**Innovation in Evaluation**

**April 4th and 5th, 2011**

**Cambridge, MA.**

## *Executive Summary*

During a two-day workshop organized by OLPCA and Sugar Labs, participants from five OLPC initiatives in the Latin-American region met with members of the OLPCA team and pedagogy experts from the Boston area: to share current evaluation initiatives in their OLPC programs; to exchange ideas about new methods and strategies; and to discuss ways to make the impact of the program visible, understandable, and actionable by as broad an audience as possible. This report outlines an evaluation framework that is the output of the workshop. The framework takes into consideration micro-, mezzo-, and macro-scale metrics, each of which is detailed in the report.

## *Introduction*

Approximately two-million children living in more than 40 countries around the world have received an XO laptop. Those laptops represent the deep commitment by politicians, community leaders, and educators to implement disruptive large-scale education-reform initiatives that will advance their countries into the twenty-first century and prepare their children for interconnected global creative-knowledge economies. The expectation for the success of these initiatives is high; local stakeholders as well as numerous international organizations look to these bold experiments with cautious optimism. These programs hold the promise to realize and radically expand the learning and creative potentials of entire nations at all societal levels. As such, arguably, one of the greatest challenges facing these initiatives is in designing and implementing mechanisms that help make their outcomes visible,

understandable, and actionable by all audiences.

As background for the meeting, we reviewed a number of evaluations done not only in the region (where the five participant countries are located), but also in other parts of the world where OLPC programs have been implemented. The main goal was to get a better idea of the aspects that the evaluators were looking to study and the results of those studies, and to find common aspects/ indicators that would help us build a framework of understanding and evaluation for all OLPC programs. In addition to the framework for understanding and evaluating, several strategies and mechanism for evaluation were discussed. Those mechanism will be designed and implemented at different levels:(1) at the micro level, to understand emerging learning and progress by *children* at all times ; (2) at the mezzo level, to understand learning in the *classroom/school*, as well as development of the program; and (3) at the macro level, to understand impact at the level of *program* (nation, state, community) and across nations.

## I. An aggregation of prior studies

OLPCA (Melissa Henriquez) presented an aggregated review of the evaluations conducted across the region (See Appendix A). We took the indicators from this summary to design a new common framework.

Table 1 is a compilation of educational assessments for projects that implement the 1:1 computing model of One Laptop Per Child. For each evaluation report describes the measured indicators and tools used for data collection. The indicators are divided into three groups: social impacts, learning impacts, and additional measurements of aspects related to program implementation (See Table 2). Following this description are listed the main results of each assessment.

**Table 1:** OLPC Evaluations

| Report | Country | Date | Author |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. “Monitoreo y Evaluación Educativa Plan Ceibal” | Uruguay | 2009 | Área de Evaluación del Plan Ceibal |
| 2. “Síntesis del Informe Evaluación General Un Computador por Nino” | Paraguay | 2010 | Fundacion Alda |
| 3. “Evaluación Experimental programa OLPC en Perú” | Peru | 2010 | Banco Interamericano de Desarrollo |
| 4. “Informe de evaluación del programa OLPC” | Colombia | 2010 | Ana María Velásquez, Ph.D |
| 5. “Evaluación Proyecto Piloto OLPC en Islas Salomón**”** | Islas Salomon | 2010 | ACER (Consejo Australiano para Investigación Educativa) |
| 6. “Aprendizaje innovador en Etiopia” | Etiopia | 2010 | OLPC Etiopia en conjunto con Eduvision y la Universidad de Groningen |
| 7. “Informe de evaluación pre-piloto OLPC Haití” | Haiti | 2009 | Anco Interamericano de Desarrollo |
| 8. “Introducing XO Laptops in four Nigerian schools: an evaluation of the first year (SEED-OLPC)” | Nigeria | 2010 | Gerstein and Associates, Trabajadores Sociales Clínicos Autorizados |

**Table 2:** Summary of common indicators

| Social impact | Learning impact | Program implementation |
|---|---|---|
| Opinion/attitude of principals and teachers regarding the XO | Integration of teaching tasks with the XO | Technical difficulties / repairs |
| Opinion/attitude of the children regarding the XO | Use of the XO for learning by the children and attitude towards learning | Understanding of the software and internet access |
| Internet access | Understanding of ICT | General implementation of the program |
| Access to technology | Activities most used in the classroom or for homework | |
| Opinion/attitude of the families regarding the XO | Peer learning and collaboration | |

| | | |
|---|---|---|
| Creation or modification of social network | Type of use of ICT on XO | |
| Frequency of use of the XO during free time | Frequency of use of XO in school | |
| Type of use of the XO during free time | Academic performance | |
| Vocational aspirations of students | Time to learn how to use the XO | |
| Communication tools | Learning to use the XO | |
| | Independent and self-guided learning | |

***Summary of results***

- Assessment models, as well as the implementations of the program themselves, vary greatly in part due to the operation of the entities involved.
- The focus of evaluations has been a formative evaluation: What has been done? How does the community perceive the project? What are students doing with the XO?
- The results are affected by changes in the program.
- The results of existing evaluations tend to be positive, highlighting the impact of education and attitude in students, the effects on teacher-student relations and their impact on the community.
- OLPC deployments reduce the digital divide: the majority of children use XO as their primary computer.
- The expected results include improved self-esteem and motivation, higher attendance and better learning outcomes. Only some evaluations are focused on performance as measured by scores on academic tests.
- Most of the results reported better motivation and attitude and reducing repetition rates. However, it has not been generally reported that the

project has contributed to improved learning along standard metrics.

## II. Framework

**(COMING SOON)**

**become fluent with the technology,**

**problem solve,**

**think critically,**

**use multiple sources of information,**

**be reflective, and communicate with multiple media,**

**work individually and in a team,**

**be a self learner, and**

**bring significant changes to community (??)**

## III. Design and implementation of new strategies for evaluation

Since the goal of OLPC is to have social-economic impact on the children and the communities in which the laptops have been deployed, an evaluation of the program must look more broadly than those data that are captured by standardized tests. Therefore, we present a series of recommendations for innovation in evaluation at different levels. The recommendations came as a result of discussion of presentations by the different participants and invited guest speakers, and the reflections about the OLPC programs and work. The work done by the different programs includes: the use of OLPC to conduct standard evaluations online, that gives immediate feedback to the teachers on students' learning and understanding of the work presented at school (Plan Ceibal); and innovative evaluation strategies that can complement both national and international standardized testing (e.g., Paraguay Educa and the Edücate program in Vichada Colombia). Also discussed were some software innovations

that facilitate the use of digital-portfolio evalutions within the context of OLPC deployments.

