs por semana	Entre 2 e 4 horas por semana	Entre 4 e 6 horas por semana	Mais de 6 horas por semana
Matemática	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ciências	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Informática	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Português	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Em média quantas horas você fica no computador? \***

jogando, estudando, navegando na internet, no facebook...

- menos de 2 horas por semana
- entre 2 e 4 horas por semana
- entre 4 e 6 horas por semana
- mais de 6 horas por semana

**Em média quantas horas você fica no celular por dia? \***

- menos de 2 horas por dia
- entre 2 e 4 horas por dia
- entre 4 e 6 horas por dia
- mais de 6 horas por dia

**Em média quantas horas você usa o computador ou o celular para estudar?**

(pode ser jogo educativo)

- menos de 2 horas por semana
- entre 2 e 4 horas por semana
- entre 4 e 6 horas por semana
- mais de 6 horas por semana

**Já ouviu falar em programação? \***

**Em caso afirmativos, o que é programação e onde você aprendeu?**

**Descreva um(a) profissional de tecnologia. \***

**Porque você se matriculou nesse curso? \***





## Appendix B

### Observation Activities

The first one was designed focusing to understand how they manage to find information using technology, then get an idea of their digital literacy levels. If they just copy and paste or if they put some effort to create an answer. The mission was individual and it was given 10 minutes for them. It is the following:

Does anyone know what is digital literacy? No?! So let's find out. Using your computer and not talk to anyone I want you to answer the following questions:

Questions:

- What is literacy?
- What is digital literacy?
- How can we improve the digital literacy level for high school students from Brazil?

The second activity was designed to measure their leadership and ability to work in groups, always trying to understand their digital and technology literacy level. The activity was the following and they had fifteen minutes to complete without talking in the common ways, but they had a big restriction: they had to use the technology to communicate with their pairs.

You have 5 minutes to form groups and find a way to communicate with your partner. You can use the tools we have in the room, but you can't lift chair and you can not speak during those 5 minutes. You'll have to find a way!

The mission:

Teacher Camila wants to take everyone to walk around USP campus, but she has a problem: how to get out with 30 underage students around campus that is so big? What are the main points that they want to know? How to discover it? And she needs to control all the students and keep them safe. Develop an activity that solve the Camila's problems.

This proposal should be collaborative, huh !? Everyone should participate.

When you finished, one of the students will send the file with the following name: Activity 2 - [groupname].  
The file must contain the name of all members of the group.

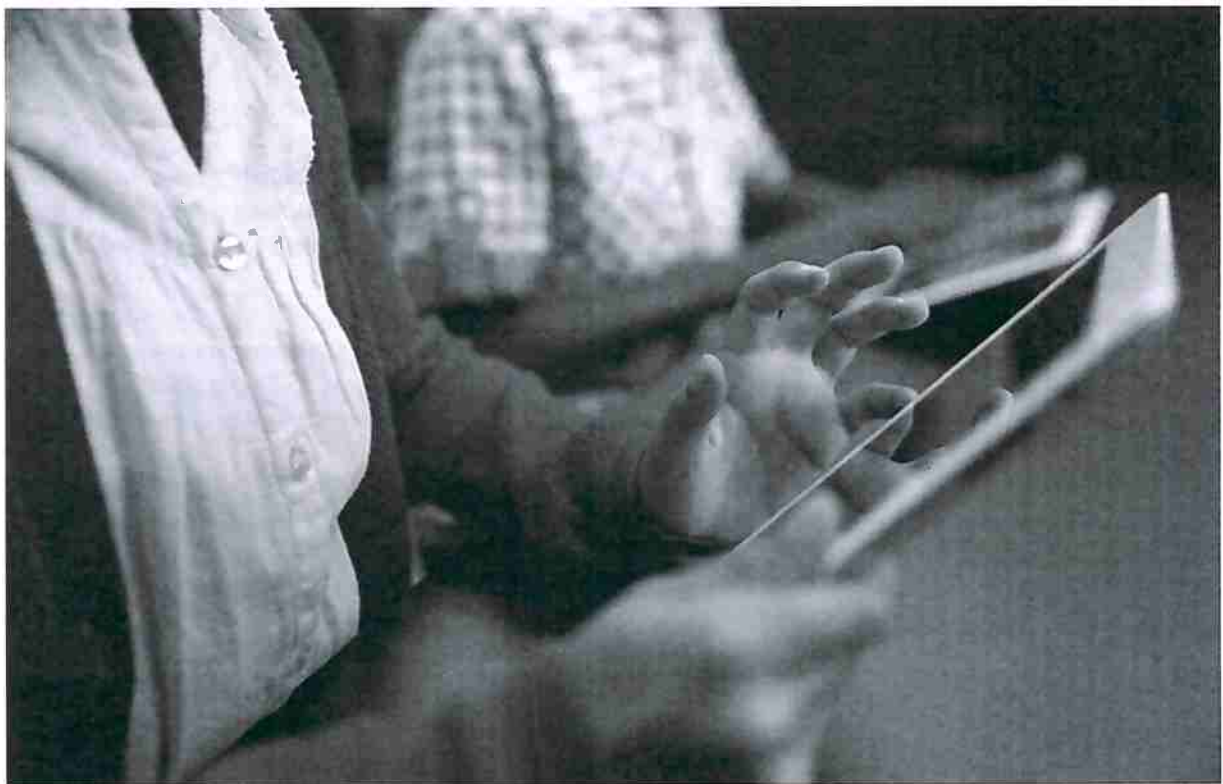


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# Literacia3.0

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Entendendo, produzindo e inovando com tecnologia



AULA 01 - Como os computadores pensam? Como a Internet funciona?.

*1º Edição*

## Appendix C

# Produced resources for the first framework instance classes

Resources at this appendix were produced for the created instance of the proposed framework. They aim to exemplify and materialize concrete possibilities of using the framework. The simplicity and the informal style of interaction with the participants are the main characteristics of this material that is open to be used by any person that want to improve digital and technology literacy in any size group or any different background community. All these materials are available at the website: <https://www.linux.ime.usp.br/cachutti/mestrado/literacia3.0/>

The materials were produced to fulfill in a 2 hours class. The given format for the Summer and Winter School at the IME - USP were 10 class of this duration. The resources represents the complete guide for all the basic curriculum of digital and technology literacy. The content of the material is not just about all the required information to build that specific knowledge, but for the way to think and build this knowledge.

These resources are for everyone involved in the learning journey. They are for the teachers, directors, parents and participants, without any distinction between them. No prior knowledge is required for any of them. In this hand, no extensive preparation is required to the classes, it is simply to go through the material reading, understanding and searching for more information about the topics discussed. These proposed resources are just a guide for everyone to help each other and achieve the ultimate learning goal.

The first instance of the framework, this curriculum was proposed and applied in Brazil, this is the reason for all the material in Portuguese. All the resources are attached to this work as used during the course, which may incur reading difficulties for non-Portuguese speakers, but, even without the completely understand of each word, the material still shows valid to exemplify the simplicity of the resources used during the curriculum facilitation. As consequence, making it clear that any component of the educational system could use it to provide digital and technology literacy to anyone.

# O CAMINHO DA URL

## A WWW

WWW é a sigla para World Wide Web, que significa rede de alcance mundial, em português. É a reunião de várias mídias interligadas por sistemas eletrônicos de comunicação e executadas na Internet, onde é possível acessar qualquer site para consulta na Internet. A tradução literal de world wide web é "teia em todo o mundo" ou "teia do tamanho do mundo", e indica a potencialidade da internet, capaz de conectar o mundo, como se fosse uma teia.

A Web trabalha por meio de três parâmetros: URL, o HTTP e o HTML.

- ▶ URL: especifica o endereço único que cada página da internet vai receber e delimita como ela vai ser encontrada pelos usuários.
- ▶ HTTP: protocolo de comunicação que assegura a transferência de informações e dados entre redes.
- ▶ HTML: método para codificar a informação da internet, a fim de que seja exibida de diferentes formas.

Em conjunto, esses parâmetros trabalham da seguinte forma: o hipertexto é codificado com a linguagem de programação HTML, que possui marcas de codificação interpretadas pelos clientes www. Para realizar a transferência de informações no www é utilizado o protocolo HTTP, que possui suporte aos sistemas de informações e hipermídia.

Mas pode ficar calma(o) que vamos explicar tudo com mais calma ao longo das aulas :)

## História da sigla WWW

ganhou a característica que conhecemos hoje com o surgimento do WWW (World Wide Web). Desenvolvido pelo físico inglês Tim Berners-Lee, nos laboratórios da Organização Europeia para a Pesquisa Nuclear (Cern), o WWW estabeleceu uma linguagem padrão para a circulação de dados na rede, permitindo que qualquer computador, de qualquer parte do planeta, tivesse livre acesso ao mundo virtual.

Foi assim que surgiu a Internet, conjunto de redes mundial, e o nome tem origem inglesa, onde inter vem de internacional e net significa rede, ou seja, rede de computadores mundial. E nem preciso dizer que ela é uma rede de computadores interligadas, composta por milhões de redes particulares, formada por residências, empresas, universidades, órgãos do governo, e etc., que possibilita o acesso a informações sobre e em qualquer lugar do mundo e por isso tornou-se um fenômeno! Não é mesmo?! Nem imagino como viver sem ela! : )

IP

O endereço IP, de forma genérica, pode ser considerado como um conjunto de números que representa o local de um determinado equipamento (normalmente computadores) em uma rede privada ou pública. É como o endereço da nossa casa, mas para os computadores.

Para um melhor uso dos endereços de equipamentos em rede pelas pessoas, utiliza-se a forma de endereços de domínio, tal como "www.wikipedia.org". Cada URL é convertido em um endereço IP pelo DNS, o Domain Name System que é um mecanismo que converte nomes em endereços IP e endereços IP em nomes. Este processo de conversão é conhecido como resolução de nomes de domínio.

Mas vamos fazer um teste.



Abra o seu terminal (se você está no Windows, clica na bandeirinha, digita cmd na busca. Se você está no Mac ou no Linux, basta procurar pelo aplicativo Terminal)e digite: ping [facebook.com](https://www.facebook.com)

Se eu digitar esse número (31.13.76.68) no meu navegador agora eu vou parar no facebook. Não adianta você digitarem esse, viu!? Isso está atrelado à rede que vocês estão conectados e para qual dos endereços do facebook vocês foram sorteados, ele tem várias “casas”. Já pensou se todo mundo tivesse que entrar pela mesma porta na casa do facebook!? Ia congestionar! É isso que acontece no mundo digital também, se todo mundo tentar acessar o mesmo servidor, temos problemas! Vai mudar se você fizer isso no computador da sua casa ou da escola.

## Front-end & Back-end

O front-end de um sistema é a parte que você como usuário consegue enxergar e usar, em resumo é a aparência de um site, a cor, os detalhes, tudo isso é front-end. Você já viu o efeito de zoom nas imagens do Aprendiz Web? Isso foi feito pelo programador front-end.

O back-end de um sistema é a parte que você como usuário não consegue ver e nem usar. Mas ela é fundamental para a existência de um site ou sistema.

No mundo front-end existem 3 importantes tecnologias (HTML, CSS e Javascript).

- ▶ Linguagem de Programação: Javascript
- ▶ Linguagem de Marcação: HTML
- ▶ Linguagem de Folhas de Estilo: CSS

As linguagens de programação back-end são: Ruby, Java, Python, PHP, Cobol, Fortran, dentre outras.

Back-end consiste basicamente em 3 partes: Um servidor, uma aplicação, um banco de dados. Se você faz uma compra online, durante as telas do processo de compra, muita coisa está acontecendo por trás: dados sendo processados, requisições chamando e consultando o banco de dados,

linhas e linhas de código sendo processadas, arquivos sendo carregados, tudo invisível a “olho nu”.

Detalhando as três partes:

- ▶ Servidor: É a casa. Onde fica hospedado os arquivos do projeto, onde possui todas as tecnologias necessárias para computar tudo, desde programação backend para ser interpretada até o mais alto nível que será exibido ao usuário.
- ▶ Aplicação: O projeto em si.
- ▶ Banco de dados: Há casos que dispensam, mas quando há o conjunto é necessário um banco de dados que armazena, organiza e informa o código sobre o que será exibido e/ou processado. o PHP é uma das principais linguagens que funciona como ponte de comunicação entre o banco de dados e a ação final, exibida ao usuário e podendo ser manipulada por ele.

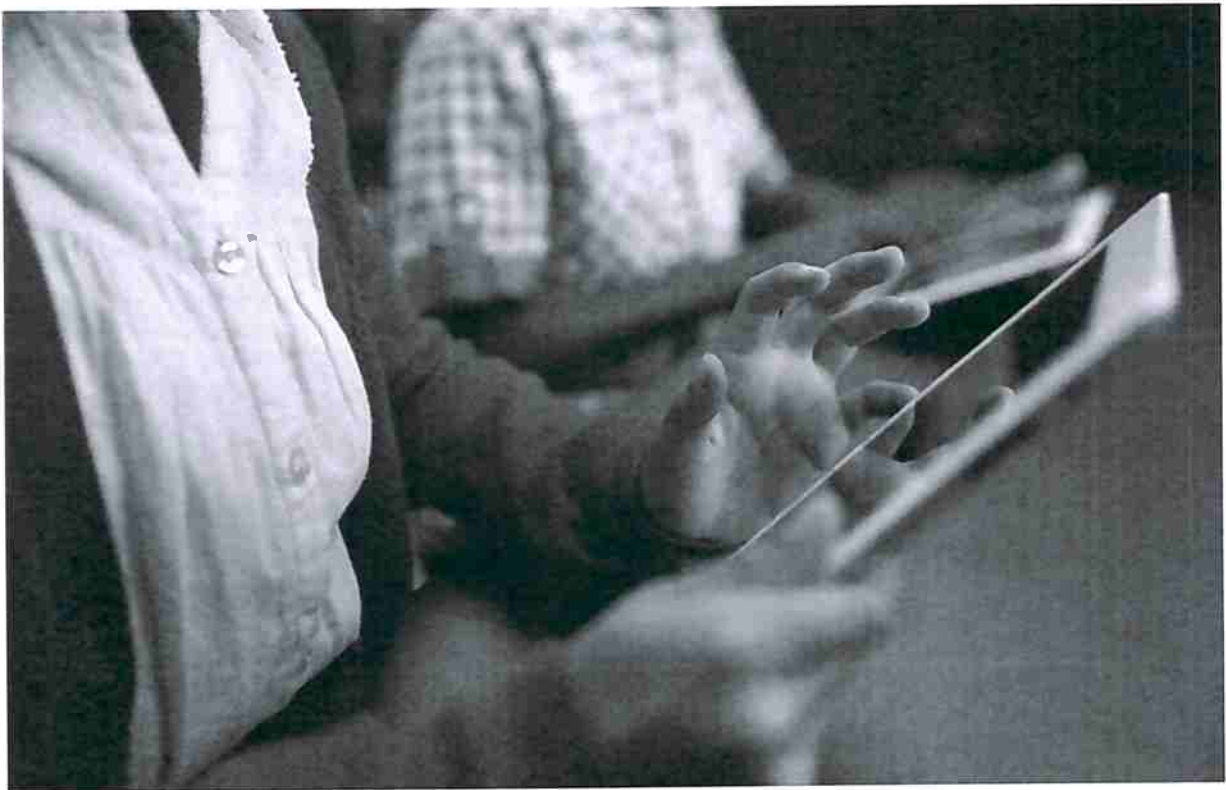
Tanto o front-end quanto o back-end fazem parte da programação. Essas duas vertentes se comunicam afim de formar um produto final: seja um site, um aplicativo ou uma aplicação. Uma não faz sentido sem a outra. Não existe um nível de importância, sabe!?

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Entendendo, produzindo e inovando com tecnologia



AULA 02 - Vida Digital: Entendendo e Avaliando.

*1º Edição*

# VIDA DIGITAL: O que é isso?

Dado *versus* Informação

Antes de começar reflitam entre vocês quais as diferenças entre dados e informação? Será que é a mesma coisa?

Escrevam em algum lugar o que vocês pensam que é cada uma dessas coisas e só aí passe para a próxima página : )

Definições para dados e informação segundo o Aurélio:

Dados: "Elemento de informação, ou representação de fatos ou de instruções, em forma apropriada para armazenamento, processamento ou transmissão por meios automáticos".

Informação: "Conhecimento amplo e bem fundamentado, resultante da análise e combinação de vários informes; Coleção de fatos ou de outros dados fornecidos à máquina, a fim de se objetivar um processamento".

No nosso dia-a-dia ouvimos muito sobre dados e informação. Mas sabemos qual a real diferença entre esses dois termos? No primeiro momento podemos até achar que tudo é a mesma coisa, pensar que os conceitos são os mesmos, mas na verdade não são! Dado é uma coisa, informação é outra. Veremos...

Mas afinal qual a diferença?

Ambos são o alicerce para a construção do conhecimento. Sem dados e informações isto seria impossível.



O dado não possui significado relevante e não conduz a nenhuma compreensão. Representa algo que não tem sentido a princípio. Portanto,

não tem valor algum para embasar conclusões, muito menos respaldar decisões.

Já a informação é a ordenação e organização dos dados de forma a transmitir significado e compreensão dentro de um determinado contexto. Seria o conjunto ou consolidação dos dados de forma a fundamentar o conhecimento.

Entenderam??? Temos que trabalhar pra transformar dados em informação. E hoje o que não falta é dado na internet...mas anda faltando informação! ;)

# COMO AVALIAR FONTES E INFORMAÇÕES?

Repare no autor e/ou curadoria

Pensando nisso, aí vão algumas dicas para ajudar você a avaliar as fontes de conteúdo na internet:

**1 - Credibilidade das informações:** observe a existência de instituição e/ou pessoa física responsável pelo conteúdo disponibilizado, além de credenciais e formas de contato, caso necessite sanar quaisquer dúvidas;

**2 - Atualização do conteúdo:** verifique quando a página foi atualizada pela última vez, certificando-se de que o conteúdo é atual e, também, teste os links (uma fonte atualizada não apresenta links quebrados);

**3 - Qualidade da informação:** avalie fatores como a coerência com as normas cultas, se existe foco do conteúdo e a consistência estrutural com que a informação é apresentada em toda fonte;

**4 - Segurança:** analise as questões de acesso restrito e a proteção contra aqueles não autorizados;

**5 - Usabilidade:** atente para a facilidade de uso e navegação e ao design, se é apropriado ao propósito da fonte;

**6 - Consistência e relevância:** considere a coerência na abordagem do conteúdo, se há referências a fontes pesquisadas, se a cobertura (temporal e temática) está de acordo com a que se propôs a fonte;

Vamos prestar atenção em tudo isso a partir de agora?

E não se esqueçam de colocar a fonte de onde vocês tiraram qualquer dado ou informação!



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# Literacia3.0

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Entendendo, produzindo e inovando com tecnologia



AULA 03 - Rede Social e o Poder da Internet.

*1º Edição*

# Redes sociais

O significado de um share: a foto do Papa

Já pararam pra pensar o que significa dar um share? Antes de continuar lendo escrevam em um pedaço o que você pensa antes de “dar um share”.

Se você escreve que é simplesmente apertar um botão, vamos pensar um pouquinho no significado de dar um share:

Significado do *share*

Quando apertamos aquele botãozinho de compartilhar, retweetar, repost estamos apoiando uma causa. Hoje, todos nós somos produtores de conteúdo, alguns só não perceberam isso. Pense nos youtubers.

Estamos em uma sociedade que colabora e se ajuda seja na vida real ou na virtual. Ao compartilhar e passar aquela foto, vídeo ou texto para a sua rede você está ajudando as ideias iram pra frente, alcançarem mais pessoas. Não usem desse poder sem ter certeza, só por ímpeto ou obrigação, ok?! Reflitam! Você está mostrando concordância com tal ideia.

E hoje em dia, nossas redes sociais são nossa cara para o mundo. Quem estuda com você, quem quer te conhecer, seus futuros empregadores, seus pais estão acompanhando tudo!

Para terminar, queria que vocês vissem essas fotos:





Elas estão separadas temporalmente por quase 10 anos e mostram como a tecnologia evoluiu no mundo nos últimos oito anos. A primeira, mostra a passagem do corpo do papa João Paulo 2º, em 2005; a segunda, a escolha do Papa Francisco, o cardeal argentino Jorge Mario Bergoglio, em 2013.

Além do avanço tecnologia, temos representado aqui a necessidade de compartilhar e registrar tudo virtualmente para compor nossa identidade digital. Vamos tomar cuidado para não deixar de viver a realidade e ver tudo por uma telinha de celular?

## Boas e más práticas

Refletindo sobre nosso uso de redes sociais vamos trabalhar para construir juntos uma lista de boas e más praticas.

Peguem pedaços de papel e gastem 10 minutos escrevendo tudo que podemos fazer de errado, não pensem só naquilo que vocês fizeram, mas em tudo que podemos fazer de errado, tipo compartilhar um vídeo que não vimos até o final e eles ser totalmente contrário ao que pensamos.

Feito!? Agora pega outra folha e gastem mais 10 minutos escrevendo tudo de bom que podemos fazer usando internet, tipo manter sua prima que mora longe informada sobre o que está rolando na sua vida e nem parecer que ela mora tão longe...

