"Matsiko": Rwandan children doing curiosities investigation with their laptops

Silvia Kist, *silvia@laptop.org*
One Laptop per Child Association

Juliano Bittencourt, *juliano@laptop.org*
One Laptop per Child Association

David Cavallo, *cavallo@laptop.org*
One Laptop per Child Association

Abstract

This paper's goal is to explore one of One Laptop per Child micro-level learning initiatives being developed in Rwanda that is part of a larger strategy for macro-level change in the educational system. This strategy is based on the framework developed by Cavallo(2004) which suggests models of growth from small progressive pedagogical initiatives to large scale computers in education programs through the development of exemplars, models and symbolic expressions (language). Such models of growth were designed in order to overcome the school system assimilation mechanisms through changes in the learning culture and to spread innovative educational practices in laptops saturated communities.

The model of growth is discussed via the implementation of the Matsiko, a project-based practice that explores the act of making questions to develop student's critical thinking and scientific inquiry through the investigation of their own curiosities about their world. The main goal of the activity is to provide children with personally powerful learning experiences by formulation of questions and "construction" of their answers. By instantiating such types of activities we hope to provide teachers with **exemplars** and **models** of learner-centered and constructionist approach they can relate to.

By providing exemplars of innovative practices, we show what is possible to do, what might be accomplished as we try to set new cultural expectations about what children can achieve and learn when given the right opportunities. It does not mean to create a model to be replicated. Instead, it means to introduce powerful ideas about learning, taking advantage of local culture, in a way to spread new educational practices, showing new possibilities for instantiating dynamic learning environments, illustrating with our practice in Rwandan schools. We also explain how this specific action aligns with a vision of the laptop's use in education.

In this paper we will talk about the principles behind Matsiko, look through its roots in Fagunde's (1999) learning project methodology and discuss the adaptations made for the local context. It also describes Matsiko implementation in schools of Kigali-Rwanda, justifying how it makes a common cause with the country's vision for economic development.

Keywords

Curiosity, One Laptop per Child, one to one, Learning Project, Constructionism, Technological Fluency

Introduction

Matsiko means **Curious** and **Curiosity** in Kinyarwanda, the mother tongue spoken in Rwanda. When we talk about Education, *Matsiko* is a meaningful word. Children in very early ages show curiosity and interest to learn about the world.

Curiosity for Piaget "plays a part in the search for coherence and organisation. It is a motive force in the need to order reality." He also viewed curiosity as a product of cognitive disequilibrium caused child's attempt to assimilate new information into existing cognitive structures (Loewenstein, 1994). When such structures aren't able to assimilate new information that disturbs their system, a gap (*lacunae*) is created which impels the system to look for equilibrium, therefore creating an internal motivation for the children look for the answers that satisfy their curiosity/lacunae.

But when children enter school, they start suffering a "curiosity castration," an expression created by Paulo Freire. Freire (1985) believes that the question's repression is a dimension of a larger human's repression, of his expressiveness in his relations in the world and with the world. The school, traditionally authoritarian, refuses the children's question or creates bureaucracy to the act of asking. The school pours out answers (content) that were not asked for and does not allow questions out of its program. The only acceptable question is the one about the content that already has a closed answer. But, in fact, "what is authoritatively intended with the imposed silence, in the name of order, it is to drown in it the inquiry" (Freire, 1985, p.47). Passive people who do not inquire go in the opposite direction of the demands of our times.

Freire insists, "*Education in general is an education of answers, rather than being an education of questions. An education of question is the only creative education and able to stimulate the human capacity to marvel, to respond to his astonishment, and solve their real essential and existential problems. It is knowledge itself.*" (Freire, 1985, p.52)

By sharing Freire's ideas about the importance of curiosity as part of education and Papert's ideas about constructionism, the One Laptop per Child (OLPC) Learning Team introduced the Matsiko idea to schools in Rwanda, as one of its micro-level initiatives in the country.

