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One Computer per Student City - Total UCA
An All Inclusive Totality under Discussion

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Abstract: This paper discusses the National Policy of the Inclusive Education and the distribution of Laptops - PROUCA. Both operate under the logic of inclusion in the context of education, the first aiming at school inclusion and the other at digital inclusion. In order to observe how the inclusive process of people with disabilities mediated by laptops occurs, a qualitative descriptive research was performed, focusing on the TOTAL UCA reality in Tiradentes, Minas Gerais. The results of the research project showed that the distribution of laptops, labeling the offered tool under the concept of technological homogeneity and uniformity, imposes barriers to the care for diversity in a socio-digital inclusion scenario.

Keywords: Socio-digital inclusion, Accessibility, PROUCA
Categories: L.3.8, L.3.1, L.3.6

1 Introduction

Due to the economical development, Brazil nowadays has positively responded to the international democratization programs of the access to technological resources in varied social-cultural spaces. An example that illustrates this movement can be seen in the country's participation in the international project One Laptop per Child (OLPC), which aims to spread a new configuration to the insertion of digital information and communication by distributing one laptop per student. At the same time, the Brazilian educational agendas are facing the demands of the new Special Education Policy that works from the perspective of Inclusive Education.

In order to analyze these aspects more deeply, we present in topic 2, *The National Policy of Inclusive Education*, the way Brazil has been building an inclusive scenery in its territory. In topic 3, *The One Computer Per Student Distribution Policy-UCA*, we approach issues related to the Laptop distribution policy in the Brazilian context. In Topic 4, *The Intersection Of The Policies In The School Context*, we establish how

the relationship between these two governmental actions has been happening in the school environment. In topic 5, *Researching That New Reality*- We present the research methodology which was applied in order to find answers to the following questions: (i) What movements are triggered by the mediation of educational laptops in the PROUCA context to enhance the socio-digital inclusion of individuals with disabilities? (ii) Do the educational laptops used in PROUCA present an accessible interface to individuals with disabilities? Answering the research questions, In topic 6, *Total PROUCA And UCA: A Totality Under Discussion*, we present a pilot experience in a city where the educational laptops are distributed to all students. In topic 7, *Analysis of the Inclusive Movements in the Total UCA City- Tiradentes/MG*, we bring to discussion the inclusive aspects that are triggered by the insertion of mobile devices in a Brazilian city. In topic 8, *Verification of Accessibility And Usability Of PROUCA Technology*– we discuss the accessibility and usability evaluation of the educational laptops that are nationally distributed. In topic 9 – *Conclusions,* we present some inferences about how the social-digital inclusion has been happening with the students with disabilities included in the TOTAL UCA city context. Last, we finish with the Future work in topic 10.

2 The National Policy of Inclusive Education

The extinct Secretaria de Educação Especial - SEESP (Special Education Department) which was a branch of the Education Ministry (MEC) strongly influenced by the inclusive international documents, such as The Salamanca Statement (ONU, 1994), and the Convention on the Rights of Persons with Disabilities (ONU, 2006), has had the proposition of developing programs, projects, and actions in order to build the Special Education National Policy from the Inclusive Education Perspective [Brasil, 08].

Inclusion in its etymological meaning is to comprehend, to contain, to take part. That is why speaking about an inclusive school means saying that all its students actually participate in the activities. This inclusive perspective is very similar to the propositions for a school reform that [Vygotsky, 97] discussed and presented in the last century. This author defended the premise that people with disabilities should be part of the regular educational system to achieve their whole development. He also proposed the existence of an auxiliary environment, which should support the regular school in a fully integrated way and promote strategies that focused on the socio-cognitive development and not on the disability.

With the implementation of the Special Education National Policy in the Inclusive Education Perspective, the concept of difference constitutes a new construction in the Brazilian Educational System, as attending regular school becomes a legal right for everybody, regardless of physical, sensory or mental fragilities that the student may present. Accepting the difference is no longer just altruistic but also a constitutional right.

The Inclusive Education proposal intends to ensure the inclusion of students with disabilities, global developmental disability and high ability/gifted in regular school. The main objective is the access, the participation and the learning development of these students, directing the teaching departments to provide responses to special needs through different guidelines. Among these guidelines, it is included the supply

of a Specialized Educational Assistance (AEE), an educational space to provide and organize resources which promote the students involvement in class taking into consideration the individual characteristics. It is important to emphasize that the AEE is not supposed to substitute the school activities, but supplement them.