Agora com os dois lados da moeda vamos pensar em atitudes que podemos tomar para repetir mais vezes as coisas boas e deixar de fazer as coisas ruins.

Vamos começar pelas coisas erradas, sem necessidade de propor uma ordem alguém lê uma das coisas que escreveu e todos que tem algo parecido podem simplesmente riscar da folha sem qualquer comentário, ou acrescentar algo a discussão. O segundo momento é a reflexão sobre qual a atitude devemos tomar para que isso não se repita...vamos repetir esse processo até que todas as coisas que escrevemos no papel tenham sido riscadas.

Quando acabamos a parte das coisas erradas partimos para as boas práticas, ações que podemos tomar para que as coisas boas que fazemos usando redes sociais aconteçam mais vezes.

Com as más e boas práticas vamos nos tornar mais críticos com o uso de tecnologia e mais especificamente redes sociais e vamos assim colaborar para um mundo digital melhor, acreditem em mim!

# Poder da tecnologia

## Tecnologias Exponenciais

Você conhecem a Lei de Moore? Ela diz que: transistores nos circuitos integrados dobra a cada dois anos.. E na prática o que isso significa? A cada dois anos a velocidade de processamento dobre e o custo cai pela metade.

Hoje vivemos um momento no qual várias tecnologias estão a seguir essa mesma regra de Moore antes aplicada somente para computadores. Estas são as tecnologias exponenciais! Algumas das áreas são:

- Energia;
- Equipamentos médicos e laboratoriais;
- Biologia sintética;
- Robótica;
- Manufatura 3D (impressão 3D);
- Inteligência artificial (IA);
- Comunicações;

Em todos esses campos estão acontecendo três coisas:

- (i) as tecnologias/produtos estão se tornando 'digitais';
- (ii) o desempenho cresce exponencialmente; e
- (iii) os preços caem exponencialmente.

E só para vocês terem uma ideia do que significa exponencialmente vamos fazer uma comparação usando passos e onde podemos chegar aumentando eles linearmente e exponencialmente:

Seqüência com crescimento linear é: 1, 2, 3, 4, 5, 6, 7...

Seqüência com crescimento exponencial é: 1, 2, 4, 8, 16, 32...

Dá pra perceber que a diferença do crescimento exponencial pro linear é grande. Mas na verdade é muito maior do que você imagina.

Se você der 30 passos (cada passo com 1 metro) lineares, você anda 30 metros, certo!?

Se você der 30 passos (cada passo com 1 metro) exponenciais, você daria 26 voltas na Terra!!!! OMG!!!

Como isso está acontecendo? Cada vez mais é a partir de modelos computacionais (digitais) de estruturas atômicas, moleculares, proteicas, neurais etc. que novos materiais, formas vivas e 'formas de inteligência' são criadas.

As aplicações médicas e outras (neurotecnologias) se valem desses avanços combinados: biologia sintética, bioinformática, impressão 3D, IA etc. Vem um mundo novo por aí.

Por que não percebemos muitas vezes esses movimentos? Bem.... muitas das tecnologias ainda estão no início, parecem ser de nicho, apresentam baixo desempenho (mesmo que dobre a cada ano, você provavelmente não irá perceber)... mas no final da história acabam por 'redefinir' um indústria.

Talvez você não esteja vendo, mas a mudança vem aí! Fique de olho, pois experimentaremos muitas transformações!

Vamos entender um pouco melhor cada uma delas?

## Drones

A associação mais simples para entender o que são drones, e mesmo para que servem, é lembrar de brinquedos de controle remoto. O conceito é simples: com um controle via rádio, você pode manobrar um drone sem tocar nele. No geral, estes aparelhos são concebidos para realizar tarefas arriscadas ao ser humano ou ferramentas para trabalhos que ninguém quer realizar.

Essas características ajudam a entender como esses equipamentos se tornaram muito comuns entre aparatos militares e de vigilância. No entanto, há aplicações mais pacíficas, como no uso profissional de fotógrafos, resgates e limpeza de lixo tóxico.

Aí vão as foto de algum deles:





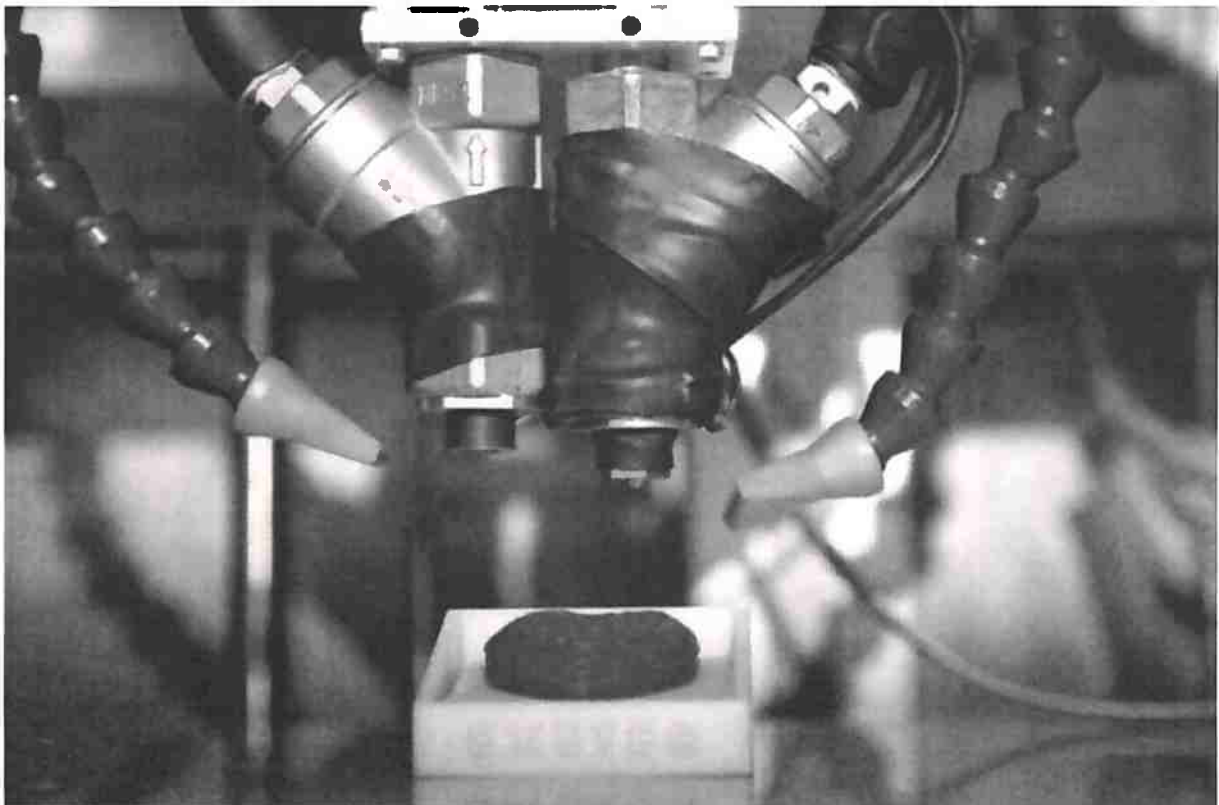
## Impressão 3D

As impressoras 3D conseguem imprimir qualquer tipo de coisa utilizando a tecnologia de impressão tridimensional. Os materiais usados na impressão costumam ser resina plástica e modelagens com laser, e sua estrutura é de metal. Ao fazer a leitura de arquivos para impressora 3D, é possível criar os mais diversos tipos de objetos, como peças decorativas, alimentos e até mesmo tatuagem.

Aí vão as fotos de alguns delas:



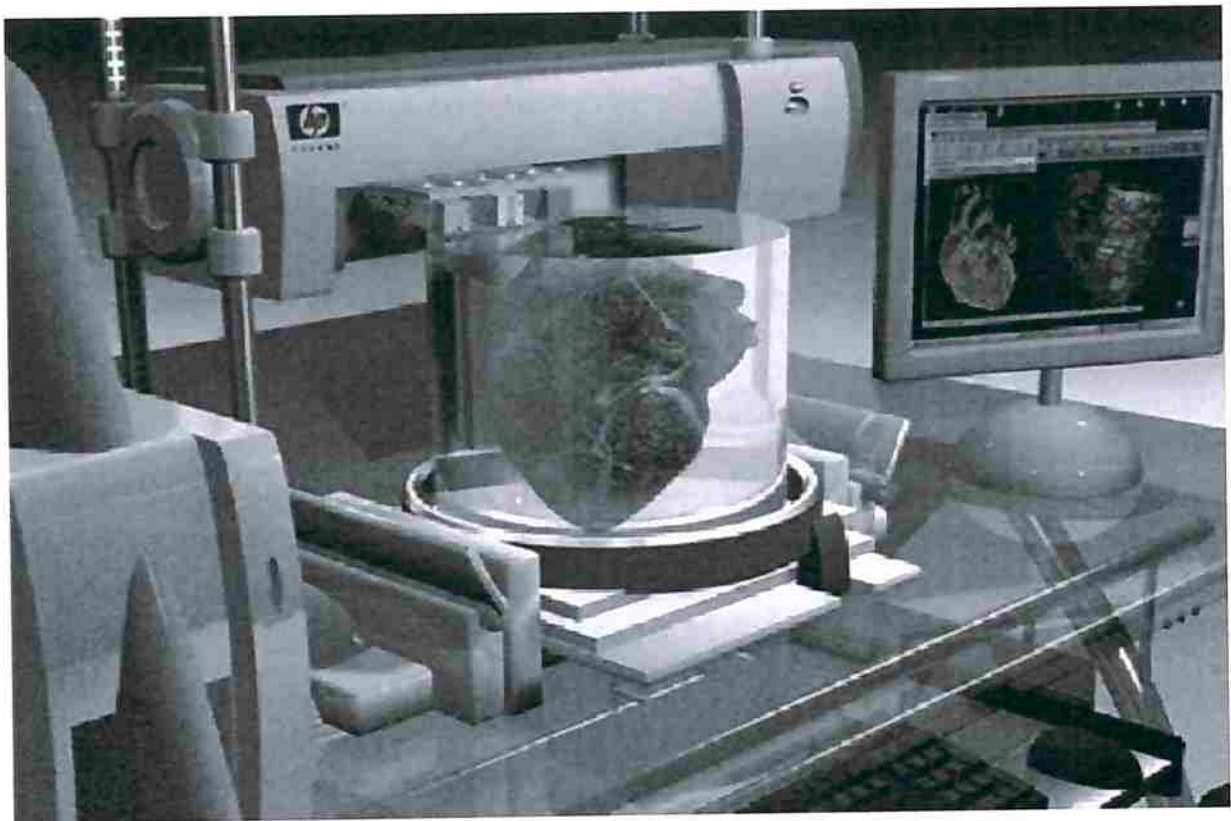
Além de brinquedos e miniaturas podemos imprimir comida, tipo chocolate...já imaginou?







E olha esse projeto: impressão de próteses. Conseguimos fazer próteses nas medidas do paciente a um custo muito baixo.



E impressão de órgãos...já pensou? Isso já é uma realidade!

## Inteligência Artificial

Inteligência Artificial (IA) é um ramo da ciência da computação que se propõe a elaborar dispositivos que simulem a capacidade humana de raciocinar, perceber, tomar decisões e resolver problemas, enfim, a capacidade de ser inteligente.

Existente há décadas, esta área da ciência é grandemente impulsionada com o rápido desenvolvimento da informática e da computação, permitindo que novos elementos sejam rapidamente agregados à IA.

Hoje em dia, são várias as aplicações na vida real da Inteligência Artificial: jogos, programas de computador, aplicativos de segurança para sistemas informacionais, robótica (robôs auxiliares), dispositivos para reconhecimentos de escrita a mão e reconhecimento de voz, programas de diagnósticos médicos e muito mais.

## Internet das Coisas

A “Internet das Coisas” se refere a uma revolução tecnológica que tem como objetivo conectar os itens usados do dia a dia à rede mundial de computadores. Cada vez mais surgem eletrodomésticos, meios de transporte e até mesmo tênis, roupas e maçanetas conectadas à Internet e a outros dispositivos, como computadores e smartphones.

A ideia é que, cada vez mais, o mundo físico e o digital se tornem um só, através dispositivos que se comuniquem com os outros, os data centers e suas nuvens. Aparelhos vestíveis, como o Google Glass e o Smartwatch 2, da Sony, transformam a mobilidade e a presença da Internet em diversos objetos em uma realidade cada vez mais próxima.

Aí vai um vídeo para te ajudar a entender melhor sobre o assunto:

<https://www.youtube.com/watch?v=jlkvzcG1UMk>

# Primeiros passos em programação: HTML

Onde achar informações confiáveis

Quando o assunto é HTML e CSS o melhor site é o: [www.w3schools.com](http://www.w3schools.com). Ele é o maior site de desenvolvimento web do mundo e está em inglês! Mas calma, se seu inglês não é dos melhores basta clicar no globinho no canto superior direito e escolher português que o site inteiro será traduzido.

Além de achar a documentação para quase tudo lá no site ainda tem um espaço chamado *Tutorials* (esse aqui é o de HTML: [http://www.w3schools.com/html/html\\_intro.asp](http://www.w3schools.com/html/html_intro.asp)), que tem uma sequência de conteúdos para você aprender tudinho sobre HTML e CSS.

Outra ótima referência é a Codecademy. O curso de HTML & CSS em português está aqui: <https://www.codecademy.com/pt-BR/learn/web>. Completando esse curso você está preparado pra fazer seu site! E a melhor notícia de todas: é gratuito! Não tem desculpa, hein!?

Pensa em um esqueleto

Antes de entrar nos detalhes de HTML e CSS queria que vocês lembrassem de um esqueleto toda vez que ouvir HTML. E porquê isso? HTML é uma linguagem de marcação, o que quer dizer que ela marca onde as coisas vão ficar no seu site e não como. Entenderam a diferença? E é por isso que todo arquivo em HTML tem HEAD, BODY e FOOTER, que em português significam: CABEÇA, CORPO e PÉS.

Já quando falarem em CSS pensem em algo como a pele para o nosso esqueleto, que cobre tudo e deixa as coisas serem como são. É o CSS que define cores, tamanhos e espaçamentos. Por enquanto vamos trabalhar só com HTML e na próxima aula aprendemos como usar CSS, ok?!

Feita essa comparação vamos as bases do HTML : )

```
<!DOCTYPE html>
<html>
<head>
<meta charset="utf-8"/>
<title>Título da Página</title>
</head>
<body>

<h1>Isso é um título!</h1>
<p>Isso é um parágrafo.</p>

</body>
</html>
```



## Isso é um título!

Isso é um parágrafo.

Agora é a vez de vocês. Digitem esse texto em um editor e salve com o nome teste.html. Se você clicar nesse arquivo ele já vai abrir no navegador e você vai ver tudo bonitinho!

Com a estrutura geral você pode começar a descobrir quais tags fazem o que você quer. Basta lembrar que todas as tags como `<p>`, `<h1>` vão dentro do `<body>` que é o seu conteúdo e todas elas têm que abrir e fechar, ok!? Comece pesquisando por essas aqui: `<em>`, `<strong>`, `<a href=" " ></a>`, `<ul>`, `<li>`, `<ol <br />`, ``, `<span style="color: green;" ></span>`

### Inspector

A última dica dessa aula é o Inspector. Se você abrir qualquer site no Chrome (se você não tem ele instalado tem nesse link aqui: <https://www.google.com.br/chrome/browser/desktop/>) e clicar com o botão direito do seu mouse, vai ter a opção Inspect.

w3schools .com

O maior site de WEB desenvolvedora do mundo

The screenshot shows the w3schools.com website. The main heading is "HTML" with the subtitle "A linguagem para a construção de páginas web". There are two buttons: "Aprender HTML" and "REFERÊNCIA HTML". On the right, the browser's developer tools are open, showing the "Inspect" tool. The "View Page Source" option is selected, displaying the HTML code for the page, which matches the code shown in the first image. The code includes a title "HTML Tutorial" and a heading "This is a heading" followed by a paragraph "This is a paragraph".





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# Literacia3.0

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Entendendo, produzindo e inovando com tecnologia



AULA 04 - Produtividade, Privacidade e Segurança

*1º Edição*

# Privacidade e Segurança.

Privacidade

Mas afinal o que é Privacidade? Você acha que esse conceito mudou com a chegada do celular e da internet?

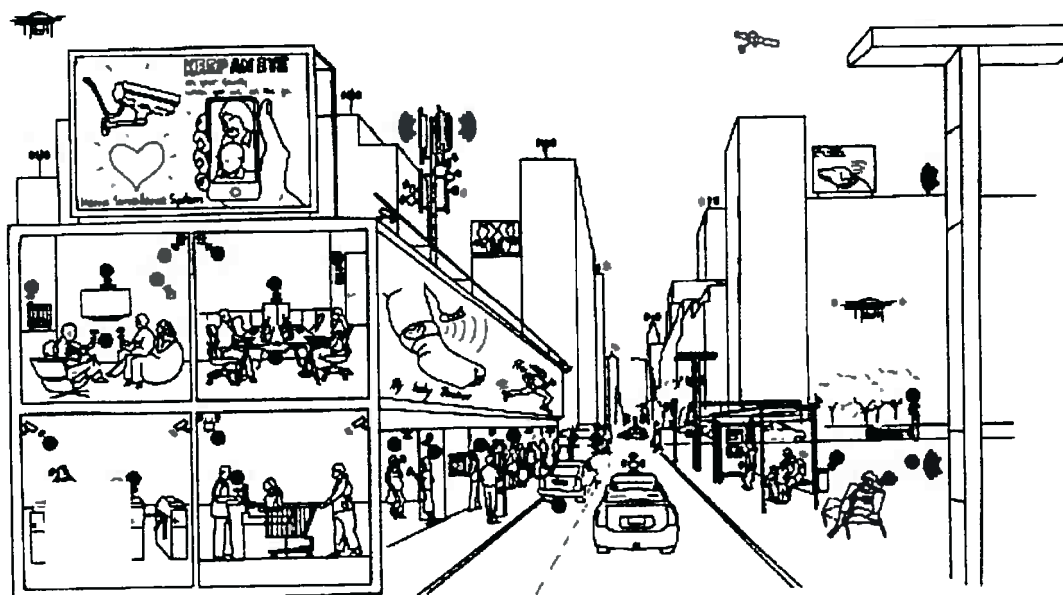
Se você acha que não lê esse texto do jornal El Pais aqui embaixo com ainda mais atenção:

## O que acontece com nossos dados na internet?

As informações pessoais se tornaram mais um produto comprado e vendido

GEMMA GALDON CLAVELL

12 JUN 2015 - 00:00 CEST



Todos nós ouvimos dizer alguma vez que quando um produto é aparentemente gratuito é provável que na verdade estejamos pagando por ele com dados. Isso acontece com as redes sociais, os cartões de fidelidade de lojas e supermercados ou com infinitos aplicativos que oferecem serviços mais ou menos relevantes em troca, somente, dos nossos dados pessoais.



## **UMA VIDA VIGIADA**

Tecnologia e dispositivos que produzem ou armazenam dados de nossas atividades diárias:

- 1/6/14.** Videovigilância: as imagens podem ser interceptadas.
- 2.** Medidores de eletricidade e termostatos: fornecem informação sobre hábitos.
- 3/4.** Televisores inteligentes e consoles de videogames: possuem câmeras e microfones.
- 5.** Controles biométricos de entrada e saída.
- 7.** Monitoramento remoto no trabalho: capturas de tela para medir a produtividade do trabalhador.
- 8.** Bases de dados pessoais: podem conter dados fiscais e de saúde dos clientes.
- 9.** Sensores de contagem de pessoas: monitoram o fluxo de compradores e os tempos de compra.
- 10.** Cartões de fidelidade: em troca de descontos, criam perfis do comprador.
- 11.** Ibeacons: enviam ofertas para celulares próximos.
- 12.** Wifi gratuito: pode ser oferecido em troca do acesso ao perfil do Facebook.
- 13.** Bilhetes de transportes públicos: cartões recarregáveis que produzem dados de deslocamentos.
- 14.** Redes de bicicletas públicas: registro dos trajetos.
- 15.** Carros: existem sistemas para ler as placas.
- 16.** Telefonia móvel: permite geolocalizar.
- 17.** Câmeras térmicas e sensores sonoros: medem o fluxo de pedestres e níveis de ruído.
- 18.** Mobiliário urbano que detecta a presença de pedestres.
- 19.** Sistemas de estacionamento: o pagamento com cartão de vagas azuis e verdes gera dados do usuário.

Na verdade, cada vez que visitamos uma página com o computador, o celular ou o tablet, recebemos dezenas de pedidos de instalação de *cookies*. Somos, portanto, o produto, porque em troca da informação que obtemos fornecemos detalhes sobre nossa atividade *online* e, frequentemente, dados pessoais como nome e localização, hábitos, cartão de crédito, etc., sobre os quais não temos nenhuma maneira de controlar para onde eles vão. Diante disso, o único recurso de autoproteção é não aceitar *cookies* e renunciar ao serviço, ou excluí-los sistematicamente do nosso computador, algo tão enfadonho como escassamente útil.