One Laptop per Child is an NGO, whose mission "is to create educational opportunities for the world's poorest children by providing each child with a rugged, low-cost, low-power, connected laptop with content and software designed for collaborative, joyful, self-empowered learning." (OLPC) In order to improve the quality of education, OLPC's mission is not only to provide laptops, but to create a culture of learning, engaging children in their own education, and developing the passion for learning.

The goal of this paper is to detail one of our initiatives to turn the OLPC mission into reality. We will highlight Matsiko and its principles, showing new possibilities for instantiating dynamic learning environments, illustrating with our practice in Rwandan schools and also trying to explain how this specific action aligns with our vision of computers use in education, the laptop initiative's model of growth and Rwanda's vision for economic development[1].

One Laptop per Child in Rwanda

Rwanda is a small country of eastern-central Africa squeezed between the Democratic Republic of Congo, Kenya and Tanzania. Despite its size, it has a very high population density with more than 10 millions inhabitants, with almost 1 million living in the capital city of Kigali.

As with many different African countries, Rwanda has plotted a national plan to guide the country's growth, and in Rwanda's case, out of the devastated landscape left by the 1994 Genocide. The VISION 2020, as the plan was named, "*seeks to fundamentally transform Rwanda into a middle-income country by the year 2020*" (Rwanda Vision 2020, p. 9). Rwanda

[1] We would like acknowledge of all OLPC learning team based in Rwanda, specially, Jimmy Parfait, Désiré Rwagaju and Joy Riach for their help in the implementation of this project.

Vision 2020 elected the area of services, specifically tourism and ICT, as the ones with the best chances to become the country's economic engine.

It is not necessary to say that this choice brings its own myriad of challenges, but at least it sets the country's focus on developing its population as the solution for social and economic growth. Essentially education becomes the country's major priority and a world-class educational system becomes a necessary step. For education to accomplish its role, a transformation of the learning environment is also essential. Technology enables the transformation, not only by providing access to high-quality current materials for every child in a more cost-effective way, but also by providing a learning environment where children can truly develop the requisite knowledge and 21st century skills.

The vision that One Laptop per Child initiatives might be one of the solutions to leap ahead in education was what motivated the Rwandan government to commit its scarce resources to such a complex project. In November 2007, Rwanda started one small pilot with 100 laptops and two classrooms in the Rwamagana B Primary School. In 2008, the pilot was expanded to 10,000 laptops in 17 schools, which provided valuable experience. Moving to the next phase, the government ordered 100,000 laptops in 2009 and started to prepare for a large-scale deployment in 2010.

One Laptop per Child valuing the vision and commitment of Rwanda moved its Learning Team to the country in 2009 and started to work in partnership with the government to spur the implementation of the project in the country and in the region. The experiences described in this paper represent a segment of the activities of the OLPC Learning Team in Rwanda and are a small part of a larger implementation project.

A View of the Rwanda School System

There are no formal studies about the current school and teaching practices in Rwanda that we can use to draw a picture of the pedagogical aspect of education in the country. Such a portrait is necessary for the purposes of this paper in order to discuss the context where the Matsiko Project is being developed, how it connects with OLPC's work in the country and why we consider it relevant.

We can count on some official information to understand the big picture. Rwanda has 2.2 million children enrolled in primary education. Until 2009, the country had 6 years of primary education with grades conveniently named from Primary 1 – P1 to Primary 6 – P6. In 2008, the government started a program to expand primary education to 9 years as part of its commitment to the Millennium Development Goals of achieving universal primary education by 2015. Primary education is defined as fee-free, meaning that students do not pay fees to attend to school.

In 2008, the Ministry of Education also started to move the education in the country to a tri-lingual system. This means that Kinyarwanda (the country's mother tongue), French and English are all studied simultaneously at school, with English being the main language of teaching. Another major change in the recent past for the primary education was the adoption of double shifts as a strategy to get better teacher/student ratios. Even with this measure, classes with 70 students are not unusual, especially in the lower primary grades. Lack of textbooks and libraries are also a big challenge to the government.