3 The One Computer Per Student Distribution Policy – UCA

The educational laptop policy adopts the propositions of the One Laptop per Child project (OLPC[1]), which was conceived by Nicholas Negroponte. This international action invited several countries, in particular the developing countries[2], to engage in an effort for the democratization and universalization of the computing technology access, with the main purpose of assuring that all the children at school age have access to their own computer. In Brazil, an inter-ministerial group has been established to evaluate the proposal and the viability for the project implementation, which is called One Computer Per Student Project (UCA).

From 2008 to 2010, the PROUCA had its first phase, applied experimentally in 5 public schools in São Paulo-SP, Porto Alegre-RS, Palmas-TO, Piraí-RJ and Brasília-DF. In these cities, the project established some cooperation agreements with Federal Universities so that they could give technological support for the laptop maintenance, provide the training for the educators involved, and analyze the implementation process to support the decisions for the qualification of the continuity of the UCA Project. The Higher Studies and Technological Evaluation Council (CAEAT[3]), of the Federal Chamber of Deputies, carried out a study to evaluate this implementation process of the Public Policy and identify the aspects that could guide the procedures in the second phase of the project. This report had as objective to systematize the results obtained in this experimental phase, and give supporting tools to the educational process in the next phases of the project.

After the partial results of the CAEAT report, the government created provisional measures and opened tenders for the continuity of the process. The PROUCA entered its second phase, called Pilot Phase, predicting the service for 300 schools in the country as well as the amplification and the deepening of the proposal by providing all the public school systems of the cities Barra dos Coqueiros/SE, Caetés/PE, Santa Cecília do Pavão/PR, São João da Ponta/PA, Terenos/MS and Tiradentes/MG with computers. This new project interface is called "Cidades UCA Total" (Total One computer per student cities). In six cities, all the public schools, either state-run or municipal ones, receive one computer per student, which ratifies the definition of these cities as digital cities.

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[1] The OLPC is a nonprofit organization created by the media lab researchers of the MIT (Massachusetts Institute of Technology in 2001. It was created with the purpose of distributing education laptops at low cost

[2] "OLPC's mission is to empower the world's poorest children through education. We aim to provide each child with a rugged, low-cost, low-power, connected laptop. To this end, we have designed hardware, content and software for collaborative, joyful, and self-empowered learning." (http://one.laptop.org/about/mission/.)

[3] The acronym CAEAT stands for "The Higher Studies and Technological Evaluation Council".

The laptop offered by the government through PROUCA is the Classmate PC (figure 1), a “low-cost” notebook (about $275.00) designed by Intel and nationally developed by CCE. This piece of equipment was designed for schoolchildren, therefore it is shock resistant and its format is portable, it weighs only 1.3 kg. Its configuration includes a Celeron-M 900 Mhz Processor, 256MB DDR2 memory plus 1 GB flash memory, 2 USB doors, a 7 inch LCD screen, wireless and Ethernet networks. It has a soundboard with microphone entrance, built-in microphone and two speakers. The Metasys Classmate operating system is already installed on the laptop and it has some exclusive applications for the classroom learning process. This system is based on Metasys with some changes that are compatible with the Classmate PC and proper for the target public, that is, elementary, middle and high school students.

Figure 1: Classmate computer

The insertion of educational laptops in Brazilian public schools is unarguably justified as it allows the teacher to leverage the construction of inclusive practices overcoming the rigidity and scarcity that characterizes the model of computer insertion in educational institutions. By breaking with the "school map" which projects the Computer Lab as "the place of technology" in the school, there is a true "spread of technology," and the computer is placed in the hands of one of the actors of the school setting, the learner, and at the same time transforms the classroom into an effective and promising time and space for digital, educational and social inclusion.

The displacement of technology to the student's home broadens the access to information and communication technologies in an unquestionable way for part of the population who has been deprived of significant human formation processes. By placing technology in the hands of students, the financial resources invested in the purchase of educational laptops are ratified and optimized, as it is possible to overcome idleness and underutilization of the technology, not only because it allows the access during school hours, but also because the community begins to benefit from the potential of social insertion associated with the use of communication and information digital tools.

The school conquers a tool to perform an important social function, which is to enable formation practices to be built in the socio-cultural context where it is inserted. The assumptions that build the pedagogical and technical configuration of educational laptops must respond to principles that are central for the implementation of inclusion practices:

- *Mobility*: A concept that allows to break with the configuration of the Computer Lab as the place of technology in the school, creating opportunities for the learning process to be established beyond the school walls. The PROUCA potentiates the process of digital inclusion in the family and community contexts by ensuring the possibility of taking the educational laptops to the student's home. For students with motor and sensory specificities the continuous use of information and communication technologies can facilitate the systematization and consolidation of practices of social interaction mediated by Assistive Technologies.