O Facebook, rede social utilizada por mais de um bilhão de pessoas por mês, dispõe dos dados que o usuário deposita voluntariamente nele, mas também faz inferências com base em nossas interações com pessoas e informações, compartilha-as com terceiros e desenvolve um perfil único que permite determinar o que aparece no nosso mural, tanto por parte de nossos amigos como de anunciantes. Todo “curtir” ou registro feito por meio do Facebook gera informações que são analisadas e classificadas por algoritmos tanto para nos conhecer em nível individual quanto como consumidores, para desenvolver perfis sociais para agências de publicidade. O registro continua mesmo que tenhamos fechado a página: a não ser que saíamos manualmente, os *cookies* do Facebook continuam espionando tudo o que fazemos *online*.

O espaço doméstico é talvez aquele onde esse monitoramento dos nossos movimentos e rotinas para elaborar padrões vendáveis aumenta de forma mais preocupante: todos os eletrodomésticos inteligentes, do medidor de energia elétrica ao aparelho de televisão, passando pela geladeira, constroem uma rede de extração de dados que quer aperfeiçoar a imagem de quem somos, do que queremos e do que podemos querer. O desafio é ser capaz de se antecipar às nossas necessidades para nos tentar a comprar produtos ou serviços que ainda não sabemos que desejamos. Pagamos duas vezes: quando adquirimos o eletrodoméstico ou pagamos a conta de luz, em dinheiro, e a cada vez que proporcionamos informações, com dados pessoais.

Algumas empresas começaram a explorar a possibilidade de se tornarem *data brokers* dos cidadãos, uma espécie de corretores de dados que gerenciariam nossa informação, devolvendo-nos parte dos lucros gerados por ela. Que ninguém espere ficar rico: no momento, as empresas que tentam abrir caminho nesse mundo obscuro não pagam mais do que alguns euros por mês em troca de informações tão sensíveis como dados médicos ou bancários. Por enquanto, o verdadeiro dinheiro não está na relação entre os cidadãos e os serviços que coletam dados. A economia dos dados ainda é pouco mais do que uma promessa, da qual até agora se beneficiam muito poucos atores (Facebook, Tuenti, Google, Foursquare, YouTube, etc.), e mais pela febre de investimento do que pelos resultados. Na aurora dessa promessa de negócio proliferam corretores de dados dedicados ao cruzamento de diferentes bases para aumentar o preço de venda dos perfis gerados a partir do cruzamento de informações de atividade *online* e *offline*: relatórios médicos, por exemplo, podem adicionar muito valor a um histórico de busca na internet.

**Algumas empresas já exploram a possibilidade de se tornar 'brokers' de dados dos cidadãos**

Para algumas pessoas, esse cenário não provoca nenhuma inquietude. Pagar com informação própria também abre a porta para a promessa de serviços personalizados e atenção individualizada. No entanto, os corretores de dados não se limitam a cruzar detalhes do que compramos, com quem interagimos e do que gostamos. Esse comércio inclui também, e cada vez mais, relatórios médicos, dados fiscais e de renda ou bancários. O tipo de informação que pode determinar se nos concederão um crédito, se nos oferecerão um plano de saúde mais ou menos caro ou se conseguiremos um emprego. De repente, o preço pago com informações pessoais surge como algo totalmente desproporcionado e incontrolável.

**Gemma Galdon Clavell**, é doutora em políticas públicas e diretora de pesquisa da *Eticas Research and Consulting*.

A aí? Mudou de ideia? Vamos começar a refletir sobre quais sites e aplicativos vamos usar? Mais do que isso, como vamos usar cada um desses aplicativos!

## Criptografia e as cifras de César

As **senhas** foram criadas com o intuito de proteger algo (pasta, arquivo ou sistema). Já a **criptografia** foi criada para proteger essas senhas e também arquivos, pastas e sistemas, de forma que os mesmos se tornem ilegíveis.

**Criptografia:** conjunto de regras que visa codificar a informação de forma que só o emissor e o receptor consiga decifrá-la. A primeira técnica criada de criptografia foi a **Cifra de César**.

---

Cifras de Cesar:

A transformação pode ser representada alinhando-se dois alfabetos; o alfabeto cifrado é o alfabeto normal rotacionado à direita ou esquerda por um número  $n$  de posições.

EXEMPLO: Cifra de César esquerda com chave 3

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  
D E F G H I J K L M N O P Q R S T U V W X Y Z A B C



esquerda



Direita

Então a mensagem: *“Olhe para a direita”* criptografada seria: *“ROLH SDUD D GLUHLWD”*

---

Como quebram nossas senhas?

Já parou pra pensar como é possível descobrirem/roubarem/copiarem/chutarem e acertarem nossas senhas?

Aí vai a explicação das 3 principais maneiras de se fazer isso:

1. Força bruta;
2. Redes sociais; para hackear seu login e senha
3. KeyLogging.

#### Força bruta:

- aqui o que rola é o famoso chute. Em geral ele não é feito manualmente o que acelera um pouco as coisas e outra estratégia é começar tentando pelas senhas mais comum por aí...por exemplo essa listagem aqui embaixo:

1º	123456	11º	123123
2º	password	12º	admin
3º	12345678	13º	1234567890
4º	qwerty	14º	letmein
5º	abc123	15º	photoshop
6º	123456789	16º	1234
7º	111111	17º	monkey
8º	1234567	18º	shadow
9º	iloveyou	19º	sunshine
10º	adobe123	20º	12345

#### Redes sociais:

- Assim como podemos começar tentando com as senhas mais comuns, as redes sociais têm sido muito usadas para compôr possíveis senhas. Afinal lá temos os nomes das pessoas mais importantes das nossas vidas, temos as datas de aniversário e assim por diante. Por isso, cuidado com o que você tem postado nas suas redes sociais.

#### KeyLogging:

- Entre os “truques” mais utilizados para “roubar” informações está o keylogger, um programinha capaz de gravar tudo o que é digitado no teclado, incluindo as senhas! Keyloggers podem estar na forma física com um pendrive ou ser um programinha. Por isso para se proteger evite digitar informações muito importantes em computadores desconhecidos sem antes dar um olhadinha se não tem nada estranho com ele.

# Produtividade

## Cloud

Sabe quando alguém diz para colocar na nuvem? Ele está querendo fazer isso para que esse documento, foto ou vídeo possa ser acessado de qualquer lugar em qualquer computador. E essa é a primeira dica para sermos mais produtivos.

Se você tiver sempre a mão tudo que precisa, vai ser bem mais fácil encontrar aquela informação importante ou transferir coisas para alguém.

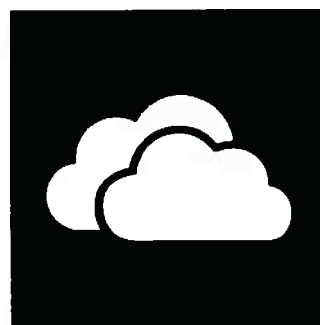
Hoje temos vários aplicativos e sites que ajudam a gente nessa missão. Os principais são:



Google Drive



DROPBOX



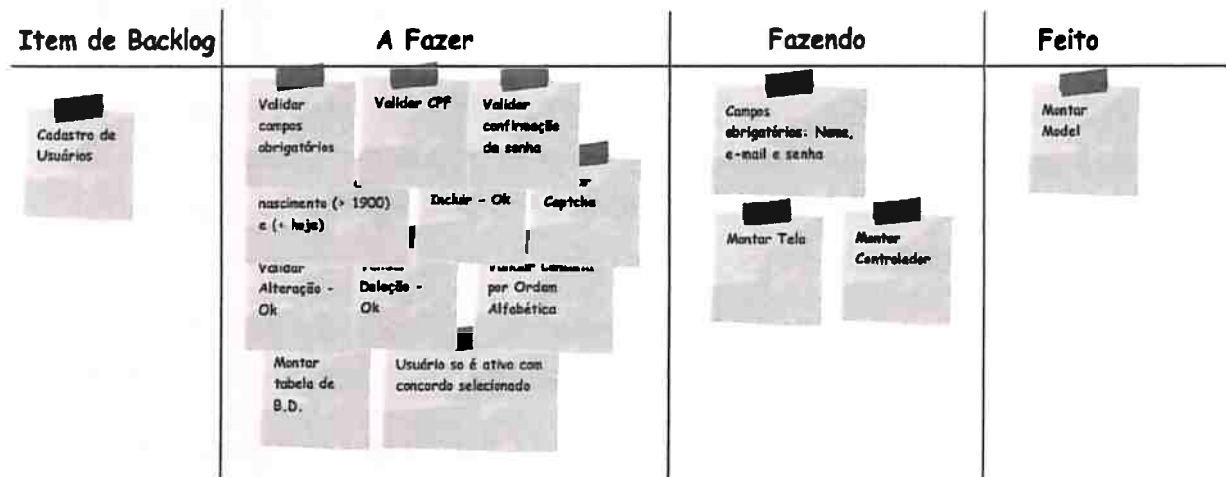
OneDrive

## Kanban e nossas listas

A palavra KANBAN vem do Japão: kanban significa “placa ou registro visíveis”. Mas a gente pode pensar nessa palavra como uma ferramenta muito útil pra produtividade.

Para ficar bem simples: imaginemos um quadro. Nele, serão coladas as atividades, que em geral são escritas em post-its. E em geral trabalhamos com 3 colunas: Tarefas a fazer, Fazendo e Feitas, assim você pode ir

alterando as colunas de cada uma das tarefas a medida que elas forem sendo desenvolvidas. Dessa maneira é possível ter uma noção visual da sua produtividade. Olha aí um exemplo de kanban:



Você pode fazer esse quadro em uma cartolinha e usar post its : )

Além da versão offline, vale a pena dar uma olhada na ferramenta Trello, ela é uma ferramenta de kanban digital e gratuita. Não é demais?no

Pomodoro: como ter foco com tanta coisa?

A Técnica Pomodoro é um método de gerenciamento de tempo desenvolvido por Francesco Cirillo no final dos anos 1980. A técnica utiliza um cronômetro para dividir o trabalho em períodos de 25 minutos chamados de 'pomodoros'. O método é baseado na ideia de que pausas frequentes podem aumentar a agilidade mental.

Como vocês perceberam a técnica é velha, mas em tempos de 1000 e uma notificações ela vem sendo cada vez mais usada e o processo é bem simples:

- Escolher a tarefa a ser executada
- Ajustar um mecanismos de marcar 25 minutos, que você não precise ficar checando, pode ser um alarme por exemplo
- Trabalhar na tarefa até que o alarme toque;



- Fazer uma pausa curta (3 a 5 minutos)
- A cada quatro "pomodoros" fazer uma pausa mais longa (15-30 minutos).

Se você digitar no Google ou na loja de aplicativos do seu celular vai achar um app pra te ajudar nesse mecanismo. Senão um velho e bom relógio com cronometro já é mais que suficiente.

# Um pouco mais de Programação: HTML e CSS

Se você já completou a última aula e completou o curso do Codecademy ou gastou um tempinho no W3School tenho certeza que nada do que veremos agora será novidade.

HTML e CSS são duas linguagens que tem ligações entre si, estas ligações podem ser "ids" ou "classes", veja no exemplo abaixo, uma parte HTML, com um ID, e outra parte com uma CLASS.

```
<p id="descricao">Este é um parágrafo com ID descricao</p>  
<p class="descricao">Este é um parágrafo com a classe descricao</p>  
<!-- OBS.: a tag <p></p> marca um parágrafo em HTML. -->
```

No código acima criamos 2 parágrafos, um com o ID descricao, e outro com a classe descricao, o modo de utilização é "Abre tag HTML + id ou class + sinal de igual + aspas + nome do ID ou Classe + fecha aspas + fecha tag HTML" (Ex. <p id="nome\_da\_descricao">).

Vamos supor que você queira criar dois parágrafos, um com a cor verde e outro com a cor branca. Então isso poderia ser feito utilizando:

```
<p style="color:green;">Este é um parágrafo verde!</p>
<p style="color:white;">Este é um parágrafo branco!</p>
<!-- OBS.: a tag <p></p> marca um parágrafo em HTML. -->
```

Agora imagine que você tem que criar um parágrafo com o tamanho da fonte, colocando tudo em negrito, com a cor vermelha, itálico, e assim por diante, isso iria ficar mais ou menos assim:

```
<p style="font-family:Verdana, Geneva, sans-serif; font-weight:700; font-style:italic; font-size:12px; color:red;">
  Este é o parágrafo com a font Verdana, Negrito, Itálico, Tamanho da fonte 12px, cor vermelha
</p>
<!-- OBS.: a tag <p></p> marca um parágrafo em HTML. -->
```

Percebeu como tudo fica muito sem organização e que o código fica gigante? Então, para que isso não aconteça, você pode criar uma classe, e todos os parágrafos que terão as mesmas qualidades, terão esta classe.

O exemplo anterior ficaria assim, no arquivo CSS:

```
.descricao {
  font-family:Verdana, Geneva, sans-serif;
  font-weight:700;
  font-style:italic;
  font-size:12px;
  color:red;
}
```

Já nos parágrafos com as mesmas configurações, fica assim:

```
<p class="descricao">Parágrafo 1</p>
<p class="descricao">Parágrafo 2</p>
<p class="descricao">Parágrafo 3</p>
<p class="descricao">Parágrafo 4</p>
```

A diferença entre ID e Class, é que não podemos fazer a mesma coisa que fizemos anteriormente com as classes, o ID é único para cada uma das tags com este atributo. Portanto, utilizamos ID para criar a estrutura de nosso site, já que não seria muito simples, criar um ID para cada Parágrafo, por exemplo.

Para fazermos o mesmo que fizemos com os Parágrafos anteriores utilizando IDs, fica da seguinte maneira:

O arquivo CSS:

```
#descricao {
    font-family: Verdana, Geneva, sans-serif;
    font-weight: 700;
    font-style: italic;
    font-size: 12px;
    color: red;
}
```

O HTML:

```
<div id="descricao">
  <p>Parágrafo 1</p>
  <p>Parágrafo 2</p>
  <p>Parágrafo 3</p>
  <p>Parágrafo 4</p>
</div>
```

Então, para resumir tudo o que disse, você já sabe que pode utilizar ID para agrupar várias configurações em uma área do site (id é único), e pode agrupar várias áreas do site utilizando uma classe (várias tags com a mesma classe).

Muito bem, mas como vamos agrupar cada área do site?

Olhando para o exemplo anterior deu pra perceber o que fiz para agrupar todos os Parágrafos? Isso mesmo, se você está lendo atentamente, vai notar que existe uma tag chamada `<div id="descricao">` e fechada com `</div>`, tudo o que está dentro da DIV com a id descricao, terá as configurações que você escolheu no seu arquivo CSS.

A tag DIV, é utilizada a nível de bloco, como vimos no último código HTML, existe uma DIV que serve apenas para dizer que aquela área do site tem o ID descricao, então podemos utilizar o CSS para configurar tudo o que está dentro dessa DIV, já a tag SPAN, é um elemento neutro e que não adiciona qualquer tipo de semântica ao documento, isso quer dizer que, dentro um uma DIV, eu posso criar várias TAGs SPAN para modificar uma pequena Área. Veja o Exemplo:

```
<div id="descricao">
  <p>Parágrafo <span class="outra_classe">1</span></p>
  <p>Parágrafo 2</p>
  <p>Parágrafo 3</p>
  <p>Parágrafo 4</p>
</div>
```

Suponhamos que eu tenha um Parágrafo com a frase "Tenho uma blusa vermelha":

```
<div id="descricao">
  <p>Tenho uma blusa vermelha</p>
</div>
```

Agora eu quero que a palavra "vermelha" apareça na cor vermelha, então fica assim:

```
<div id="descricao">
  <p>Tenho uma blusa <span style="color:red;">vermelha</span></p>
</div>
```

## Integrando CSS e HTML

Existem várias formas de integrar o CSS com HTML, vamos ver algumas delas:

- ▶ No mesmo arquivo

Você pode utilizar o CSS no mesmo arquivo utilizando a estrutura do HTML e a TAG <style>. Essa TAG deve ficar abaixo do fechamento da tag HEAD (</head>), vamos continuar com nosso exemplo:

```
<html>
  <head>
    <title>Título do Documento</title>
  </head>
  <style>
    #descricao {
      font-family:Verdana, Geneva, sans-serif;
      font-weight:700;
      font-style:italic;
      font-size:12px;
      color:red;
    }
  </style>
  <body>
    <div id="descricao">
      <p>Parágrafo <span class="outra_classe">1</span></p>
      <p>Parágrafo 2</p>
      <p>Parágrafo 3</p>
      <p>Parágrafo 4</p>
    </div>
  </body>
</html>
```



► Na DIV ou SPAN

Você também pode utilizar o CSS dentro de uma DIV ou SPAN, deste modo:

```
<html>
  <head>
    <title>Título do Documento</title>
  </head>
  <body>
    <div style="color:red;">
      <p>Parágrafo <span style="color:green;">1</span></p>
    </div>
  </body>
</html>
```

Ou seja, você cria uma DIV ou SPAN e coloca com a palavra STYLE para fazer as configurações, deste modo: <div style="AQUI VEM O CSS"></div> ou <span style="AQUI VEM O CSS"></span>

► Em arquivo externo

O modo mais utilizado para integrar o CSS com o HTML, é em arquivo(s) externo(s), você cria um arquivo com a extensão .css (ex.: config.css) e faz uma referência dentro da sua tag HEAD, vamos ver o exemplo:

```
<html>
  <head>
    <title>Título do Documento</title>
    <link rel="stylesheet" type="text/css" href="config.css" />
  </head>
  <body>
    <div id="descricao">
      <p>Parágrafo <span class="outra_classe">1</span></p>
      <p>Parágrafo 2</p>
      <p>Parágrafo 3</p>
      <p>Parágrafo 4</p>
    </div>
  </body>
</html>
```

O formato da referência é:

```
<link rel="stylesheet" type="text/css" href="CAMINHO DO ARQUIVO CSS" />
```

Onde você deve substituir "CAMINHO DO ARQUIVO CSS", pelo caminho do seu arquivo (Ex.: /css/config.css).

Clique em arquivo, "Salvar como..." e digite o nome "index.html".  
Salve o arquivo dentro de uma pasta.

Agora vamos criar o nosso arquivo CSS, para isso abra o bloco de notas e digite os códigos:

```
body {  
  font-family: Verdana, Geneva, sans-serif;  
  font-size: 12px;  
  color: #444;  
}
```

Clique em arquivo, "Salvar como..." e digite o nome "config.css" com aspas. Salve o arquivo dentro da mesma pasta.

## PRONTO! Agora você já pode fazer seu site!

**OBSERVAÇÃO:** Para essa atividade não é necessário conexão com a internet, porém se somente dispositivos móveis estiverem disponíveis não será possível acompanhar a atividade executando as tarefas.



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Entendendo, produzindo e inovando com tecnologia



AULA 05 -Introdução a programação

*1º Edição*

# INTRODUÇÃO A PROGRAMAÇÃO

O que é programação?

Embora a tecnologia esteja tão avançada, os computadores ainda não 'pensam' exatamente, no sentido literal da palavra. Eles não tem sentimento e nem raciocinam! Precisamos ajudá-los, afinal eles simplesmente executam o que lhe são ordenado.

As pessoas simplesmente não percebem, ou não precisam, ou acham que não precisam, e acabam por se contentar com o Facebook por exemplo, mas você pode sim ter o total controle sobre uma máquina dessas e usá-la para seus propósitos, quaisquer que sejam os seus planos, saber programar vai te ajudar. Em qualquer profissão por exemplo, você pode ensinar o computador a fazer muitas coisas e tornar automático muitos processos!

Mas e aí?! O que é programação?! Como começar a programar?! Pra que serve e onde é usado programação de computadores?! Com programação podemos:

- criar jogos;
- criar sistemas operacionais, tipo Windows e Android;
- criar programas para fazer suas tarefas no dia-a-dia para facilitar seu trabalho, como o Calendário do seu celular;
- fazer pesquisas científicas e/ou acadêmicas;
- realizar cálculos qualquer tipo;
- criar aplicativos, como Snapchat;
- criar o próximo Facebook;
- milhões, mas milhões de outras utilidades mesmo;

Programar é você dizer para o computador o que você quer, e ele simplesmente fará.

Mas como dizer isso? Falando? Em português? Inglês? E se eu gritar? Ou chutar a máquina? Resolve?

Não!

O que fazer então? Como me comunicar com ele? Através de linguagens de programação, ué! Vamos falar logo mais sobre os tipos de linguagem de programação.

## Conceitos Básicos

### Variável

Vamos começar com um exemplo! Que tal darmos um nome para o seu ano de nascimento? Em outras palavras, vamos atribuir um nome para ele, por exemplo nascimento. Fazemos isso da seguinte forma:

```
>>> nascimento = 2003
```

Primeiro escrevemos o nome da **variável** do lado esquerdo e dizemos que isso é igual ao valor que colocamos do lado direito.

A partir desse momento, sempre que nos referirmos ao nome "nascimento", o computador saberá que ele se refere ao valor que atribuímos acima.