We concluded that evaluation strategies and mechanisms should be design at different levels: micro (at the level of individual students, teachers, and parents); mezzo (at the level of a classroom or school); and macro (national and global indicators). Each level is discussed below.

**1. Micro level**

At the micro level, we propose the further development of digital portfolios to support reflection that can help students (as well as teachers and parents) be aware of their own learning, and do so by documenting their work and thinking over time. The idea of increased utilization of portfolios is based on the work of Evangeline Harris Stefanakis, a professor from the School of Education at Boston University. Prof. Stefanakis shared her work on digital portfolios and multiple intelligences as part of a “comprehensive system that combines formal, informal, and classroom assessment, including portfolios, to inform the state, the district, the school, and the teacher.” As she points out [CITE], without a way to make visible what students do and what teachers teach, it is impossible to make changes to improve those dynamics.

*Background on digital portfolios.* Through standardized testing, we have the means to measure “which child knows more”; these data tell us about relative merit of the school in which a child is enrolled. A portfolio assessment tool would shows “what a child knows”; children become the curators of their own work. They advance their own learning and help their teachers, parents, and school administrators understand better the depth and breadth of what they have learned.

An article[1] in the *Chronicle of Higher Education* claims:

- Portfolios can integrate student learning in an expanded range of media, literacies, and viable intellectual work;
- Portfolios enable students to link together diverse parts of their learning including the formal and informal curriculum;
- Portfolios engage students with their learning;
- Portfolios offer *colleges* a meaningful mechanism for accessing and organizing the evidence of student learning.

Portfolios engage children in the process of reflecting on their work—what they have done, how they have done it, and how success these efforts have been—as they create a multimedia narrative to show their teachers, parents and peers what they have learned. Portfolios have been shown to be "a powerful means for children to assess their own work, set goals, and take responsibility for their future learning."

*Portfolio assessment in OLPC deployments.* To date, portfolio assessment has seen limited applicability. But the Sugar learning platform has the potential to provide a practical, engaging means to use portfolios. By building upon the automatic accumulation of work in the Sugar journal (including an automated "screen capture" of student work) the portfolio process can readily be integrated into the classroom routine. Reflection becomes the norm: children are encouraged write in their journals (young children could record audio notes) for a few minutes after *every* class.

Culling from the Journal can become part of a period (including end-of-term) assessment process. This process of telling one's story as a learner requires further reflection by the learner. At a "portfolio social", parents could be invited to view presentations and ask children about their learning; the child's voice is heard. The teacher-parent-child dialog can be based upon actual artifacts.

The classroom teacher can add addition assessment slides to the portfolio about themes such as work habits and personal growth, as part of an archive

[1] http://chronicle.com/wiredcampus/article/3668/electronic-portfolios-a-path-to-the-future-of-learning

that travels with a child across grade levels. Through juxtaposition, the child and teacher can see what has changed over the course of the years, trends, and areas for improvement. Also, a classroom portfolio can be assembled as part of a teacher-assessment process.

The currently available Sugar/OLPC portfolio assessment tool builds upon the journaling functionality of Sugar, where every action or activity a child takes in the classroom is automatically recorded in a folder: (1) by enabling the child to select important learning achievements, be they in reading, writing, arithmetic, arts, music, physical education, history and social science, etc. Children answer questions such as “I chose this piece because...” (2) creating a multimedia narrative presentation from their selections (including audio voice-overs and video), reflective of the multiple ways in which children learn; and (3) sharing their presentation with classmates, both to celebrate what they have learned, but also to engage in a critical dialog about their work.

The Sugar/OLPC portfolio tool is innovative in three ways: (1) it builds upon a journal of *all* learning activities that is automatically collected; (2) it has unique programmability, fun and accessible to even the youngest elementary school children, but interesting and engaging to middle-school children as well; and (3) it has unique tools for both collaborating on the construction of the portfolio and its subsequent sharing with others.

The Sugar/OLPC portfolio tool lets the learner create multimedia slide shows from material retrieved from their journal entries. The basic idea is to import images (and movies, audio, and text files) into slide templates, not unlike Powerpoint, and then show a presentation by stepping through them (See Figure 1). At present, the Sugar/OLPC portfolio tool creates a slide show from Journal entries that have been 'starred' by the student (See Figure 2). Figure 3 is a collection of portfolio entries from students and teachers in Nigeria.


**Figure 1:** The Sugar/OLPC portfolio tool. The title of the journal entry is shown at the top of each slide; the ‘thumbnail’ image is shown in the center of the slide; the text at the bottom is pulled from the Description field in the journal.

