Open Education Report

http://www.apoplous.org | Newsletter # 9 | February 2007 |

"HELL

There Are No Rules Here - We Are Trying To Accomplish Something."

Thomas E. Edison

"The best way to predict the future is to create it"
~ Alan Kay

"As for the future, your task is not to foresee it, but to enable it."
~ Antoine de Saint-Exupery

Editorial- Welcome to the Laptop Issue

Nothing excites us more than the prospect of one laptop per child, regardless of its origin- be it the OLPC Laptop or some other machine. As we have covered in our previous Report, the Laptop is the right answer for 1-1 computing.

Open Education Report

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The Apple eMate: it was a dream machine, with many of the features of the Laptop but it got axed during the mid- nineties when Apple was in serious trouble and Steve Jobs had just returned as interim CEO.

Laptop Revolution

One of the most innovative technologies we have ever seen was undoubtably the Apple eMate. It offered a robust case, especially designed for children, with wireless communications, no moving parts, a keyboard, a touch screen, and of course the right software to do the job. And it even had a battery that managed to keep it going for more than 6 hours straight. And that was in the mid 90s!

We are moving towards the end of the first decade of the 21st century and just now we are seeing a dramatic change in the laptop market, and the first signs of laptops designed especially for children. The Apple eMate was probably the first, and after many years of no similar products, we are lucky to witness the introduction of the OLPC Laptop and of course all the competition it has sparked, from companies such as Intel or from countries such as India.

We cannot be sure if the OLPC Laptop will manage to capture the imagination of every school child on the planet. What we do know is that it has already caused a ripple effect that will forever change the way companies deal with the education market. Up to now, they were just selling ordinary computers. From the moment OLPC announced its laptop, the competition heated up new products reached -or will reach soon- the market. Competition is good, and it creates great opportunities for the end user. We are glad the Laptop has managed to cause such a situation, because, at the end of the day, competition helps improve a product and take it up the road of excellence.

Editor's Note:

Computers are great as educational tools, as long as we have the proper methodologies and content.

But, even with those in place, we still need to be able to choose the right technology to do the job.

This entire issue focuses on the proposed solution for a proper implementation of ICT in education with a one - one ratio.

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The Need For Speed Change

March the 23rd will see the official introduction of PS3 in Europe. With it, 3.2 TerraFLOPS of previously unimaginable power will be in the hands of children! With such power in their hands, can education treat them the same?

The Mac Pro Quad, running on Two Dual Core Xeon Processors. With more than 40GFLOPS of performance is one of the fastest and most expensive 'personal' computers in the world.

The Playstation 3: a Game Console, with Yellow Dog Linux running inside. 3.2 TerraFLOPS in the hands of children!

"The power of a warehouse full of standard PCs in a box that fits on your desk- this is Sony's frighteningly awesome PS3". These were the words we used in our first OpenEducation Report, more than 2 years ago, and they still reflect the power of this new beast. Power that has been unleashed in the hands of children (of any age!).

The Need for Change

The late Minister of Education and Culture of Cyprus, mr Peykios Georgiadis, once said that 'a doctor from yesteryear, if he was transported to a hospital today, he would not be able to use any of the new technologies of medicine. However, a teacher of the past could still enter a modern classroom and perform his/her duties, since very little has changed'.

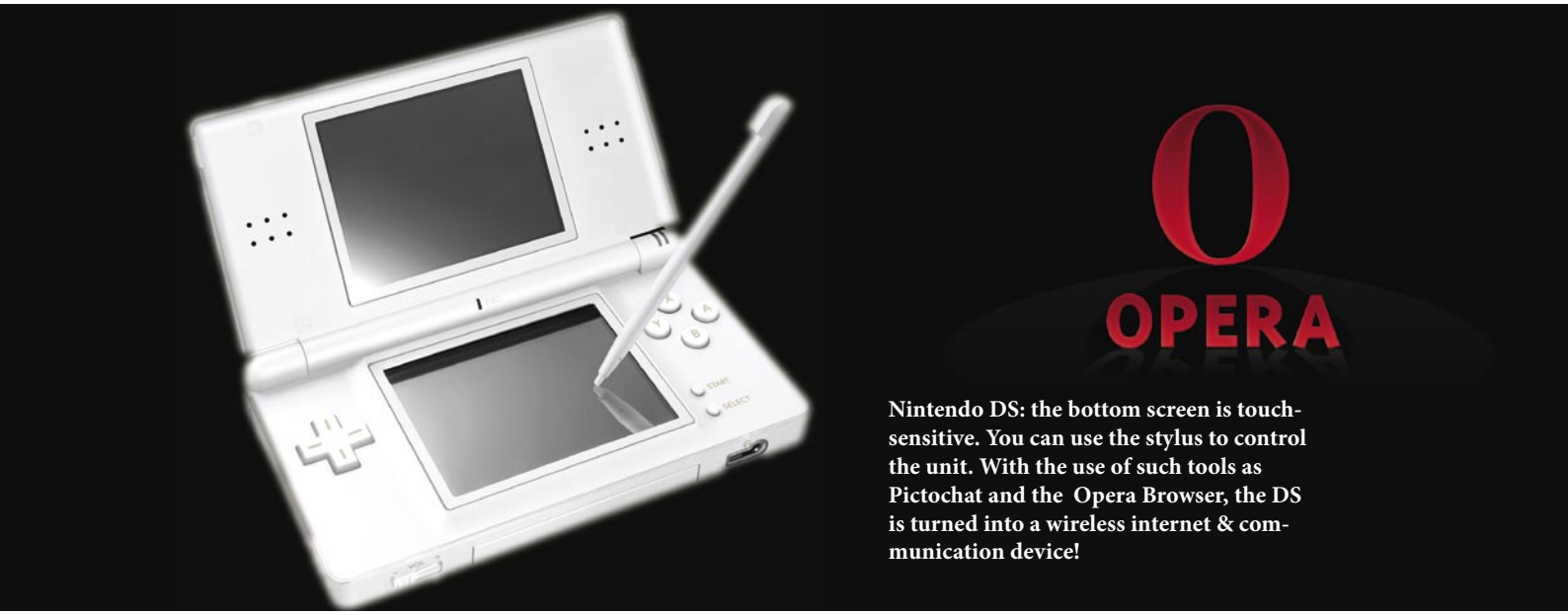
Indeed, this is vastly correct. Even though we have made cosmetic changes to the classrooms (and schools) and we have added maybe one computer per classroom and internet access, we are still far from truly revolutionizing the way we interact with knowledge. Children are still required to use their textbooks as the primary source of information. Every day we ask them to 'turn to page x, read the passage and discuss it etc'. Maybe we try to implement the latest theories of learning, albeit using outdated and outclassed methods, since our books, our curriculums and our schools are still based on the 'traditional' models.

The information age leads -inevitably- to an information overload. Skills required to handle this information are rarely mastered, since the emphasis is usually on following the curriculum. More often than not, children are 'failing to connect', and we have to rethink of our overall strategy.

This is the Playstation generation, they have grown up to this age taking computers and the internet for granted, having multiple channels on TV, and being able to communicate with their friends using technologies even our generation (the 30something) has trouble using. We can not and should not revert to traditional methods. A revolution in education should take place!

The 'Touch' Generation

Children need a different way to interact with information. Nature has given us the ultimate 'pointing device': our hands! Technologies such as the Nintendo DS has enabled children to 'touch' information!



Nintendo DS: the bottom screen is touch-sensitive. You can use the stylus to control the unit. With the use of such tools as Pictochat and the Opera Browser, the DS is turned into a wireless internet & communication device!

The mouse has been in use for more than 30 years, and it was invented much earlier than that. Even though it still is a very good way of controlling the computer and the information displayed on it, the machine has started to really show its age, especially when it comes to mobile devices.

Nature's way

Our species has evolved (even though to some, 'evolution' is highly controversial) from Homo Habilis to Homo Sapiens because of our ability to handle tools. Our primary 'interface of interaction' with our environment and the objects within it has always been our hands. Our senses play a great deal when it comes to better understanding this environment, however it would be next to impossible to use -let alone create- anything if we did not have 10 highly capable 'pointing' devices- our fingers.

If we consider the use of a mouse, we will understand that we are using an (unnecessary?) level of intermediate interaction between the user and the object on the screen. Our hand touches the mouse and the mouse controls and 'touches' information. By removing the mouse from the equation, we are left with a unique way of using our hands (and fingers) to 'touch' that object. There are many approaches to this interaction. Probably the most common in use (at schools) are the interactive whiteboards. Some models (ie SMARTboards) support both finger input as well as pen input. Other models (such as the Promethean boards), require a pen for controlling and interacting with information.

> "..we're going to use the best pointing device in the world -- our fingers"
>
> ~ *Steve Jobs, introducing the iPhone*

Mobile appliances such as Tablet PCs, PDAs, Smartphones, and game consoles such as the Nintendo DS are aggressively trying to create the ultimate 'touch' interface. Laptops, any laptop, should seriously take this into consideration!

The 'M' Factor

Mobile devices are becoming more common every day, especially in the hands of children. Latest statistics show that more than 88 % of students ages 10-16 have a mobile phone with color screen and multimedia features.

Apple's iPhone is a remarkable project, not so for its fancy specs as for its OS: MacOS X is built into the phone, opening up the potential for some yet-unheard of capabilities.

The Sony PSP is far more than just a portable PlayStation2: it offers advanced media player capabilities, huge storage, and remote access to contents on the PS3.

Children already have access to wireless communication devices that can -in many cases- take notes and browse the internet. They are called 'mobile phones'.

The Mobile Factor

Mobile phones have taken residence in almost every single household in Cyprus, and most other European Countries. The 11th Report on the Implementation of the Telecommunications Regulatory Package (2005) clearly indicates that at least 8 member states of EU have reached a 100% penetration of mobile phones.

The 'Smart' Factor

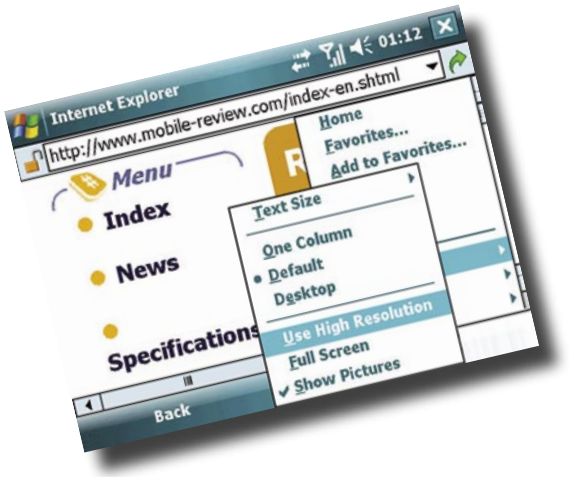
Mobile phones, just like computers, tend to become faster, better and with more characteristics as time goes by. Sooner or later, what is now considered a 'smart' phone (offering advanced multimedia and data-handling features) will most likely become the standard. Already the PDA market has been shown the teeth of 'smart' phones that do as much as any other device and in some cases they are much, much better. We already have mobile phones from various companies that support text input on the screen, and their operating systems are just getting better and better, with Microsoft investing vast sums of money in development of its Mobile OS.

Apple has just joined the market with a product that is still some time from shipping. It does, however, raise the bar on integrated services (even though it also receives criticism for not supporting others) as well as the integrated OS. Instead of using a 'lite' derivative version of their OS, much like Microsoft does, they claim they went all the way to porting MacOS X to this device.

Much has to be said about 'smart' phones. They sure have lots of features and they are capable communication devices. However, we have to take into consideration that these phones are built specifically for being used as phones and not as computer-alternatives. They can replace computers in many cases, but a Laptop is still needed for more crucial operations.

Embedding the OS

Hard drives may not be the right 'ingredient' in a laptop tailored for children. Not only they are quite 'slow' for instant-on operation, consume much power and emit heat, but they are also a serious point of failure.



Laptops or mobile devices used by children are prone to failure due to hard use, frequent drops and any other computer-related nightmare one can imagine. Hard drives have the tendency of failure under such hard conditions, never mind the fact that they are far too slow when we talk about instant-on operation

Flash Vs Hard Drives

Flash memory has seen exponential development and improvement over the last few years, thanks to factors such as portable MP3 players. Samsung Electronics even went as far as releasing the first flash-memory based PCs, with 32GB flash memory (Solid State Drive).

Because of their significantly small size, silent operation, modest power consumption and reliability, let alone speed, they are the perfect addition to any mobile device that does not require extreme storage capacities. For devices used by children they can be the perfect choice, since they provide enough storage for an embedded OS (see previous Report), and they are fast enough to support (almost) instant-on operation. The OLPC Laptop uses such technology, and it is not the only device to do so. The Fourier Nova 5000 Tablet PC, uses Flash memory to store its operating system (Windows CE 5.0) and a number of applications such as a PDF reader, a Word, PowerPoint and Excel- compatible programs, a Media Player, Internet Explorer with full Shockwave/ Flash support, as well as the highly-regarded Inspiration software package.

The Fourier unit is surprisingly fast, and it supports pen-input. The screen is touch-sensitive and we can move icons and make selections using our fingers. USB ports on the sides of the unit allow the increase of storage space by using external USB memory sticks.

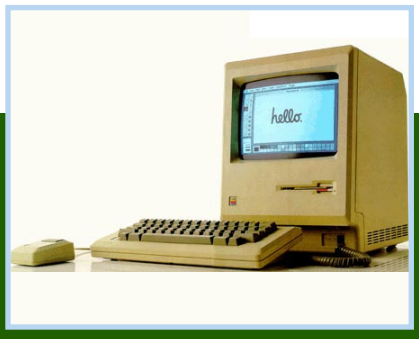
Even though the increase in demand will drive prices for flash memory down, while increasing the storage space, we don't see the technology replacing hard drives any time soon. However, we do believe (and expect) more and more devices to use Flash memory as the primary storage technology.

Top Left:
Microsoft Windows Mobile 6 has a similar look and feel to the VIsta environment (albeit with a much simplified set of capabilities).

Top Right:
The Fourier Nova 5000 is currently based on Windows CE 5.0. It is a very sturdy, lightweight and capable unit, that comes in a small form factor, offers WiFi, a touch screen, and proprietary ports for connecting with gadgets that allow children to perform experiments in Science.

Creating New Standards

Some products are so revolutionary they create their own standards. Probably the 3 most significant products in the history of personal computing are the Apple II, the IBM PC and the Apple Macintosh. Are we going to experience a new revolution?



The Apple II (Top Left), the IBM PC (Center), the Apple Macintosh (Top Right) and the OLPC Laptop (Bottom Left)

In the late seventies, a young Apple released a ground breaking product: the Apple II, which ignited the personal computer industry. IBM soon followed with their own PC, and by following an open architecture, it managed to make its product the dominant player in the personal computer market. Apple retaliated with the Macintosh in 1984, an inspirational machine that never managed to recapture the past glories of the Apple II. The Laptop is probably the next significant milestone in the history of personal computing.