Agora, vamos fazer as contas da idade que você terá em 2020, 2050 e 2075, só que vamos usar essa variável que acabamos de criar.

```
>>> 2020 - nascimento
```

```
17
```

```
>>> 2050 - nascimento
```

```
47
```

```
>>> 2075 - nascimento
```

```
72
```

Observe que eu usei o nome variável para me referenciar à nascimento, isso porquê esse valor também pode mudar, se quisermos. Podemos imaginar

uma variável como um pedacinho da memória do computador que armazena um determinado valor e pode ser chamado por um nome que escolhemos. **Imagina que é uma caixinha que você pode colocar coisas dentro e você coloca um rótulo, pra quando você for procurar pelo que está lá dentro você ache mais fácil.** Deu pra entender?!

## Procedimento

A partir de agora quando alguém falar de Procedimento, Função e Algoritmo quero que pensem em um passo a passo! Eles tem significados específicos, mas nesse momento não precisamos saber disso! : )

Lembra quando sua mãe pergunta se você está pronto pra ir pra escola? Ela não precisa falar todas as vezes todos os passos e “coisas” que você tem que ver para poder responder que sim, afinal vocês dois já sabem qual é o passo a passo explícito para ir pra escola. Não percebemos isso porque nosso cérebro é muito rápido e já estamos “no automático”.

**Então procedimento para um computador é uma sequência de passos que recebe um nome, ok!?** Aí só de falar esse nome já sabemos todos os passos! : )

## Tipos de Linguagem

### PROCEDURAL

É um dos mais conhecidos! Ela executa tarefas em série, ou seja, uma após outra, manipulando variáveis baseando-se em ordens ou comandos, onde variáveis são lidas num processo de entrada, manipuladas ou alteradas e por fim atualizando variáveis e gerando a saída.

Exemplos de linguagens desse tipo: Ada, Algol, Basic, C, Cobol, Fortran e Pascal.

### FUNCIONAL

Essencialmente desenvolve programas escritos em linguagem definida por expressões e declarações, considerando a computação como uma avaliação de funções matemáticas. Oferece-nos também a possibilidade de programar onde podemos determinar o que se pretende construir e não como será construído. Não utiliza o conceito de atribuição pelo fato de que

os programas são formados por definições de funções. Valores podem ser criados, mas não podem ser modificados.

Exemplos de linguagens desse tipo: LISP, Scheme, Miranda e Haskell.

## ORIENTADA A OBJETOS

Aqui a programação é fundamentada na composição e interação de várias unidades de softwares denominados objetos os quais se relacionam e trocam mensagens entre si. Estes objetos são chamados de classes. Nestas classes cada comportamento é denominado como método (ações). Já os estados de uma classe são chamados de atributo. Em cada método e atributo podemos também definir a forma de relacionamento com os outros demais objetos.

Exemplos de linguagens desse tipo: Smalltalk, Python, Ruby, .Net, C#, C++ e Java.

## ORIENTADA A EVENTOS

É quando você escreve código para responder a eventos. Na programação orientada a eventos, uma rotina especializada em monitorar os eventos avisa o código especializado em responder a um determinado evento que aquele evento que ele esperava ocorreu; e então o código recém avisado responde ao evento.

Exemplos de linguagens desse tipo: Visual Basic, Delphi, Javascript e Blockly (é essa que vamos trabalhar daqui pra frente!)

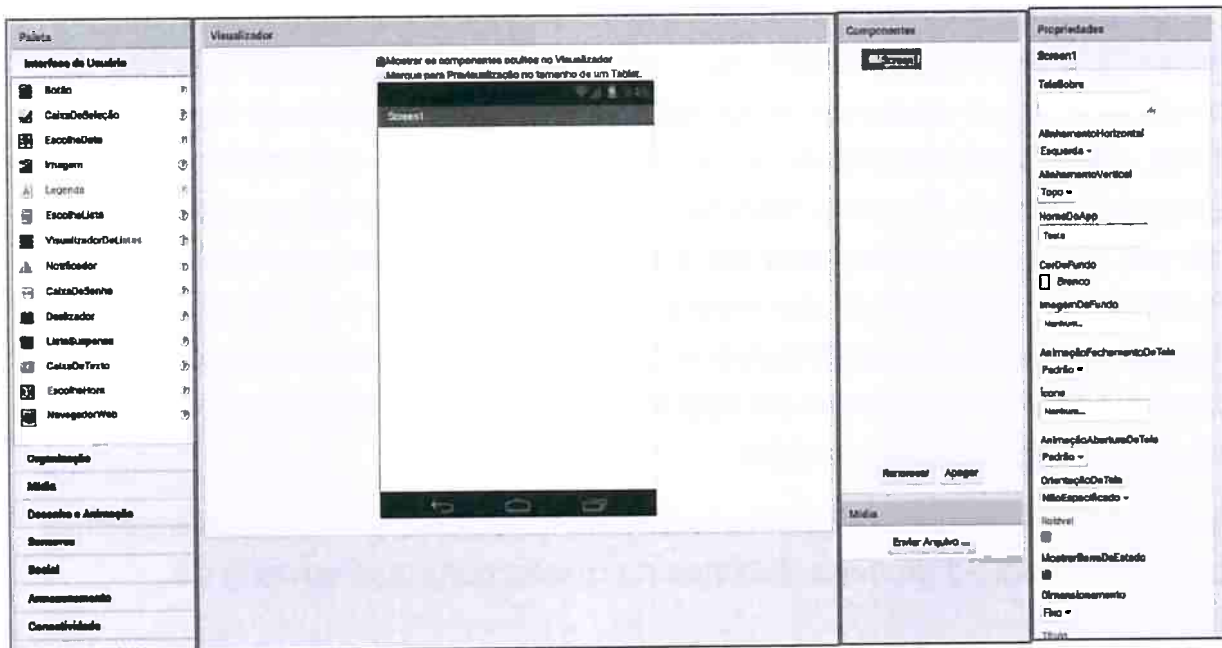
O que é o AppInventor?

Bele! Agora que já sabemos de tudo isso vamos começar a programar? Aqui vamos usar uma ferramenta chamada AppInventor, tudo começou no Google e hoje a ferramenta é melhorada pelo MIT. Vamos entrar um pouquinho mais no detalhe da ferramenta agora : )

O conjunto é composto por duas seções: **o App Inventor Designer e o App Invento Blocos**, cada uma com uma função específica.

# App Inventor Designer

O Designer é a tela inicial de um projeto. É aqui que você desenha seu aplicativo, escolhendo a posição dos botões e imagens, inserindo fotos, droplists, checkboxes e outros componentes disponíveis para a construção de um programa. Ele é dividido em quatro colunas.



1. Paleta 2. Visualizador 3. Componentes 4. Propriedades

## 1. Paleta

A primeira coluna é onde ficam todos os componentes utilizáveis num aplicativo. Esta paleta é dividida em seções para facilitar a localização dos componentes, que vão dos básicos (botões, imagens e textos) até uma seção exclusiva para integração com ferramentas de Lego Mindstorms. Para utilizar um desses componentes basta clicar sobre ele e arrastar para cima da segunda coluna, chamada Visualizador.

## 2. Visualizador

Na coluna central, o usuário pode organizar cada um de seus objetos, montando o aplicativo como ele deve ser. Uma janela de exibição simula a tela de um smartphone com o sistema operacional Android, apresentando

uma versão próxima da final ao programador, à medida que ele organiza o espaço de uso do programa. Todos os itens adicionados da Paleta ao Visualizador são apresentados na terceira coluna, chamada de Componentes.

### **3. Componentes**

Na coluna de componentes, ficam armazenados todos os itens adicionados, sejam eles visíveis ou não na tela do programa. Dessa forma, fica muito mais simples selecionar cada objeto, pois eles estão listados de forma ordenada e acessível. Aqui também é possível renomear cada item. Assim, você pode chamar os componentes por nomes que façam sentido para o seu projeto. É muito mais fácil encontrar cada coisa se você mesmo criar um nome específico para ela, Como “botão de som” em vez de “Button1”. É possível também inserir arquivos de mídia pela terceira coluna. Clicando no botão Enviar Arquivo você importa sons, fotos e vídeos do seu computador para o servidor do App Inventor, e eles ficam disponíveis para que você possa usar no projeto.

Clicar sobre qualquer um dos itens da lista na coluna Componentes permite que você possa editar seus detalhes na quarta coluna, chamada de Propriedades.

### **4. Propriedades**

Esta é a coluna mais importante do Designer, já que aqui você pode definir os tamanhos e conteúdos dos textos de botões e caixas de informação, tamanho das imagens, cores de fundo, largura e altura de objetos, enfim, você consegue deixar as coisas do jeito que você quiser. Essas e muitas outras configurações são aplicadas instantaneamente na tela do Visualizador.

Uma vez que seu aplicativo já tem a carinha das primeiras telas, é hora de começar a atribuir funções a cada um dos componentes que você selecionou. Para isso é preciso clicar no botão “Blocos” no canto superior direito.

## **App Inventor Blocos**

O Editor de Blocos permite programar de forma simples.



Após instalar Java no seu computador (por isso não conseguimos usar o celular ou o tablet para programar com App Inventor), você pode começar a fazer a mágica da programação. Acessando o “Blocos” você pode começar a associar ações para cada item do seu programa. Usando uma interface simples e intuitiva, a construção do aplicativo parece muito com montar um quebra-cabeça.

O menu na lateral esquerda fornece duas abas de comandos: Internos e Blocos dos componentes daquela janela. Todos os objetos que você inseriu em seu programa terão comandos de início na aba que tem o nome da sua tela, ao passo que os comandos de execução estão localizados na aba Internos. A combinação de um ou mais comando dos seus blocos e comandos internos forma uma ação completa. E para facilitar a construção das ações, os comandos são estruturados como peças de quebra-cabeças. Apenas funções compatíveis se encaixam.

Por exemplo, caso você crie um botão em seu programa que deve tocar um som toda vez que for tocado, basta arrastar o comando do evento/início (dentro do submenu do botão que você deseja clicar) “quando NomeDoBotao.Clique fazer” para o campo à direita. Após isso, na mesma guia, selecione o componente de som e arraste a opção “chamar.NomeDoSom.Iniciar” para dentro do outro componente, criando uma ação completa. Quando o botão for clicado no seu programa, o som vai tocar.

## **Instalação do app em um Android**

O jeito mais fácil de instalar o seu aplicativo em um dispositivo Android é sem dúvida através de um leitor de QR Code, sabe aquele quadradinho cheio de outros quadradinhos?!

O App Inventor te dá a opção de gerar um desses para acessar o seu aplicativo e baixar no seu celular. Para isso basta baixar um leitor de QRcode no seu celular, se você digitar isso na busca no Google Play você pode baixar o primeiro que aparecer :)

Aí é só clicar no menu lá em cima em Compilar e depois selecionar a primeira opção: App (fornecer o QR code para o .apk) aí é só seguir o passo a passo que o próprio celular vai te guiando :)

Meu primeiro aplicativo

Tutorial da bola de cristal.

Veja os seguintes vídeos:

INTRO: <https://www.youtube.com/watch?v=mDzMkMn4eM0&index=10&list=PLe9iGEQ2t4s6aHM1jUt-F44laAb9tichR>

Bola de Cristal - PARTE 1 [Designer]: <https://www.youtube.com/watch?v=CPCIA20Csec&index=11&list=PLe9iGEQ2t4s6aHM1jUt-F44laAb9tichR>

Bola de Cristal - PARTE 2 [Blocos]: <https://www.youtube.com/watch?v=JwAWtqt24-U&index=12&list=PLe9iGEQ2t4s6aHM1jUt-F44laAb9tichR>

Bola de Cristal - Parte 3 [Instalação]: <https://www.youtube.com/watch?v=Xx80I3Crleg&index=13&list=PLe9iGEQ2t4s6aHM1jUt-F44laAb9tichR>

**Cenário offline:** a alternativa aqui é trabalhar com o AppInventor offline. A preparação do ambiente pode ser bastante trabalhosa, mas todas as informações se encontram aqui: <https://sourceforge.net/projects/allivecomplete>.

Outra possibilidade é trabalhar com a seguinte atividade de programação offline: <http://csunplugged.org/wp-content/uploads/2014/12/portugese-brazil-12.pdf>

Por fim, a versão offline do Scratch pode ser utilizada. Mais informações encontradas aqui: <https://scratch.mit.edu/scratch2download/> (é possível trocar o idioma para português no rodapé da página). Para a atividade utilizar o Material de Apoio que está na mesma página.

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AULA 06 -Interface e User Experience

*1º Edição*

# INTERFACE

Afinal o que é isso?

Interface é um termo que deriva do vocábulo inglês interface (“superfície de contato”). No mundo de tecnologia, é possível entender-se a interface como sendo um espaço (o lugar onde decorre a interação e a troca), um instrumento (a modo de extensão do corpo humano, como o rato que permite interagir com um computador) ou uma superfície (o objecto que fornece informação através da sua textura, forma ou cor).

Conhece-se como interface do utilizador o meio que permite à pessoa de se comunicar com uma máquina. A interface, neste caso, é composta pelos pontos de contato entre o utilizador e a máquina. Por exemplo, o monitor, o mouse e o teclado.

Aqui vamos pensar em interfaces de celulares e seus aplicativos ok!? Então podemos definir como:

A cara que o aplicativo tem e que você interage : )

Como fazer uma boa interface

E aí vão algumas diquinhas para fazer uma boa interface para dispositivos móveis:

1. Tenha poucas funções no mesmo ambiente. Mantenha o foco!
2. “Tudo é essencial” não é uma opção.
3. Use botões grandes. Lembre-se que o toque de um dedo é bem diferente da seleção com um cursos.
4. Pouca digitação. É difícil, demorado e chato ao usuário. Formulários pequenos sempre!
5. A forma deve refletir a função, que é mais importante que a beleza aparente.

6. Existem padrões de interface para cada um dos sistemas (Android, iOS e Windows), parece bom segui-las uma vez que os usuários de cada uma já estão acostumados.

Com essas dicas básicas, seu aplicativo já vai ter uma carinha muito bacana e funcional! : )

Outra dica bacana é você pensar quais são os apps que você mais usa e acha bonito. Pegue eles como exemplo e inspiração para o seu. Afinal, se você curte a interface ela deve ter alguns pontos bem bacanas que você pode se inspirar e aprender.

# USER EXPERIENCE

Afinal o que é isso?

Experiência de Usuário, que em geral nos referimos somente como UX, é um termo para o nível de satisfação geral dos usuários enquanto usam um produto, site ou aplicativo. Se for uma boa experiência, eles estão felizes. Se for uma má experiência, seus clientes não voltam, e eles contam para todos os seus amigos. Como não queremos que isso aconteça acho bom a gente se preocupar com esse experiência certo!? Portanto vamos entender UX como:

**UX = SOMA DE VÁRIAS INTERAÇÃO  
E A PERCEPÇÃO DEIXADA POR  
ELAS.**

Todas as interações são abertas a interpretações subjetivas, algumas pessoas não gostam de azul simplesmente, mas não é por isso que vamos deixar de usar essa cor nas telas do nosso aplicativo. Afinal, quase todos nós já escutamos a famosa frase: É impossível agradar todo o mundo!

Lembre-se que percepção é sempre verdadeira na mente do percebedor. Se você pensa, por exemplo que ver o por do sol é deprimente, afinal o sol está indo embora não há muita coisa que podemos fazer para lhe convencer do contrário. Por outro lado, esse é o motivo pelo qual devemos

usar as chamadas “boas práticas”, que são as propostas que a maioria das pessoas responde positivamente, por exemplo, uma grande maioria das pessoas curte pores do sol, então podemos usar sem culpa, sacou?!

Para projetar a “experiência de usuário”, portanto, precisamos:

- coordenar interações que podem ser checadas (projetar e programar botões).
- Interações cognitivas que estão fora de nosso controle (por exemplo uma imagem que não é tão agradável na tela de entrada do seu aplicativo)
- Reduzir as interações negativas (aplicativos que ficam dando erro e travam o celular ou o computador)

Vamos pensar agora como desenvolver uma UX bacana : )

Como desenvolver uma user experience bacana?

Há bastantes informações na internet sobre técnicas de design de UX você pode usar quando elabora seu app. Aqui estão 8 características de um app de sucesso (UX legal e interface bacana):

- ▶ **Fácil de entender:** clareza é o elemento mais importante para uma interface com o usuário. Na verdade, o propósito maior de uma interface é permitir que as pessoas interajam com o aplicativo. Se as pessoas não descobrirem como sua aplicação funciona elas ficarão confusas e frustradas.
- ▶ **Não enrola, vai direto ao ponto:** Mantenha as coisas claras, mas, também, mantenha as coisas concisas. Quando você conseguir explicar uma característica em uma sentença, ao invés de três, faça isso! Quando conseguir rotular um item com uma palavra, ao invés de duas, faça isso! Economize o valioso tempo de seus usuários mantendo as coisas concisas.
- ▶ **Familiar:** “Familiar” é somente isso: algo que se aparece com alguma outra coisa que você já encontrou antes. Quando você estiver familiarizado com algo, você sabe como esse “algo” se comporta; você

sabe o que esperar. Identifique as coisas que são familiares para os usuários e integre em sua user interface.

- ▶ **Responsiva:** “Responsivo” significa duas coisas. Primeiro de tudo, significa respostas rápidas. A interface, se não o software que está por trás, deve trabalhar rápido. Esperar as coisas carregarem e usar interfaces pesadas e lentas é frustrante. “Responsivo” também significa a interface prover algum tipo de feedback. A interface deve comunicar ao usuário e informar o que está acontecendo. Você apertou aquele botão corretamente? Como você sabe? O botão deve ter um estado “pressionado” para dar esse feedback por exemplo. E é por isso que essa palavra é usada para se referir a aplicações que ficam bacanas em vários tamanhos de telas, ou seja, aquele site que fica bacana no celular e no computador, sabe!?
- ▶ **Consistente:** Interfaces consistentes permitem que os utilizadores desenvolvam hábitos de uso – eles aprendem sobre os diferentes botões, abas, ícones e outros elementos da interface e os reconhecem e percebem o que eles fazem em diferentes contextos. Os utilizadores também aprendem como certas coisas funcionam e serão capazes de trabalhar a forma de operar novas funcionalidades mais rápido, com base em suas experiências anteriores.
- ▶ **Atrativa:** uma boa interface deve ser atrativa. Atrativa em um sentido que torna o uso dessa interface agradável. Sim, você pode fazer a sua interface simples, fácil de usar, eficiente e ágil, e vai fazer o seu trabalho bem – mas se você pode ir para a etapa extra e torná-la mais atrativa, então você vai fazer a experiência de utilização dessa interface verdadeiramente gratificante. Quando o software é agradável de usar, os seus clientes ou funcionários não vão simplesmente usá-lo, eles ficarão ansiosos para usá-lo.
- ▶ **Eficiente:** Uma user interface é o veículo que faz você chegar aos lugares. Esses “lugares” são as diferentes funções de um software ou web site. Uma boa interface deve permitir desempenhar essas funções mais rapidamente e com menos esforço. Uma interface eficiente descobriu exatamente o que o usuário está tentando alcançar e, depois, deixá-lo fazer exatamente isso sem maiores complicações. Implemente uma interface que permita que as pessoas facilmente consigam o que



querem ao invés de simplesmente prover acesso uma lista de características/funções.

- ▶ **Capaz de “Desfazer”**: Ninguém é perfeito, e as pessoas estão sujeitas a cometer erros enquanto usam seu software ou web site. O quão bem você lida com esses erros é um importante indicador sobre a qualidade de seu software. Não “castigue” o usuário – construa uma interface que tenha a capacidade de desfazer os erros que possam surgir, isso é, que tenha a função “Desfazer”.

Atingir um equilíbrio perfeito exige habilidade e tempo, e cada solução dependerá de uma análise caso a caso exigindo dedicação. Para terminar aí vai 5 passos para uma UX perfeita:

### 1) Pesquise!

A pesquisa é fundamental antes de qualquer projeto. Você não pode simplesmente sair desenhando o que você julga ser bonito. **NÃO!** Analise a sua concorrência, veja o que eles estão fazendo e veja como e o que você pode fazer melhor! Lembra o que eu falei de ver os aplicativos que você curte e entender a UX e a Interface que eles usam? É a mesma coisa!

Além disso é interessante você saber o que é que o seu usuário vai procurar ou querer enquanto utiliza o sistema, assim você pode se focar nesses pontos. Você precisa conhecer eles. Converse com o seus potenciais usuários e com aqueles que já estão usando!

### 2) Planeje!

Lembra que eu falei sobre conhecer seu usuário? Então, agora você tem que fazer isso ainda melhor! Crie uma persona para o seu público (vamos ver como fazer isso logo mais!)

Durante o planejamento levante as ações que os usuário farão dentro do seu projeto. Como eles vão de uma página para outra, o que eles podem fazer em cada página.

### 3) Prototipe!

Recomendo friamente a criação de um Wireframe, que aqui vamos chamar de prototipação em papel (fica calmo que vamos falar disso com calma mais pra frente)

Mas você tem como simular toda a experiência do seu aplicativo com apenas um lápis e um pedaço de papel. O importante aqui é ter a certeza de que não ficaram falhas de navegação, acessibilidade, usabilidades, funcionalidades e demais. Assim você não vai ter retrabalho na hora que já estiver programando.