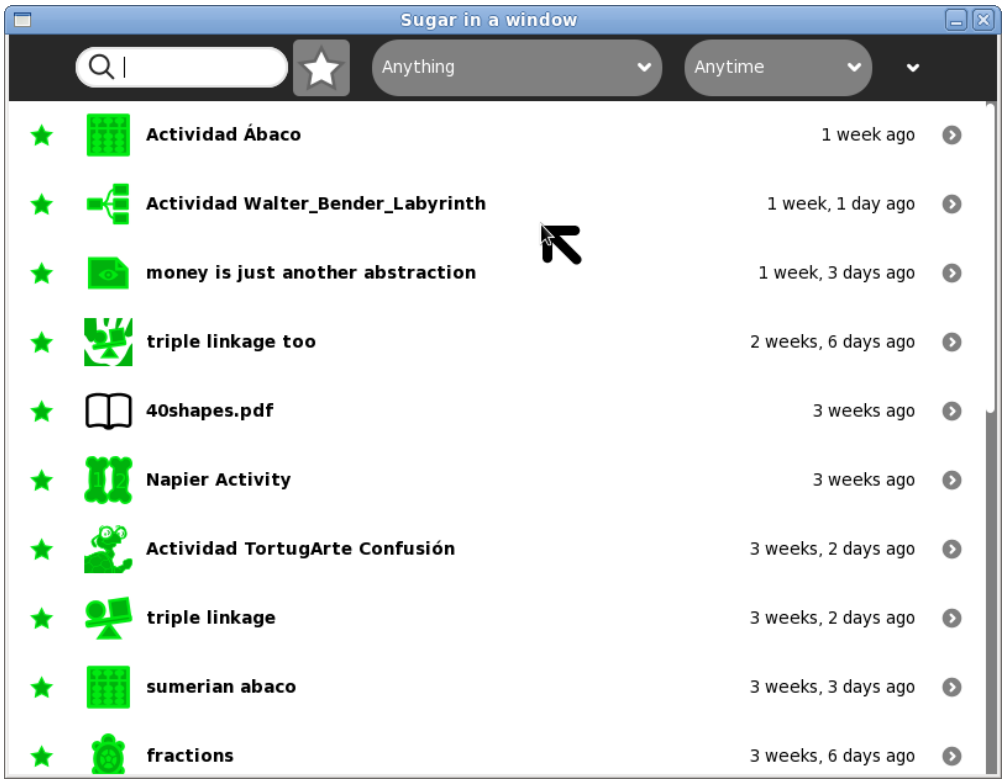



**Figure 2:** Entries in the journal that have been 'starred' are automatically included in the portfolio. Thus it only takes a single 'click' to add an entry to a portfolio.

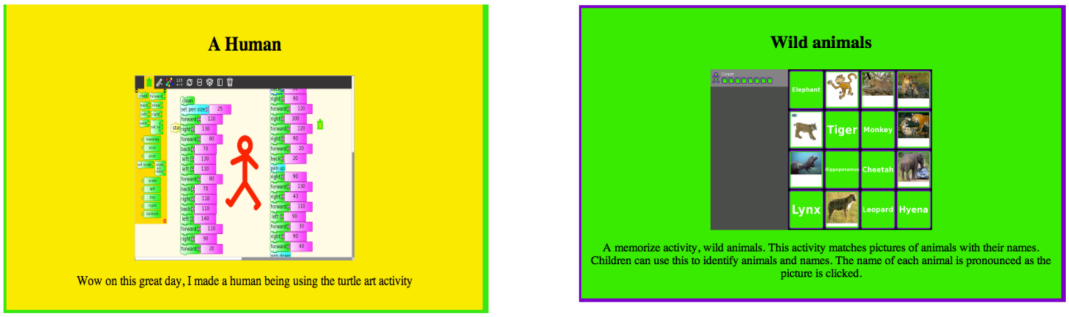



**Figure 3:** Portfolio entries from students and teachers in Nigeria.

Since a critical component of a digital portfolio is the child's reflection on her/ his process of designing and creating objects or "artifacts"[2], the description that tells the story is included in the slide. This description is automatically culled from the description field in the Journal entry for each artifact. Currently, the content of a specific portfolio can be saved and shared at any given time by exporting its content into an HTML document that can be opened in any browser, archived on

[2] Papert refers to learners' products or work as artifacts.

removable media or uploaded to a school portal.

More advanced portfolio features are including in the Turtle Art Activity. These features include the typical functions of presentation software: an editor that allows text to be inserted and formatted, a method for inserting multimedia (from the Journal), and a slide-show system to display the content. What makes it a bit different than tools such as Powerpoint is that the learner can program slides using Turtle Art blocks (See Figure 4). Turtle Art also has an export-to-HTML function so that presentations can be viewed outside of the Sugar environment.


**Figure 4:** Using Turtle Art to program a portfolio presentation (images from student work in Caacupé, Paraguay).

### *Recommendations*

At the workshop a number of recommendations were made for enhancements to

the Sugar/OLPC journaling and portfolio functionality. It was suggested that:

- the journal include fields relating to specific questions that the learner may consider during reflection;
- the addition of audio and video annotations to journal entries;
- the ability to link to artifacts from the Portfolio tool;
- the ability for teachers to annotate the portfolio entries of their students as a means of providing feedback;
- a facility for easily uploading portfolio entries to a school server;
- a facility for coupling portfolio entries to curricula guides as a means of sharing classroom artifacts among teachers; and
- to provide strategies that help students and teachers use portfolio in an effective way.

**2. Mezzo level**

At a mezzo level, we propose to design tools that would help understand the impact and evolution of the program in a larger context—at the level of the classroom or the school. The goal is to design tools that navigate and visualize data backed up in a server, both in synchronous and asynchronous way. These data would help teachers, administrators and stakeholders understand the impact of the program and make adjustments to it.

*On-line testing.* “Toward online learning evaluation system” (Hacia un sistema de evaluación de aprendizajes en línea) is a evaluation system designed by the Ministry of Education in Uruguay, presented by Andres Peri (REF) (See Figure 5). This new evaluation systems started with serveral ideas in mind: (1) possibility of generating an instance of evaluation in line with the new framework, (2) possibility of real-time feedback for teachers, evaluators and stakeholders, (3) possibility of generating a discussion around teaching and learning strategies. This system allows the student to take tests (Science, Reading and Math), and

the teacher to assess students' level of understanding of the work presented in the classroom at all times, and to make changes based of the results. Evaluations are traditional multiple-selection tests conducted online (with the OLPC web browser).


**Figure 5:** Hacia un sistema de evaluación de aprendizajes en línea (Uruguay)

The results are made available to teachers in a tabular form that enables them to quickly see where individual students are excelling and lagging behind in respect to the standard curriculum (See Figure 6). During the first month of the pilot of the new evaluation system, 85,000 students[3] from 2nd and 6th grades took 260,000 individual tests (three different subjects). After the success of the pilot and the high level of acceptance from institutions, Uruguay is planning to developed a permanent platform/site to host the evaluation system (bidding in

[3] There are 105,000 students in 2nd and 6th grade in the country, from both private and public schools.

2011), and to incorporate computerized adaptive testing that takes into account individual student response.