After 18 months of working with schools in Rwanda, it is possible to share some observations of the pedagogical practices in the country. Such testimonials do not have the value of a formal study, and, most importantly, should not be generalized to all schools in the country. Although we think they bring some context to this paper. The pedagogical practices of primary education teachers in Rwanda are based on oral instruction, copy and memorization. Class activities usually consist of the teacher reciting a lesson, students taking notes, and then the teachers making questions about the subject with the expectation for a single "right answer". This reflects a noticeable lack of qualification of the teachers that, despite their wiliness and tremendous enthusiasm, were not prepared as professional teachers. Most of them qualified as a teacher by simply having finished Secondary school.

Models of Growth

To spread change in the educational system is a much more complex task than it might initially appear from a management perspective. The injection of new ideas into schools always faces the problems of rejection or accommodation to the pre-existing structures and practices. As with any attempt to bring new ideas to the school system, the OLPC initiative in Rwanda faces the same challenge: to devise strategies of implementing new educational practices on a large scale.

Most efforts to school reforms, independent of the quality of its ideas, have failed with the attempt to grow from pilots to large scale because of the use of predetermined, usually massive, fully formulated designs imposed from above. The adoption of a cascade model, training the trainers, does not work most of the time because quality decreases with the growth of the chain. The trainers tend to replicate the form without understanding the principles (Cavallo, 2004).

We need to approach educational change in a more systemic way, thinking about it not as the outcome of a single action or as an instantaneous process. Many initiatives will be necessary to create a new learning culture and in each place a different strategy is required, because the needs, concerns and possibilities of the circumstances are different.

Cavallo (2004) proposed a new framework for thinking about change and growth. Based on Kuhn's description of components of a paradigm, he suggests three fundamental elements to think the change: exemplars (real experiences), models (expectations of the outcomes) and symbolic expressions (language about learning).

Laptops may provide a means for new models of growth. Rather than needing to rely on a centralized, standardized reform, we can develop high-quality, localized models of improved practice, and utilize the network and rich media to create mechanisms for spreading. A foundation is thus created for three distinct, but overlapping, phases: enabling powerful learning in and out of school; the positive change to specific school practices; and the transformation of schools from funnels of received information to engines of knowledge construction and appropriation.

We also do believe that change is inherently a process of learning, where we cannot accelerate or impose our ideas onto people's minds. We do want to create a different mindset about learning. But, as when we work with children, we should create opportunities of learning and of development. For that we need to destabilize teachers' certainties about their practices and about learning. Many teachers do believe in what they do because it is the only way of working that they know up until now. They do not feel the need to change or to try new approaches. Therefore the production of necessity is one of the challenges for promoting educational change.

As outsiders, we also cannot foster change by ourselves since we lack the cultural grounding necessary to promote emergent designs. As a principle, we work through the development of people, so in the future they can assume a role of leading and supporting the change. "Rather than focusing only on change within an existing institution, we adopt a broader view of change with human agents as carriers hosted by a variety of institutions with the change developing through improving practice and developing ideas through the reflective trial and error of creating exemplars." (Cavallo, 2004, p. 109)

The Models of Growth framework in Rwanda

Papert used Piaget theoretical framework to compare the school as a complex system, that has mechanisms to protect itself from constant buffering of small chaotic changes. As an organism, school tries to resist changes to its previous structures, therefore transforming any reform attempt into something that can assimilated into the current system. Piaget also offers us a framework to think educational transformation by postulating "process of growth happens inside pockets of stability(…) that eventually become strong enough to overcome the resistance" (Papert, 2001)

Among OLPC's 5 principles (OLPC) two of them were designed to avoid that the usage of laptops happen strictly when the teacher or the school allows. **Child's ownership** of the

computer (kids take laptops home) and **saturation** try to assure that children have access to the machine whenever they want.

However, the simple distribution of laptops doesn't guarantee by itself that school system is going to move from its current state. Teachers can simply assimilate the laptop to their current practices and children may not reach powerful uses of their machines without some support.