The New Challenge

In an age where a computer is no more a luxury but is becoming a necessity, many people still have no access to the technology. Financial and other constraints prohibit many millions of students around the world from owning a computer, thus increasing the digital divide.

> "To create a new standard it takes something not just a little bit different but something entirely new, that really captures people's imagination"
>
> ~ *Bill Gates, former Microsoft CEO*

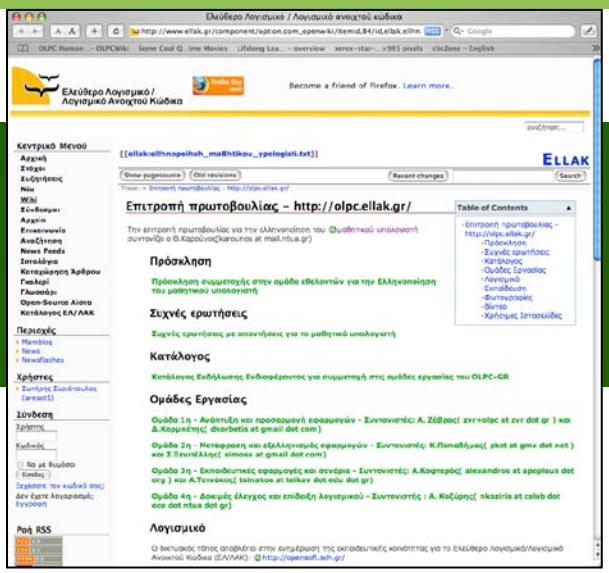
The OLPC was established with one single purpose: to make sure every child in every country will have access to a computer and to the internet, and be able to use it as a learning tool. This reminds us of Steve Job's vision of interpersonal computing back in the 80s. However, his machines, even though incredibly inspiring, where highly priced and never in the reach of the masses. The visionary that first dreamt of such a machine is -without a doubt- Alan Kay, when he talked and even designed his Dynabook. However, in the 60s, the technology was not available to make his dream a reality.

Some 30 years later, Nicholas Negroponte, after assembling a group of highly-skilled individuals, and by recruiting the visionary Alan Kay, managed to produce an incredible device that is -at least- as much inspiring as the original Macintosh was, and as much a breakthrough as the Apple II in its glory days.

The success or not of the machine will be judged not by the numbers sold, but by the acceptance by both teachers and students and of course by the content developed for it. After all, no technology is useful without content!

OLPC : Greece & Cyprus

Greece has taken a very aggressive approach for the implementation of the laptop: 4 committees, of volunteers, with the effort officially embraced by at least one Minister. Cyprus is seriously considering a Pilot Study as well.



The web site of the Greek FOSS community, hosting the OLPC project (http://olpc.ellak.gr)

Greece has been an active supporter of Free/OpenSource Technologies for quite some time now, hosting international conferences and developing its own Linux distros (KNOPPEL), while its members are already localizing such packages as OpenOffice.

OpenSourcing Greece

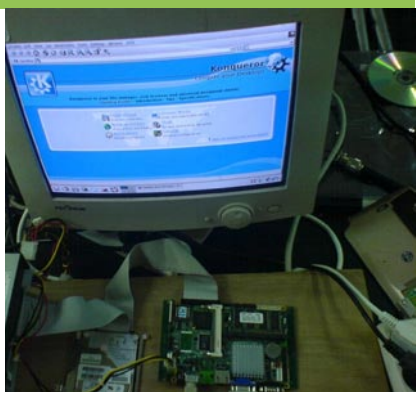
Greece responded quite early with the OLPC initiative. This was mostly due to the remarkable work already done in Greece regarding FOSS, and also because a group of individuals and academics realized the huge benefits this could have for education.

The initiative originally started by Theodoros Karounos, of the National Technical University of Athens. Mr Karounos informed Michalis Bletsas of OLPC about his intentions, and a line of communication was established to promote -through volunteer work- the localization and implementation of the Laptop in Greece. Very quickly the Greek OpenSource Society started hosting information and the invitation/announcement for the formation of the volunteer communities, and within a few months time, the first groups started forming. Long before the first B1 Laptop was built, Greece received some development boards which were distributed to several labs and universities across the country for testing purposes. Then, in November 2006, the first two B1 units of the Laptop arrived in Greece and ever since they have been shown in presentations and conferences around the mainland country and the islands.

Currently there are 4 groups of volunteers, each with its own mission. A Wiki allows group coordinators to update information regarding their progress, and a mailing list allows them to inform the more than 450+ volunteers on the course of the project. Very soon Greece is expecting the arrival of several B2 units.

OLPC Cyprus

One of the coordinators of the greek committees, the only Cypriot in the group, assumed the role of coordinator in Cyprus. This will allow teams to work together, and to make best use of their resources in creating content and methodologies for implementing the Laptop.



Several Universities across Greece, collaborating on the OLPC implementation, started experimenting with the development boards as early as summer of 2006.

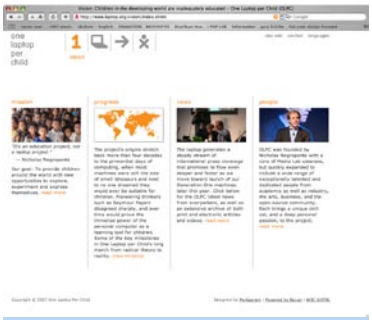
One Laptop Per Child

When your mission is to provide every child -especially in poor countries- with a laptop, you sure have a herculean task at your hands. Whos is this OLPC organization and who are its early adopters?

"...if I am annoying Microsoft and Intel then I figure I am doing something right!"

~ *Nicholas Negroponte, OLPC founder*

The OLPC Wiki: http://wiki.laptop.org



The OLPC web site: http://www.laptop.org

OLPC (One Laptop Per Child) was established as a non-profit organization with a very brave mission: to bridge the digital divide by providing every single child with the ultimate learning tool in the form of a laptop.

The Organization

OLPC was founded by Nicholas Negroponte as (his) personal answer to the question of the digital divide. According to Dr Negroponte, there are more than 2 billion children around the world with little to no access to computers and proper education. He firmly believes that technology can play a crucial role in providing children around the world with the proper tools for learning.

He outlined his ideas for a $100 laptop in an e-mail to Hector Ruiz, the CEO of AMD in January 2003. AMD became one of the first supporters of the organization to be called One Laptop Per Child, followed soon by Google, News Corp. and RedHat to name a few.

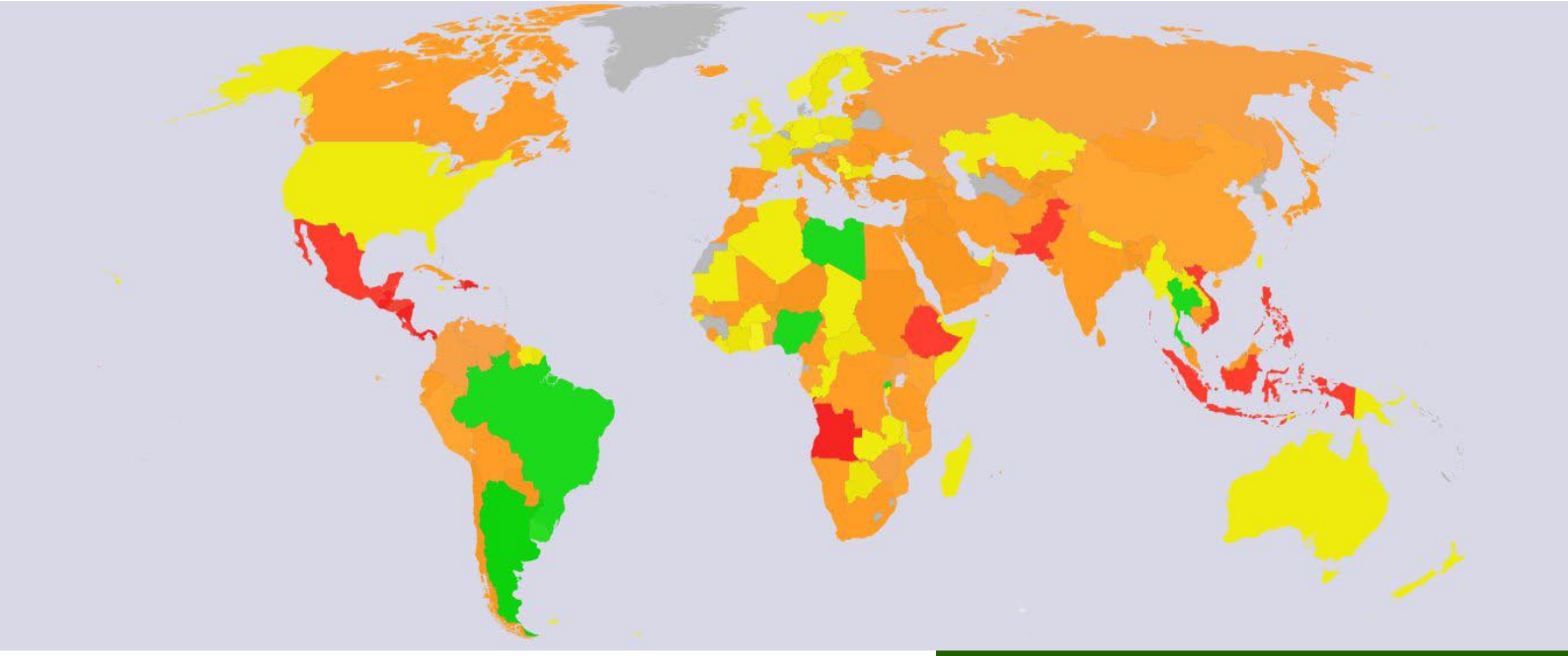
The idea of this project was quickly embraced by many people, including the former UN Secretary General Kofi Annan. At the same time, however, it drew fire from several third-party vendors or large corporations such as Microsoft and Intel. Others, like Apple, offered their support and even pledged to transfer their software to the new platform. The creators of the Laptop decided to use OpenSource Software as the basis for both the OS and the applications included.

Mission Possible?

Nobody claimed that OLPC's mission is easy or straightforward: not only they have to convince of the real value of using the laptop in education, but they also have to make sure that countries will have the necessary infrastructure to handle the technology properly. Some of the problems associated with the laptop, deal with how the idea actually works: there is still a great controversy on the value of giving each child his/her laptop in countries where basic needs are note even met. After all, if a school has no teacher, or no classrooms, and children are not fed properly, how can technology really change things?

Globally Accepted?

The vision of OLPC is huge: provide 2 billion children with laptops! Several countries have indeed expressed their interest, but the question remains: what is the global acceptance of the project?



The idea of OLPC is radical and can really benefit education greatly. The level of implementation can vary from country to country, and a project that begun as a solution to the digital divide of poor countries, is now taking shape -at least in some cases- in Europe as well.

Global Acceptance

"Selling" the idea of One Laptop Per Child to governments across the world, is not an easy thing to do. Already India, seen as one of the possible recipients of the Laptop, has rejected the idea. Other countries, however, have shown interest in the technology, and have signed up for an implementation. One such example is Libya, a country that wishes to become one of the more developed in the region. Other countries already committed to the project include Brazil, Argentina, Uruguay, Nigeria, Rwanda and Thailand.

Greece has expressed serious interest for the laptop, with at least one Minister declaring the pilot implementation of the Laptop in his speech at the Parliament. (page 4). In Cyprus, the Ministry of Education & Culture is closely observing the development of the Laptop, in order to evaluate its possible implementation as part of its overall ICT strategy and planning.

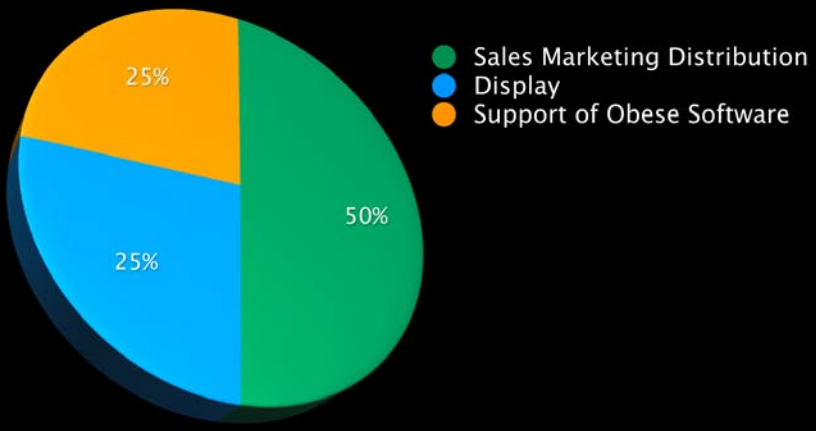
European Advantage

Europe could make best use of such technology, and it blends perfectly with the Lisbon strategy of 2010. Even though various groups interested in FOSS have expressed their interest in the project, an equal number of groups have been very sceptical about its benefits. Sceptics exist everywhere, and OLPC has been taking criticism from almost every direction.

Only post-launch, and after we evaluate the pilot studies in some of the first 'believers', we will be able to really understand the pros and cons of this new concept.

The Cost of a Laptop

When even the cheapest laptops in the market cost more than $400, how can any organization come up with a quality machine for a fraction of that cost?



The graph on the right depicts the costs of modern laptops, according to OLPC. By selling directly to governments, OLPC has eliminated 50% of the costs. By using custom-built components and special versions of Linux OS, together with a revolutionary new display, the makers of the laptop have managed to reach a price of 100 euros per unit- expecting this to drop to the $100 target when the machines take off.

Even with component prices such as LCD displays on an ever-decreasing slide, laptops still tend to cost $400+. When OLPC begun its extremely ambitious project, they analyzed the costs of an actual laptop.

The $100 Laptop

The Laptop is better known as the '$100 Laptop' due to the original price target. As the graph above shows, half of the price of a laptop goes to Sales, Marketing and Distribution while one fourth goes to the costs for the display. By eliminating the Sales, Marketing and Distribution Costs, the price of the Laptop has been greatly reduced. The Laptop, since the early inception of the OLPC, has been targeted towards Ministries of Education of various countries and as such there is no need for anyone in between.