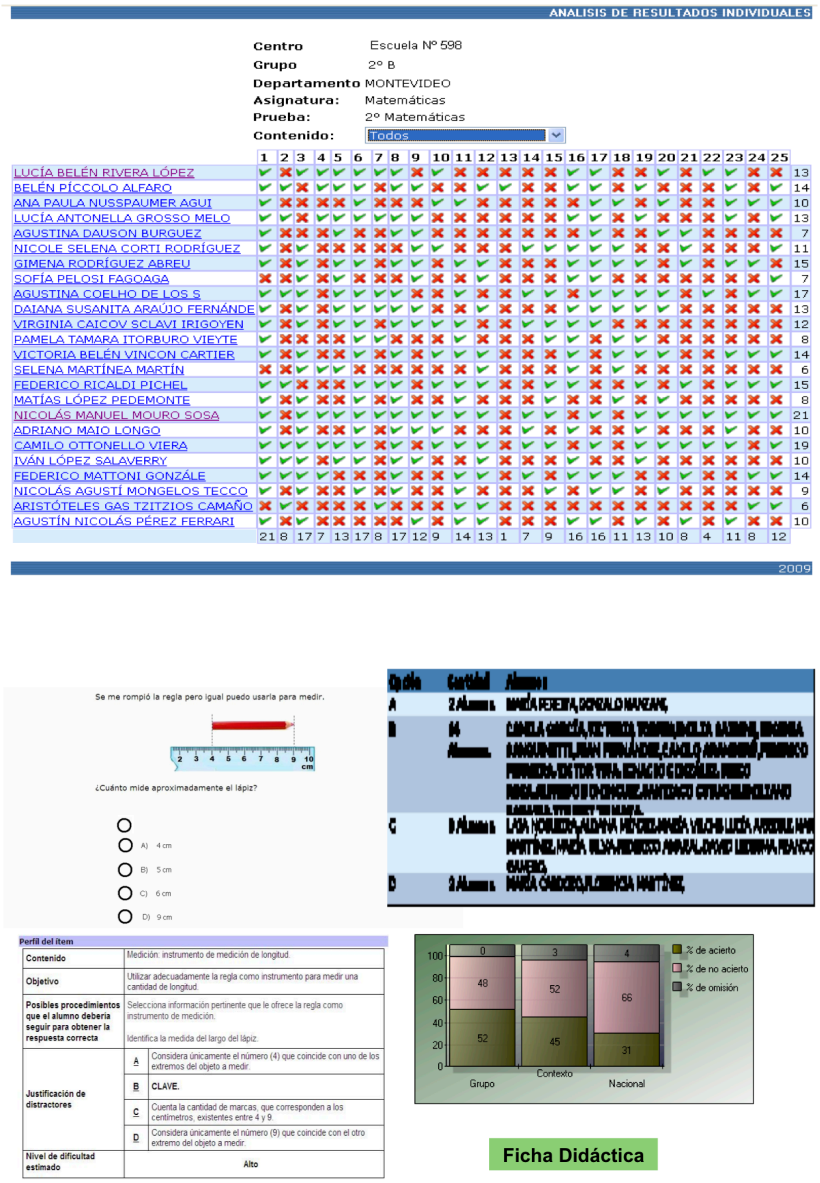
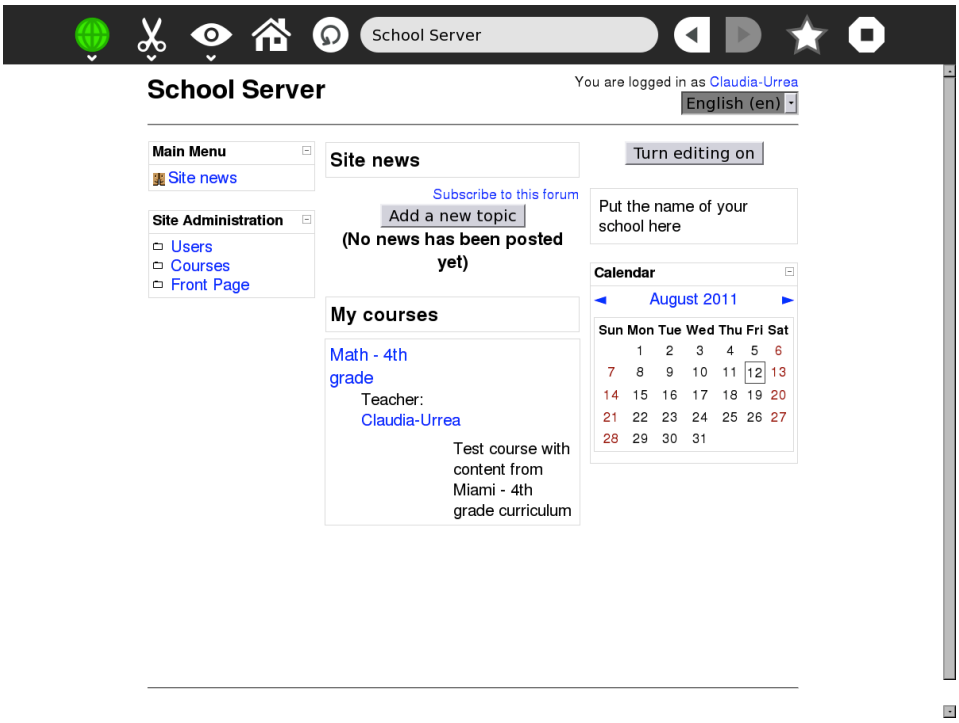



**Figure 6:** Results of the test by the students, or by an individual student in relation with the rest of the class.

*The School Server*. Typical of OLPC deployments is the use of a School Server. The School Server provides additional infrastructure extending the capabilities of the laptops. While the laptops are self-sufficient for many learning activities, other activities and services depend on the School Server providing connectivity,

shared resources and services. Services, tools and activities running on the School Server allow asynchronous interaction, can use larger storage capacity, and take advantage of the processing power.

A variety of School Server configurations have been used by deployments. But they have much in common: from a main page, users (teachers and students) have access to number of resources such as calendar, available courses, forums, among others (see Figure 7). Teacher and administrators can edit the information available in this page, register users and can make courses available to students (see Figure 8).




.