- *Connectivity*: By providing a communication interface for wireless network, the educational laptop concretizes the principle of mobility through the capacity to promote effective and comprehensive communication in the school and in the community. Students with disabilities in the language area can develop mental structures that are crucial to leverage the cognitive development by using a vocalizer and communication digital boards,

- *Belonging*: By giving students the right to have "your computer", it is created a sense of belonging, essential condition for weaving productive social relations. In the classroom, the educational laptops into the hands of students establish a common origin that unites different individuals, allowing mutual recognition, but also allowing respect for individual differences.

- *Customization*: By allowing a customization process - name registration and colorful stickers glued on the external interface of educational laptops -, as well as the compliance with sensory and motor specificities , the sense of belonging is increased. It is the opportunity of customization that ensures the student with disabilities the respect for their specificities, allowing the heterogeneity that characterizes human diversity being read as an advantage, not a disadvantage. An offset that happens when the technology produces an interface, which enables mediation and interaction to all students, even in the homogeneity of educational strategies, developed in the classroom.

- *Equity*: This is the principle that supports the action of the previous concepts and emerges from the disposition of socio-cultural contexts to recognize the right of participation of all. Equity works for human diversity by offsetting the disadvantage that the disability imposes through the accomplishment of accessibility to cultural tools produced by mankind throughout its history.

The right of access to cultural tools must be a possibility for all school students participating in the PROUCA. The relevance of such a right is clearly set out in the

minimum requirements established in the bidding process for the purchase of educational laptops:

> - *Accessibility* - aspects of accessibility must be observed, allowing the adaptation or installation of resources (software and hardware) that ensure and facilitate the use by disabled people, in order to comply the decree 5.296 de 02/12/2004.

Discussing digital accessibility, as Conforto [Conforto, 06] problematizes, is not restricted to transposition of architectural and/or technological barriers , but rather the removal of obstacles to build socio-cultural processes that can effectively improve the conditions and quality of life for human diversity.

Ensuring access to digital technologies of information and communication to a growing number of users democratizes the possibility of interacting in the universe of digital networks and, therefore qualifies and stimulates practices of Inclusive Education. The digital accessibility consisting of:

(1) ensuring that people, regardless of sensory and cognitive characteristics, can realize, understand, navigate and interact with digital technologies of information and communication;

(2) permitting the use of computer systems consorted with Assistive Technologies;

(3) providing tools for protagonism and individual and collective authorship for human diversity. The technological resources offered to the school must ensure access and interaction for all students with and without disabilities.

4 The Intersection of The Policies in The School Context

In a country of continental proportions as it is Brazil, where the implementation of communication networks finds obstacles in the long distances, we can translate the initiative designed by PROUCA in the entire school network of the UCA TOTAL cities into an attempt to visualize the communication and human interaction potential this action can produce when it becomes a national reality. Having the Inclusive Education National Policy and considering the total service to six school networks, we can infer that all the students of these networks are favored with educational laptops. According to IBGE[4], 14.5% of the Brazilian population presents some kind of disability, which means that twenty seven million people are included in this part of the society. A substantial part of these people is at school age and, therefore, must be benefited by the actions applied in the schools.

We realize that the tools made available by the PROUCA can help to escape the rationalist exclusionary logic, allowing the human diversity, which has always been part of the school, be also reflected in the learning process by respecting the specifics and the life story of the students.

Computing resources promote the change of the homogeneity parameter, which the didactic book illustrates and reinforces, to conquer the heterogeneity by offering a

[4] IBGE - Instituto Brasileiro de Geografia e Estatística (Statistics and Geography Brazilian Institute)

set of technological resources to qualify the pedagogical actions. In the school space and time, the unity of the text language is challenged by a variety of new languages that open multiple communication and information channels, and, consequently, promote new learning processes The educational process is qualified by the acquirement of significant technological resources and these resources change the life of a person with disabilities, improving the communication and the intellectual development. Educational Laptops together with assistive technologies[5] indicate a big contribution to the development process by allowing the students with disabilities to perform the same activities as the other students, which accomplishes one of the important principles of Inclusive Education, that is, the construction of the belonging sense.

Researches on Information Technology in Special Education, Santarosa [Santarosa, 10] highlights the relevance of the work with technology in the development of disabled people by overcoming obstacles and breaking down barriers. The accessible technologies open doors and make it possible for everybody to show their abilities, which results in the alleviation of social discrimination and segregation. Accessible computing resources, completely available in the classroom time and space, increase the spreading of opportunities, mainly for the people whose learning patterns don't follow the typical development charts.

When we relate the possibilities of the public policies of the Education Ministry and the Technology Ministry presented in this article we can create a representative image of the Brazilian educational scene as two sides of a coin. On one side inclusive and on the other side technological. Inclusion and Technology are intertwined when we approach issues related to the modern school.