Matsiko is one instance of micro-level activities that aims to contribute to fill this gap using the context of child's ownership and saturation to spread and achieve macro-level impact in the school. The principal goal of the activity is to provide children with personally powerful learning experiences through the raising of their questions and "construction" of their answers. By instantiating such kind of activities we hope to provide to teachers with **exemplars** and **models** of learner-centered and constructionist approach they can relate to.

During the development of Matsiko activities we got involved Rwandan university students (through volunteer and internship programs) so they could understand the principles underlining this kind of activities and possible develop local and more culturally fitted versions of it. By the development of local people we aims to provide them with a new language and models of learning and teaching that can spread and grow in the "fertile ground" created by a community saturated with laptops.

The Matsiko Principles

The Matsiko initiative is one pedagogical practice that tries to develop student's critical thinking and scientific inquiry through the investigation of their own curiosities about their world. The Matsiko concept is deeply rooted in Fagundes' work (Fagundes, 1999), especially her Learning Projects methodology. It was developed during the work with 6-year olds in 1:1 contexts in Brazil (KIST, 2008) and it acquired its current format during the work with students in Rwanda. It is not definitively a one size fits all formula, but a pedagogical practice with some principles and many possible implementations. It has five core main principles:

- It needs to start with a kick-off activity that engage children in the practice of questioning;
- Students must be encouraged to make questions and each child needs to do at least one personal question;
- Students must decide which question they want to investigate and usually only one project is carried out at a time;
- The teacher acts not as the question's answer but as the student's guide in the investigation process;
- The investigation of the question is a cooperative construction process executed by the children. It isn't only an issue of providing the "right answer" nor to trivialise the process only doing a search on the Internet; and
- Students must create models and simulations as part of their research and be able to participate in design critics sessions. The models need to be tested and confronted with the real world and therefore debugged.

In Fagundes' Learning Projects (LP), the main focus is also the development of an investigation question by each student in the classroom that should work on their own investigation during a few weeks individually or in small groups. Based on Piaget's ideas, Fagundes assumes that when a child does a question, he or she already has a simple hypothesis about its answer. She also thinks that an authentic question is deeply connected to the student's personal history and interests; therefore, the child already brings with it a big motivation to investigate its answer, a pool of information/experiences that allowed him to formulate it. The project needs to serve the children's passions and curiosities and not a pre-defined curriculum.

The major difference in Matsiko from the LP's is that, at least in the beginning, only one question is investigated at a time by a class. With the LP's, there are many questions at the same time by different groups of children. The rationale behind **many questions** is that different children inside a classroom have distinct curiosities and nurture different passions; therefore, they should work in projects that they are interested in. By selecting only **one question** we know that the

selected one will not reflect the curiosities of all students and lose part of its meaningful aspect and as a result, will cause some students to not get engaged. Nevertheless in a classroom of 6-year olds in Brazil, as well as, in our experience in Rwanda, students still lack enough autonomy to develop the whole investigation by themselves. In the case of early elementary school, children are still too young to work without close supervision of the teacher. In Rwanda, the students are, most of the time, very passive inside the classroom, always waiting for the teacher's instructions. In addition, Rwanda has limitations because of the lack of written documents and of materials to help them find information or to create scientific experiments.

We agree in principle that **many questions** is a better practice, yet the required autonomy does not develop fast. We see the Matsiko approach as an intermediary step to develop the child's capacity to work more autonomously. By investigating a single question at a time per class, we try to keep some important ideas of Fagundes' methodology but try to bring it closer to actual possibilities of implementation by teachers and interns.

In a pedagogical practice of the question, like Matsiko, the teacher is not the answerer of the child's question. Quite the contrary, he/she needs to control his/her own desire to provide the right answer to the child and instead to work as an advisor by helping the child to construct knowledge. In other words, it is important to understand the child's thoughts behind the question and based on that, to try to do an intervention that allows the child to see the contradictions of his/her initial ideas. Through this game of equilibrium and disequilibrium of the child's hypotheses, the teacher will guide the child to a more stable explanation created by the child on his/her own.

Fagundes' work is deeply influenced in the early works of Papert (1980) and both share a common root in Piaget's ideas. Although, in the last decades with the advent of Internet, the idea of building things and debugging got de-emphasized compared to the informational aspect of the computer's use.