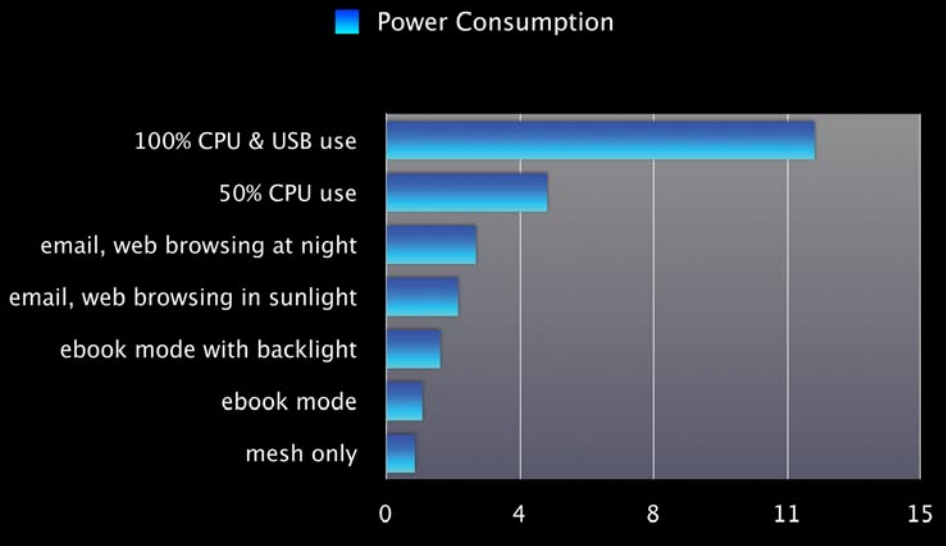
The Display has been a result of some revolutionary work under the administration of Mary Lou Jepsen, and it not only consumes a tiny fraction of the power that other similar displays require, but it can also be used in direct sunlight. This is a crucial requirement, especially for field trips and studies outside the confinement space of the classroom. The display of the laptop also has a tremendous resolution of 1200 x 900 at 200DPI, making it one of the highest resolutions on a laptop ever. The size of the screen is rather small at just 7", however it compensates with the extremely bright and ultra-crisp image quality it produces.

'Obese' Software

A laptop we purchased 5 years ago, was perfectly capable of running software developed at that time. However, with new software such as latest versions of Office suites, web browsers or even new operating systems, that same laptop will be struggling today. According to Nicholas Negroponte, most of what the hardware is doing in laptops or personal computers is compensating for the extreme needs of modern software, in much the same way as a fat person uses most of his muscles to move his weight around. By redesigning the laptop from scratch and by using a modified version of the Linux system, OLPC has produced an ultra-efficient machine without including expensive and so-called 'cutting edge' components just to keep the system running with an acceptable speed.

All-day operation

What use is a laptop if we still need cables for power? This is unfortunately the case with most laptops today, since they cannot operate for a full day without recharge.



The Laptop offers tremendous power-saving features. Its energy efficiency is incredible and allows the system to run up to 10 hours without the need of recharge. The estimated life of the battery is 2000 recharges before the capacity is reduced to 50%.

The Power Consumption of every laptop is a defining factor in the purchase of such a unit. After all, when we purchase a laptop we are mostly interested in being independent of any cables - be it network or power related.

Ingenious architecture

The Laptop was designed to be used in countries where no electricity might be available at homes. It was the original intention of the creators of the machine to even include a child-powered hand crank to generate electricity so that the unit could continue to work without requiring an ordinary source of electricity.

The hand crank model has been dropped, at least from the B1 and B2 laptops, but alternative child-powered ways have been devised for the extreme cases where the machine has to be used but there is no available power supply.

When the laptop is fully operational, with the backlight on and the USB ports reading and writing to various devices, the machine consumes less than 13 w of power. This is significantly less than most Thin Clients in the market, without counting the monitor attached to the Thin Client! Normal operation of the Laptop requires less than 4w, meaning that -in most cases- the battery can last far more than 8-10 hours! This is groundbreaking and it is far beyond the capabilities of any other 'ordinary' laptop most people can purchase.

For saving power, the laptop can shut down any unnecessary components, including the CPU! As an example, when the student uses the laptop as an eBook, the machine does not use the CPU for updating the screen, thus keeping the same information projected on the display using less than 2 w of power! Even in mesh mode, where it has to share its connectivity with other machines, it consumes less than 1 w making it capable of becoming a part of the network without consuming significant energy.

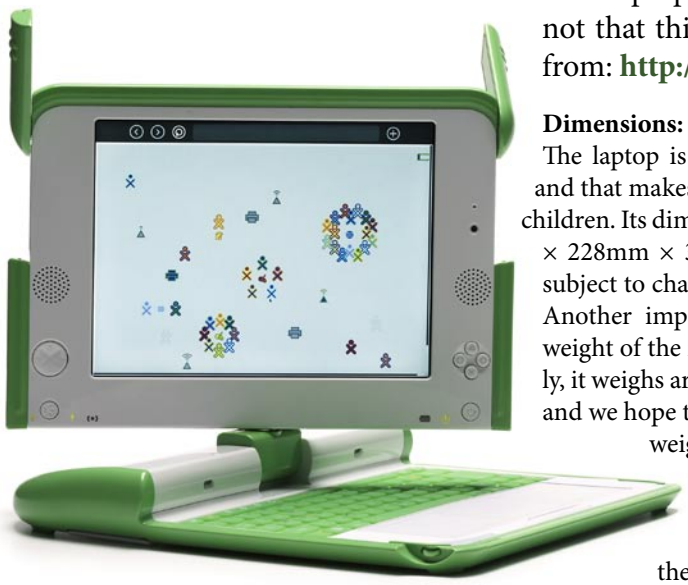
This energy efficiency makes it not only ideal for school use, since children have to spend many hours there before they get home, but it is also an absolute necessity in an era where the energy crisis is hugely evident and power must be conserved any way possible.

The Hard(ware) Facts

"...It's an education project, not a laptop project"
--Nicholas Negroponte, OLPC founder

The Hardware Facts

The Laptop has some impressive (for its kind) specifications. Please not that this information refers to the B1 model. Information taken from: **http://wiki.laptop.org/go/Hardware_specification**



Undergone several changes before it reached the first working units, the XO (as the Laptop is called) seems to have found its (almost) final shape. It might look sexy in the photo, but it looks even sexier 'in the flesh'!

Dimensions:
The laptop is quite small in size, and that makes it ideal for younger children. Its dimensions are: 242mm × 228mm × 30mm but these are subject to change in the final unit. Another important factor is the weight of the machine. Fortunately, it weighs around 1.5 Kg (target) and we hope the final product will weigh even less.

CPU & Storage:
The CPU inside the machine is not the ordinary multi-core multi-gigahertz beast we find in most laptops today. It uses a more humble AMD Geode running at 366MHz, but the unit is optimized to work with such a CPU. Negroponte always points out that most of the CPU power in computers today is used to drive bloated software much like a very fat person uses most of his energy to move his weight.

The Graphics Controller is integrated with the Geode CPU, offering a more compact working unit.

The basic memory in the machine is 128 MB of DDR266 RAM. It also uses a 512MB NAN D flash for storing applications and data. Even though the RAM and the storage seem to be very constrained, the machine has been especially built around these specifications. Also, since the Laptop offers advanced connectivity options, the storage will rely on web-based content mostly. As an additional storage option, users can connect external USB memory sticks for storing files and/or loading applications.

Display:
The display is one of the most important and revolutionary parts of this project. It uses a dual-mode 7.5" TFT screen with a remarkable resolution of 1200x900 at 200 dpi which allows the machine to display ultra-sharp text. Thanks to technology developed with the help of Mary- Lou Jepsen, the display is one of the most innovative products of its kind, allowing students to work in direct sunlight while consuming the minimum possible power.

Connectivity:
The Laptop has been built with web connectivity in mind. The machine is fully *802.11b/g compliant. One of the greatest benefits, however, is the Mesh Networking Capability that allows the system to directly connect and give access to other Laptops.*

Available Ports:
The Laptop comes with 3 USB 2 connectors that allow the system to be extremely versatile. A large number of peripherals can be connected to the unit, and we expect the list to grow with the machine. Even though the Laptop has a very capable internal microphone, as well as built-in stereo speakers, it offers standard audio-in and audio-out ports for further connectivity. An extremely important addition to the unit is the SD card slot.

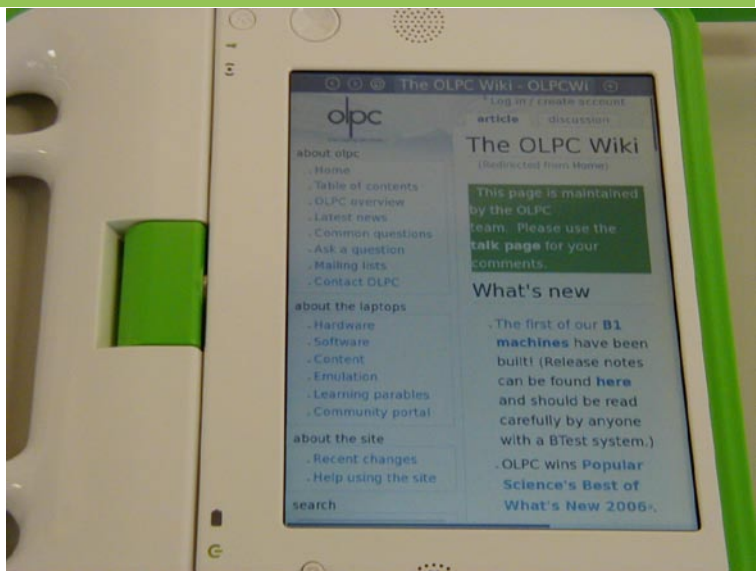
Battery:
No Laptop can be said to be effective without a large battery life. The unit uses a NiMH type 5 Cells battery that is user removable with a capacity of 22.8 Watt-hours. Thanks to the design of the laptop, this battery can give it enough energy to run for up to 10 hours of continuous use!

Input devices:
The Laptop uses a 70+ keys keyboard. It also includes a trackpad that supports pen-input in a similar way as Graphics Tablets. It also comes with an integrated video camera with a resolution of 640x480 at 30 FPS.

We shall discuss some of its more prominent features later in this Report, since every single aspect of this machine has been re-invented from scratch.

Versatility in the Design

Is it a Laptop, an eBook, a Graphics Tablet or a Games Machine? The design of the Laptop is so radical it can easily claim multiple roles- earning it the name of 'Jack of All Trades (and Master of Several)".



The screen might be small in size compared to laptops with 17" monitors, but the extremely high resolution makes reading text off the laptop a real joy, even in daylight!

Ask any student in Cyprus and Greece, and probably in most other European countries and he/she will probably tell you that communicating with other children, accessing a computer, playing video games, watching movies and reading books are among his/her priorities. The above would require a number of different devices or items.

Versatility & Adoptability

When OLPC was evaluating the characteristics of their laptop, they held their ground in developing a solution that could satisfy most needs in almost every single area. Granted, the processing power of the Laptop might not be in par with the multi-TerraFLOP beast that is the Playstation3, nor the graphics quality of any movie (at present) downloaded from the internet cannot be compared to a full HD 1080p BluRay film, but the unit can satisfy most needs with a single offering.

Use the laptop in its normal form, and there you have a very capable laptop that can run for hours and hours without recharge. Use the trackpad with a stylus to mimic hand-writing, thus keeping the best input device nature has provided us with- our hands!

Rotate the screen and there you have a Media Center that can show movies streamed from the Internet. And with the possibilities opened with such technologies as Flash video (not officially included), the sky is definitely NOT the limit here.

Raise the antennas and immediately you can communicate -without paying a cent- with any other student using the machine, or just connect to the web and browse for information or send and receive emails from all your friends around the wall. You could even use the embedded web-cam for much better face to face communication. Or, play those nice games developed using Squeak, or turn the unit on its side and read any text book using the ultra crisp 200DPI display.

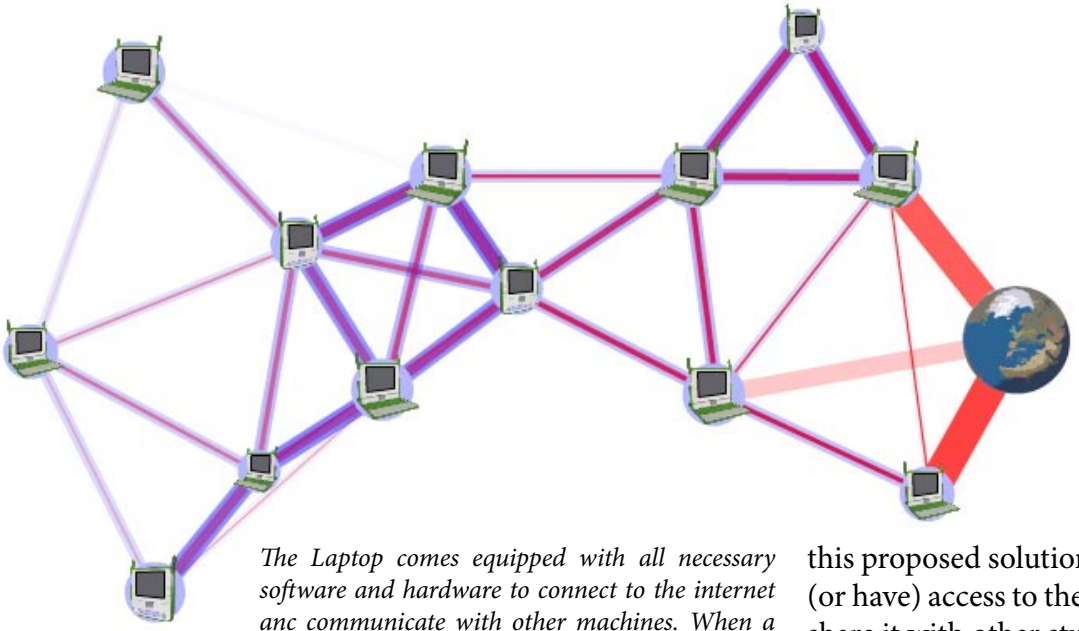
Possibilities are truly endless!

The End of PC Gaming?

One of the main reasons people purchase high-end PCs is for playing games. Just take a look at most graphics cards sold today, equipped with at least 256MB of on-board RAM. This is definitely not used for Word Processing or Spreadsheets but -in most cases- for playing games. We do not see the Laptop as a threat to 3D games. We do not see it as a threat to game consoles such as the Playstation or the Nintendo DS. What we do believe, however, is that it will generate its own market for games developed especially for the unit.

The Power of Connectivity

How can the strategy of using the internet for communication and collaboration when most children don't (yet) have broadband access from home? The solution is here in the form of the Mesh Network.



The Laptop comes equipped with all necessary software and hardware to connect to the internet anc communicate with other machines. When a child is at school, he/she can use the internet connection that is already established. What happens when the child goes home and there is no broadband connection?

The Mesh Network

School children tend to live (usually) close to their schools, or at least close to other students. The cases where a students lives in a remote area far away from other students are quite rare, especially in European countries.

The school, as well as some students, can have wi fi internet access. The built-in antennas of the laptop can connect to the wi fi network of the school (or home) and browse the internet. These antennas have a (theoretical) range of 400 m, and they can detect other laptops. If a child leaves within that range from school, he/she will be able to have internet access even though there might not have an established wi fi connection at home. Similarly, if a second student lives within that range from the first student, he/she will be able to get internet access too. In this proposed solution, one child will get (or have) access to the internet and it will share it with other students.