The education institutions have undergone organizational and pedagogical modifications in order to encompass the student´s diversity in the regular system. This way they are also a response to the actions of the Education Ministry, which aims the accomplish the Inclusive Education presuppositions, but also the actions of the Science and Technology Ministry, among them the distribution of the Educational Laptops. These actions fulfill the educational and technological faces of the modern configuration of the Brazilian Education. With this configuration the Brazilian School is now structured through two interfaces, bringing a new set of demands implicitly. The inclusive face needs the technological face to release accessible resources to boost the interlocking process of the government actions to build an inclusive technological school.

5 Researching That New Reality

Brazilian school considers itself today as an institution that houses the difference and breaks with educational activities that are molded by the rigid demarcation of time and space for learning. In this way, the presence of human diversity and the mobility

[5] According to Rita Bersch [Bersch, 06] Assistive Technology is the resources and services that contribute to providing or increasing the functional ability of impaired people. It comprises a set of resources, software or hardware, that aims to lessen the motor, sensory and communication demands

of the educational laptops provide the concepts of fluidity, flexibility, difference and customization in the school scenario, supported by the National Public Policy.

The focus of the analysis conducted by researchers of Núcleo de Informática na Educação Especial (NIEE), of Universidade Federal do Rio Grande (UFRGS) encompasses as scope of study the construction of knowledge in the emerging field that surrounds the investigation of technological accessibility and socio-digital inclusion. Inclusion that is attempted through the interface woven in the relationship between educational laptops and students with disabilities. Therefore, a research that is epistemologically supported by socio-historical theory is built conducted by two major questions: (i) what movements are triggered by the mediation of educational laptops in the PROUCA context to enhance the socio-digital inclusion of individuals with disabilities?; (ii) do the educational laptops used in PROUCA present an accessible interface to individuals with disabilities?

The investigation is methodologically configured as a qualitative exploratory/explanatory research, which was performed in its first stage in the city of Tiradentes/MG. As techniques for data collection, we highlight the direct observation, document analysis, semi-structured interviews and the construction of Focus Group dynamic. To promote an even more qualified process of continuous collection and recording of information, at each institution that is part of the research we appointed Observation Agents, inclusive class teachers, mediators of the learning process for students with disabilities, schools contemplated by the project UCA.

The action of the observation agent took a central role in the research, a relevancy endorsed by the inseparable relation teacher / researcher, a movement that seeks to qualify, maximize and optimize the process of data collection. The teacher who works with the disabled student has the role of an observation agent, with the responsibility of performing a participant focus analysis, a methodological choice which is justified by the triggering of the process of information gathering that:

(1) supposes the interaction researcher / researched;

(2) implies knowing how to listen, to see, to make use of all senses in order to learn the aspects related to technical and pedagogical mediation and intra and interpersonal interaction of students with disabilities;

(3) establishes a research routine, promoting a collection of information by maintaining a field journal.

Among all the aspects pointed to ratify the actions of the observation agent in the research protocol designed for this study, we highlight the possibility of minimizing the presence of an observer that is oblivious to the dynamics of the school and, undoubtedly, can cause changes in the behavior of the subject, which is the focus of the observation. The data collection starts to operate in a real scenario to trigger a mining of data that emerge during routine pedagogical actions. Aiming to qualify the process of mediation with teachers who took the role of observation agents, the research project was also organized in a digital interface in order to create a virtual network of researchers, exclusively for the team.

Figure 2: Virtual environment for the interaction between the research team in the process of data collection

This methodological strategy forges a prolonged and systematized framework for data collection, allowing to register deeper observations which are integrated in the school setting, enabling a greater understanding of the evolution of the mediation and interaction promoted by educational laptops.

6 PROUCA And UCA Total, A Totality Under Discussion

With the objective of observing which movements are triggered by mediation of educational laptops in the context PROUCA in order to potentiate the socio-digital inclusion of individuals with disabilities, we focused on a UCA TOTAL reality, as it comprehends the whole educational system from one location and, also, to expand the possibilities of identification of students with disabilities in the regular education. The choice of the city of Tiradentes, in the state of Minas Gerais, as a research locus occurred precisely because we observed an advanced stage of project implementation and identified students in inclusive situations in the education system.

In this way, a six-month research was performed, from May to November 2011, which featured different stages. As the scope of the research in the first part of the study, aspects related to the management of municipal education, the setting of the school context, the actions of the school administration, teachers and students and the students' families were analyzed in the process of socio-digital inclusion.

After the initial stage of identification of the inclusive situations, the research scope was delimited, an investigative map that pointed out an interesting context: three different teachers were responsible for the inclusion of 9 students with different disabilities: a subject with intellectual disabilities, five subjects with low vision and three subjects with Attention Deficit Disorder (ADHD). The table 1 presents the investigative scenario. To preserve the identity of the research subjects, they are identified with fictitious names.