How it Works

In this paper we are only focusing on the Matsiko initiative developed in the scope of the OLPC initiative in Rwanda. In 2009 we did the Matsiko Project with 5 different groups of students in the format of summer camps and after school programs. It involved 200 students from two public schools in Kigali. The students were selected by the schools and studied in the 4th and 5th grades; the average age of students was 14 years old (the youngest was 10 years old and the oldest 23 years old). The first Matsiko group worked 4 hours per day during the one-week summer camp. The other four groups, since it was during school period, worked 2 hours per day in the opposite class shift, once a week, during 10 weeks.

As mentioned before, the first step for all Matsiko begins with a **Start Up** activity. The chosen activity was to read to the children from a book entitled, Curiosity is the Award Itself (*Curiosidade Premiada in Portuguese)* (Almeida, 2000). This book is originally written in Portuguese, but it was translated into English and most importantly into Kinyarwanda. The book tells the story of Gloria, a little girl whose family thinks she is sick because of her habit of making lots of questions. Taken to a doctor, Gloria is diagnosed with "Accumulated Curiosity" and the prescribed treatment is to try to satisfy her curiosity and the book illustrated how her family transformed this problem into an opportunity to discover interesting things about the world.

In the context of Rwanda education, this story was fundamental to engage the students in the activity, especially when you consider that making questions about what you are interested in is not a common practice at school. The fact of listening to a story was meaningful to their oral culture. In the same way, it was important for the kids to have the book loaded onto their laptops. It opened the possibility to come back, to see the images, to read it again and again and also to spread the story into their school and into their homes.

After reading aloud the story to the whole class, we asked the children to find the book on their laptops and read it. In practice, children got inspired by the story and started to express their own curiosities, like a ritual to become part of the "Matsiko Club." Since they had many

questions, we asked them to choose the 1 or 2 they consider the most interesting and to write them in the text editor. By doing that, they started to learn how to find and to open the book's file in the Sugar's journal (to open, to change the page, to zoom in and out) and also how to use the Write activity for notes (to open, to save, to find the document in journal). Next, all the students shared their questions with the class.

Since the beginning, we had many hypotheses of which kind of questions Rwandan students would formulate and how hard it would be for them to express them (even in Kinyarwanda). Fortunately the children were very fertile in expressing their curiosities and theories about the world. Some of the questions the children made are listed below:

- Why some people are white and others are black? (Kagugu school,G1)
- Why HIV is transmitted only by sexual relations? (Kagugu school,G2)
- Under this world, there is another world? (Kagugu school,G2)
- Why do elephants have big noses? (Kagugu school,G2)
- Where is the path to the moon? (Kagugu school,G3)
- If we dig very deep can we find the hell? (Kagugu school,G3)
- How does the airplane fly without wind? (Kagugu school,G3)
- Where does the human come from? (Nonko School,G1)
- Why snake does not have legs? (Nonko School,G1)
- People use to say that the earth turns around the sun, why don't we feel it? (Nonko School,G2)
- Why do people say that a stone doesn't have life? (Nonko School,G2)
- If Egypt is up and the heaven is up too, is the heaven in Egypt? (Kagugu School,G2)

In this small sample of a much larger set of questions, it is impossible not to be mesmerized by the creativity and diversity of the children's curiosities. Through the analysis of those questions, we can unveil a lot of information about the children's logic, theories, misconceptions, beliefs, values, concerns, fears and also about their educational system.

Let us stop for a moment and take a closer look at the question: "**If Egypt is up and the heaven is up too, is heaven in Egypt?**" When we first listened to this question, we got quite confused about its meaning. It was necessary to ask further explanations to the student who made it. He explained to us that when he goes to church, the priest says that when they die, they will go to heaven (in many languages, including Kinyarwanda, the words for "heaven" and "sky" are the same). When he studies geography at school and the teacher draws the map of Africa on the chalkboard, Egypt is always above Rwanda (up, if you consider the orientation of the map drawn on the board). In his line of inference, Heaven was probably located on Egypt because this country is "up."