The Laptop itself will indicate which users have access to the internet and which student is sharing his/her connection. Through icons of the Sugar interface, students will be able to view which other students are online, and communicate with them.

This theoretical model seems to be ideal for handling the problem of (lack of) internet access from every students. However, such a bold step towards bridging the digital divide must be evaluated in action before we can consider it a 100% success. There are many issues involved, one of which is the response from the Internet Providers, since such a scheme will enable all households with students to have (at least from the laptop) complete access to the internet without paying an ISP any fees.

It does, however, offer -at least in theory- a practical solution to the internet problem.

Free, as in Freedom

According to rumors, Microsoft offered OLPC a version of Windows CE. Also, it is common knowledge that Steve Jobs of Apple Inc . offered Nicholas Negroponte an embedded version of Mac OS X. Why, then, did they pick Linux?

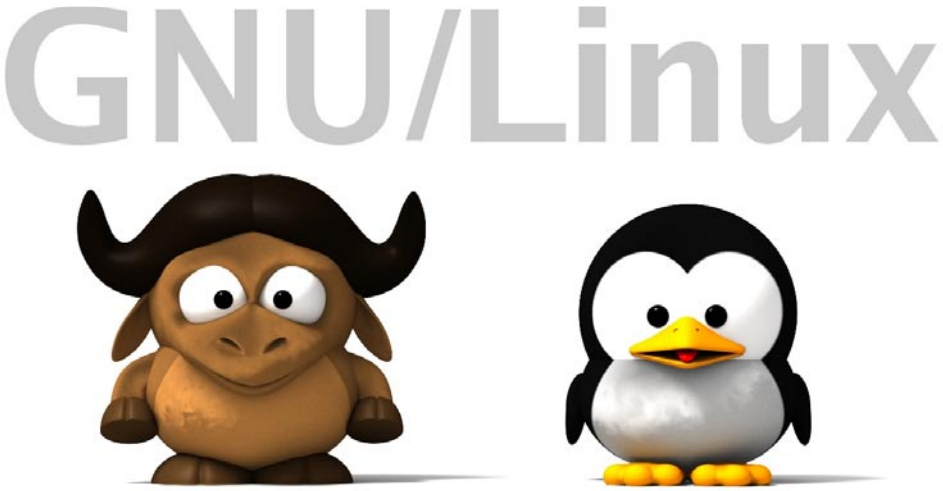


Image taken from: http://mirrors.ibiblio.org/pub/mirrors/gnome/teams/art.gnome.org/archive/backgrounds/OTHER-GNU-Linux.jpg

In the process of eliminating all unnecessary costs, the OLPC organization decided to use Linux as the primary operating system. However, most people wrongly associate Free/OpenSource Software with the term 'free' as in 'no cost'. Although most Open Source Software carry no licence fees, this is hardly the benefit of going Linux!

Free For Freedom

Open Source Software is Free in the sense that you can freely distribute the software but, most importantly, make any changes or additions to it as you please. This is essential when you need to custom-built an application or the entire operating system in order to better suit your needs instead of the other way around. This is true with the Laptop as well, since all the software used for the machine are Free/OpenSource.

A strategic partnership with RedHat, one of the leading companies developing Linux distributions, OLPC was able to deploy its own GUI solution in a very efficient and totally cost free and restriction free environment. The B1 version of the laptop is based on the Fedora Core 6 Linux distribution. The GUI that usually comes with Fedora is usually Gnome (or KDE), but OLPC has re-invented the GUI and came up with what it calls 'Sugar'.

The web browser is based on Firefox, albeit a modified version suited for the screen and extremely hi-res display of the Laptop. Most of the functions have been readjusted so that all unnecessary complexity be eliminated.

The included word processor is none other than AbiWord, an excellent package that is available for every single format out there, including Windows, Linux and MacOS X.

For communication and collaboration with other students, the system uses a modified version of the GAIM instant messenger.

The system also includes Squeak eToys, a multimedia authoring environment that is based on Alan Kay's and Seymour Paperts views on constructionism, probably the leading theory on child development today.

No Flash, No Java!

The B1 version of the laptop has no support for Adobe Flash nor Java. The creators of the Laptop insist on including only open source software on the machine, a gesture not uncommon in the world of Linux. Some distributions like K12OS (Fedora Core/LTSP) don't come with Flash support but they provide shortcuts that directly download and install some necessary (and proprietary) applications or plugins.

Apart from that, there is no technical issue with installing either Java or Flash on the machine and this will probably be the case if the interested Ministries consider these technologies a must-have.

The Operating System

The OLPC Laptop is based on Fedora Core Linux version 6. This is no ordinary Fedora distribution and it includes a custom-made GUI.

RedHat Linux is one of the official sponsors and supporters of OLPC. It is not surprising that the Operating System of the Laptop is based on the Fedora Linux distribution, albeit a modified one.

The OLPC GUI

GUI stands for Graphic User Interface. It is the environment that allows the user to easily control the computer through a set of menus, icons and windows, with the help of a pointer. They are also called 'WIMPS' (Windows, Icons, Menus, Pointers).

Initially, the first screenshots from the laptop were showing a standard Gnome desktop, one of the leading GUIs of Open Source Software. During the course of development for the laptop, there was a concurrent development of an entirely new GUI, suited even to children that have never laid hands on a computer before.

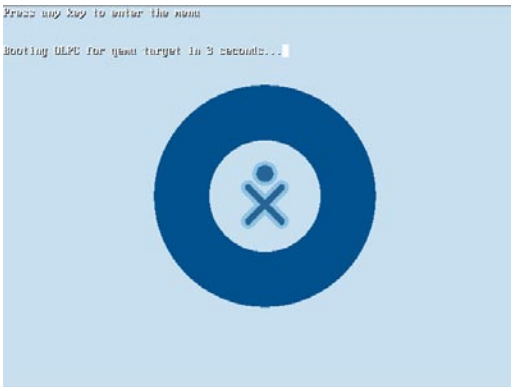
Sugar, as the environment is called, is a very intuitive product that is suitable for children, especially for primary education.

It's Fedora, But Not As We Know It!

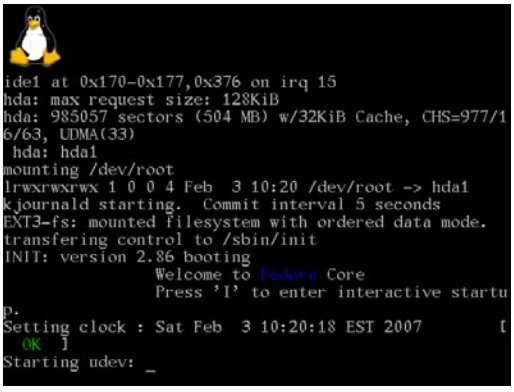
There is a lot of discussion in the Linux community regarding the 'best' educational Linux distribution. Some support Fedora and the K12OS version (which includes many educational applications, and the Linux Terminal Server Project). Others support Edubuntu, a Debian-based distribution, while others prefer Skolelinux.

RedHat is one of the main players in the Linux world and therefore it is not surprising that it has been a strategic partner of OLPC right from the beginning. Initial testing units of the machine was based on a modified Fedora Core 5 version, with Gnome running as the main GUI environment- the default used by RedHat. The B1 units, and the shipping units, have replaced Gnome with Sugar, a child-centric Graphic User Interface that breaks the mold firmly established by Apple more than 2 decades ago.

This re-invention of the wheel is a great gamble for OLPC, and one that will most probably make or break the machine. Still, many Linux fanatics have demonstrated the possibility of installing Edubuntu or other Linux distributions, and this is not unexpected since we have seen similar 'hacks' on such devices as the iPod(!) or even mobile phones.



The startup screen. Anyone familiar with Fedora Core, and especially K12OS, will instantly recognise it.

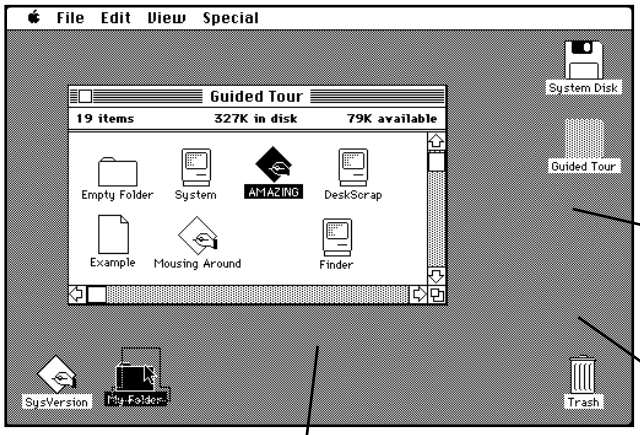


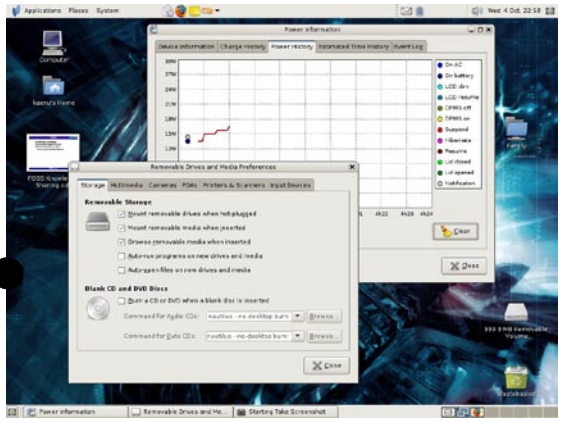
Yes, it is Linux, and yes it is Fedora underneath Sugar!

Included with the system are a number of applications, most notably a communications program based on GAIM, a word processor based on AbiWord, and a web browser based on Firefox. The most notable application is Squeak eToys, a multimedia authoring environment for children. All applications have been modified to comply with the OLPC Interface guidelines.

The GUI Experience

The original Apple Macintosh set the standards for the Graphic User Interface of today. The Laptop makes an 'about-face' on those standards





Top Left:
The Original Mac OS

Left:
Microsoft Windows Vista

Right:
Mac OS X 'Leopard'

Top Right:
Gnome 2.16

History tells of how Xerox PARC was the real inventor of the GUI. In reality, they did invent the concept but Apple pushed it much further with the first release of MacOS. The principles established back in late 70s still have their roots firmly in the GUIs of today.

...15 minutes longer

During Steve Jobs infamous 'walk' inside the Xerox Palo Alto Research Center, he was shown many technologies including Ethernet for collaborative work between scientists developing the technologies behind the Alto. Steve was so impressed with the Graphic User Interface, that he admitted to Byte Magazine (1992) he did not have eyes for anything else but if he had stayed for 15 more minutes, maybe computers would have been much different today.

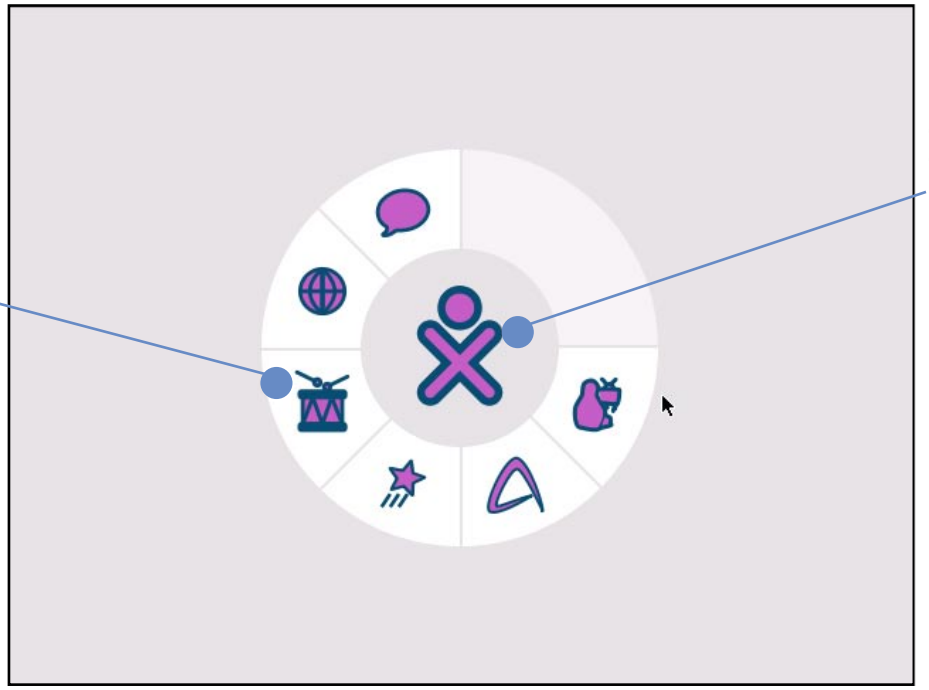
Thus, Apple developed MacOS, Microsoft created Windows, and the rest is history... But, if we look at the Graphic User Interface of today, even though outstanding progress has been made, it still relies on 30+ year old concepts: that of Windows, Icons, Menus, Pointers or 'WIMP' as they are known. And even though networking and collaborative tools have been built for these modern operating systems, they still rely on the initial concept that Xerox invented and Apple materialised. Thus, computers, even though highly sophisticated and with mighty powerful tools, they are not build from scratch as collaborative tools.

About Face

OLPC makes an 'about face' to that concept, and has built a GUI from scratch, to encourage and support collaborative work.

Sugar: A Child-Centric Approach

The people behind OLPC did not rest on their laurels by designing an ultra energy efficient and inexpensive Laptop. Oh no, they had to reinvent the machine from scratch!



Human Interface

OLPC has been quite heavily researching the Human Computer Interaction for quite some time. Sugar is the product of those efforts, and a detailed explanation of the rationale behind it can be found on the web.

http://wiki.laptop.org/go/OLPC_Human_Interface_Guidelines

Sugar can be seen as either the weakest or the strongest part of the Laptop. It is amazing what the OLPC team has done in just a short amount of time.

A Child-Centric Laptop

OLPC could have gone with a normal Linux distribution on their systems, and include a (modified) version of either Gnome or KDE, or even one of the many Windows Managers available for Linux. That could probably make more sense in various areas, especially in secondary education where Office Automation tools such as OpenOffice or Microsoft Office are used, or where traditional programming packages such as Visual Basic or -in some extent- RealBasic are taught.