### 4) Desenhe!

Agora que já pesquisamos, planejamos e prototipamos podemos ter a certeza de que não existem falhas de usabilidade no nosso projeto e podemos seguir adiante. O que nós fizemos até agora garante, sei lá, uns 50% da Experiência do Usuário perfeita no nosso projeto. Mas a etapa de desenhar é uma das mais importantes e, muito provavelmente, responsável por outros 50%.

Aqui você precisa pensar em muitas coisas e lembrar que são os detalhes que vão ganhar os seus projetos. Cada interação, cada feedback para o usuário deve ser bem pensado e bem trabalhado.

### 5) Acompanhe e Teste!

Bom, não vai adiantar nada todo o seu esforço até aqui se você não acompanhar e testar o seu projeto. Veja usuários interagindo com ele, pergunte o que acharam e tenha uma postura de melhoria contínua (vamos falar ainda mais disso mais pra frente!)

**DEPOIS DE TODAS ESSAS DICAS  
NÃO TEM COMO SUA UX E SUA  
INTERFACE NÃO SAÍREM BACANAS!**

**MÃOS À OBRA!**

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Entendendo, produzindo e inovando com tecnologia



AULA 07 -Design thinking e Ideação

*1º Edição*

# DESIGN THINKING

Afinal o que é isso?

DESIGN THINKING é um termo de difícil tradução. Podemos tentar substituir por “Projeto”, “Criação”, “Plano”, mas nem sempre funciona pois design pode ter significados diferentes conforme o propósito de uso, como por exemplo, webdesign, design de interiores, design gráfico e Thinking também. Essa segunda palavra vem do verbo em inglês “to think”, significa “pensar” ou “achar” em alguns casos.

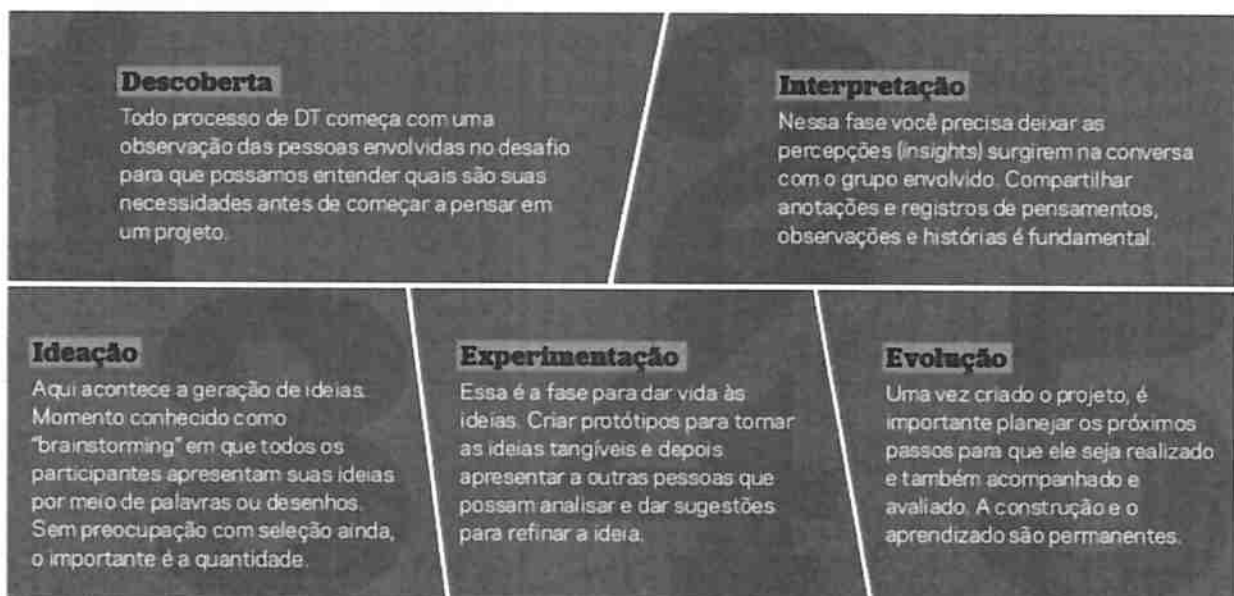
E agora, os dois juntos, “Design Thinking”? Se você digitar num tradutor online, provavelmente vai aparecer: “Pensamento de Design”, que até faz sentido, mas como definição, Design Thinking é um novo jeito de pensar e abordar problemas ou, dito de outra forma, um modelo de pensamento centrado nas pessoas.

Pra entender um pouquinho melhor vejam esse vídeo:

<https://vimeo.com/86045117>

Além disso tem muito material incrível no site: <http://www.dtparaeducadores.org.br/site/>

Bom, vale a pena se aprofundar no assunto, mas por hora vamos pensar nas etapas do processo design thinking e trabalhar melhor a parte de IDEIAÇÃO na próxima sessão:



# Uma jornada de ideação

A vida e uma bolinha de tênis

Sempre uso uma metáfora que envolve física (os que não gostam de física e bufaram dêem uma chance para a minha explicação, please!)



Quando eu joga uma bolinha de tênis no chão o que acontece?

Ela quica no chão e volta, certo!?

Se eu jogar ela mais forte contra o chão, o que vai mudar?

Ela vai voltar com mais intensidade!

Na vida, os resultados que obtemos seguem a mesma regra que um bolinha de tênis. Quanto mais esforço você colocar em um projeto, ideia ou atividade o seu resultado vai ser melhor. Dizemos que é diretamente

proporcional. Se o esforço é maior o resultado também é! :)

Por isso, lembrem-se: QUASE TUDO NA VIDA É COMO UMA BOLINHA DE TÊNIS! :)

Trabalhando em grupo

Já parou para pensar como é poderoso ter um time? Quando você quer realizar alguma coisa é sempre importante pensar quem poderia te ajudar diretamente a fazer o seu plano se tornar realidade.

E quando você for pensar em escolher seu time, sempre lembre como DIVERSIDADE é importante, afinal de que adiante se o seu time for composto de pessoas que são muito parecidas com você? O ideal é procurar formar time complementares ou seja, se você é muito bom de português, encontre alguém que é bom de matemática e vice-versa. Se

você é tímido, encontre alguém mais extrovertido. Procure ter meninos e meninas no time também.

Com o time completo e diversificado tenho certeza que o seu projeto vai ser incrível e vai sair do papel.

Essa é a hora de formar os seus times para as próximas atividades. Formem grupos de 3 a 5 pessoas.

Pronto?! Então vamos pra a próxima sessão!

## Personas

Personas são personagens fictícios criados para representar os diferentes tipos de usuário. Nessa área de inovação e aplicação online o termo persona é bastante usado!

São úteis para refletirmos sobre os objetivos, desejos e limitações de usuários. São perfis de pessoas fictícias para representar usuários de um site ou produto.

Aqui vamos pensar nas personas que queremos ajudar. Por exemplo, quero ajudar os animais abandonados, os carteiros, as mães, os estudantes pré-ENEM. Todas essas personas tem características específicas que fazem delas um personagem que nos ajuda a entender como podemos desenvolver algo para elas, sabe!?

Uma vez que sabemos quem são as potenciais personas que queremos ajudar vamos trabalhar nas tarefas que elas têm que desempenhar. Pode deixar que vai estar explicadinho na próxima sessão : )

## Jobs to be Done

Um famoso professor de Harvard (aquela universidade americana famosa, sabe?!) chamado Clayton Christensen defende que quando um consumidor compra um produto ele está, na verdade comprando a realização de um trabalho específico. O raciocínio seria então: se eu quero fazer algo para alguém não vamos “vender” simplesmente um produto e serviços para elas, mas sim vamos ajudá-las a resolver suas intenções e porquês de trabalhos-a-serem-feitos (Jobs To Be Done em inglês significa isso!).



Questionar-se sobre o que as pessoas pretendem quando usam um determinado produtos ao invés de apenas supor que produtos eles podem comprar, muda totalmente o nosso jeito de pensar. Esse conceito orienta para a inovação e busca melhoria de soluções atuais. A teoria do JTBD (Jobs-to-be-done) não é um produto, serviço ou uma solução específica;

## **JTBD é o propósito mais elevado para o qual os clientes compram produtos, serviços e soluções.**

VAMOS VER UM EXEMPLO:

### Os Milk-shakes do McDonald's

Esse é o caso mais clássico usado para ilustrar a ideia de Jobs-to-be-done. A rede de fast-food queria descobrir alguma forma de aumentar as vendas de seus milk-shakes. Começou utilizando análises mais óbvias: analisou os dados demográficos de consumidores, tentando descobrir se existiam características que ajudassem a entender quem eram as pessoas que compravam o produto, se eram apenas jovens, ou apenas idosas, mas não parecia haver nenhuma tendência que pudesse gerar uma solução.

Realizaram ainda pesquisas com grupos selecionados de consumidores, perguntando a eles o que eles acham que deveria ser melhorado no produto. As pessoas pesquisadas listavam características que elas achavam que poderia ser melhoradas. Mas após aplicar essas melhorias, as vendas de milk shakes não melhoravam.

O McDonald's chamou então o professor Christensen, que observando e conversando com clientes que compravam milk-shakes, conseguiu informações muito mais úteis. Nesse levantamento descobriram que pelo menos metade dos milk-shakes eram comprados de manhã, por pessoas que compravam a bebida e iam embora de carro.

Conversando com alguns desses clientes descobriram qual era o trabalho para o qual estavam contratando o milk-shake. Essas pessoas levavam

muito tempo para chegar ao trabalho, e ficavam muito tempo dentro do carro. O milk-shake estava cumprindo o trabalho de alimentar ao mesmo tempo que gerava uma distração durante o percurso, por ser algo que leva mais tempo para ser consumido. Além disso, tinha vantagens sobre outros lanches, por não gerar migalhas e não derramar tão fácil.

Usando essas informações, as lanchonetes começaram a produzir milk-shakes mais densos, para que eles durassem por mais tempo, além de outras mudanças que levavam em consideração o trabalho a ser feito pelo produto. Com isso, as vendas de milk-shakes quadruplicaram.

Entenderam? Legal né!? Vamos pensar nas nossas ideias usando esse conceito!

## Brainstorm

Uma vez que já defini as personas que quero ajudar, quais os Jobs-to-be-done delas. Preciso começar a pensar como ajudá-las de fato a fazer essas tarefas de uma maneira mais inovadora, certo!?

Brainstorm é uma palavra em inglês cuja tradução é “tempestade mental”, que numa bom português seria “chuva de palpites”. É uma metodologia de exploração de idéias, visando a obtenção das melhores soluções de um grupo de pessoas. Ele é um bate-papo direcionado, que pode favorecer ou não o surgimento de idéias novas, que ajudem na solução de problemas ou situações. Para isso temos algumas regrinhas famosas da Ideo:

- 1 - Uma conversa por vez: não fiquem de conversinha paralela, bele!?
- 2 - Quantidade importa. Procure criar o máximo de ideias possíveis, não se preocupe em escrever bonitinho ou ficar escolhendo as palavras.
- 3 - Construa sobre a ideia dos outros.
- 4 - Encoraje as ideias doidas.
- 5 - Seja visual.
- 6 - Mantenha o foco. Fique no assunto proposto.
- 7 - Não faça críticas, nem julgamentos.

Bele, agora vamos à prática:

- Comece com um tema ou assunto e peça para os presentes expressarem todas as idéias que lhes venham à mente espontaneamente.
- Todas as idéias devem ser contadas e escritas de maneira a ficarem expostas para todos, estimulando novas idéias.
- Ao término do período definido para a atividade todas as idéias escritas e expostas devem ser repassadas e analisadas para seleção das mais adequadas à situação.
- A seguir, selecione a melhor idéia (Vamos falar melhor sobre isso na próxima sessão!)

## Seleção e A melhor ideia

E aí existe uma ideia que é melhor que as outras? Como podemos saber qual é? **TÁ AÍ! NÃO TEMOS!** Então nem adianta ficar procurando. Quando falamos: escolha a melhor ideia, queremos só saber qual será a primeira ideia que vocês vão tirar do papel. Não quer dizer que todas as outras são ruim e perdemos tempo com elas, sabe!?

Por isso nem adianta perder um tempão discutindo qual a melhor ideia! A minha sugestão para que a primeira ideia que o grupo vai trabalhar seja escolhida é a técnica dos 3 pontos imaginários

### TÉCNICA DOS 3 PONTOS IMAGINÁRIOS:

- Agora não vale mais defender, nem explicar melhor nenhuma das ideias;
- Disponha os post its de maneira que todos possam ser vistos por todos;
- Agora sem precisar esperar um ao outro distribua seus 3 pontos em silêncio.

**LEMBRE-SE:** Você pode distribuir seus 3 pontos da maneira que quiser, ou seja se você gostou muito de uma ideia, pode dar todos os seus pontos pra ela, ou então distribuir 2 pontos para uma das suas ideias favoritas e o último para outra ideia que você também curtiu.

## Prototipação em Papel

Protótipos em papel se caracterizam como uma forma rápida de expressar e melhorar o design através de um teste com usuários. Pode ser usado também como uma ferramenta de comunicação para facilitar o entendimento de um design. É usado geralmente no início do projeto para ajudar a defini-lo.

A prototipação em papel é um modo rápido, fácil para projetar e tornar visualmente comunicáveis ideias de projetos. Uma de suas principais vantagens é que ele permite a colaboração e a rápida exposição de conceitos, além do papel poder ser dobrado e cortado, sugerindo superfícies materiais com agilidade.

Para mais informações veja esse vídeos: <https://www.youtube.com/watch?v=CZ12RPxbKM8>

Aqui o que vale é a criatividade para aproximar a realidade do seu projeto de maneira rápida.

Para projetos de aplicativos como os que serão feitos aqui podemos usar o POP - Paper Prototyping.

## Validação

Ok! Mas ainda que se tudo isso, quando vamos poder ter certeza que nossas hipóteses foram validadas? Por vezes temos uma ótima ideia, mas fica aquela eterna dúvida: Será que isso tem chances de dar certo?

Se você validar a sua ideia, ou seja, provar que ela tem valor, a chance do seu projeto ser bem sucedido é bem maior.

Então aí vão algumas dicas para validar uma ideia:

Avalie friamente a sua ideia

Muitas vezes, quando ouço falar em uma “ideia genial” pego meu celular e, muitas das vezes, em poucos minutos constato que o produto ou serviço “genial” já existe, simplesmente fazendo uma busca no Google.

Por isso, antes mesmo de se envolver mais profundamente em uma ideia, faça uma pesquisa minuciosa para descobrir se alguém já não pensou nisso antes. Se isso tiver acontecido, não desista de imediato, afinal é possível melhorar uma coisa já existente ou então agregar valor a ela de forma a criar um diferencial em relação ao que já existe. Será que o mercado está satisfeito com o que é oferecido atualmente?

Se a sua ideia pode fazer a diferença, passe então para a próxima etapa.

**Busque um feedback**

Converse com outras pessoas sobre sua ideia, para ver o que elas acham, especialmente as pessoas que você confia e nas quais reconhece um critério de avaliação. Nesta fase, o que você realmente quer é um feedback honesto e não apoio incondicional apenas para agradar.

Ouvidas as opiniões, como foi que a sua ideia se saiu? As pessoas gostaram, acham que tem chances de dar certo, ou você é o único ser na face do planeta que acha ela boa? Se esse for o caso, talvez seja melhor reavaliar.

**Construa um MPV**

Se a sua ideia parece boa e passou pelo teste de avaliação das outras pessoas, é então chegada a fase de construir um MPV – Mínimo Produto Viável, para ver se é esse o produto que você imaginou e se as outras pessoas vão realmente querer consumir.

Crie um protótipo que seja o mais próximo possível do produto ou serviço que você deseja oferecer e teste-o em situações reais de consumo. Se o seu MPV passar pelo teste de uso com você e outras pessoas, vá em frente, mas se ele se revelar um fracasso, pare por aqui.

**Crie um plano para chegar nos seus usuários**

Não se iluda com a história de que não faltarão clientes para uma boa ideia. Se ela não conseguir ser percebida como um bom produto ou serviço, será muito difícil ter sucesso com um projeto. Reflita bastante sobre como você vai ficar conhecido!

Cumprindo todos os passos com certeza seu projeto será um sucesso!

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Entendendo, produzindo e inovando com tecnologia



AULA 08 -Principais dúvidas de AppInventor.

*1º Edição*

# PROGRAMANDO COM APPINVENTOR 2.

Como dividir tarefas e organizar a construção do seu app

Pessoal! Agora que vocês já entendem um pouco melhor como começar o projeto de um aplicativo desde a ideia até a implementação temos que começar a nos organizar para trabalhar na programação e na entrega desse aplicativo.

A primeira reflexão que vocês vão precisar fazer é em quanto tempo vocês conseguem terminar o trabalho. Esse raciocínio pode ser diferente se você tiver um limite para entrega e aí você vai ter que pensar quais são as funcionalidades que são prioridade e cabem nesse prazo.

Independente dessa ordem o raciocínio é o mesmo: em quantos somos? Quanto tempo temos para nos dedicar pra isso? Quais são as tarefas que temos que realizar? Vamos conversar sobre cada uma delas, mas de trás pra frente : )

A. Quais são as tarefas que temos que realizar?

Para conseguir realizar essa missão a primeira tarefa é listar todas as funcionalidades que o meu app vai ter. Por exemplo:

- vai ter login e senha;
- vai ter um cadastro para novos usuários;
- vai ter uma tela que explica como o app funciona;
- toda vez que eu chacoalhar o meu app vai sortear uma resposta que vai aparecer no meio da tela;
- toda vez que eu clicar na bola de cristal vai apagar o que está escrito na tela.

Com todas as funcionalidades listadas, pensa em tudo que você vai precisar pra conseguir finalizar ela. Vou dar um exemplo.



Pra ter login e senha precisamos:

- criar a tela inicial de login e senha;
- consultar se o login e a senha já estão cadastrados quando apertar o botão confirmar;
- se não estiver correto avisar o usuário;
- se der certo redirecionar pra a próxima tela.

Façam essa quebra em tarefas menores para todas as histórias. Aí com uma noção melhor de tudo que precisa ser feito, passamos para a próxima parte: estimativa.

#### B. Quanto tempo temos para nos dedicar pra isso?

Agora é hora de estimar quanto tempo vamos demorar cada uma dessas tarefas. O jeito mais fácil de fazer isso é passar por cada uma delas e discutir em grupo como vocês resolveriam, não gastem muito mais que 3, 4 minutinhos por tarefa. Depois da discussão, classifiquem cada uma delas em FÁCIL, MÉDIO ou DIFÍCIL.

Com uma ideia melhor das dificuldades e tamanho do trabalho vamos para a próxima fase que é decidir quem fará o que e quanto tempo vamos levar : )

#### C. Em quantos somos?

Vamos agora usar a força do grupo. Não tem mágica pra dividir tarefas e fazer o time trabalhar sincronizado, mas aí vão algumas dicas:

- A. Nem sempre o que você quer fazer é a melhor opção. Tente avaliar imparcialmente no que você pode contribuir mais e se comprometa com isso.
- B. Pense em quanto tempo você vai poder se dedicar pra realizar a sua tarefa. Apesar de querer ajudar você tem que ser sincero com você e com o seu grupo sobre quanto tempo você tem disponível para se dedicar.
- C. E a última dica é: se comuniquem! Vocês vão estar trabalhando num mesmo projeto com o mesmo propósito, todos devem

estar sabendo o que cada um está fazendo e como vai o andamento das tarefas.

**Tenho certeza que vocês vão fazer um trabalho e tanto e mudar o mundo!**

Onde achar mais informações

Pessoal! Como já falei pra vocês o inglês ainda é um limitante. A maior parte dos tutoriais de AppInventor está em inglês, tem MUITO material e se você tiver um inglês ainda que básico dá pra tirar proveito de todo esse material.

Se seu inglês anda à desejar a minha sugestão é a seguinte:

1. Procura em português se tem alguma referência pra te ajudar,
2. Se não encontrar, coloque o que você está buscando tradutor, pra conseguir procurar em inglês
3. Aí vai no youtube e procura pela sua dúvida em inglês. Aqui o youtube funciona bem porque você consegue acompanhar tudo que está rolando mesmo sem entender a explicação : )

Para dar os primeiros passos em AppInventor em português, tem os seguintes materiais:

- ▶ Maratona de Aplicativos (que é inclusive feito por mim em parceria com o Felipe Barreiros): <https://www.youtube.com/playlist?list=PLe9iGEQ2t4s6aHM1jUt-F44laAb9tichR>
- ▶ Material do Neri Neitzke: [https://www.youtube.com/playlist?list=PLGffUAt\\_pphIVs7LXsFZlnTh\\_1zBgnvZ1](https://www.youtube.com/playlist?list=PLGffUAt_pphIVs7LXsFZlnTh_1zBgnvZ1)

Na próxima sessão vou separar alguns vídeos bacanas das principais dúvidas de AppInventor!