We believe this question is a privileged example to show how children try to make sense of their personal experiences and all the information they receive, and that they do this by an active and constructive process, in this case elaborating a theory about the physical location of heaven. It also shows to us how superficial and abstract the study of geography was for this student who, only by seeing an illustration on the chalkboard, could not create a spatial representation of the map.

Continuing on the activity, after the class had the discussion about the questions, as a democratic practice, the students voted for the question that would guide their investigation. During the Matsiko implementation in Rwanda, the following questions where selected by different groups of children:

"Where does the sun go when it is night?" (Kagugu school, G1), **"Where is the path to the moon?"** (Kagugu school, G2), **"If Egypt is up and the heaven is up too, is heaven in Egypt?"** (Kagugu school, G3), **"Where does the human come from?"** (Nonko school, G1) **"People use to say that the earth turns around the sun, why don't we feel it?"** (Nonko school, G2)

Each and every question has a story, as simple as it might be. By enunciating the question, we know that children already know something about the question's background and sometimes have hypotheses about possible answers. The next step was to ask children to formalize such information by writing it in their laptops. To record their previous ideas is important for the

students to notice what they knew about the subject, what they thought they knew and later on to compare with what they are learning.

After planning collectively how to investigate their question, they started to put it into practice. In some cases, we started testing the previous ideas, where kids could make it through drawing, text, video, programming or experiments. In other cases, as the one about the question **"Where does the sun go when it is night?"** (Group 1), we started by observing the sun and its position in the sky.

During Group 1's investigation, after observing the sun, we had a discussion about its positions in the sky at different times of the day. Where is the sun in the middle of the day? Where is the sunrise? Where is the sunset? Based on the observation, two ideas came from the students: the sun is small and moves. In order to put this idea in contradiction, we proposed for the students to look for information on the Internet, on Wikipedia, and on the offline contents on the laptop to check if those ideas were right. During this time, they learned how to access the Internet.

Since Internet was not working well, we decided to look for information on the laptop's library and we found a book about the solar system with images. In the graphical representation of the solar system on the laptop, the students could observe that the sun is bigger than the earth and that the earth and other planets turn around the sun.

At this point, one question came from the students: "If the sun is bigger, why when we look at it in the sky, it looks small?" One student expressed the hypothesis that it happens because the sun is far away. In order to test this hypothesis, we went out of the classroom and did an experiment to understand why things far away look like they are smaller. All the students used the camera to make a video of the globe, an object available at school. In the beginning, the globe was close up and it looked big. Then one student started to walk with the globe in her hands and the farther the globe moved, the smaller it looked. (see Figure 1).

Figure 1. Children doing an experiment about perspective where the laptop records the globes movement.

Through this experiment, watching the video made by each child and reflecting about it, it was possible to understand the relativity of our perception, in this specific case, why things far away look smaller.

The students also found in the solar system book that there are other planets. In addition, another student found information that the earth turns to make day and night and it takes 24 hours. We used the globe and the children's body to simulate the earth's movement to make day and night.

For symbolic representation of this knowledge, they needed a tool where they could play, try, experiment, and represent their comprehension. For this we started to use Squeak/Etoys. Etoys is a media-rich authoring and programming environment loaded on the laptop, where children can draw or import objects and attribute commands for these objects, making animations through their own scripts. Etoys is a tool to think with. Its principle is to "make abstractions more palpable, allowing children to visualize and explore new ideas." (Etoys site).

In our work, using Etoys, the students constructed their own simulations about the solar system. Some students drew all the objects, others imported images from the Internet and from the laptop. After that they used the programming model of the Etoys, choosing commands to create their own scripts in order to simulate the earth's movements.

When they shared with classmates and we compared their simulation with what they had learned, they faced some problems like: size of the sun and the earth and the trajectories of the earth and the sun. We discussed again which is bigger, how much bigger is the sun, and what are the earth movements, if the sun moves. We also used the body to simulate these movements. They arrived at the conclusion that their initial hypotheses were false. The sun is bigger and does not move or turn. The sun remains in the same position. It is the EARTH that turns, around itself and around the sun. At night the EARTH shows another part of the sun.