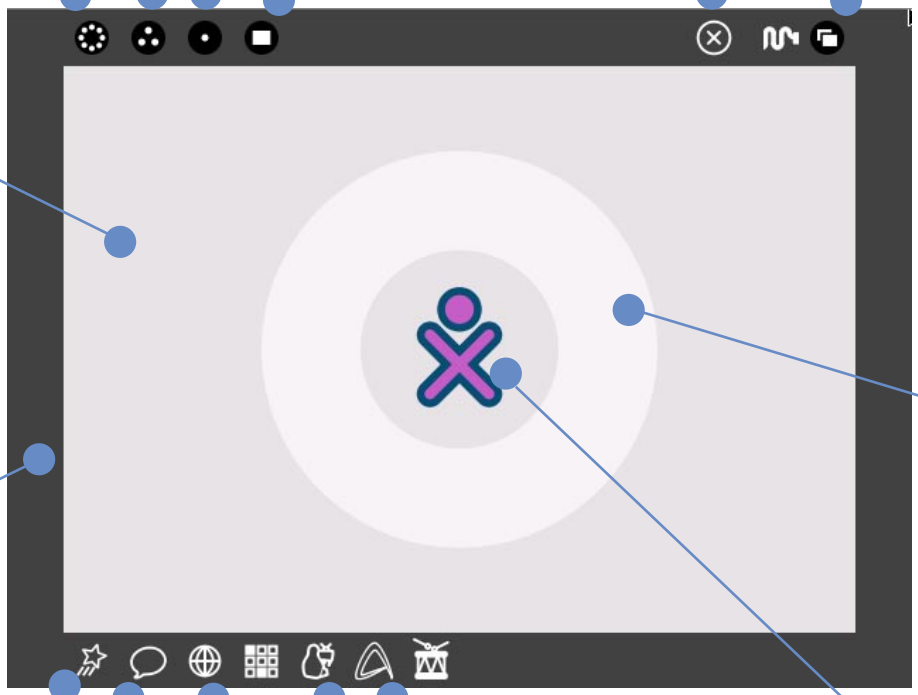
The people behind the Laptop decided to go all the way, not only by redesigning the Laptop and introducing new and innovative technologies, but also by rewriting the rules of Human-Computer Interaction thus placing the child -the target group for the laptop- at the center of the universe!

I must admit, I was very frustrated at first of not being able to work with the Gnome environment I love so much, but upon persisting with the Sugar environment-at least for primary education- you cannot help but realise the wisdom that has gone into developing the concepts and the rationale behind it.

We are still skeptical of how it can succeed in higher grades, especially in high school, but maybe it was never meant for those grades after all. Its greatest impact will be had in Primary Education, where the focus is entirely on the use of computers as learning tools. Or maybe it can be effectively used across public education as the ultimate communications device. It sure is a great gamble, but it is probably the most innovative way of interacting with a computer since the launch of the original Apple Macintosh.

Introducing Sugar

Forget the WIMP environment, forget the Desktop metaphor... Sugar has gone a looong way to provide us with an alternative GUI solution



Neighborhood
This option shows all the Laptop users in a wide area radius

Groups
Shows other laptops close to the user

Home
Returns to main view, showing all open applications

Activities Control
From here we select and switch off running applications

Switch Off
Even the Laptop needs to be switched off!

Switcher
Move between Activities

Work Space
This is the area where activities are displayed. Also, this is the working area of the Laptop

Activities
All running applications, depicting activities, are shown in this area

The Frame
All Options and Documents are displayed here. It appears when we move the cursor to the edge of the screen

The User
Sugar is a User-Centric environment. Each user can have his/her color and name

Squeak eToys
A Multimedia Authoring environment especially designed for children based on the theories of Constructionism

Communications
The Instant Messaging Application is based on the OpenSource GAIM

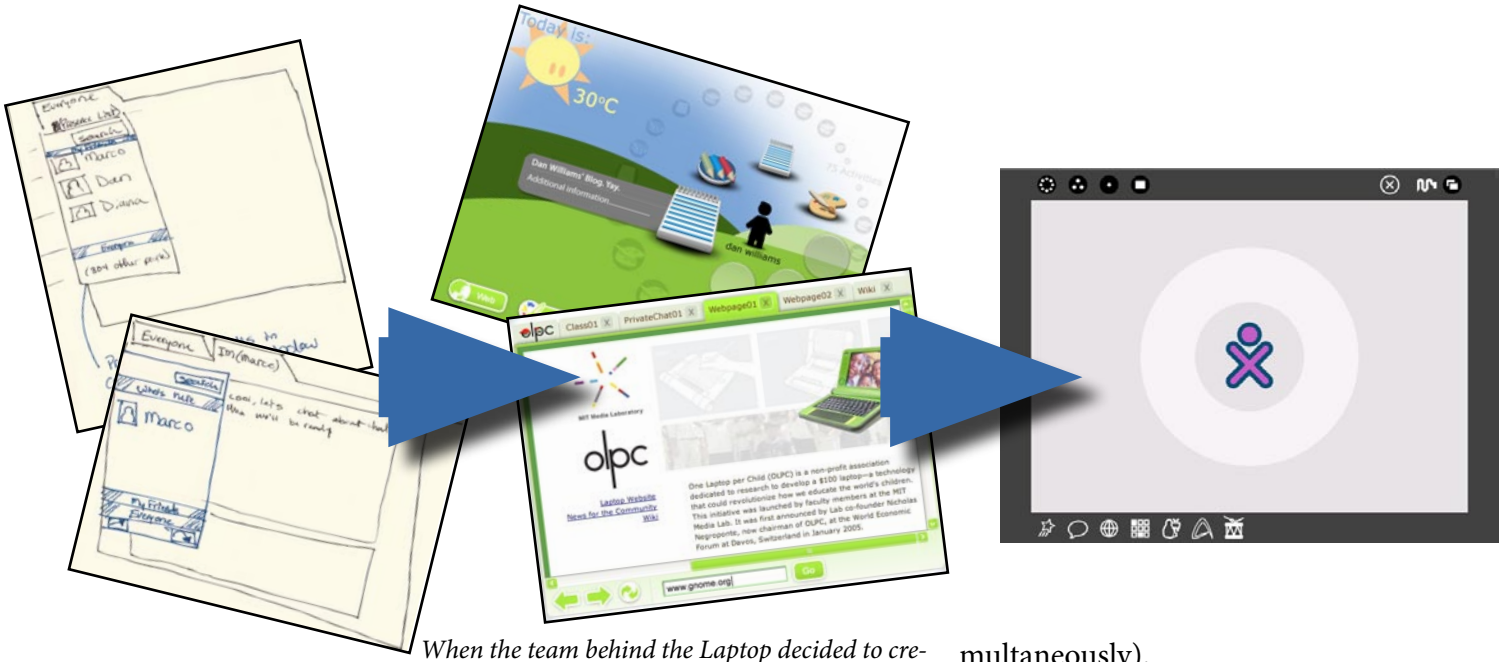
Web Browser
Based on a modified version of FireFox

RSS Viewer
For viewing RSS feeds & digital content

AbiWord
A lite-yet very capable OpenSource Word Processing Application

The Laptop Experience

Many of the concepts introduced with the original Apple Macintosh are dropped in the Laptop. Collaborative Learning is the name of the game, so Sugar had to be developed from scratch to support it properly!



When the team behind the Laptop decided to create a revolutionary project, they were not just considering adding a well-accepted GUI: they went all the way in creating a new experience.

Designing Change

The GUI used in the laptop underwent many changes before it reached the B1 version of the machine. Starting with a standard Linux distribution based on the Fedora Core/ Gnome solution, they then moved to a radically different environment. Early screenshots were showing the prototype GUI as being part of the Gnome interface. As time went by, a more intriguing pseudo-3D environment was introduced, which eventually transformed into the utterly simplistic yet highly intuitive 2D environment we have experienced on the actual B1 unit (and the emulators/ images released simultaneously).

> "Simplicity is the ultimate sophistication"
>
> ~ *Steve Jobs, CEO of Apple Inc.*

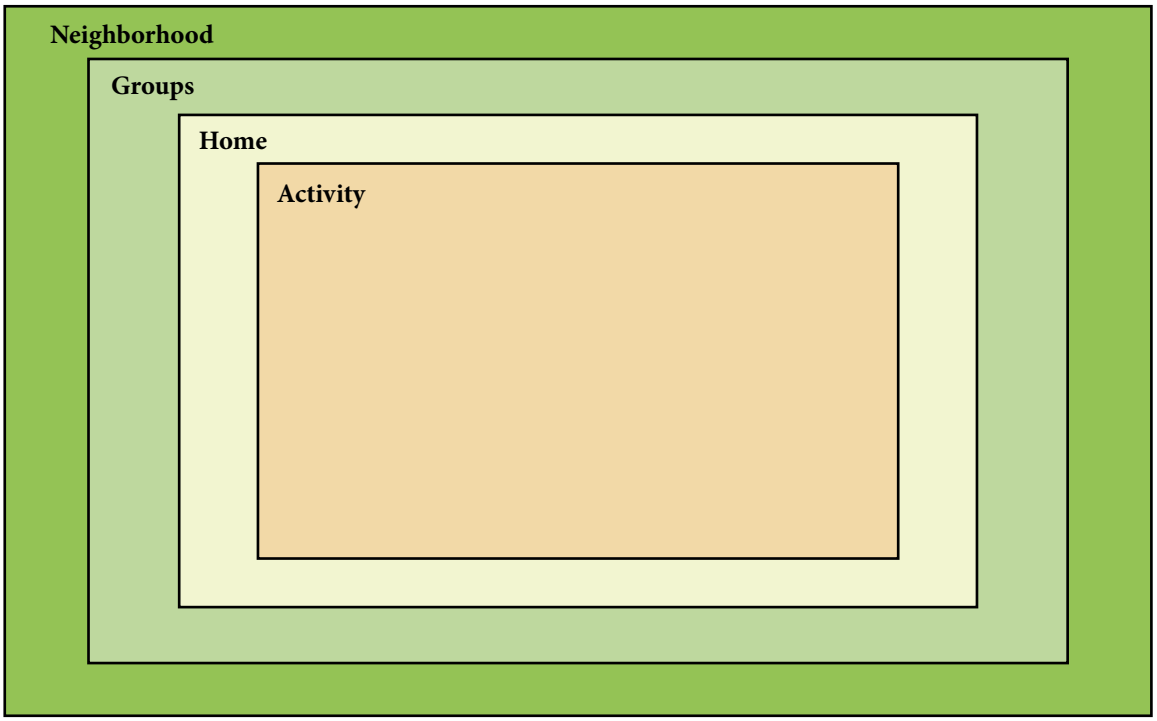
The final version of the Sugar environment is very functional and the 2D solution requires the minimum resources from the system, compared to a 3D environment. There are no fancy effects here, no 'genie' windows or Aero-based transparency- just 100% functionality, at least in the way the creators of Sugar have envisioned.

Quite remarkably, when we asked sixth grade students (with experience in both Fedora Gnome and Windows environments) to work with OLPC, at first they had to play around the environment but they had mastered it in under 10 minutes. Unfortunately, even though they could browse the internet through the integrated FireFox, we could not use the connectivity and communications feature.

We reserve to doing that with actual units instead of the VMware based environment.

The Zoom metaphor

Modern GUIs are still using the Desktop metaphor. The Laptop is replacing that with the 'Zoom' metaphor. We explain in detail below.



The OLPC is a child-centric laptop, with the hardware and software supporting this concept. At the same time, the laptop includes all the technologies -hardware and software- to support collaborative learning, even when the children are far apart from each other.

The Zoom Environment

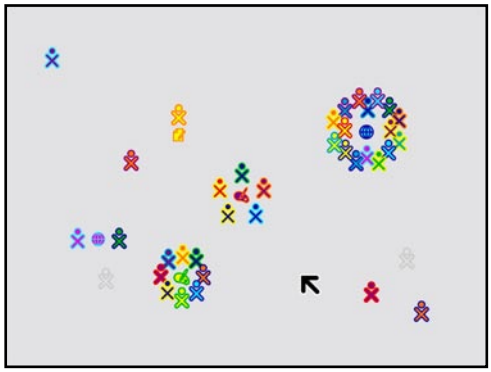
The level of interaction between students is divided into several sections, following a non-strict hierarchy. At the top-most level, the Neighborhood displays every single student that is within range of our laptop. These can be shown individually or as groups (more on this next page). At a lower level, the child can see specific Groups of children, and they can work together on projects or assignments. The Home level is where the child works on his/her own, while accessing documents or applications (activities). In this zoom level, the entire process becomes more personal. The Activity level is where a certain application (named 'activities') takes place. An example is the browsing of web pages using the embedded Firefox browser.

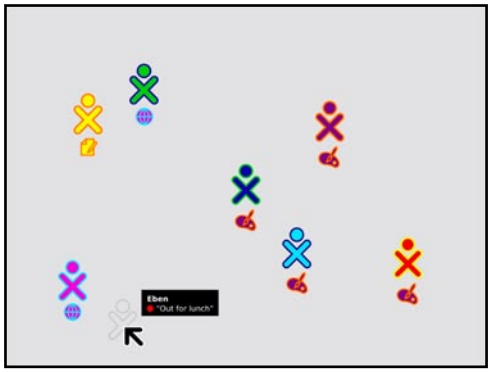
Too Far Advanced?

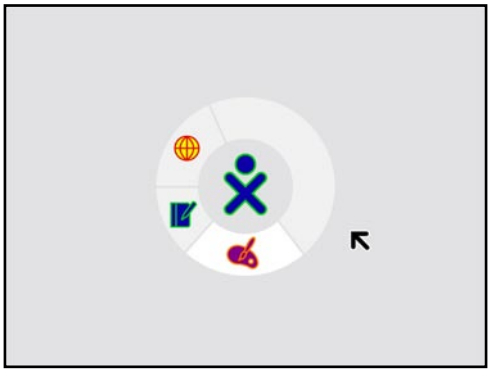
There is no doubt that children can adapt to any environment we provide them with. Through the past 4 years, we have experienced a multitude of different Operating Systems and GUIs, including MacOS X, Windows (98 to Vista), Linux (Gnome & KDE) and Solaris 10. Also, our experience with students that worked with Sugar under VMware has proven that they have no problem becoming productive when given the chance and time to explore the environment. The major issue is how this entirely different environment can coexist with other systems. Let's not forget that any implementation of 1-1 computing will also encourage people to provide their children with other laptops (say Mac or Windows). And how will they 'talk' with one another?

Neighborhood, Groups, Home

In the previous page, we went through the 'Zoom' metaphor of the Sugar environment. The three most important levels are obviously the Neighborhood, the Groups and the Home.







From Left to Right: The Neighborhood View, the Groups View and the Home View. Of all three views, the Home view is the one that more closely resembles a 'normal' GUI. Notice the ease with which the child can communicate and collaborate with other students.

To identify each student, a dual-color icon called 'XO' is used. Also, a rollover with the cursor over any icon will provide a pop-up with the name of the specific user.

Strange as they appear, these three levels are so intuitive, they can change the way we interact with our machines forever.

The Neighborhood

The mesh networking capabilities of the Laptop allow us to view a large number of users across a significant distance. The Neighborhood is a wide-area view of all connected users. These users can be shown on screen with their individual two-color icons. By moving the cursor over these icons, their name is revealed telling us exactly who is the user we are pointing at. Users can be individually shown in single items, or they can be working together on a certain activitiy (groups). There is no fixed minimum number of users that can be defined as a group. When two or more users are working together on a specific activity, the icon representing that activity is shown either in the circle or under their respective icons.