## Principais dúvidas da AppInventor

- ▶ Como lidar com login e senha:
  - ▶ AULA 1: <https://www.youtube.com/watch?v=9ct56EFd5RM>
  - ▶ AULA 2: <https://www.youtube.com/watch?v=RN9555Htv2o>
  - ▶ AULA 3: <https://www.youtube.com/watch?v=yDCBWxlSVeA>
  - ▶ AULA 4: <https://www.youtube.com/watch?v=7iKhE18RYOE>
- ▶ Banco de Dados no AppInventor:
  - ▶ <https://www.youtube.com/watch?v=HQfWeYHXO80>
- ▶ Testando aplicativos sem ter um Android:
  - ▶ <https://www.youtube.com/watch?v=L0Ie68MdD0Y>
- ▶ Como fazer um timer:
  - ▶ <https://www.youtube.com/watch?v=EzavOUMpdPM&spfreload=5>
- ▶ Listar, incluir, alterar, deletar contatos ou tarefas ou qualquer coisa:
  - ▶ [https://www.youtube.com/watch?v=42\\_inwvkvk8&index=17&list=PLGFfUAt\\_pphIVs7LXsFZInTh\\_1zBgnvZ1](https://www.youtube.com/watch?v=42_inwvkvk8&index=17&list=PLGFfUAt_pphIVs7LXsFZInTh_1zBgnvZ1)
- ▶ Transição de telas:
  - ▶ [https://www.youtube.com/watch?v=sOImnbqhuCE&index=8&list=PLGFfUAt\\_pphIVs7LXsFZInTh\\_1zBgnvZ1](https://www.youtube.com/watch?v=sOImnbqhuCE&index=8&list=PLGFfUAt_pphIVs7LXsFZInTh_1zBgnvZ1)
- ▶ Como abrir links, inclusive do youtube:
  - ▶ [https://www.youtube.com/watch?v=Cz\\_2uH0jqAs](https://www.youtube.com/watch?v=Cz_2uH0jqAs)
- ▶ Como fazer um chat no app inventor:
  - ▶ <https://www.youtube.com/watch?v=GbfI0eepcpU>
- ▶ Notificações PUSH:
  - ▶ <https://www.youtube.com/watch?v=bPdQJ8UT9I8>

- ▶ Como fazer busca no App Inventor:
  - ▶ <https://www.youtube.com/watch?v=Rv5YBeKnDL0>
- ▶ Bloco de Notas no App Inventor:
  - ▶ <https://www.youtube.com/watch?v=zCxiOyJ78Po&index=7&list=PLnrb4hCvdrAzM8krjYYWxkdJ-k9HuGAF>
- ▶ Cadastro e armazenamento na nuvem:
  - ▶ <https://www.youtube.com/watch?v=IfTP-0HnMIE>

**Cenário offline:** os alunos podem em protótipos de papel mais elaborados como os seguintes:

[https://youtu.be/x48qOA2Z\\_xQ](https://youtu.be/x48qOA2Z_xQ)

<https://www.youtube.com/watch?v=B7M0fVXdovM>

<https://www.youtube.com/watch?v=6TbyXq3XHSc>

<https://www.youtube.com/watch?v=g4GGtJ8NCY>

<https://vimeo.com/38256134>

Além disso eles podem trabalhar com o AppInventor offline, porém a preparação do ambiente pode ser bastante trabalhosa, mas todas as informações se encontram aqui: <https://sourceforge.net/projects/ailivecomplete>

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# Literacia3.0

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Entendendo, produzindo e inovando com tecnologia



AULA 09 -Como fazer um pitch e defender a sua ideia.

*1º Edição*

# COMO FAZER UM BOM PITCH

Como saber o tamanho do meu mercado?

Você pode ter a melhor ideia do mundo, mas se não houver pessoas querendo comprar, usar ou colaborar não tem como ela ir pra frente. Por isso uma das primeiras preocupações que temos que ter para começar uma empresa, um projeto ou uma campanha que usa produtos digitais é ver o tamanho do seu mercado.

Para dimensionar o tamanho do mercado em que sua empresa está inserida serão necessárias três informações.

A. Número de “consumidores” da sua região atendida;

Para simplificar vamos dar o exemplo de uma farmácia fictícia que atende determinado bairro. A área de atuação da empresa são todas as pessoas e empresas estabelecidas no bairro, de onde as pessoas ligam ou vão pessoalmente até a farmácia comprar.

Dica: Caso você tenha dificuldade para delimitar sua área de atuação converse com seus clientes e pergunte onde moram, e anote em um papel. Outra forma seria verificar os endereços dos clientes nos cadastros da sua empresa.

B. Número de “concorrentes” da sua região atendida;

Os seus “concorrentes” são todas as empresas, campanhas, ongs, que vendam, distribuam produtos ou soluções semelhantes a sua.

Para descobrir qual a quantidade de clientes comprarão da sua empresa você deve dividir o número de residências pela quantidade de concorrentes, incluindo vocês

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EXEMPLO: Estamos supondo que haja apenas três concorrentes e que somando com a sua seriam quatro soluções de um aplicativo para crianças concorrendo pelo mesmo mercado.

Supondo ainda que o número potenciais usuários de um aplicativo para crianças na nossa área de atuação seja de 4mil. Assim:  $4.000 / 4 = 1.000$  usuários por aplicativo concorrente.

Desta maneira sua empresa teria um número de 1.000 residências como potenciais compradores.

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C. “Consumo” médio por cliente da empresa.

Aqui não é tão simples obter esse número, ainda mais se a sua ideia não tem um preço fixo, nesse caso você pode substituir pelo valor que um consumidor traz pra sua empresa ainda que não pela compra do seu produto. Uma vez que você tem esse valor podemos partir para o cálculo do potencial de mercado

$$\text{POTENCIAL DE MERCADO} = \frac{\text{TAMANHO DO MERCADO} \times \text{VENDAS MENSAS POR CLIENTE}}{\text{N}^\circ \text{ DE EMPRESAS CONCORRENTES}}$$

Aí vai um exemplo. Se eu estou fazendo um aplicativo que custa \$1.

Assim o tamanho total do mercado consumidor seria \$1 dólares, multiplicado pelo número total potenciais compradores.

Ex:  $\$1 \times 4.000 = 4.000$

Para descobrir qual o tamanho da participação que sua solução deveria ter deste mercado você deve dividir 4mil por 4, que é o número de empresas que concorrem com os mesmos produtos ou produtos substitutos pelos mesmos usuário.

Assim o potencial do meu aplicativo para crianças é de \$1.000 dólares

Agora que você já tem uma estimativa de quanto a sua ideia “vale” ou pode pelo menos valer, precisamos entender como explicar ela direitinho! Os próximos dois tópicos vão te ajudar nessa missão!



## Storytelling

O conceito de Storytelling ainda é novo para a maioria das pessoas, entretanto, esse é um assunto que vem atraindo muita atenção. O termo pode ser definido de diversas maneiras, mas em geral, podemos definir como:

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É um método que utiliza palavras ou recursos audiovisuais para transmitir um conteúdo, tem sido bastante utilizado na publicidade e no marketing como um meio de promover uma marca sem fazer a venda direta. O Storytelling é uma ótima ferramenta para compartilhar conhecimento.

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Basicamente o storytelling possui como finalidade auxiliar na construção da estratégia de relacionamento com clientes, marcas e soluções, utilizando-se do compartilhamento do seu "conhecimento" para alcançar esse objetivo.

Mas como fazer isso? É simples, ela organiza seus fatos reais, em uma estrutura de história e trabalha os elementos e mensagens que compõem a história (story), seguido pela elaboração das obras narrativas (telling). O processo pode ser resumido em sete etapas: ouvir, aprender, descobrir, explorar, criar, comunicar e encantar.

Podemos dizer que o principal segredo do Storytelling está em atribuir significados emocionais à elementos técnicos por meio de um contexto. Esse contexto emocional auxilia à trabalhar a curiosidade e a expectativa dos seus consumidores, aumentando o envolvimento dos mesmos para com a organização.

Para isso, é necessário elaborar uma narrativa de qualidade que alcance o lado emocional do espectador. É importante ter em mente que para o storytelling dar certo é preciso descobrir a história única, real e exclusiva da sua ideia, que fará sua solução ser lembrado quase que instantaneamente pelos seus consumidores. Outras empresas podem até copiar sua marca, ou seu produto, mas ninguém conseguirá copiar sua história.

Segue aí um infográfico para vocês entenderem melhor o que esse lance de Storytelling:

# STORYTELLING

## COMO CONTAR HISTÓRIAS INESQUECÍVEIS QUE SE VENDEM PRATICAMENTE SOZINHAS

### O QUE É STORYTELLING E QUAL A SUA IMPORTÂNCIA PARA SEU NEGÓCIO

**STORYTELLING É UMA DAS FORMAS MAIS PODEROSAS DE DAR VIDA A SUA MARCA, SENDO UM DOS PRINCIPAIS COMPONENTES DE UMA ESTRATÉGIA DE MARKETING DE CONTEÚDO.**

Uma boa história é autêntica, criativa, faz uma conexão emocional e pessoal, inspira ação e leva o público a uma viagem com a marca.

Storytelling é a mais antiga forma de passar conhecimento e grande parte da forma como olhamos para o que gostamos de chamar de fatos é influenciada por histórias e pela forma como as interpretamos.

Qualquer meio pode ser utilizado para contar uma história, incluindo blogs, filmes, canais sociais e multimídia. Cada meio provoca uma reação diferente em seu público, por isso, as histórias devem ser adaptadas. A chave do sucesso é saber qual história contar em qual meio.

#### TODOS QUEREM CONTEÚDO MULTIMÍDIA



Comunicados de imprensa que contêm multimídia tem 77% mais respostas em comparação a lançamentos contendo somente textos.



Posts de blogs com vídeo tem 3x mais links do que posts contendo apenas textos.

#### NINGUÉM LÊ

79% das pessoas "varrem" a web ao invés de ler palavra por palavra.



#### TODOS ESTÃO OCUPADOS



Profissionais gastam 51% do seu tempo gerenciando informações ao invés de agir sobre elas.



90% dos profissionais pesquisados admitem terem jogado fora informações importantes.

#### MARKETING É BARULHENTO



O número de anúncios veiculados na internet, em 2012, foi de 5.3 trilhões de dólares.



Estima-se que as pessoas veem 5000 mensagens de marketing por dia.

#### A INTERNET ESTÁ LOTADA DE OPÇÕES E RUÍDO

O Google realiza 700.000 buscas a cada 60 segundos.



#### COMO AJUDAR SEU CONTEÚDO A SE DESTACAR E PASSAR POR CIMA DO EXCESSO DE INFORMAÇÕES?

##### Enquadre sua mensagem como uma história

79% das pessoas apenas visualiza, mas não lê artigos na web. Enquadre a mensagem de sua marca como uma história. Não se esqueça de um título forte e convincente para garantir que seu público-alvo leia cada palavra.



##### Faça sua marca memorável



Assim como autores fazem personagens memoráveis, você pode fazer o mesmo para a sua empresa. Para fazer com que sua marca se destaque, pense nela como um personagem. Descreva sobre o que é a sua empresa e torne-a apresentável.

##### Mostre, não apenas conte

Este é o clássico conselho para Storytelling. Utilize conteúdos multimídia para mostrar sua história ao seu público.



#### AS 6 HISTÓRIAS MAIS EFICAZES PARA CRIAR UMA RÁPIDA CONEXÃO COM SEU PÚBLICO

##### 1 JORNADA DO HERÓI

- 1 Vida normal até que surge o chamado para a aventura;
- 2 Resistência ao chamado;
- 3 Encontra com o mentor e aceita a missão;
- 4 Enfrenta diversos problemas e obstáculos;
- 5 Prepara-se para uma grande mudança;
- 6 Supera os desafios;
- 7 Retorna à vida normal e inspira os demais.



##### 2 INIMIGO PÚBLICO COMUM

- 1 Se você não é um dos nossos, então você está contra nós;
- 2 Os segredos que "eles" não querem que você saiba;
- 3 Não é sua culpa... (mesmo que talvez seja!);
- 4 Você, claramente, não é um deles.



##### 3 A JORNADA DO IDIOTA

- 1 Comece antes com a sua luta e dificuldades;
- 2 Lembre-se de como era no início, antes de você saber o que você sabe;
- 3 Seja autêntico e não tenha vergonha de mostrar seus erros e tropeços;
- 4 Incentive as outras a fazer mais;
- 5 Mas nem sempre foi assim...



##### 4 DO FRACASSO A FAMA

- 1 Você tinha um problema específico;
- 2 Talvez até não era assim antes, mas algo no caminho aconteceu;
- 3 Você fez uma descoberta;
- 4 Essa descoberta revolucionou sua vida, mesmo você sendo uma pessoa comum;
- 5 Agora, quero mostrar como você também pode sair do fracasso e ir para a fama.



5

## HERÓI POR ACIDENTE (OU HERÓI RELUTANTE)

- 1 Você tinha um problema e descobriu como resolvê-lo;
- 2 Ajudou alguns amigos e eles espalharam a mensagem;
- 3 Muitas pessoas começaram a pedir sua ajuda;
- 4 Você é uma pessoa comum, como elas, também apresentando falhas.



6

## NÓS SOMOS PARECIDOS

- 1 Eu sou bastante parecido com você (eu entendo você);
- 2 Tenho os mesmos sonhos e medos;
- 3 Como eu encontrei a solução;
- 4 Porque eu decidi compartilhar a solução com todos.



## AS 17 MELHORES REGRAS DA PIXAR PARA CRIAR HISTÓRIAS INESQUECÍVEIS



1

Um personagem deve se tornar admirável mais por suas **tentativas** do que pelo seu sucesso.

2

É preciso ter em mente o que é interessante para o **público**, não para você. As duas coisas podem ser bem diferentes.

3

As melhores ideias aparecem depois de várias iterações. **Então reescreva.**

4

Era uma vez um/uma \_\_\_\_\_  
 Todo dia, \_\_\_\_\_  
 Um dia, então, \_\_\_\_\_  
 Por causa disso, \_\_\_\_\_  
 Por causa disso, \_\_\_\_\_  
**Até que, finalmente,** \_\_\_\_\_

5

Crie o seu **final** antes de saber como será o **meio**. Finais são difíceis, comece a pensar nisso o quanto antes.

6

**Termine sua história**, deixe-a fluir mesmo que não esteja perfeita. Em um mundo ideal você possui os dois, mas siga em frente. **Faça melhor da próxima vez.**

7

Quando você tiver um **"branco"**, faça uma lista do que não pode acontecer em seguida. Muitas vezes, o material para continuar a história aparece neste momento.

8

**Separe** as histórias que você gosta. O que você gosta nelas faz parte de você. É preciso **reconhecer essas características** antes de utilizá-las.

9

Colocar no **papel**

9

Colocar no **papel** permite que você comece a consertar as falhas. Se deixar em sua cabeça, **uma ideia perfeita**, você nunca a compartilhará com ninguém.

que você gosta. O que você gosta nelas faz parte de você. É preciso **reconhecer essas características** antes de utilizá-las.

10

Ignore a **1ª** ideia que vier a sua cabeça. É a **2ª, 3ª, 4ª, 5ª**. Tire o óbvio do caminho. **Surpreenda a si mesmo.**

11

Crie personagens com **fortes opiniões e visões de mundo**. Ser passivo ou maledível pode parecer bom enquanto você escreve, mas é como um veneno para o **público**.

12

Por que você precisa contar **essa história**? Por que ela merece a atenção do público e o faz aplaudir-la? A resposta é o coração da sua história.

13

Se você fosse o seu personagem, nesta situação, como você se sentiria? **Honestidade dá credibilidade** para situações inacreditáveis.

14

**Nenhum trabalho é desperdiçado.** Se não está funcionando, deixe passar e siga em frente. A ideia irá voltar quando for útil mais tarde.

15

Coincidências que coloquem seus personagens em problemas são ótimas. **Coincidências** que os colocam fora deles, são **trapaças**.

16

Você deve se **identificar** com situações/personagens, não simplesmente escrever de qualquer forma. O que faz **VOCÊ** agir desta maneira?

17

Qual a **essência** da sua história? Qual a forma mais curta de contá-la? Se você souber a resposta, pode começar a construí-la a partir daí.

## Fontes:

1. [http://www.1agers.com/Main/Articles/itshography.cfm\\_Tips\\_for\\_effective\\_storytelling\\_47181.aspx](http://www.1agers.com/Main/Articles/itshography.cfm_Tips_for_effective_storytelling_47181.aspx)
2. <http://www.socialmediatoday.com/news/2013/02/using-storytelling-to-strengthen-your-brand/>
3. <http://www.kellogg.com/essentials/our-story/brand-storytelling>
4. <http://www.slideshare.net/powerfulpoint/17-14-10-top-17-rules-for-storytelling-powerfulpoint-14141414>
5. <http://www.marketingpower.com/insights/17-rules-for-storytelling>
6. <http://www.stratagem.com.br/2013/07/17/17-regras-para-criar-historias-inesqueciveis/>

Os principais pontos para se abordar no seu pitch

**Cassio A. Spina**, foi empreendedor por 25 anos, sendo atualmente investidor-anjo. É o fundador da Anjos do Brasil e autor do livro “Investidor-Anjo – Guia Prático para Empreendedores e Investidores” e contou a algum tempo atrás quais são os cinco slides mais eficientes para você se basear quando se apresentar para um investidor, cliente ou potenciais usuários.

Primeiramente o pitch é uma apresentação sumária de 3 a 5 minutos com objetivo de despertar o interesse da outra parte (investidor ou cliente) pelo seu negócio, assim, deve conter apenas as informações essenciais e diferenciadas. O pitch deve tanto poder ser apresentado apenas verbalmente quanto ilustrado por 3 a 5 slides. Ele deve conter basicamente:

1. Qual é a oportunidade.
2. O Mercado que irá atuar.
3. Qual é a sua solução.
4. Seus diferenciais.
5. O que está buscando.

Estes tópicos são genéricos, pois cada ideia tem suas peculiaridades, assim o que importa realmente é conseguir demonstrá-los sucintamente na sua apresentação.

Lembre-se que durante a apresentação as pessoas estarão analisando não só o seu negócio, mas principalmente você, o empreendedor, assim tão importante quanto apresentar claramente sua empresa é conseguir demonstrar seu conhecimento e capacidade de execução.

Lembrar também que não existe fórmula universal, pois cada investidor, principalmente tem um interesse distinto, assim, é possível que tenha de elaborar 2 ou 3 versões do seu pitch para apresentar conforme o perfil do ouvinte. Antes de efetivar sua apresentação, procure descobrir qual é o nível de conhecimento do mesmo sobre o seu mercado e seu negócio.

## A Apresentação

Detalho abaixo como elaborar cada slide do Pitch com base no modelo de apresentação em PowerPoint em [www.anjosdobrasil.net/pitch.html](http://www.anjosdobrasil.net/pitch.html):

### ► Slide 1 – Identificando a Oportunidade

Um pitch deve começar indicando qual a oportunidade que sua empresa irá atender, isto é, qual o mercado e a necessidade que o mesmo tem e não é



bem atendida pelos players majoritários, de forma bem objetiva e direta. Exemplo: “Nós iremos resolver o problema das perdas na distribuição de água” -> aqui você já determinou o mercado (“distribuidoras de água”) e a oportunidade (“resolver o problema das perdas”).

▶ Slides 2 e 3 – Apresentando a sua Solução

A seguir apresente rapidamente qual a solução que propõe para atender a necessidade da oportunidade já destacando a sua inovação/diferenciação. Continuando o exemplo anterior: “através uma tecnologia própria não-invasiva de monitoramento ativo que identifica os pontos de perda para reparo”. Veja que não foi necessário detalhar como a mesma funciona, mas ao mesmo tempo já destacou um diferencial (“tecnologia própria”). Insira amostras do seu produto/serviço, sejam telas do mesmo, fotos de um protótipo, um vídeo explicativo, etc. Tudo que tanto facilite o entendimento quanto demonstre sua capacidade de execução.

▶ Slide 4 – Destacando seus Diferenciais

Você deve agora reforçar suas vantagens competitivas perante a solução dominante do mercado. Observar que deve-se comparar com quem já tenha maior market-share no mercado que irá atuar independentemente de ser similar. Exemplo: “Nossa tecnologia, diferentemente do maior player deste mercado, não precisa que se instalem medidores específicos, pois monitoramos o fluxo de água por nosso equipamento de detecção”.

▶ Slide 5 – Explanando sua Proposta

Aqui, se você estiver apresentando para um investidor, deve apresentar qual o estágio do seu negócio, qual valor do investimento está buscando e para que será utilizado. Exemplo: “Já temos um protótipo funcional testado e avaliado pela companhia XYZ e estamos buscando um investimento de R\$ nnn para completar o desenvolvimento, fabricar as unidades piloto e fechar os primeiros contratos”. E completar perguntando se teria interesse em avaliar para investir.

Se você estiver apresentando para um cliente, deve apresentar qual sua proposta comercial. Exemplo: “Nossos serviços são remunerados com uma parte da economia que geramos para sua empresa; você não precisará fazer qualquer investimento”.

Concluída a elaboração da apresentação, simule a mesma tanto utilizando os slides quanto sem os mesmos para verificar que está consistente. Busque apresentar para colegas e amigos, solicitando feedbacks, em especial se está atrativa despertando o seu interesse.

## Como ficar calmo e arrasar

Agora que você já sabe tudo só tem que ficar calmo! Para isso aí vão algumas dicas:

### #1 – Estude e Chegue Mais Cedo

Primeiro de tudo, prepare uma boa apresentação e estude bastante, faça alguns ensaios da sua apresentação em casa e sozinho. Isso já ajuda muito a manter a calma. Chegue mais cedo no local que será realizada a apresentação para começar a se acostumar com tudo.