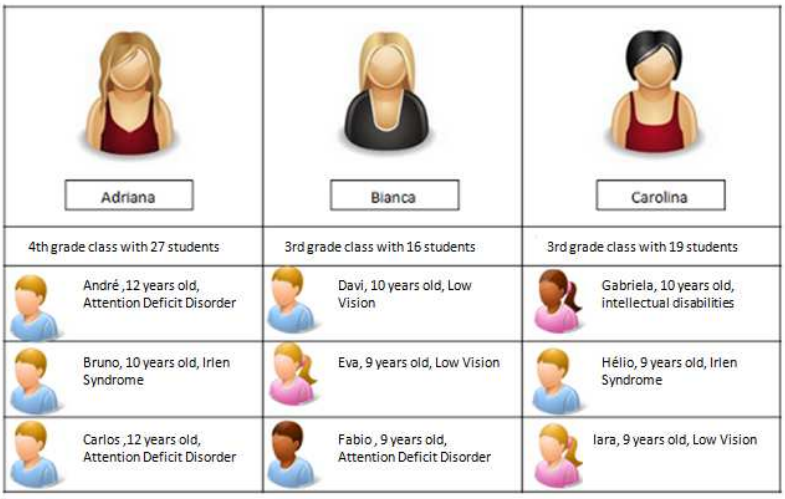

Figure 3: Scenario research - Tiradentes -UCA/TOTAL

7 Analisys Of The Inclusive Movements In The Uca Total City-Tiradentes/MG

When we analyzed the survey data we need at first to broaden the perspectives beyond the classroom in which the study subjects were enrolled. When we noticed that the political actions and context settings were influencing this reality, it was necessary to observe the city as a stage of social and digital inclusion of these students, and only after that to get a closer look at the subject and the elements involved in its inclusive process. The specifics of a city listed by UNESCO World Heritage affected the implementation of the Project UCA / TOTAL in the city of Tiradentes.

Digital inclusion projects have put the city of Tiradentes in the world of a globalized society. However, the need to guarantee that this technological insertion does not modify the architectural history imposes limitations regarding the possible solutions, causing the decision making not always to consider the most effective option, but the one that causes less impact.

This historic-technological conflict of the city reflected directly on the implementation of the project. The bureaucratic obstacles to permit architectural modifications for the creation of storage places for the equipment were appointed as the obstacle for the biggest school not to offer the technology to their students. This fact made 590 students watch the technology to become out-of-date without being able to use the educational laptops (figure 4).

This constant pursuit of the conservation of cultural heritage causes us to infer that the city will remain as a place inaccessible to human diversity. What is to worry is that this will also echo back to the school system of Tiradentes, since they are using

XVIII century's buildings, which do not observe the access requirements to their facilities, which is a basic assumption of the present inclusive policy.

Figure 4: Technologies stored without being use

One of the rural schools is not using the laptops due to the lack of Internet signal. As it is in an isolated area and with no cable network, the Internet access will only be possible via satellite. However, the City Administration does not have the budget for this kind of expenses. When we suggested the use of the software programs available on the laptop without the Internet, we found another weakness: the lack of qualification of the teachers to work with the computer resources.

The Municipality of Tiradentes performed a hiring selection process for the Education area and the approved teachers were only designated after the initial in-class training for this project. Therefore, the new teachers are not familiar with the operating system, which has little resemblance to the one they are used to, and they do not know the pedagogical potential this technology has. These are appointed as the main reasons why the teachers are not working with the laptops when there is no Internet.

On the other hand we can highlight the actions that already show a setting of an inclusive city when we observe that access to mainstream education is being offered to all students. However, we emphasize that inclusion depends not only on open doors, but also on different actions to ensure that children with disabilities take part in all school movements. Given that in Tiradentes the technology permeates the educational environment, it becomes another requirement to be observed in the inclusive process that takes on a social and digital meaning here. When we focus on the studied reality, we find that for the nine studied subjects the process of socio-digital inclusion assumed different configurations.

The construction of a support structure for the inclusive process is perceived in the city of Tiradentes. By establishing a partnership with a mainstream school, two subjects are in dual enrollment and other three in the process of receiving this support soon. Nevertheless, the remaining four did not even have the pedagogical support at school, which needs to be addressed by the city managers in order to supply specialized care to provide education for this public. In the cases where there is not

extracurricular attention the inclusive process falls under the responsibility of the teachers, who are in charge of articulating actions with other participants and making their practices meet the needs of students with disabilities.

It should be pointed out that in this research we found that only four of the nine studied families participate in the process of education of students. As the parents need to work to survive, they have to outsource the education of their children, leaving it to the school, increasing the responsibility of the teacher for the students.