**Figure 7:** Main page of the School Server. It shows the users registered in the server, My Courses, calendar, etc.


**Figure 8:** Details of a Course of Math - 4th Grade organized by topic. Courses can be organized by week, activity, day, etc.

Students' information can be accessed using the Course back up option, from the course page (See Figure 9) or using the "Bulk user action" from the main School server page (see Figure 10).

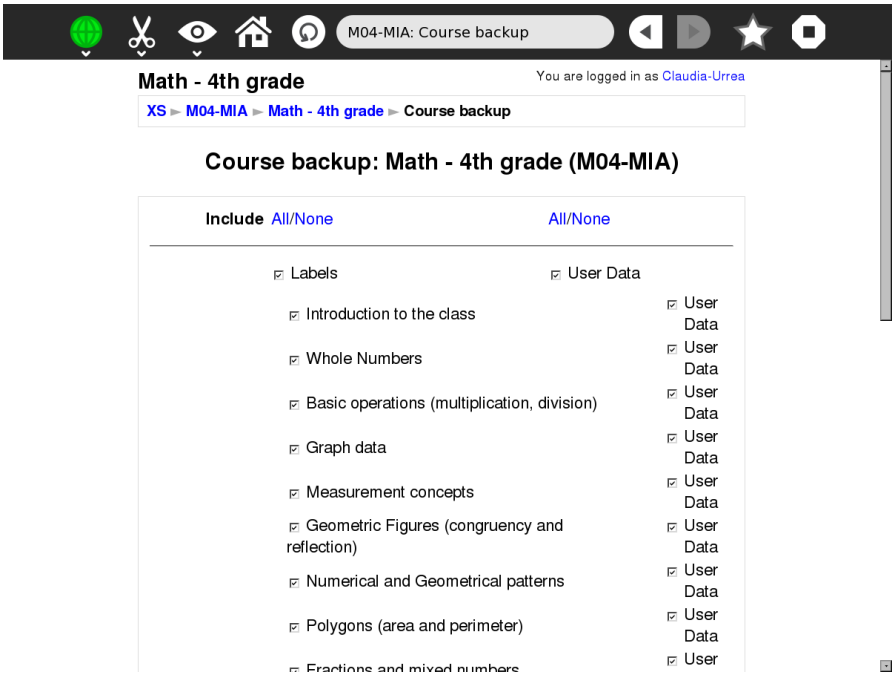



**Figure 9:** Work by students can be made available to the teacher using the “Course Backup” option.

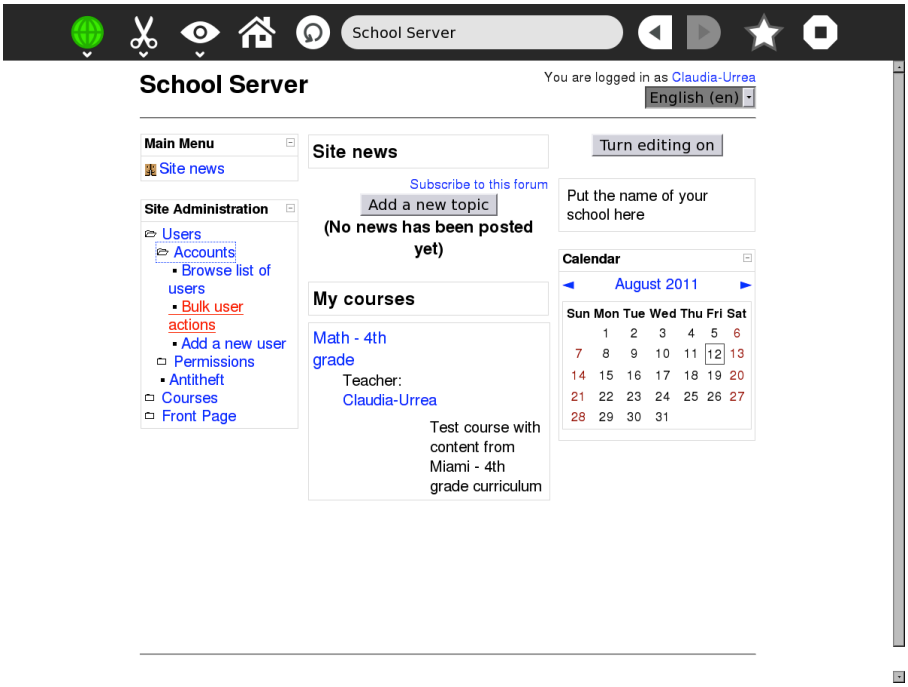



**Figure 10:** Students’ journals can be accessed using the Bulk User Actions, available from the main page of the School Server.