The Groups

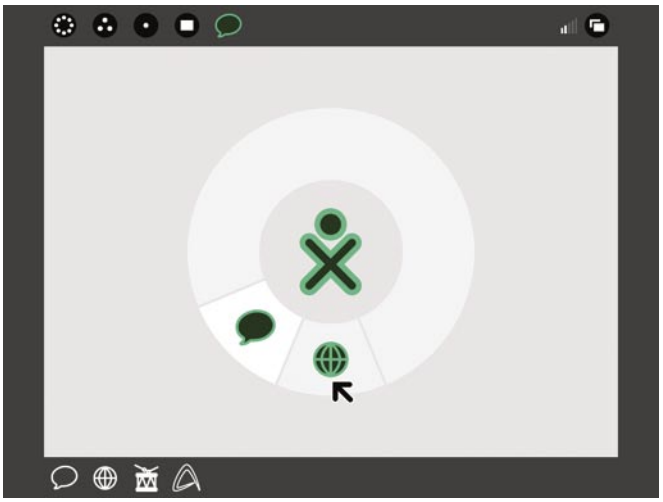
Since collaboration and collaborative learning is one of the main issues addressed with the Laptop, its creators have provided us with a fast and extremely user friendly way of communicating and interacting with other users at a group level. The default group is the actual class group, with all students and the teacher. However, the Group view can help a child organise his/her groups of friends, either through preference (ie my best friends) or through other factors (ie friends who like movies, friends who like cycling etc). Each group can have its own Bulletin Board where they share Objects they work on, or exchange views and ideas regarding a common problem or project. It can also allow a student to view what activities his/her friends are engaged on.

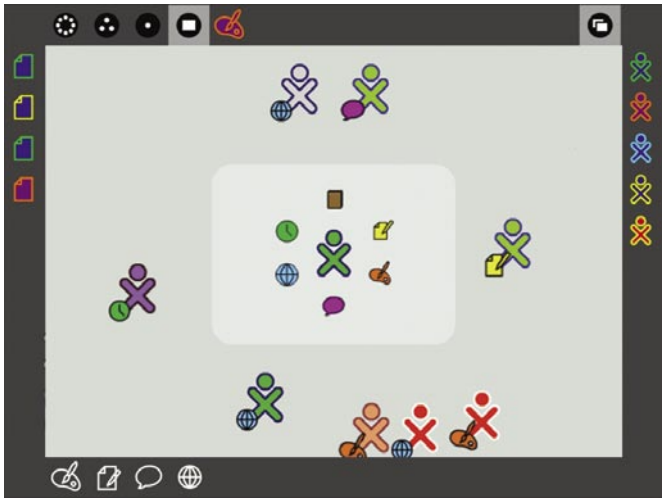
Home

This is the first screen the child will see when he/she powers up the Laptop. It is entirely child-centric and this is also depicted by the placement of the dual-color icon in the middle of the screen. All activities are launched (and exist) around the child, and he/she has the complete authority on what to do (ie paint, write a poem, browse the internet). From here, the child has the liberty to move to the Groups or the Neighborhood view, and vice versa.

Activities

Forget applications; activities is the name of the game when it comes to interacting with software installed or running through the Laptop.





The concept of using applications has lead to an application-centric environment in ordinary GUIs. The Sugar environment is completely different, since it requires the child to use applications as part of educational activities. Therefore, gone is the 'applications' term as we welcome 'activities'.

Private Work

At the Home view, a child can launch any activity using the icons on the bottom side of the Frame. By clicking on the icon, an instance of the activity is launced. The same user can launch multiple instances of that activity. For example, a student could start working on a text with the help of other students, and at the same time have another instance of the word processing activity of writing a poem or taking notes.

Working Together

The most distinctive advantage of the Activities model, is the collaborative nature of the tools used. Once a child starts an activity, any other child that is part of the same group can join that activity. When a specific group has completed work on an activiy (for example, working together on the lyrics of a song), then they can open up that activity to the rest of the class for further reviewing or for sharing opinions.

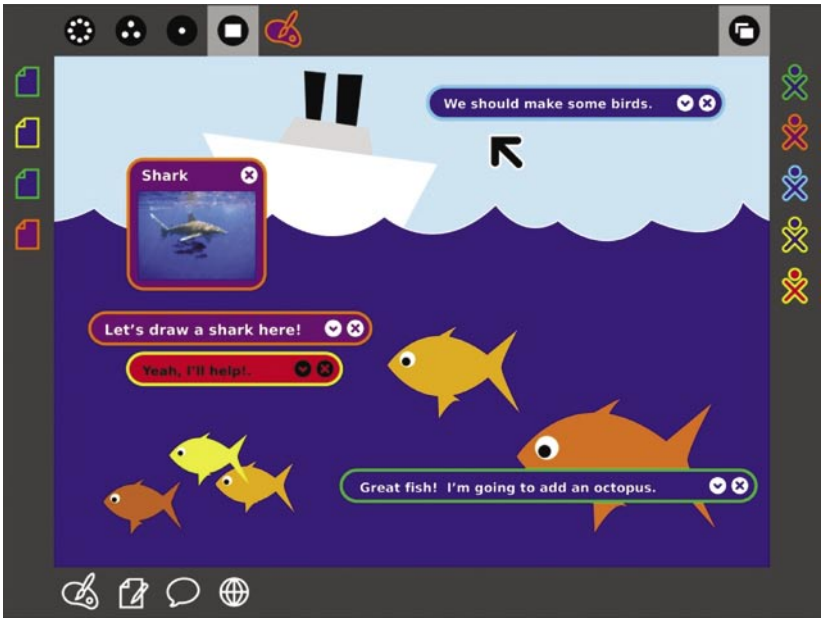
This way, children can more easily share their views on the work they do, and exchange ideas. Children can also search for activities that interest them. For example, a child can search for any activities related to music so that he/she can work with other students.

Selecting Activities

From the Home view, we can select any currently open activity. Some activities might have more than one instance. Usually, under other GUIs, multiple applications are run inside different windows. This is not the case with the OLPC Laptop. Instead, each activity occupies the entire screen. We can view all open activities in order to select the instance that we need to work with. This is a very flexible and easy way to control each and every activity we have, or even terminate them.

The Bulletin Boards

The Activities model is extremely flexible and provides children with an easy way of collaborating. The Bulletin Boards add an extra dimension to the sharing of information between children.



The Bulletin Boards is one of the most significant parts of the Laptop. Not only can the child post notes that act as reminders, but can also help him/her share objects and chat with other children.

Bulletin Boards: Home

Bulletin Boards provide a layer over the various activities in which the child is engaged. For every activity we can have a specific Bulletin Board in which the child can post information and objects (files) for sharing. When the child is in the Home view, the Bulletin Boards can only be accessed by the child itself. This is extremely useful when the child needs to keep the Bulletin Board as a place for posting notes and other information regarding the activity he/she is engaged with.

Bulletin Boards: Groups

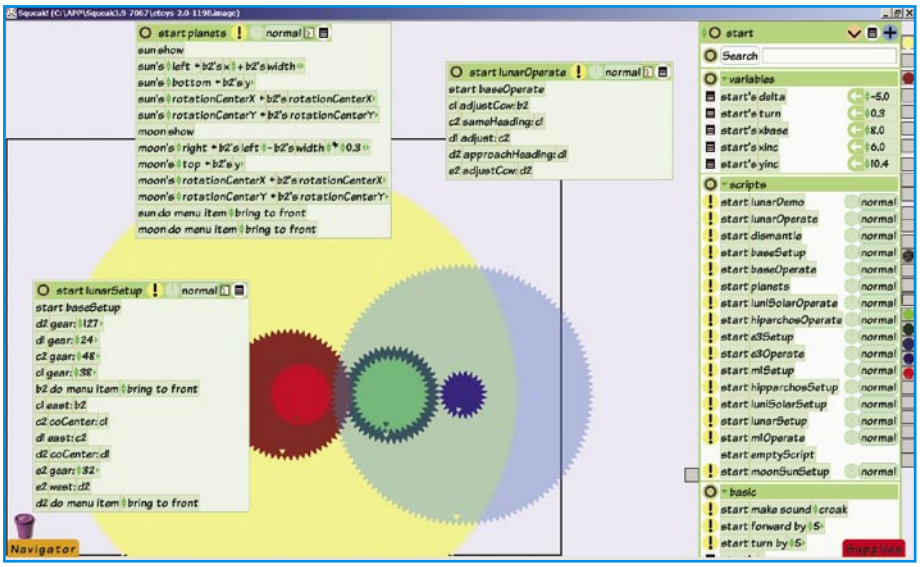
Under the Groups view, any activity that has a Bulletin Board can be viewed and shared between users in the same group. This is very important since children can use the Bulletin Board as a place to exchange and share objects (ie image files) between one another. Another important aspect of Bulletin Boards is the ability to engage into a chat using text. This chat is quite similar to a Forum, where two or more people are engaged in discussion over a specific topic. However, unlike Forums, there is no strict order in which text created by children appears on screen. All replies appear on the screen and can be manipulated in any order the child chooses.

Sharing information

The Bulletin Board is the ultimate place of sharing information and objects. Any child participating in an activity can post an object (a sound file, an image) on the related Bulletin Board. Immediately, all other students can enter the Bulletin Board and receive that file. This is probably the best way of sharing resources and information when engaged in a common activity. Tools such as the Bulletin Board are invaluable in a collaborative environment.

Squeak eToys: Constructing Learning

Modern pedagogical theories suggest that children learn best when they construct their own knowledge. The Laptop is built around these theories, therefore a tool for constructing knowledge had to be included.



Seymour Papert and Alan Kay are proponents of Constructionism, a learning theory that suggests children learn best when they construct their own knowledge. Squeak eToys is a tool that supports their theories.

The Software

Just like everything else on the Laptop, Squeak eToys is essentially a free product that can be downloaded from the URL http://www.squeakland.org. Keep in mind that Squeak eToys is based on the more 'advanced' but harder to learn and use Squeak (www.squeak.org).

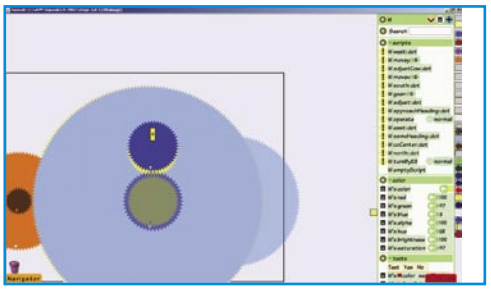
When Alan Kay envisioned his Dynabook back in the early 70s, he had the original idea of implementing an environment that would be suitable for children to use in order to bring their ideas to life. Years later and Squeak is born, a powerful multimedia authoring environment. One of its derivative projects, Squeak eToys, has been built specifically for younger children and has been included with the Laptop.

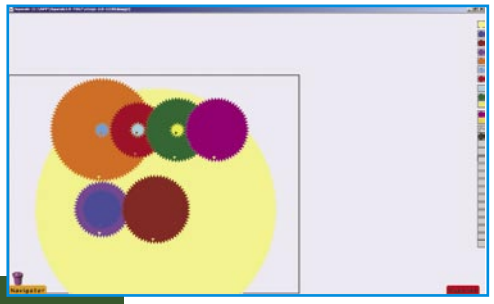
The Environment

Squeak eToys offers a very simple yet powerful environment. Simplicity does have its own learning curve, however, so it would take some dedication before we manage to master the program. Once that is done, though, Squeak will reveal its true potential.

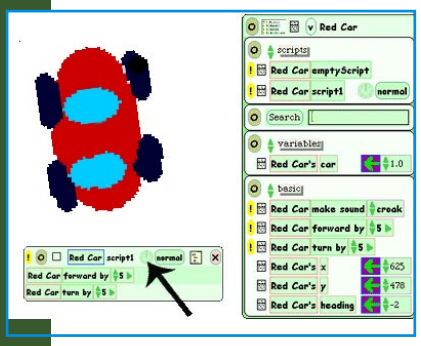
eToys includes lots of functions that are hidden within its objects. These objects can be used to control other objects, or to perform various functions (for example, displaying information in a 'book' format). Each object on the screen can have its own 'scripts', that allow the user to control it. There is no need to learn commands or difficult structures- rather, scripts in Squeak eToys are created using a visual interface that allows the rapid development of small applications, even by children.

Squeak eToys is a tool that can unleash the creative potential hidden within every child. For further reading you can visit http://www.squeakland.org.





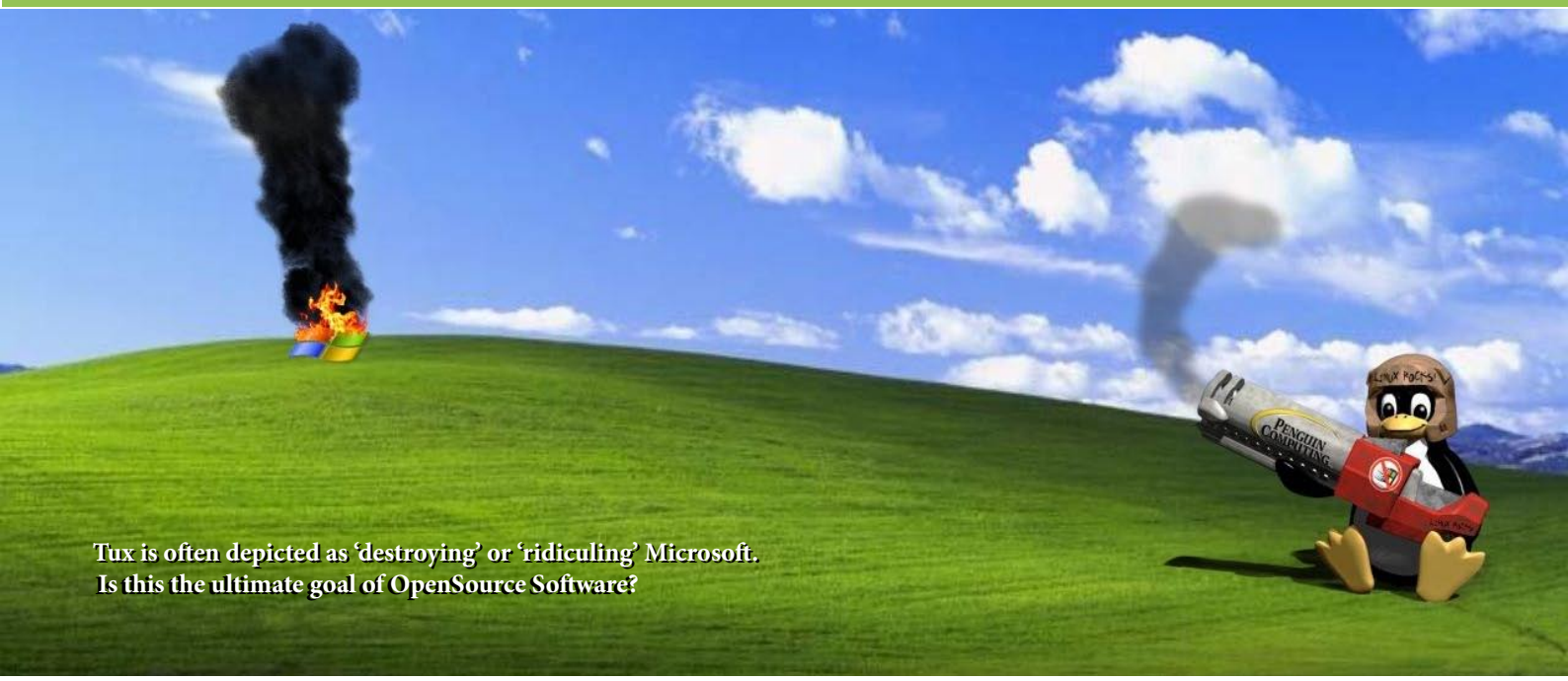
ameso- The Antikythera Mechanism on eToys
Dr. Diomidis Spinellis, one of the supporters of OLPC implementation in Greece, has been developing a complete emulation of the Antikythera mechanism on the Squeak eToys enironment (http://www.dmst.aueb.gr/dds/sw/ameso/)



Squeak eToys offers a very simple yet powerful authoring environment. With it, children can create almost anything- their only limit is their imagination!