Regarding the teachers' formation of teachers to act with an inclusive educational approach, a weakness is evidenced. Educators finish their undergraduate courses with only a superficial contact with the topic of special education and, when faced with situations that require such knowledge, are lead to intuitive practices, without theoretical foundation. The exception is one teacher who reports to have acquired knowledge and experience during years of teaching and who is really engaged to perform actions that encompass the diversity that the presence of the diversity requires in school. The teachers perceive themselves unprepared to work with students with disabilities, especially in situations where they must mediate the use of technology.

The weakness in the processes of initial and continuous formation of teachers for the care of students with disabilities hinders the construction of technological interfaces to promote socio-digital inclusion practices. The lack of knowledge of the possibilities of the technologies to operate as citizenship interfaces citizenship for the human diversity and the conception of a subject forged in deficient paradigm have placed the target public of Special Education outside the processes of technological appropriation and, therefore, far from the opportunities of socio-digital integration.

All teachers who take part of the corpus of this research are unaware of the contributions that the field of Assistive Technology can offer, so they expose their students to a laptop use in its normal configuration. However, it must be noted that few adaptations would be possible for the offered laptop. As it uses the Metasys system, created under the Gnu/Linux logic based on Fedora, the laptop does not have many resources, since this is a Linux distribution that has a community a small number of developers.

It is necessary to note that the use of the laptop in Tiradentes still is regulated by the teacher's authority, being the teacher either the promoter of its use or responsible for its disposal. During the period of this study, we observed that the teachers' perception of the technology influenced directly on its offer in the classroom.

The teachers who were familiarized with the resources of the equipment saw it as an aggregator agent, and frequently offered the use of the technology in an educational way. The teacher who only recently learned about the tool saw it as just one more device, not making sense of its use, which made her use the laptop just occasionally and in a recreational way.

Even in this reality where the computer is used for entertainment, we realize that the technology contributes to the cognitive development of the subject, for they start to learn about the functionalities of the resource. But, we can only observe an optimization of the tool pedagogical possibilities in the realities mediated by teachers who perceive technology as contributory contexts in which the laptop has become the new medium for learning.

In the process, we observe that the group has an important role in the student-laptop relationship. We could observe that the discovery of something interesting was announced to everybody so that the others could learn it too. In this way, the exchange of knowledge happened in an ordinary natural way, without incentives or requests. In general, other classmates who showed or helped to follow the steps until a task was completed mediated the students with disabilities. Sometimes, we could also see that some of the research subjects themselves took the role of mediators and shared their knowledge with the rest of the class.

We see this sharing process as a side project that raises the possibility of allowing the subject to be more autonomous in the learning process, provided that they are mediated to learn its functionality and authorized to use the resource. However, the control exercised by the teacher is only absent in one of the classrooms where the use proposed is very close to the project designed for the laptop to be available to the student at any time. In two other educational institutions that were investigated, the use of mobile technology, both inside and outside school, needed the educator's acceptance and endorsement.

It is appropriated to bring the contributions of Conforto [Conforto, 06] that, when analyzing the transformation from l hardware school to software school, pointed out that to use the Computer Lab, the subjects were captured by a timetable, trapped in r time / space relationship to carry out activities mediated by technology. For being this a physical environment shared by an entire school reality, the timetable dictated the variables "when" and "who" would use the equipment. In this configuration, there was still the role of the computer lab monitor, who was responsible for the Lab and exercised the control of these variables, in addition to having the power of blocking access to certain contents.

We observe that in these two realities, the mobility and availability brought about by the educational laptops were not sufficient to transcend the old control model of the use of technology. The only change we have is the extinction of the position of the computer monitor, now performed by the teacher.

8 Verification Of Accessibility And Usability Of PROUCA Technology

The government action PROUCA has technological weaknesses related to the accessibility and usability of the educational laptops purchased in project implementation. Preece [Preece, 08] points out the importance of initiating a discussion about the interface functionality and its tools based on a user-centered analysis of the technologies.

From this perspective, during the survey in Tiradentes / MG, we could identify that the technology that was purchased showed some impediments to the process of socio-digital inclusion of special public (Figure 5).

Weaknesses found in the interaction of students with disabilities and the Classmate PC (with OS Metasys)	
Hardware - Small screen size, only7´´ - Keyboard without spacing - Flash Memory Disk with only 4GB - Absence of VGA output	Software -System does not provide consistent package of accessibility -System does not support the installation of software that do not follow the logic GNU / Linux-based Fedora -Desktop Interface KDE performed for desktops (not for laptops)

Figure 5: Weakness of the technology

The educational laptop does not have a consistent accessibility package, and it does not show or support the installation of software that is directly related to assistive technology. The small size of the screen and keyboard are factors that hinder the interaction of students with visual impairments. Moreover, the absence of a Video Graphics Array (VGA) output makes it difficult to connect the laptop to a larger external screen, which would allow better visualization of the contents.