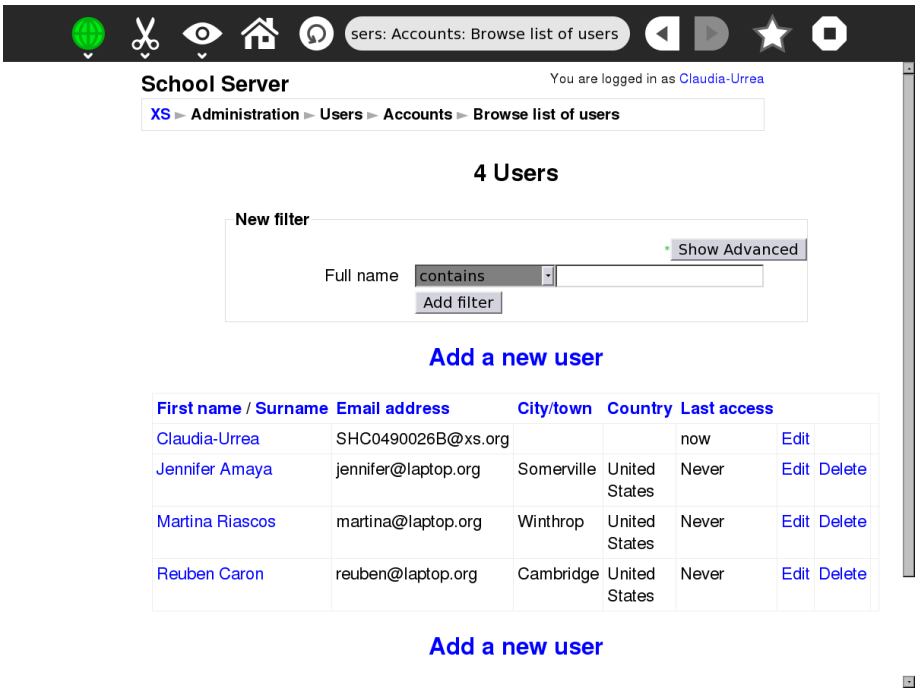



**Figure 11:** List of users registered in the School Server.

### *Recommendations*

- Need to explore what data if any we could record in the journal to facilitate assessments at this level;
- Need to explore how to correlate OLPC/Sugar portfolio output with the curriculum goals and results of the standardize testing. This includes the possibility of teacher's feedback on portfolios submitted by children;
- Develop tools to understand use of the XO by children, and its implications for learning:
    - Attendance and whether it sustains over time,
    - Use: Activities used, frequency, and time (formal and non-formal settings). This includes the download of Activities that are not listed as default in the XO, or the local Sugar image,
    - Academic use: what type of Activities are associated with activities proposed by teachers (in school and non-formal settings),
    - Fluency with technology: Type of artifacts created and its

complexity (measured by the number of programming blocks, size and length, etc), use of different type of media,

- Collaboration: number of artifacts created individually and in collaboration with peers,
- Communication: use of Activities for communication purposes (chat, browse, etc.), information children search on Internet and type of queries used to search for the information.

**3. Macro level**

We recognize the importance of understanding impact and emerging developments at the much larger level that of the OLPC program or even across program, in multiple countries. Several initiatives are being designed, implemented and refined: Edücate and Paraguay Educa.

*Edücate.* "Education and technology for strengthening culture"[4], is an OLPC program designed and implemented by public-private partnership between BHP Billiton Company, Colombia government through its program "Red Unidos" and One Laptop per Child Association. The program's goal is to contribute to strengthening the quality of education in 1:1 schools of rural and indigenous communities in the state of Vichada, Colombia. This is a region that has been recovering from internal armed conflict.

One of the most important elements of the program is its innovative evaluation strategy, based on a recent methodology published by Los Andres University in Colombia (REF). The main goal of this evaluation is to identify favorable conditions that in the short term have the potential of making an OLPC program sustainable, as well as evaluate the impact of the program in the development of high-level skills that go beyond mere academic skills (i.e. learning to learn)

A number of instruments have been designed, validated and used with the target population (student, teachers, families/communities and administrators). The initial set of information (base-line date) has been collected. The report of this initial data will serve as the reference for future observation and will inform

[4] http://olpcvichada.blogspot.com/2011/06/education-and-technology-for.html

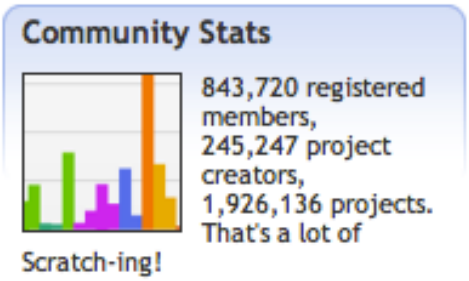
the future implementation of the program.

*Paraguay Educa.* Based on the premises that traditional learning environments do not help children developed the skills they need for knowledge society and do not allow children to develop their own potential as learners, Paraguay Educa started the educational program "One Laptop Per Child". The main goal of the program is to better prepare Paraguayan children for a technology-driven modern society. The program started in the city of Caacupé in 2009 with 4,000 children (1st-to-6th grades) from limited economic and social households, who received an XO laptop. In April 2011, the program was extended to another 5,000 children from the same geographic region and economic and social conditions.

During the first two years of the program, children who received XO laptops started to demonstrate high levels of creativity (and other high-level skills), which are not often valued or tracked by their teachers in the classroom. Paraguay Educa's team decided to start their own initiative to document and assess children's creativity in the context of the educational program. The study will compare and correlate children's levels of creative expression shown in the designed and creation of artifacts built using Sugar Activities, with the test scores those children gained in their formal education. New instruments were designed and validated for the study that involves 180 children from seven schools in the city of Caacupé currently enrolled in 4th grade.

*Repository of OLPC artifacts.* As an alternative from experimental evaluations, a strategy is proposed for understanding OLPC at a much larger scale. This strategy involves the design and implementation of a repository of objects or artifact designed by children from different OLPC programs, different countries, all over the world. There are a number of similar repositories with an important number of artifact from a individual kind exist already, e.g., the Scratch website.

The Scratch website[5] is a portal for the community of 800K users from all over the world, who have created and shared 2-million Scratch projects during more that four years (See Figure 12). This important collection of Scratch projects makes possible the analysis and understanding of the impact of the Scratch program at a large scale, and the learning that emerges, not only at the individual, but also at the collective level.




[5] http://Scratch.mit.edu


**Figure 12:** The Scratch web portal. This collection of Scratch projects makes possible the analysis and understanding of the impact of the program at a large scale.

The number of users/projects and the emphasis on design, sharing, and collaboration (remixing) has made possible the understanding of the impact of the program at a large scale, and analysis of individual as well as collective learning that emerges in the community (see Figure 13). It allows for understanding of the people who join the community (who we are), the projects they create and share (what we do), and the type of interactions and contributions they make (who makes what).