After that discussion, the students came back to Squeak/Etoys to change their projects by making the sun bigger than the earth and the moon smaller than the earth and by programming the moon's movement to turn around the earth and the earth to turn around itself. To implement the model and reflect about it was a precious moment of learning. Before the simulation on the XO laptop, the students appeared to understand, but when they expressed by simulation, they realized they did not understand initially.

This means that it was necessary for the students to express their own ideas by doing, even committing mistakes. By debugging the models, the students face contradiction with their previous theories and this is a way to build new knowledge. That is what we call, "constructive mistake," which is necessary in order to advance in their knowledge construction.

Figure 2. Solar system simulation done in Etoys(left) and a girl explaining her work (right).

What are Children in Rwanda Developing, Using the Laptop to Investigate Curiosities?

When kids are doing Matsiko, they are developing many skills that we cannot measure through traditional examinations. The main point in this practice is not the learning of the formal contents, out of context and meaningless for the students. The proposal is to learn meaningful content through procedures that develop their own competence and skills to keep learning. They are experiencing new ways to learn.

Through this, they are developing the Century XXI skills, highlighted in the Vision 2020 document, which are Creativity, Innovation, Critical Thinking, Problem Solving, Communication and Collaboration. Making investigations, they are developing science concepts too.

Through 1:1 model combined with project-based practices, students are developing Technological Fluency (MIT). Instead of using the laptop to learn office skills, they are finding ways to use the laptop with their real problems, inside a context, in facing a need and in a more sophisticated way. It changes the mindset about the way the laptop can help in learning process.

Today we need to understand the technology deeply, but this does not happen out of our reality. We know that we learn when something is meaningful to us, when we make sense in our significations system. When kids were making the investigation, they were learning a lot about

the laptop use, but it was not necessary to have a class to teach how to use the laptop. The students were learning about the machine during the investigation process, since they had a need to learn it. We taught some techniques to them, but it was not a technique by itself. The technique was a way to solve a problem, to improve an experiment or a model.

In addition, Matsiko also promoted the students to express themselves creatively, building models about the world. Moreover they are developing literacy. This is a big issue everywhere. The scholarly system is failing in this area.

Matsiko mindset brings many possibilities to develop literacy. Literacy does not mean to be able to transform code in sounds and to write (encode) without mistakes. We understand literacy as an ability to use the written language in specific situations, as well as, to understand meaning and to express meaning, being able to create things with the language. The investigation's question creates the context for children to read something meaningful and also to write with authorship. They have the opportunity to express their ideas by writing without copying models. For that we proposed that students had to document their project in a diary on the laptop. This had the goal to make them reflect and to be aware about what they were learning. Beyond this, by keeping the diary, they had the opportunity to write with authorship without copying from the blackboard. When we do this in a blog on the Internet, as we did with 6-year old children in Brazil (Kist, 2008), it is more powerful, but we need to adapt our ideas to our real constraints.

Reading skills also were developed because the students had the book loaded onto their laptops and we observed them reading it many times, in Kinyarwanda and in English and also comparing the two languages. Moreover, the information about the projects subjects was another topic of interest for them to read. Since the laptop's internal library was only available in English, it created a barrier for most students. The Matsiko activities were made in Kinyarwanda to make students comfortable with expressing their ideas, but by developing the project, the students started learning some English words.

At School, What is Changing?

Matsiko is an OLPC initiative that happens inside the school, with students, but until now it is not a scholarly activity. Teachers are welcomed in the Matsiko class but they are not responsible for the activity. It happens as an extra-curricular activity for a limited group of student. Even so, we could observe some movements at school.

All students wanted to be part of it. Considering the complexity of the work and the limited number of people to execute it, we could only work with a limited number of students, but we had problems because every day the number of students that showed up grew bigger.

The scholarly community has seen the students' engagement with the activity; the students came everyday, worked hard and had fun. The investigation question got spread across the schools. Students that were not in the Matsiko group knew about the question, others asked for the explanation about the research and how to have the Matsiko book loaded onto their laptops.