### #2 – Marketing Pessoal

Tente manter uma postura, mesmo que por dentro esteja morrendo de medo, não transmita isso para ninguém. Veja como é a roupa do ambiente, se é mais social ou não. Esteja compatível com as outras pessoas, nem muito bem vestido e nem abaixo do esperado. Esqueça o que você acha que é defeito, como “sou gordo”, “sou velho”, “sou baixinho”. Ninguém estará ali para isso, não se preocupe, preocupe-se apenas no seu conteúdo de apresentação.

### #3 – Você é TOP ou Não É?

Trabalhe a sua autoestima e esteja perto de quem gosta de você, assista alguns vídeos motivacionais na véspera da apresentação, isto vai te ajudar a melhorar a sua autoestima e se sentir mais preparado para entrar lá e arrasar, afinal, você é TOP ou não? Acredite em você.

### #4 – Morrer ou Falar em Público? Escolho morrer!

Você sabia que em uma pesquisa realizada nos Estados Unidos mostrou que a maioria das pessoas responderam que preferiam morrer do que falar em público? Você não está sozinho, pense nisso, a maioria das pessoas tem medo de falar em público, tudo porque não tem calma e tranquilidade para preparar uma boa apresentação. Por isso, não se preocupe, se você está ali na frente do público, já é um passo muito importante, a maioria daquelas pessoas na sua frente tem muito mais medo de você e não tem nem coragem de fazer o que você está fazendo.

### #5 – Alimentação Para Manter a Calma

Alguns alimentos e atitudes influenciam na crise de ansiedade que bate antes da sua apresentação por isso, evite estes alimentos. Você pode parar de tomar café, chá-preto e coca-cola (todos tem muita cafeína, aumentam a adrenalina). Outra atitude é dormir mais durante a semana e fazer alguns exercícios antes da apresentação. Fazer exercícios antes da apresentação

ajudam a eliminar a adrenalina do corpo, alguns palestrantes acordam mais cedo e fazem flexões e outros fazem caminhadas.

#### #6 – Pare de Viajar na Maionese

O que faz você perder a calma e colocar tudo a perder na sua apresentação, é deixar se levar pela ansiedade e começar a viajar na maionese, começar a imaginar coisas que não existem, como pensar que tudo vai dar errado, que vão rir de você, que você vai esquecer tudo na hora H, enfim.. tem gente que chega a imaginar que vão ser vaiadas. Pare com isso, ninguém vai fazer isso que você pode imaginar. Apenas, prepare uma boa apresentação, uma bom conteúdo, faça alguns ensaios, relaxe e vai lá e arrasa!

## AGORA VAI LÁ E ARRASA!

# FEEDBACK E MELHORIA CONTÍNUA

Interagindo com seus usuários

Como saber quem são seus usuários? Aqueles que estão usando o seu produto e potenciais usuários, certo!? E aí como podemos fazer para interagir com eles e ver o que eles estão pensando da nossa solução?

Aí vão duas dicas:

1. Fale com eles pessoalmente: simplesmente converse com eles de maneira franca, se mostrando interessado em melhorar! Essa maneira sempre será o melhor jeito de entender o que seu usuário sente e pensa!
2. Se aproveite do mundo digital: hoje em dia é bem mais fácil se comunicar com as pessoas afinal sempre podemos mandar um email ou uma mensagem no facebook. Então uma das maneiras de conhecer melhor o seu usuário é mandar um email para os email que foram usados pelos usuários na hora do cadastro por exemplo, ou simplesmente ter uma página no facebook onde você consegue ver



quem deu like na sua ideia e se comunicar com eles. Bem fácil né!? Não tem porque não interagir com eles : )

Como receber feedback

Aqui não tem muito segredo! Você tem que encarar qualquer comentário, sugestão ou crítica como um presente. Afinal, aquele simples comentário pode te poupar um tempão insistindo no erro, concorda?!

Já pararam para pensar que quando alguém diz que não usaria o seu aplicativo essa pode ser a opinião da maioria das pessoas? E aí você ia gastar um tempão e muita energia para construir algo que ninguém quer! Por isso, levem para a vida de vocês:

## **ENCAREM FEEDBACK COMO UM PRESENTE!**

Claro que ouvir crítica nunca é uma delícia, mas se você seguir o meu conselho garanto que vai ficar BEEEM mais fácil! Juro, que é uma questão de treino! ; )

Melhoria contínua

Se você acha que assim que você acabou a sua solução você nunca mais vai ter que falar com os seus usuários você está redondamente enganado! Na Era Digital, se você não estiver sempre procurando melhorar você vai ficar preso no passado e não vai crescer. Por isso a ideia de melhoria contínua é tão importante. Então lembre-se que o seu objetivo deve ser:

## **HOJE MELHOR DO QUE ONTEM, AMANHÃ MELHOR DO QUE HOJE!**

Bom, então o que afinal é Melhoria Contínua? É uma busca constante de aperfeiçoamento! Ótimo! Todo mundo quer melhorar, porquê então nem todas as empresas ou negócios adotam essa prática? A Principal

dificuldade é a resistência a mudança cultura e hábitos. Mudar nem sempre é agradável!

Agora que convenci vocês que precisamos pensar em como melhorar sempre aí vai uma dica de como fazer isso. Essa ferramenta se chama 5W. Em português chamamos de 5 porquês (o W vem de WHY que é porquê em inglês)

Como essa ferramenta funciona: Vamos sempre perguntar 5 vezes porquê antes de achar que encontramos a causa de um problema : )

Olha aí uma exemplo:

1. O produto atrasou 2 hs. Porque atrasou?
2. Ele não foi preparado a tempo de ser entregue no prazo. Porque não preparou a tempo?
3. Não tinha material suficiente para fazer o produto. Porque ...?
4. Porque pedimos a matéria prima quando tinham apenas 2 unidades Porque ...?
5. **[Causa raiz]** Porque não reparamos que tinham apenas duas unidades da matéria prima. Por que não reparamos?

**Possível solução:** criar uma checklist com as quantidades mínima de matéria prima que precisamos ter no estoque!

Para terminas a discussão de hoje vamos conhecer os 12 princípios da melhoria contínua:

Use a cabeça.  
Repita "Porque" 5 vezes.  
Trabalhe em equipe.  
Os problemas são oportunidades.  
Perceba o problema primeiro, vá e veja por si.  
Não subestime a inteligência e o conhecimento dos outros.  
A melhoria contínua não tem fim.  
Crie maneiras de medir como o seu processo está andando  
Nunca desista, seja pró-ativo.  
Evite as desculpas, assuma.  
Opte pela solução mais simples. Não espere a perfeita.  
Corrija os erros logo que aconteçam.

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# LITERACIA3.0

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Entendendo, produzindo e inovando com tecnologia



AULA 10 - Como publicar um aplicativo? Como divulgar sua ideia?

*1º Edição*

# COMO PUBLICAR O MEU APLICATIVO?

## Como exportar .aia e .apk

No AppInventor 2 é bem fácil compartilhar e exportar seus projetos. Mas antes disso vamos entender para que serve cada um dos tipos de arquivos que podemos produzir com a ferramenta:

### **.aia**

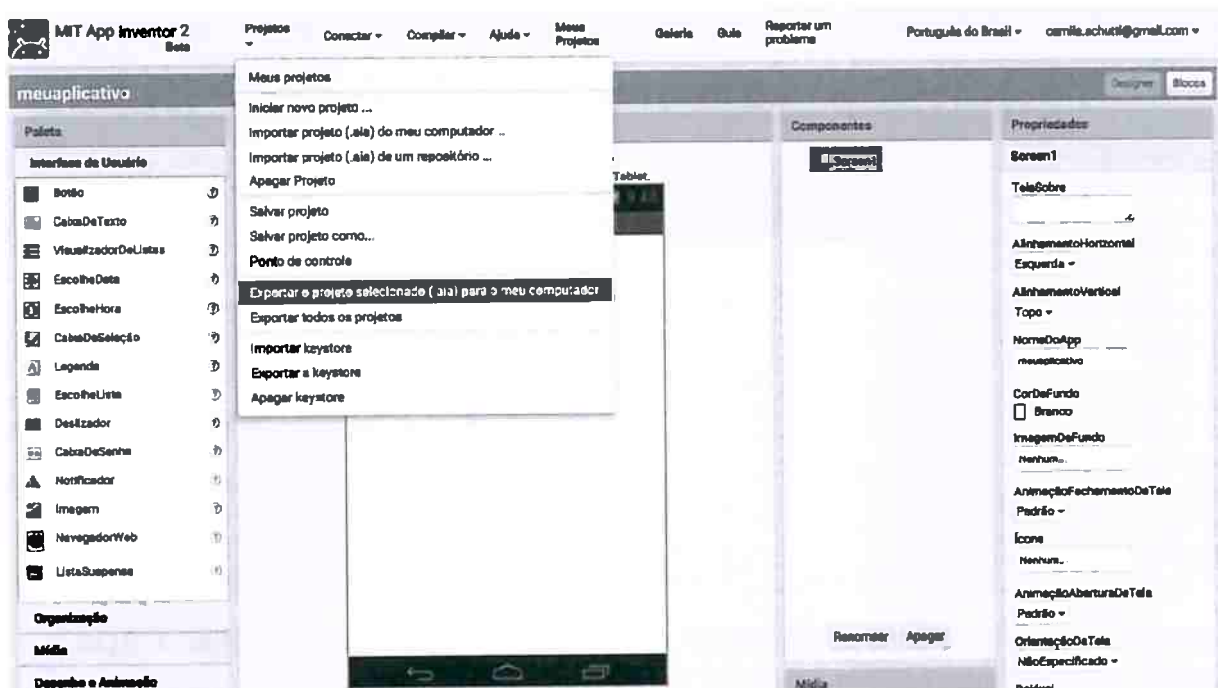
esse formato possibilita que você acesse os blocos e não somente execute o seu aplicativo. Faz sentido usá-lo quando vocês quer compartilhar sua lógica e código com outra pessoa.

### **.apk**

esse formato é o que passamos para os nossos dispositivos. Ele não nos dá liberdade para visualizar o código, nem realizar mudanças nas funcionalidades. Não adianta enviar para colaboradores.

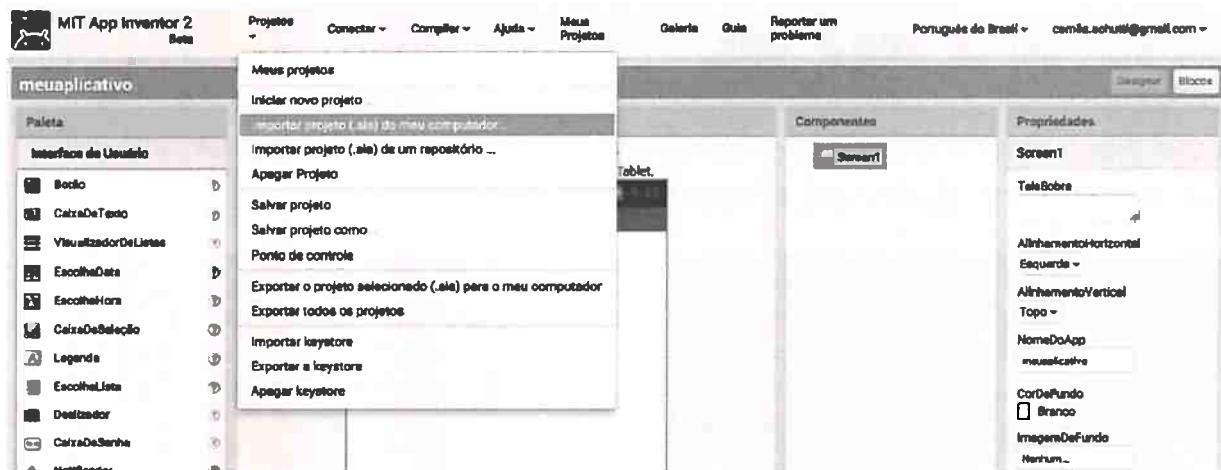
Para gerar cada uma desses arquivos siga o seguinte passo no App Inventor:

**.aia:** Projetos > Exportar o projeto selecionado (.aia) para meu computador.

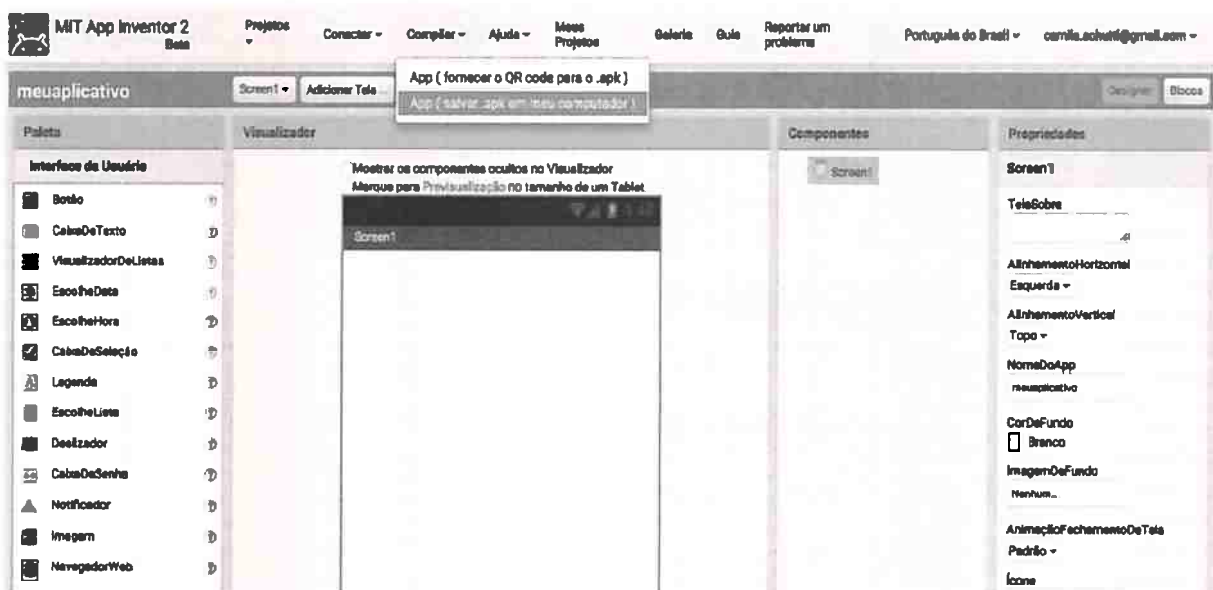


Aproveitando o embalo vamos descobrir como importar arquivos .aia para o nosso AppInventor e assim podemos colaborar em projetos que não necessariamente fomos nós que começamos.

Para importar basta clicar em: Projetos > Importar projeto (.aia) do meu computador.

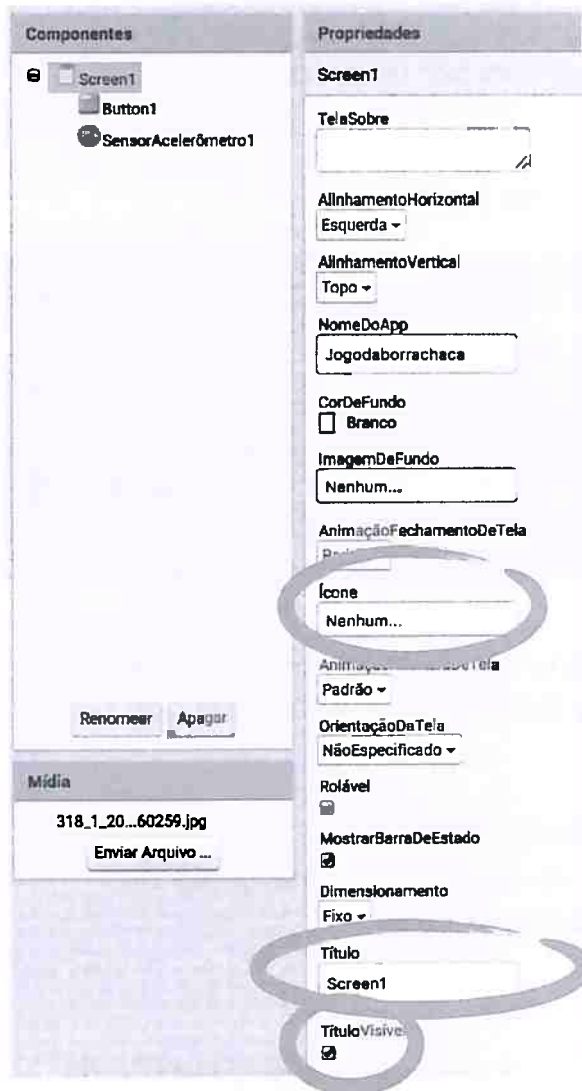


**.apk:** Além da maneira como testamos o nosso aplicativo usando o QRCode, podemos gerar um arquivo .apk que será baixado para o nosso computador. Aí você pode enviar esse arquivo para qualquer pessoa que queira instalar o seu aplicativo. Além disso você pode preferir passar o seu app para o seu celular via usb.



Para gerar esse arquivo para seguir os seguintes passos: Compilar > App (salvar .apk em meu computador)

## Como alterar a ícone do seu aplicativo para a instalação?



Para alterar o ícone basta selecionar em componentes a primeira tela de seu projeto e subir uma imagem na propriedade Ícone.

Lembre-se que a sua imagem deve ficar bacana num quadradinho, que é um espacinho limitado. Como se fosse o do Facebook ou do Whatsapp, sabe!? Não precisa colocar o nome inteiro ou muita informação no ícone. Teste várias opções.

Outras propriedades importantes para instalação de uma versão mais “profissional” é dar nomes melhores para cada uma das telas na propriedade Título e aí você vai ter que ir selecionando suas telas em componentes e alterando os nomes.

Você pode também deixar as telas sem títulos, que é o mais comum inclusive. Para isso basta tirar a marca de check na propriedade TítuloVisível.

Pronto! Agora seu app está bem profissional!

**Como criar uma conta de desenvolvedor no Google Play**  
É fácil e rápido registrar e começar a distribuir seus aplicativos no Google Play, que é a loja de aplicativos Android, que vai possibilitar com que pessoas achem e baixem seu aplicativo, sem que você precise enviar um por um o seu .apk.

Antes de começar você precisa saber que há uma taxa de registro de US\$ 25 cobrados por uma conta de Console do desenvolvedor do Google Play, o que é uma taxa considerada barato uma vez que é cobrada apenas uma vez na sua vida e você pode publicar quantos aplicativos quiser. Só pra vocês compararem a Apple cobra \$99 por ano por uma conta de desenvolvedor.

Para facilitar a sua vida pode usar essa conta aqui:

EMAIL: [aplicativosdosalunosusp@gmail.com](mailto:aplicativosdosalunosusp@gmail.com) \*\*

SENHA: noscriamosaplicativos \*

\* sim isso não é uma boa prática, mas não tinha outro jeito

\*\* não espalhem por aí essa conta. hein!? Usem para fins educacionais, ok!? Ela é monitorada por mim! ;)

Além da conta de desenvolver é necessário estar em um país compatível para distribuir aplicativos no Google Play (podem ficar tranquilos que o Brasil está nessa lista).

## Como registrar-se como um desenvolvedor

É bem simples tornar sua conta pessoal do Google em uma conta de desenvolvedor. Basta seguir o seguinte passo a passo:

1. Faça login na Conta do Google que será usada como a proprietária da sua conta de desenvolvedor.
2. Acesse a página de inscrição no Console do desenvolvedor do Google Play para começar a se registrar: <https://play.google.com/apps/publish/signup/>
3. Durante o registro, será preciso aceitar o Contrato de distribuição dos desenvolvedores do Google Play para avançar. Se sua conta já violou esse contrato, não será possível se registrar como um Desenvolvedor do Google Play.
4. Pague a taxa de registro usando uma forma de pagamento válida da Carteira virtual do Google.