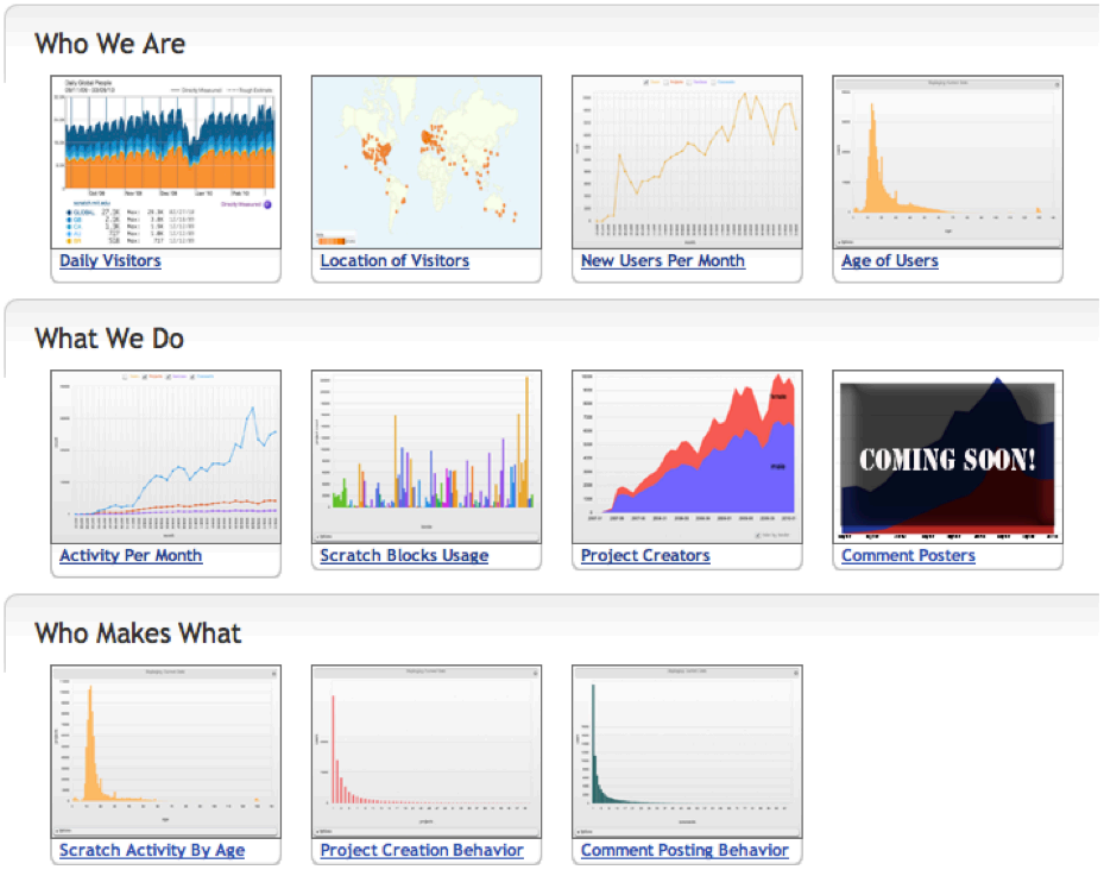



**Figure 13**: Statistic in the Scratch community.

More sophisticated analysis can be also done of the type of interactions among students (See Figure 14 and Figure 15).