The vision about the laptop is changing also. Until now, the teachers and the parents did not have a clear idea about what was possible to accomplish with the laptop. To play or to obtain ICT skills were their previous ideas. After Matsiko, they could see that they can use the laptop to learn and to create things. The headmasters of two of the schools that we work with asked us to offer the same experience to more students.

The families started to come to the school and show more interest about what their children were learning. In one situation we praised a child to his father saying how smart his child was, but the father did not believe us and said in simple English: "no, not my son." Other parents were proud of their children when they saw their projects on the laptop. The community, in general, that seemed suspicious about the students' abilities started to change their opinion when they saw and listened to the children's explanations about their projects.

Final Considerations

We acknowledge that a large-scale implementation of Matsiko inside Rwandan schools would be precipitated. Making it would imply a radical change in all methodology of teaching. As we said before, change is a process of learning that cannot be imposed top-down to teachers. To engage in a proposal like Matsiko, teachers need to feel that necessity, they need see that it works, and they need to feel comfortable with that. That takes time. Nevertheless, Matsiko brings concrete basis to question the existing practices and further create such need. Matsiko shows to the community some possibilities of how the laptop can help in the learning process and also to break the mindset that children can only learn by being taught.

Proposals like Matsiko may not be adopted as an institutional practice, but it can spread through the work of individuals. During Matsiko activities, we have met local people that have shown potential to become the agents of change. Those people have been working with us, reflecting about our actions, getting appropriated to the principles and even creating their own ways to implement it. They will be the ones that will adapt Matsiko ideas to other situations and probably to create their own learning projects. “Individuals more than institutions are the generators of growth, enhancement, and sustainability” (Cavallo, 2004, p. 105).

Finally, it is important to highlight that we do believe that macro level changes are going to be the outcome from many micro level actions and individuals will be the seeds of it. Matsiko is one of these micro-level actions that try to rescue the child’s ability to marvel, by applying the biggest powerful idea of all: to make a question.

References

Almeida, F. L (2000) *Curiosidade Premiada*. Ática. São Paulo/Brazil.

Cavallo, D. (2004) *Models of growth – towards fundamental change in learning environments*. In BT Technology Journal. Vol 22 No 4 . October.

Etoys website. http://www.squeakland.org/index.jsp (Accessed January 2010).

Fagundes, L. et al. (1999) *Aprendizes do futuro: as inovações começaram!* MEC, Brasília/ Brazil:.http://mathematikos.psico.ufrgs.br/textos.html. (Accessed January 2010)

Freire, P. et al. (1985*) Por uma pedagogia da pergunta*. Paz e Terra. Rio de Janeiro/Brazil.

Kist, S. (2008) *Um laptop por criança: implicações para as práticas de leitura e escrita*. Master. thesis, Universidade Federal do Rio Grande do Sul, Porto Alegre/Brazil.

Loewenstein, G (1994), *The Psychology of Curiosity: A Review and Reinterpretation*, Psychological Bulletin 1994, Vol 166, No. 1, pp75-98.

MIT Media Lab.*Technological Fluency.* http://llk.media.mit.edu/projects/clubhouse/research/handouts/fluency-v3.pdf (Accessed January 2010).

OLPC website. http://laptop.org (Accessed January 2010).

OLPC 5 Principles. http://wiki.laptop.org/go/OLPC:Five_principles (Accessed January 2010).

Papert, S. (1980) *Mindstorms: Children, Computers and Powerful Ideas.* Harvester Press. Brighton.

Papert, S. (1991) *Change and Resitance to Change in Education. Taking Deeper Look at Why School Hasn’t Changed.* In Novo Conhecimento. Nova Aprendizagem. Papers presented on the International Conference New Knowledge, New Learning - Lisbon, October 2000. Lisbon: Calouste Gulbenkian Foundation, 61-70

Rwanda Vision 2020. (2000) Ministry of Finance and Economic Planning, Republic of Rwanda.