Freeedom is Choice

The implementation of the Laptop will cause a monopoly since every single child will be (ultimately) using this machine. Is it a good idea to move from one monopoly to another?



Tux is often depicted as 'destroying' or 'ridiculing' Microsoft. Is this the ultimate goal of OpenSource Software?

For some, the Laptop is seen as the tool in the Holy War against Microsoft. In truth, it is a significant advantage that has to be implemented taking many factors in mind.

It's a Windows World

Like it or not, this is a Windows world. When more than 95% of personal computers on the planet using Microsoft Windows (Various versions), it is not easy to talk about replacing the De Facto standard with something else. Even if it was, then we would probably replace one monopoly with another.

The fact is, a small group of people that support FOSS believe that the future should be Microsoft-free. Such a claim is -at best- myopic, and should be disregarded as both unfeasible but also as unneeded. In truth, what we need to do is ensure that our product of choice can co-exist with the product that is dominant in the market -whichever that is-. Even if we establish FOSS as the primary driving force in the industry, and even if Linux was made the primary operating system on the planet, we would still welcome change and choice. And let's face it, Microsoft may not have invented the GUI first, maybe not even Apple has, but at least they have managed to make it mainstream and put it into everyone's desktop. I might sound as heretic, and even draw strong critisism from the FOSS community, but, does anyone really believe that KDE would have ever been created unless there was a need to outclass Microsoft Windows from the world of 'ease of use'?

And one more thing: its not about who has the greatest market share. What really is important is the fact that we have a choice: if we don't like Linux then we can move to MacOS X, or Windows, or Solaris, or whatever there is or is going to come out there. Because choice is good, and choice is freedom!

Freedom is Interoperability

A hypothetical scenario: every school child gets an OLPC Laptop. Then another child chooses to use MacBook or Windows Laptop. What happens then? How do they collaborate? Can they do it?

The year is 2010. Every single child (at least in Cyprus and Greece) has his/her OLPC Laptop for working at school and at home. However, some parents have just purchased their children some new shiny 17" Quad Core MacBooks and Windows laptops. What happens then?

Interoperability

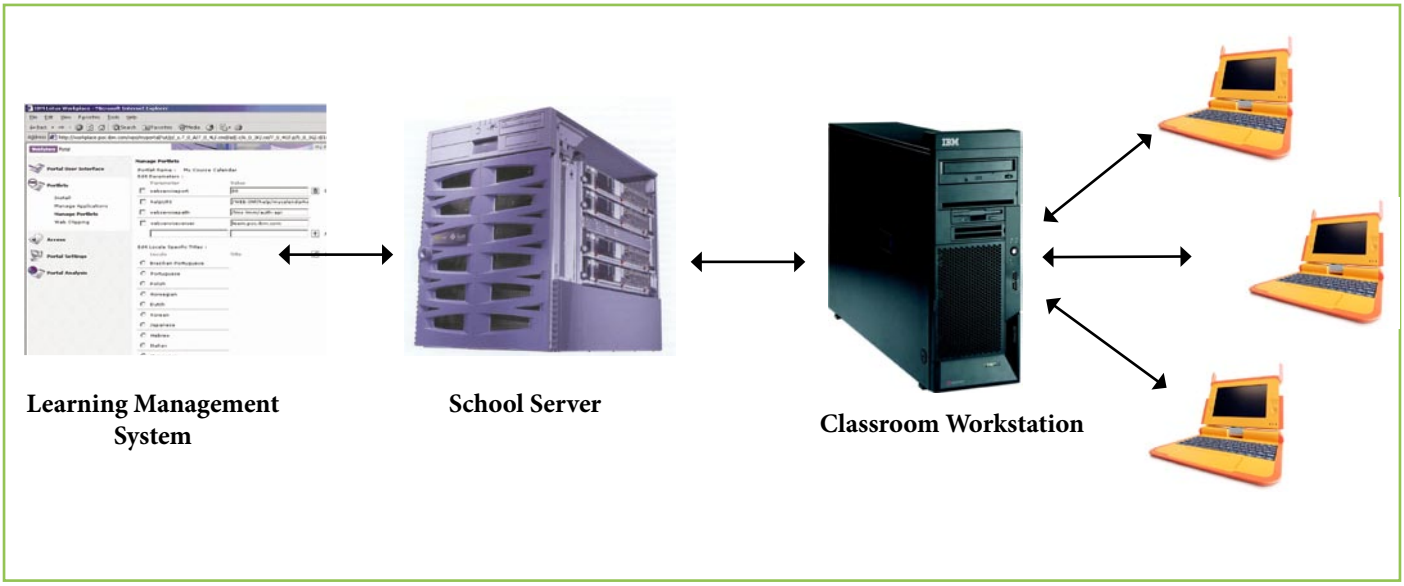
The above hypothetical scenario is not that far fetched. This is something we can (and must) expect, especially in societies like Greece and Cyprus where the average family can afford to purchase laptops for their children. The people back at OLPC have taken every measure possible to ensure that their Laptops can talk and collaborate with each other. One thing they havent thought of was the possibility of a child bringing to school another Laptop from a different vendor, one that might be running a more 'normal' version of Linux, or MacOS, or even Windows!

Sure, software such as Firefox, Squeak eToys and GAIM can be downloaded for free and be used under any platform. But, what happens to the communication systems between the Laptops? It goes without saying that any other machine would have to stay outside the Groups game- that is, children identifying their friends and then interacting with them.

Before any major implementation takes place, the factor of interoperability must be solved or at least dealt with in a decisive way. Otherwise, we are locking our children with just one platform and this is like creating a monopoly from scratch.

One to One Computing: The School

The implementation of 1-1 computing using Laptops requires many changes in the ICT structure of the school. We explain our proposed model.



Any school with a ratio of 1 laptop per child for every single student has to be considered as 'the school of tomorrow'. Such a school must be radically different than anything else and certainly make good use of the technology provided.

School Server

In such a school, having a single server might be a good idea for sharing data between school computers. This server must provide its clients with remote access, so that Laptops without LAN cards but with built-in WiFi support can still browse the internet or receive files through the local network.

Every classroom should have its own 'teacher' workstation for presentation purposes, as well as for running such devices as interactive whiteboards, a capability not yet supported (or promised) fo the next versions of the machines. The school server itself should be connected to the LMS of the Ministry of Education, in order to access content created by fellow teachers and stored on these remote servers.

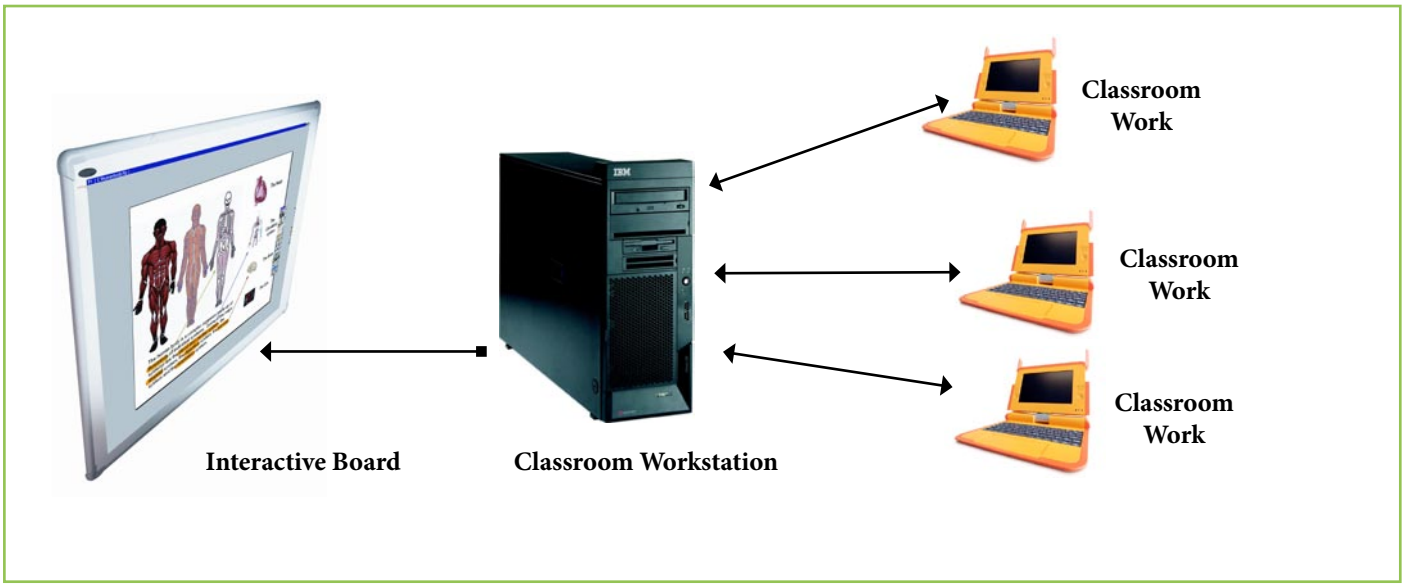
Content Management

The school server should also serve another crucial purpose: to work as a mirror for all the content used by teachers and students. This content, quite logically, cannot exist only on the school server, since the capacity will be limited. A remote server (probably at the Ministry of Education) can handle virtually unlimited space. All changes to content can occur at the central level and then transfered to school servers over the internet.

Even with a fast ADSL line, the maximum bandwidth we can get (today) is 1.5mbps. This is definitely not enough when we have to share it with 200+ computers. Therefore, the school server will store content locally, which will be accessed by the clients wirelessly at much greater speeds, saving the internet bandwidth for web browsing or other applications.

One to One Computing: The Classroom

The one-one classroom cannot use the same facilities as normal classrooms. The bare minimum such a classroom could have is internetc access, and a teacher's workstation connected to an interactive board.



The model we propose is already in place in at least 3 schools in Cyprus (minus the interactive board). We believe that the teacher has to use either a normal workstation, or a powerful laptop computer for controlling the Interactive Board and for acting as an information 'hub' for the other laptops.

The Classroom Level

Learning takes place in the classroom - at least during school hours. Students will use their laptops during a normal lesson. They can use their machines for searching for sources of information on the internet, complete interactive assignments, collaborate with other students on joint projects, develop their own simulations or models etc. Since the OLPC Laptop has no provision for an external monitor, it is crucial that at least one computer in the classroom can connect to a video projector.

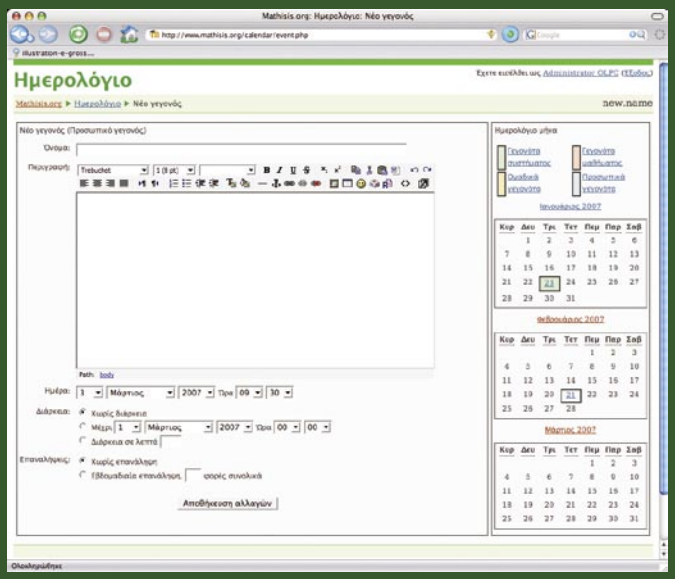
We also consider the use of interactive whiteboards to be essential in every classroom. The board, along with the computer the teacher will be using, is the hub of the entire learning process. Therefore, it is imperative that such a device exists in every classroom and that the teacher is equipped with a computer (desktop or laptop) powerful enough to drive the board and run its software as well.

The teacher will be able to select the content he/she will use from various sources (through the LMS repository of the Ministry of Education, for example) and apply that content to his/her classroom. This content does not necessary replace books- we believe in the model where the computer is the ultimate complimentary tool that will allow the teacher to use it to its maximum efficiency to support learning.

Our approach, based on the above, is not that of a complete departure from books but rather the implementation of a blended learning approach where the computer (and the LMS) are used along more traditional tools.

One to One Computing: Administration

Every school is a huge ecosystem consisting of teachers, parents, and of course children. How do we manage this ecosystem and how does school -and classroom- administration change its role?



Moodle For All

Moodle is a very mature platform, and it has been in use for quite some time from various organisations and adacemic institutions all over the world. Its implementation in Greece has lead to the development of some extremely useful tools and experience regarding its added-value use as an Administration platform as well as an LMS.

The digital school has to be much more flexible than traditional schools, and it also has to rely less on paperwork and more on information technology.

Information Technology

Every years tons of paper is waisted in schools for sending reminders or notices to parents and/or students. In several cases, students fail to deliver a notice or announcement, or they tend to do that very late. Teachers also need to notify parents regarding events or even the progress of their children. It is not always feasible to print and photocopy notices, not to mention the paper that is used.