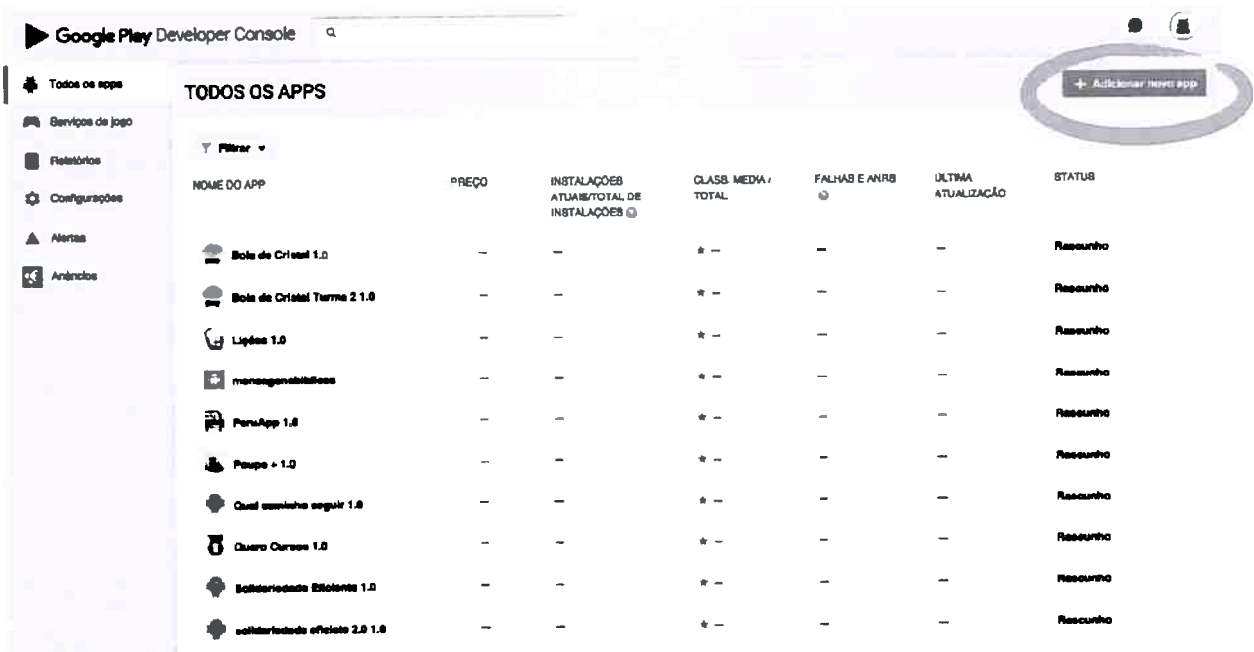
5. Preencha os detalhes da sua conta, incluindo seu Nome do desenvolvedor. Esse é o nome que é exibido na Google Play Store, então se você quer que apareça o nome do seu time é preciso alterar. Obs: A nossa conta é compartilhada então, nesse caso vamos manter o nome, ok!?

O processamento de seu registro do Console do desenvolvedor do Google Play poderá levar até 48 horas! Como você estão usando a conta compartilhada pode correr para a próxima sessão e publicar o seu aplicativo!

## Como publicar um novo aplicativo

Agora que você já se registrou como desenvolvedor, é fácil fazer o upload de seu aplicativo para o Google Play!

Na tela inicial do Console do desenvolvedor do Google Play, selecione Adicionar novo aplicativo. Será solicitado que você preencha as informações a seguir sobre seu aplicativo!



As primeiras informações que você vai ter que preencher são idioma e nome do aplicativo. Se você já tiver o arquivo .apk você já pode subir clicando em [Enviar APK], mas se você clicar em [Preparar lista da Play

Store] você pode começar a completar as outras informações e depois

ADICIONAR NOVO APP

Idioma padrão \*

Português (Brasil) - pt-BR

Título \*

0 de 30 caracteres

Como você gostaria de começar?

Enviar APK Preparar lista da Play Store Cancelar

subir  
executável.

o

Aí vão alguns outros detalhes do material que você tem que produzir para publicar o seu app:

**Arquivo APK:**

- ▶ o tamanho máximo suportado por um único .apk é 50 MB.
- ▶ os nomes dos pacotes de aplicativos são exclusivos e permanentes. Por isso, escolha-os de forma sensata.

- ▶ *arquivo .apk de rascunho do aplicativo*: ao fazer o upload de um arquivo .apk, ele pode ser salvo como rascunho enquanto você edita outros aspectos da lista. O botão Salvar rascunho será exibido na caixa de diálogo após a conclusão do upload do APK. Se você deseja fazer o upload de um novo APK, sem publicá-lo no Google Play imediatamente, é possível salvar um novo APK como um rascunho a partir do modo "Simples" ou "Avançado".

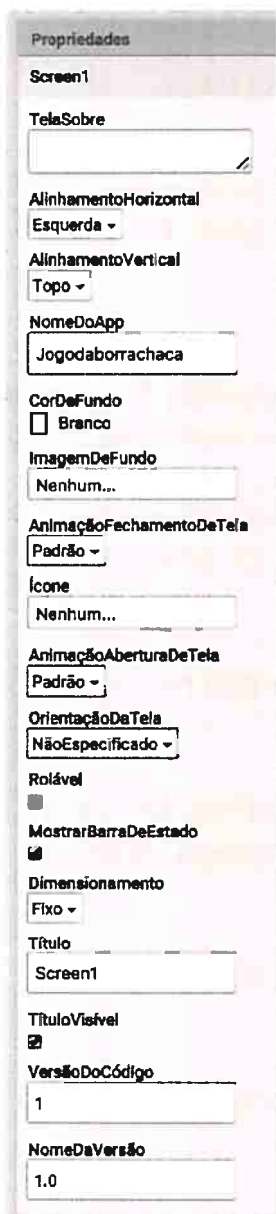
### **Capturas de tela:**

- ▶ são necessárias duas capturas de tela, e as seis capturas adicionais disponíveis são opcionais. O jeito mais fácil de fato é tirar print das telas do seu aplicativo pelo celular.

### **Detalhes da entrada:**

- ▶ **Idioma**: para indicar o idioma de seu aplicativo. O idioma padrão é o inglês americano. Mais idiomas ficarão disponíveis à medida que telefones com tecnologia Android forem disponibilizados nesses idiomas. Além disso, você pode incluir traduções do título e da descrição do aplicativo para promovê-lo para usuários que falam outros idiomas. As traduções serão exibidas no Google Play.
- ▶ **Título**: o nome de seu aplicativo como deseja que ele apareça no Google Play. Você pode adicionar um por idioma.
- ▶ **Descrição**: a descrição visível de seu aplicativo no Google Play. Utilize o recurso de tradução a fim de traduzir sua descrição para outros idiomas. Há um limite de 4 mil caracteres para esse campo.
- ▶ **O que há de novo nesta versão?**: adicione notas sobre alterações específicas às versões publicadas do seu aplicativo.
- ▶ **Tipo de aplicativo**: o Google Play está dividido em dois tipos principais de aplicativos: Aplicativos e Jogos. Escolha um.
- ▶ **Categoria**: selecione uma categoria para seu aplicativo. Leia mais sobre categorias na própria página de publicação.
- ▶ **Locais**: são os locais em que você pode distribuir seus aplicativos. Nem todos os locais listados no momento têm usuários com dispositivos habilitados para Android. Você pode selecionar locais um por um ou escolher a opção.

- ▶ **Dados de contato:** você precisa escolher um canal de suporte para seu aplicativo: website, e-mail ou telefone. Os usuários do Google Play poderão ver essas informações. Você pode oferecer vários canais de suporte.



## Como publicar novas versões do seu app

Para publicar uma nova versão você vai ter que abrir o aplicativo que está querendo atualizar no AppInventor e atualizar o campo VersãoDoCódigo e Nome da Versão. No primeiro basta adicionar 1 ao inteiro, ou seja, se estava 1 basta alterar o campo para 2. O segundo campo pode ser alterado seguindo o seguinte padrão:

- ▶ se as mudanças foram drásticas ou foram muitas você deve alterar o primeiro número e somar 1. Por exemplo, nossa segunda versão com muitas mudanças seria 2.0

- ▶ se foram apenas ajustes basta alterar o segundo número. Ou seja, a minha nova versão será 1.1

Assim que o APK estiver pronto, veja como fazer o upload da nova versão usando seu console do desenvolvedor. Basta seguir esse passo a passo:

1. Faça login no Console do desenvolvedor do Google Play.
2. Selecione seu app.
3. No menu à esquerda, clique em APK.
4. Clique no botão Fazer o upload do novo APK.
5. Faça o upload do seu APK.
6. Selecione uma opção de publicação.

## Entrega de atualizações

Após enviar uma atualização para um app, você verá o status "Atualização pendente" próximo ao canto superior direito das páginas do console do desenvolvedor do seu app enquanto este estiver em processamento. Assim que a atualização for publicada, ela começará a ser distribuída para os usuários existentes, e o status "Atualização pendente" deixará de ser exibido.



Assim que estiver disponível, os usuários poderão fazer

o download da atualização na página "Detalhes do app" ou no app Play Store Google Play, na página Meus apps. Além disso, se um usuário tiver ativado as atualizações automáticas do seu app, a atualização será transferida e instalada automaticamente.

As atualizações do app levam algum tempo para chegar aos usuários existentes, ok!? Espere pelo menos 24 horas antes de achar que aconteceu algo errado!

**Cenário offline:** os alunos podem trabalhar em cartazes criando um painel com as informações relacionadas a publicação. Terão que expor posteriormente os seguintes conteúdos referente aos projetos deles: Título, Descrição curta (140 car.), Descrição longa, Tipo, Categoria e Locais e Dados de contato.

# COMO DIVULGAR A MINHA IDEIA?

## Descobrir o seu público alvo

Público-alvo é um grupo de pessoas com algumas características em comum – como gênero, faixa etária, estado civil, localização geográfica, faixa salarial etc – que podem estar interessadas em baixar seu aplicativo. Quanto mais detalhes você tiver dessas pessoas – não só do grupo – melhor, pois mais efetiva será sua divulgação!!!

Por exemplo, você pode me dizer que seu público-alvo são “todas as crianças do mundo”. Mas, aí eu te pergunto: você acha que uma criança que mora na fazenda no interior de uma cidadezinha tem os mesmos hábitos que uma criança da cidade? Você acha que elas possuem os mesmos interesses, ou necessidades, ou ainda problemas? Claro que não!

Aí vocês devem estar pensando...então como eu vou saber qual é o meu público-alvo?”

## Dicas

### – Pesquisa

É importante conhecer muito bem o mercado que se pretende atingir. Quanto mais detalhes, melhor. Agora, claro, cuidado para não perder tempo com o que não fará diferença para sua estratégia de sucesso!

### – Delimite seu público majoritário

Agora você já sabe quem é quem no mercado em que pretende atuar. Mas vá com calma e não saia atirando para todos os lados. Afinal de contas, quem tenta agradar a todos não agrada a ninguém. Delimite um grupo específico no qual valerá a pena focar seus principais esforços, cruzando informações e identificando o que será mais vantajoso para seu negócio.

### – Evite confundir gosto pessoal e gosto dos clientes

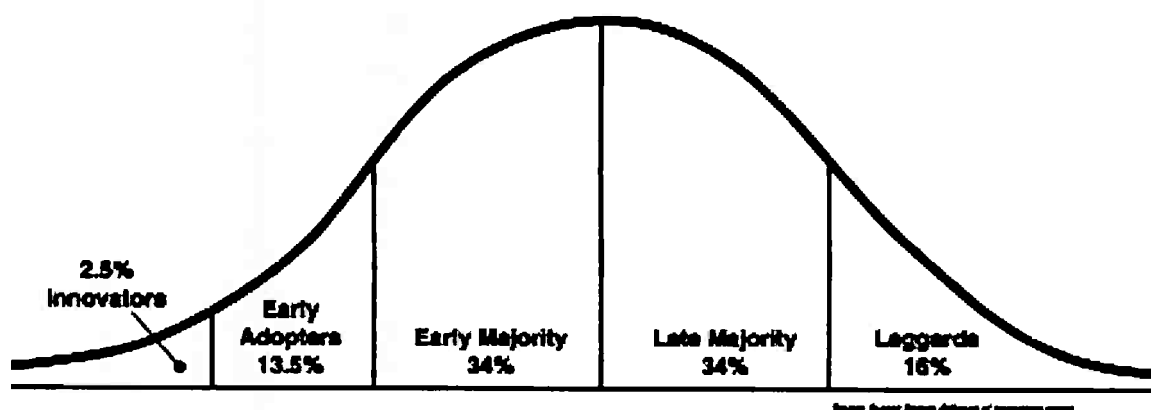
Muito profissionalismo nessa hora! Evite achar que o que é bom para você é bom pra todo mundo! Sei que é difícil! Essa é uma atitude que deve ser abandonada imediatamente! Pense no seu público alvo e nas necessidades deles!!!

### – Escute e observe

Aproveite todos os contatos e oportunidade que você tiver com seu público para ouvir e compreender quais são suas reais necessidades. Além disso, pergunte o que poderia melhorar no seu projeto.

## Curva de adoção

Há um modelo sociológico chamado Curva de Adoção de Tecnologia que classifica as pessoas em 5 categorias quanto à adoção de novas tecnologias: Inovadores (Innovators), Adotadores iniciais (early-adopters), Maioria inicial (Early majority), Maioria tardia (Later majority) e Retardatários (Laggards).



Os inovadores e os early-adopter são as pessoas que rapidamente adotam novas tecnologias e já utilizam as redes sociais como parte do seu dia-a-dia pessoal e profissional. A maioria inicial e tardia são pessoas que adotam as tecnologias depois de estarem realmente consolidadas, e os retardatários são pessoas altamente resistentes às novas tecnologias.

Entenda cada perfil:

**Inovador** – Aquele amigo que sempre te apresenta uma novidade tecnológica que ninguém mais conhece. Exemplo: Antes de lançar o iPad já leram sobre o produto e estão dispostos a pagar mais para serem os primeiros a utilizarem.

**Early-adopter** – Começam a usar e testar novas tecnologias com rapidez. Em geral, ensinam amigos e colegas como usar uma nova tecnologia. Exemplo: Pessoas que já usam o Twitter no dia-a-dia.

**Maioria inicial** - Adota a tecnologia quando percebe uma utilidade real para seu dia-a-dia. Exemplo: Adota o skype quando descobre que pode economizar muito em ligações de longa distância.

**Maioria tardia** – Mais conservadores e com maior resistência em adotar novas tecnologias. Em geral, adotam a tecnologia quando todos amigos já estão utilizando. Exemplo: Passam a usar o e-mail quando ninguém mais tem fax.

**Retardatários** - Muito conservadores e com resistência a mudanças. Em geral, são mais velhos e somente adotam a tecnologia quando a antiga não está mais disponível. Exemplo: Envia fax até que as outras pessoas se recusem a receber via fax e peçam para enviar por e-mail.

## Próximos Passos

Agora que você já sabe como definir seu público alvo e como é a adoção deles é só trabalhar bastante e nunca parar de aprender que você vai fazer muitos projetos legais usando tecnologia!





## Appendix D

# Guide for the Interviews with potential technical and non technical educators

- *RELAÇÃO COM EDUCAÇÃO*

1. Me conta um pouco da sua relação com o sistema educacional.
2. Conta pra mim a sua rotina e a infra estrutura que te cerca. [Tem computador? Quantas aulas você dá? Pra quantos alunos? Quantas séries? Treinamento e reciclagens são comuns?]

- *RELAÇÃO COM TECNOLOGIA*

1. Como é a sua relação com tecnologia no dia a dia?
2. Como é a interação do computador e do celular na sua sala de aula?
3. Você pede que eles desliguem tudo? Já fez alguma atividade com celular?
4. Você acha relevante falar do tema (Tecnologia e Vida Digital) na sala de aula?
5. Já pesquisou sobre isso? Já testou alguma coisa?

- *PROFESSOR VERSUS FACILITADOR*

1. Qual a diferença para você de um facilitador e de um professor? Qual é a melhor estratégia para ensinar?
2. Já tentou algo?
3. Se você acha que essa mudança de mindset é bacana, o que você acha que pode ser importante pra transformação? Treinamento? Suporte? Conteúdo?

- *NATIVO DIGITAL*

1. Me descreve um nativo digital? Alguém que nasceu perto dos anos 2000
2. Você acha que ele já sabe tudo sobre tecnologia e vida digital?
3. Ser produtor/construtor muda a maneira como usamos as coisas?
4. Existe um desconforto para testar algo relacionado a tecnologia por pressão do nativo digital hiperconectado?

- *APLICAÇÃO DO CURRÍCULO*

1. Sabe o que é programação? Entende que é o que? [Falar do paralelo da escrita e programação] Você acha relevante o ensino dessa habilidade?
2. Ainda que você não seja técnico, você se sentiria confortável, usufruindo do conteúdo e de uma rede de suporte para ensinar mais sobre tecnologia e vida digital?"

3. Você acredita que na sua realidade isso seria viável?
4. Como você acha que podemos realizar um treinamento em escala? Distância é uma opção? Como distribuir esse currículo?

## Appendix E

# Personal Curriculum Development and Implementation Experience

This present research started well before the beginning of my joining in the USP Master Program. All my involvement with education in computer science began almost immediately after my college first day of class, where I recognized that there were so few girls interested in technology. I started producing content for a blog called Women in Computing <sup>1</sup> in English (the name in Portuguese is *Mulheres na Computação*), where in addition to telling the story of women who had developed great work, I wrote about technical topics in a way that I believed that girls would be interested. It made me understand some very important differences in the way kids are educated. In this context, each example is very well thought out to keep the engagement.

The blog grown up and I had the chance to engage in a global project: Technovation Challenge <sup>2</sup>, a global technology entrepreneurship program just for girls. The challenge, at that time, were arriving in Brazil after 3 years of application in United State. In 2013 they accepted international projects and one group from Brazil was the third place in the finals, what gave motivation the bring more structure to Brazil, like to translate the curriculum. They need help to adapt this curriculum, to develop and facilitate workshops. The knowledge about curriculums, workshops, tools and coaching style teaching grown up a lot. Technovation Challenge in Brazil is a success, it represents thirty percent of the global challenge number. Since 2010, the challenge reach over 3,000 girls from 28 countries.

After one year of volunteer work for Technovation Challenge, mainly focused in São Paulo and after four years delivering educational content through the blog I was invited to co-organize the Marathon App <sup>3</sup>, a national wide project to teach high school students how to program through videos. My partner at the project and I was responsible for everything since the selection of the necessary content to the production of the videos. I had a way to discover the differences we have inside Brazil. The material reach all the states in Brazil and I have the chance to apply in loco some fast workshops all over Brazil.

The most impactful one was in the middle of a river in Amazon jungle with a pretty bad 3G connection with kids and teenagers for riverside community. All of them had smartphones, but they had no idea about the possibilities that the device could bring to their lives, they were just users, but know they were reachable and they already have the resources in their hands. With the smartphones is possible to arrive at the remote Brazil for example, that represent the forgotten areas in developing countries.

With Technovation Challenge and Marathon App summed up I saw more than fifteen thousand people learning how to code and the importance of this knowledge in this times. Most of them really young and taking the firsts decision about with to do for life. They return to me to ask about what is the next step to work with technology as a professional. I was not comfortable with no available

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<sup>1</sup><http://www.mulheresnacomputacao.com>

<sup>2</sup><http://www.technovationchallenge.org>

<sup>3</sup><http://www.maratonadeaplicativos.com.br>

option, so we've created Mastertech <sup>4</sup>, an immersive bootcamp to teach programming, Internet of things, artificial intelligence and 3D modelling and printing, everything we believe market is needing now. During the course a lot of tests about the coaching teaching style were done.

All this experiences brought a lot of insights for the proposed curriculum of this research, for example how appealing is the use of smartphones during the computational thinking learning.

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<sup>4</sup><http://www.mastertech.tech>

## Appendix F

# Original version of promotional material for Digital Literacy course

- *Título:* Alfabetização Digital - entenda, produza e crie com tecnologia.
- *Pré Requisito:* Nenhum
- *Ementa:*
  - Módulo 1: Contexto / Entendendo tecnologia
    1. Interação Homem/Computador: Computação Básica
    2. Interação Homem/Computador: Vida Digital
    3. Programação e resolução de problemas: Entendendo e Avaliando
    4. Interação Homem/Computador: A internet e a WWW
    5. Interação Homem/Computador: Rede Social
    6. Programação e resolução de problemas: O poder da tecnologia
  - Módulo 2: Transição / Produzindo com tecnologia
    1. Interação Homem/Computador: Produtividade
    2. Interação Homem/Computador: Privacidade e Segurança
    3. Programação e resolução de problemas: Programação
    4. Web Design: Interface e User Experience
  - Módulo 3: Produção / Criando tecnologia
    1. Negócios e resolução de problemas: Ideação
    2. Negócios e resolução de problemas: Plano de negócios
    3. Web Design: Interfaces móveis
    4. Web Design e Programação: Prototipação
    5. Programação: Programação móvel (AppInventor)
    6. DemoDay
- *Metodologia:* As atividades desenvolvidas compreenderão de 30% de teoria e 70% de atividades práticas com atividades pré e pós aulas. Os grandes projetos desenvolvidos em sala de aula utilizarão da metodologia de aprendizado baseado em projetos e aprendizado baseado em desafios, onde os participantes deverão criar para aprender e aprender a resolver problemas.
- *Objetivo:* Com uma linguagem inovadora e alinhada com o pensamento da geração interativa agora vai poder ganhar literacia digital - uso eficaz da tecnologia, como computadores, redes e smartphones. Para isso eles precisam entender do funcionamento e do potencial da tecnologia e do mundo digital, podendo assim se transformar em atores ativos da construção do seu

próprio mundo. Mais do que ensinar a programar, vamos ensiná-los a viver e tirar o máximo proveito do mundo digital. Capacitando-os a transformar suas próprias comunidades com tecnologia.

- *Carga horária:* 20hs

Besides the above description used at the three seasonal schools' websites, there was the following offline media distributed in the USP Campus (Figure )



# **1ª Escola de Inverno**

## **IME-USP**

**20 a 31/07/2015**

### **Tema: Inclusão Digital**

**Curso**

**Alfabetização Digital:**

**Entenda, produza e crie com tecnologia**

**Inscrições a partir  
de 15/06/2015**

**[www.ime.usp.br/inverno](http://www.ime.usp.br/inverno)**



**USP**



**Instituto de Matemática e Estatística  
Universidade de São Paulo**



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