It was possible to identify that for one of the students with ADHD the desktop KDE interface presents a system that has a cognitive overload, causing the student to pay more attention to learn the features than to the content itself. We also identified that the little available memory on the laptop impairs its use by one of the students, not due to their disability, but for being a frequent user who does not have Internet connection at home, so they needed to save all necessary files on their device.

Despite the software and hardware weaknesses of presented in the educational laptop, we can say that, for most children with disabilities related to cognitive deficits, this technology helps in their inclusive process, without revealing major barriers. However, for students who have sensory and physical disabilities, the small configuration presents itself as a complicating factor.

Trying to complement the data with the objective of analyzing the educational laptops, a survey has been developed by NIEE/UFRGS. This study consists of an examination of the possibilities of the Classmate PC, performed by a user with Down Syndrome and Autistic Spectrum traits, with great computer skills. The analysis of the research subject interaction with the laptop revealed a difficulty in relation to the computer system. As he is familiar with the Windows operating system, the subject shows a transposition of the handling technological skills he has already acquired, revealing difficulties in performing simple tasks like turning off the equipment with a new iconography.

The research protocols were conducted in two sessions of observation, suggesting interaction with the text editor available in the educational laptop. A very simple task was accomplished, that consisted of copying a short text and the insertion of an image. As the subject is an experienced user, he chose to use his own image, by capturing it with the built-in laptop webcam.

In the analysis of the interactions and task performance of the proposed research protocol, we observed that the research subject could not perform his formatting options in the text editor. The font format procedure - size and color - was not possible because the action confirmation icon did not appear on the screen, due to the small size of it, which prevented the confirmation of the changes proposed by the user. The screen text editor when maximized caused disorientation and motor overload in the subject, because in order to interact with the edit toolbar he had then to shift / move the screen through the application title bar. The image capture and its insertion in the text were performed effectively by the research subject.
In the second section, the research protocol proposed the exploration of educational games that are available on the system. The research subject required a more qualified help structure to mediate the appropriation of the functionality of many of its applications. We can illustrate this aspect with the guidance given by the help system of the LOGO language programming application, which did not allow the execution of primitive programming logic.

The research protocols performed with the research subject NIEE ratified the weak points mentioned in the accessibility and usability verification of the educational laptop. The research subject verbalized the dissatisfaction with the screen size, the quality of its resolution and contrast numerous times during the two interactions. In the second section of the survey, the user attached an external optical wireless mouse to the laptop that was brought in by him, as he felt uncomfortable with the touchpad format.

9 Conclusions

The different results of this study point to a Tiradentes engaged with the laptop dissemination proposal, except from the state school, and willing to comply with the provisions of the National Policy on Special Education in the Perspective of Inclusive Education. However, this research that tried to observe the movements that were triggered in the process of inclusion of students with disabilities mediated by laptops from the One Computer per Student-UCA Program, enables us to affirm that the studied scenario reflects a weakness that relates to the unfamiliarity with the technology, which is potentiated by the inclusive interface

When formulating the project, its creators presented a proposal of great importance for Brazil to occupy a place in the education vanguard. However, bureaucratic processes to acquire technology combined with ignorance of a policy that places the diversity in the context of regular education, resulted in a proposal that little includes the students with disabilities.

Historically, we consider the individuals who are different from the homogeneous standard only in a second moment and it was not different with PROUCA. The results of the research pointed out that the federal government proposal of laptop distribution, which considers the supplied tool under the concept of technological homogeneity and uniformity, impairs the fulfillment of diversity. The Classmate PC, connected to Metasys operating system, results in a closed solution that does not meet most of the accessibility requirements, preventing that software and hardware that consider this aspect from being installed in the equipment.

The strong motivation of students with disabilities overcomes the weaknesses related to the accessibility, noting that the use of mobile technology is a positive factor in the school context. We emphasize that, in some situations, the presence of the laptop was able to promote exchanges among students, where research subjects were mediated by and mediated each other's appropriation processes. But in other situations, the control exercised by the teacher sometimes blocked this aspect of the project. About this Lévy [Levy, 92] points out that the incursion of the school in the technological world takes place in a turbulent way, also due to the centralizing role of the teacher, as it has been more than five thousand years that this institution has been based on talking / dictating of the master and the insertion of technologies in this context requires to give up an anthropological habit.