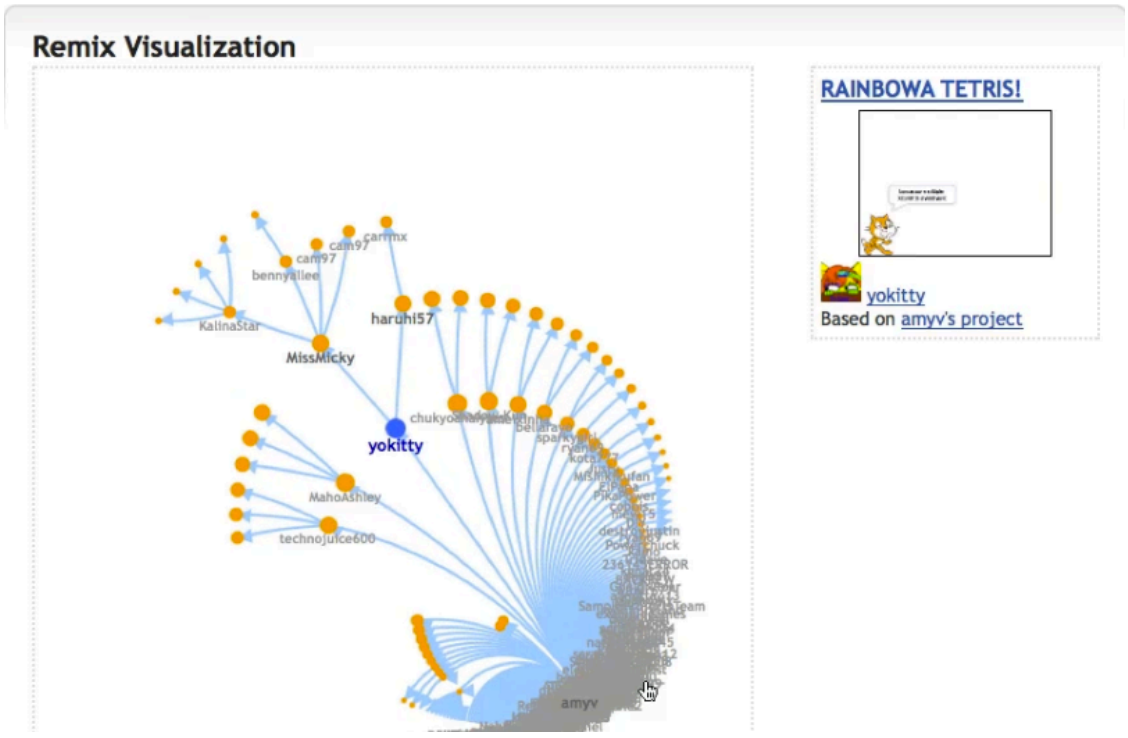



**Figure 14**: Visualization of Scratch user data showing the branching of projects

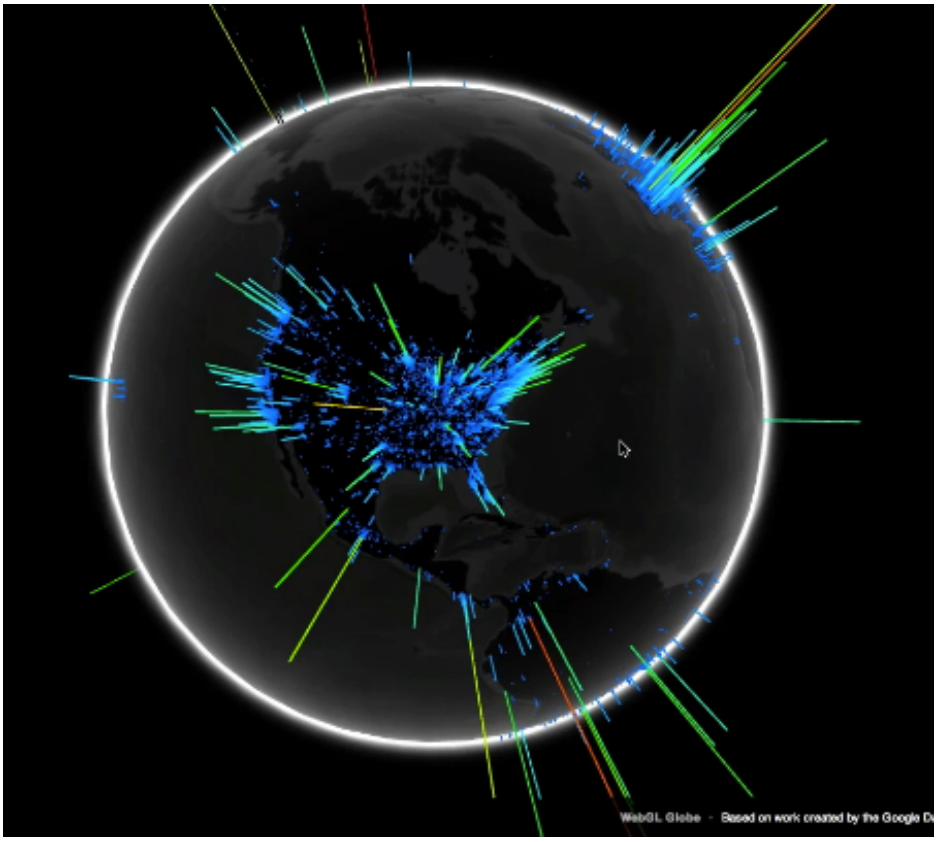



**Figure 15**: Visualization of Scratch user data showing the global distribution of usage

Turtle Art projects is a similar site that allows users to share their projects, but a general solution for sharing output from Sugar Activities would greatly enhance the ability for the cross-pollination of best practices (see Figure 16). At the moment, the Turtle Art site doesn't keep demographics data of users, nor keeps track of the interaction and collaboration among users, but it is certainly a place where users can share their work and get ideas for their projects.

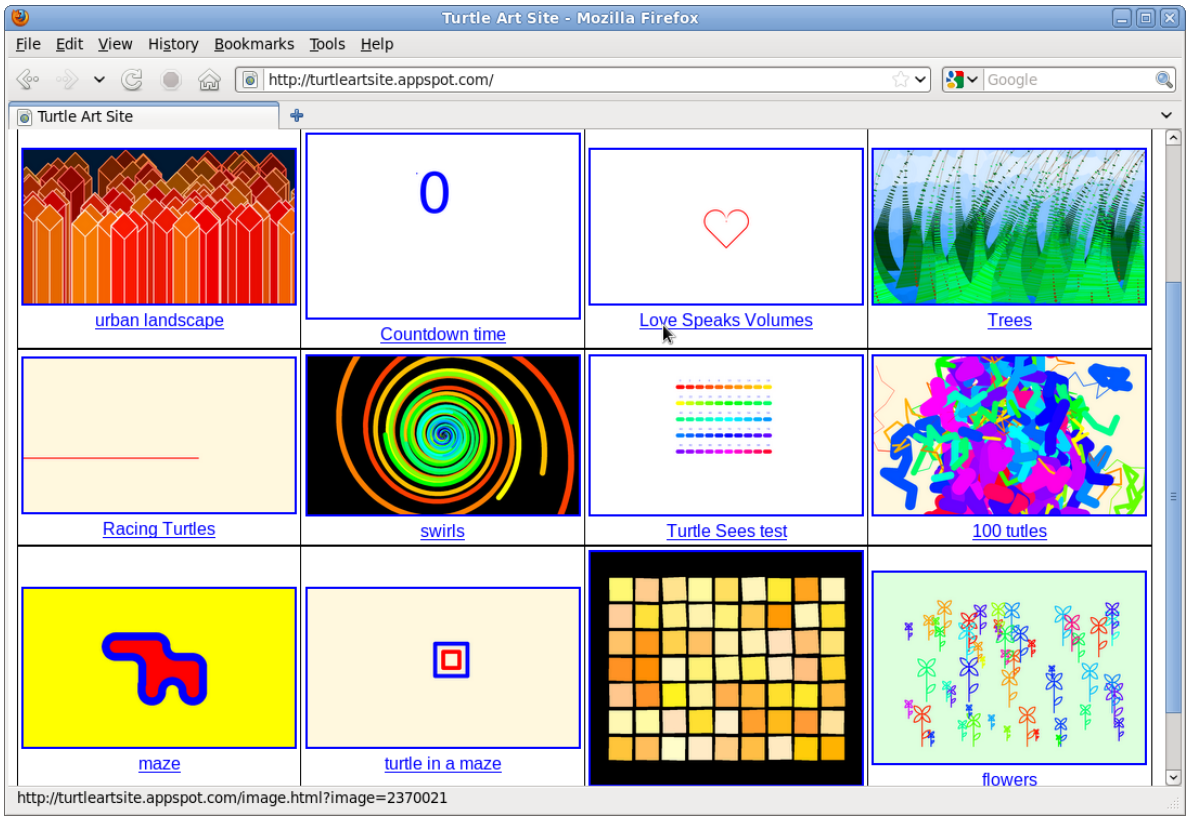



**Figure 16**: Turtle Art site, allows users to share their projects.

### *Recommendations*

At the macro level, and taking advantage of the existing (and future) innovations done at the OLPC program level, the following actions are recommended:

- to design and develop a site where OLPC/Sugars users can share artifacts done with different kinds of Sugar Activities (photos, video, images made in paint, Turtle Art projects, Memorize games, Scratch projects, etc);
- to use of such a platform and data (personal data, country, etc.) to understand and make visible differences in use and preference by age, location, culture, etc. across programs and nations, and to study emerging learning and use by students using the XO; and
- to use the results of the different research projects done at middle scale, such as the ones done in Educate project and Paraguay Educa, to make

projections of similar phenomena at a global scale.