Old practices that reaffirm the central role of teachers must be reviewed in realities permeated by technology. According to Santarosa [Santarosa, 10], the bureaucratization of the school content shows itself fragile at the moment we see that what is learned cannot be programmed or set by a metric curriculum. Only when we focus on the learning rather than the programs, we can perceive the educational action moving from the individual to the collective level, from homogeneity to heterogeneity, and only then we will be considering the diversity in our socio-digital inclusion movements.

These movements still depend on a number of other factors to happen. In Tiradentes, we realized that the lack of preparation to meet the diversity in regular school settings is still marked by the disregard for architectural access, by the restricted specialized educational services and the scarce of pedagogical support for the teacher.

The inclusive practice in the city of Tiradentes ensures the access of the special student to regular school network, but it does not articulate movements, which can promote their effective inclusion, leaving it almost exclusively at the expense of teachers who, in their vast majority, do not feel, prepared to work with the disabled student.

It is necessary to emphasize that we consider as an evolution that today we are discussing issues related to this theme, as we observe that not long ago the society used to dispose or segregate society the special public from its environments. In this way, unfamiliar with the presence of human diversity, we have generated actions that do not consider the specifics of a student with disabilities, even though today the inclusion is a right guaranteed and reaffirmed by law.

It is not an easy task to equate the different variables that make up the reality of Brazilian education and to address them in the many public policies designed to ensure a higher quality in education. However, it is necessary to have in mind that thinking about everybody does not mean to think of each one. By not considering the subjects with disabilities and their specifics in projects that are applied in the regular education context, we turn this process into a mere access to school, not allowing such students actually to be part of the formation and socialization movements that happen in the school environment.

We consider as one of the major contributions of this study to make it visible the fragile relationship among educational policies. Governmental actions forged by MEC are unaware of the goals designed by the Ministry of Science and Technology and they consistently disregard the socio-cultural contexts in which they are applied.

The PROUCA, which brings in its core the possibility to individualize the technology use, provides the students with disabilities with a technology that prevents it from customization for their sensory and cognitive specifics.

The uncertainty that is imprinted in the future of the One Computer per Student Project, reinforces the results presented in this study, since it indicates the urgency of a greater knowledge of government actions and also reveals the need for a strong coordination of public policies. With the intertwining of government actions, it will be possible to support the decision making process financially, especially those which seek to build an inclusive and technological profile of the regular education systems, which is strongly marked by the presence of human diversity.

10 Future Work

In a near future, we intend to establish parallels between this reality and others where we have already started to develop the same methodology. These are 4 different inclusive schools located in the state of Rio Grande do Sul, in the cities of Bage, Canguçu, Caxias do Sul and Panambí.

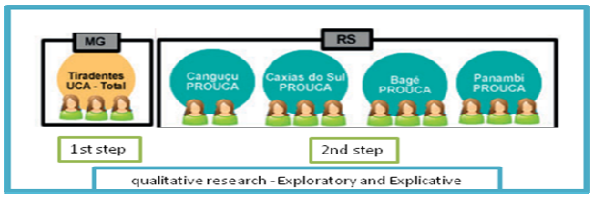

Figure 6: Further research

With the expansion of the observed scene, we intend to identify the different aspects that can influence the process of implementing socio-digital inclusive policies in Brazil.

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References

[BERSCH, 06] BERCH, R. Tecnologia Assistiva e Educação Inclusiva. in: Ministério da Educação. Ensaios Pedagógicos do III Seminário Nacional de Formação de Gestores e Educadores. SEESP, Brasília (2006)

[BRASIL, 02] BRASIL, Política Nacional de Educação Especial na Perspectiva da Educação Inclusiva, Brasília 2008. Available at: http://portal.mec.gov.br/arquivos/pdf/politicaeducespecial.pdf. Accessed: 10/11/2010

[CONFORTO, 06] CONFORTO,D. Da escola do hardware para a escola do software: o processo educativo sob a lógica da compressão do tempo e do espaço, UFRGS, 2006.

[LEVY,92] LÉVY, Pierre. As Tecnologias da Inteligência o futuro do pensamento na era da informática. 1. ed. Lisboa: Instituto Piaget, 1992

[OLPC,03] OLPC - One Laptop per Child. Base de Dados (2007). Available at: http://one.laptop.org/about/mission. Acessed: May, 30, 2011.

[PREECE, 08]PREEECE, J.; ROGERS, Y.; SHARP, H Design de interação: além da interação homem-computador. Porto Alegre: Bookman (2008).

[SANTAROSA,10] SANTAROSA, L.M.C. (Org).Tecnologias Digitais Acessíveis – Porto Alegre, JSM, 2010

[VYGOTSKY,97], VYGOTSKY L. S. Obras escogidas V: fundamentos de defectologia. Madrid: Visor, 1997