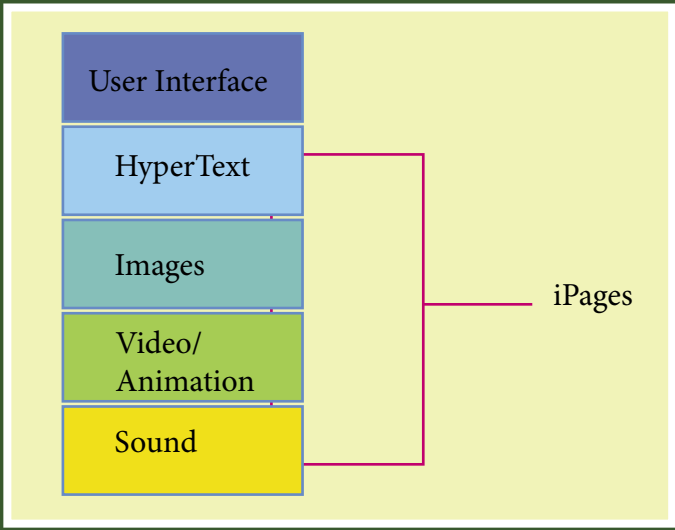
Moodle, and other simpler packages, offers the tools to deliver messages to the right recipients at all times. All parents need to do is log into the main page of their school to find out about any activities the school is planning, or about important news regarding their children (ie change in school uniform, new books etc). Since we are discussing the possibility of every child having his/her own laptop, and since we are also suggesting the use of a mesh network to ensure that everyone has internet access, we could also feel safe to assume that every household will have access to such a system.

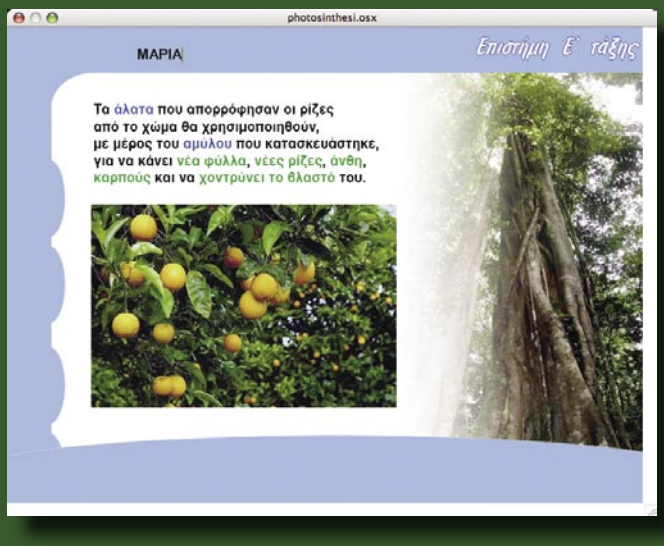
The administration of the classroom can also take place under such a system. For example, teachers can place grades on a daily basis, as well as more personal information regarding children. Of course, in such a case, parents will have access to unique accounts that they will not share with anyone else.

Last-minute information can be shared this way too. For example, when an excursion is going to be canceled due to bad weather, the teacher (or headmaster) can place a notice on the page from the previous day so that parents can be aware of this change.

One to One Computing: Content

Content is a crucial factor for the success -or failure- of any implementation of technology. Turning books into pdfs is not even close to the potential of using a computer as a learning tool. We propose our model for content development.





Content is like ammunition: it is not important how good a shooter you are, or how good your rifle is, if the ammo is not of high quality, at best it will missfire at worst it will backfire!

iPages Model

The iPage model we propose is based on an extremely flexible and adoptable design that allows the teacher to select 'pages' of information regarding a specific part of the content that he/she needs to address. iPages are connected together through the use of a 'Super Interface' that can be easily manipulated by the teacher. The design of these pages takes a strict and minimalistic approach to the way users interact with information within. The interface must be unified across all pages, with Hypertext used to define relations between each Page. For connecting to outside pages, Hypertext references should point to URLs that have either been created (or exist) or others that can be created using online tools such as MediaWiki.

iPages can and must be used as an addition to the content provided to students by their books. Their added value relies on the choice they give each teacher for using them as alternative sources of information or as direct links to other important pages.

iPages Vs Learning Objects

When we started studying the concept of iPages, it was not clear if they could provide similar or more benefits that Learning Objects. Surely enough, iPages are a great departure from stand-alone monolithic applications that occupy vast amounts of space on a CD/DVD and they are very hard to manipulate or use productively in the classroom.

However, iPages are far from being Learning Objects. In fact, iPages can consist of Learning Objects, but these Objects can coexist under a specific context. The model we propose in the next pages will show the fundamental differences when administering such content.

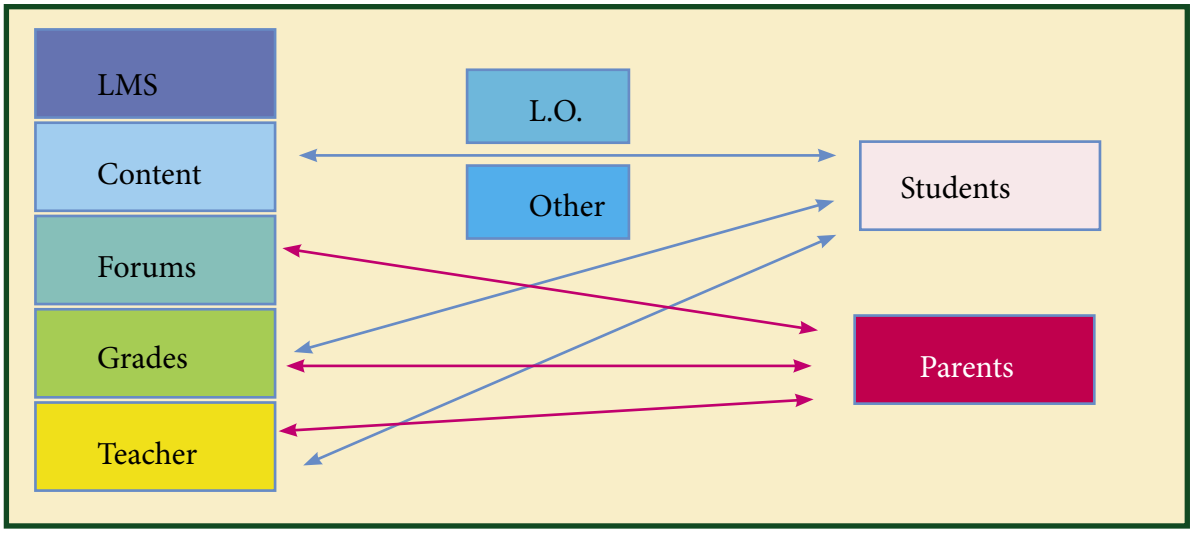
Learning Objects

Learning Objects (L.O.) are the smallest unit of data that has a specific meaning and can be used combined with other L.O.s to support learning. In Maths, for example, an L.O. can be a small applet for multiplication of single-digit numbers. It does have a meaning when is used during the lesson (or at home), but it has the maximum effect when it is used with instructions, methodology, and other L.O.s

An iPage can be a collection of 2 or more L.O.s connected with text or other types of Media on the same screen (page).

One to One Computing: Learning Model

All is good and well when we get the machines and the content. What do we do next? Individual content is 'disconnected' and can cause a nightmare to administer and control.



We have been experimenting with 1-2 computing and Moodle in Primary Education since 2004. For the past two years we have been working on a 1-1 basis introducing more and more children to the flexibility of Moodle. Our findings suggest that a central way of delviering and administering content and student access can be extremely important in the proper integration of ICT in education.

Connection Learning

A typical classroom consists of teachers, students and learning material. Methodologies are in place to bind everything together, and a curriculum exists in order to point the way. Every day tasks include children interacting with information, be it in their text books, paper assignments or even oral questions. There are vast amounts of data been handled on a daily basis, and it is next to impossible for the teacher -any teacher- to assess all of that effectively. All information or tasks we give our students are disconnected; children work on assignments or exercices but then the teacher has to gather those exercices and correct them. Self correcting is an outstanding way of enabling children to correct their own -or their peer- mistakes. But, it does not allow the best understanding of a child's capabilities in full.

By using a blended learning method, where every student has his/her computer in the classroom, and they all connect to a Learning Management System (be it Moodle, Lotus LMS or even WebCT), the teacher has a centralised way of assessing the work done by his students even after-hours without needing to struggle with literally tons of paperwork. Some assignments, especially in Maths, can give students direct feedback and -if using 'smart' content- can even help them resolve their misconceptions.

Using an LMS in primary and secondary education is an extremely new concept, compared to other uses of ICT. So far, it has been received with mixed feelings, but we do believe that proper methodologies and the right content, along with teacher training, will be the deciding factors of its success.

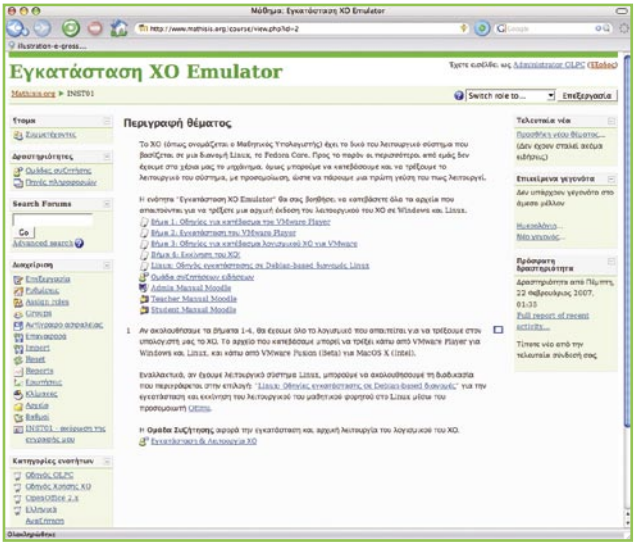
Learning Model

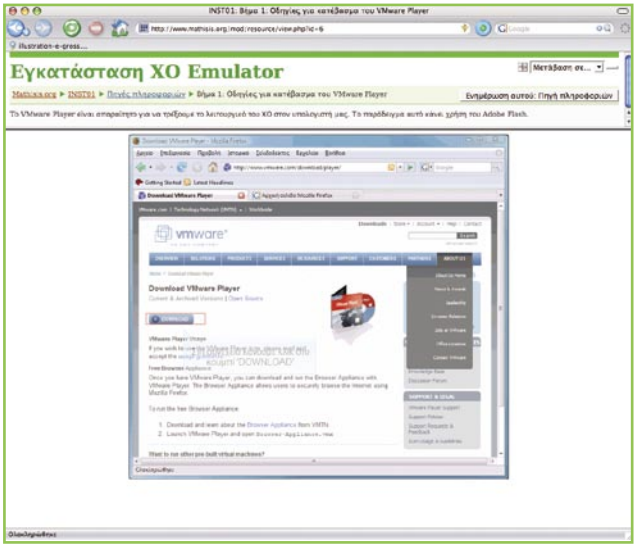
We introduced our Learning Model as early as 2004, and we have first officially implemented it the same year on a trial basis.

For further reading regarding our proposed way of implementing it, please refer to 'Open Education Report 8' (http://www.apoplous.org/downloads/report8.pdf)

One to One Computing: The Teachers

When Czar Peter of Russia was asked who's uniform is the best, the Admiral's or the General's , he pointed out to the soldier uniform: always there, at the ready, against all weather, the factor that wins or loses a war! So are teachers!





Mathisis.org (www.mathisis.org) is based on Moodle and it supports the OLPC initative in Greece and Cyprus

Teachers always take the responsibility to implement any new idea or technology in the classroom. In the past, whenever a significant change occured (ie new Maths books, new Language and History books) teachers were not trained on how to use them. For ICT to work, regardless of the technology involved, the teacher factor must be taken into account.

Training Educators

Technology, and especially implementation of a 1-1 scenario, dictates the complete change of how we interact with both learning and our students. It is next to impossible to 'throw' a large number of computers or/and content, without making sure that teachers are ready to use them in the classroom.

1-1 implementation is so radically new both in concept and in implementation, that we have to be extremely careful on how we implement it. Currently, we are faced with two scenarios. The first calls for the Pedagogical Institute and the Universities that offer undergraduate degrees, to make sure every single teacher understands what a great paradigm shift one to one computing really is in the classroom and how to make the maximum change in the classroom.

Second, since we will be more dependent on technology than ever before to perform our duties, it is extremely important to make sure teachers will be able to stay up to date with current software as well as new methodologies or technologies. In such a scenario, the most obvious and feasible solution would be to train teachers in using an LMS so that they can continue educating themselves in new technologies, from the comfort of their homes and at their own time.

For training teachers on using Open-Source Software such as OpenOffice or the Laptop itself, we have established a website based on Moodle (Mathisis), that offers teachers a set of online courses covering basic steps of these packages. This way, our volunteers can learn how to use the Laptop without leaving their homes.

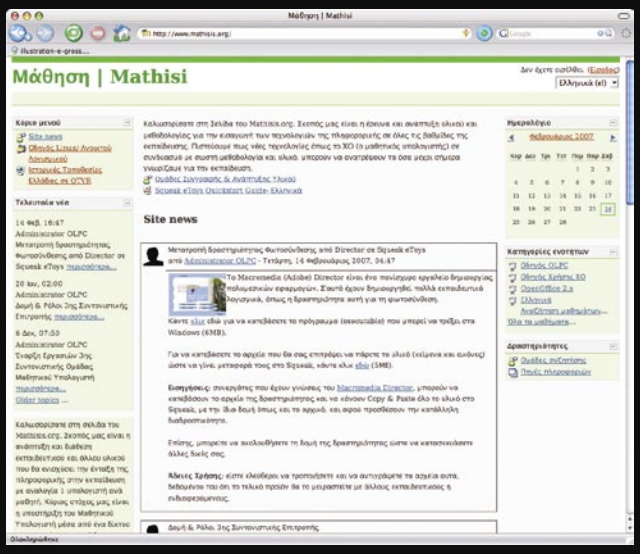
Learning Model

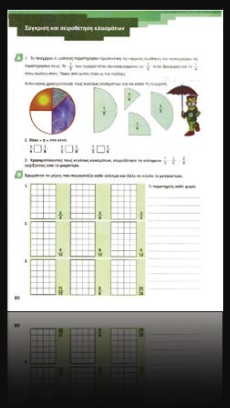
We introduced our Learning Model as early as 2004, and we have first officially implemented it the same year on a trial basis.

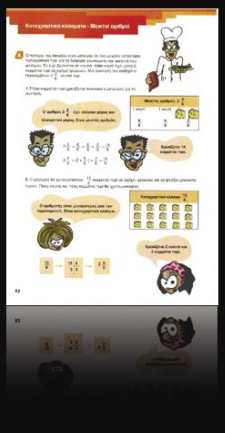
For further reading regarding our proposed way of implementing it, please refer to 'Open Education Report 8' (http://www.apoplous.org/downloads/report8.pdf)

One to One Computing: Parents

How do you involve one of the most important factors in education? Parents are -without a doubt- the first and foremost 'educators' of their children. We must, and we will, involve them in a remarkable and unique way.







Parent Problems

In an ideal situation, parents would work together with teachers for the benefit of their children. Unfortunately, as every teacher knows, not all parents are caring that much for the education of their children. Even though this group of parents are a small minority, they do exist in every educational system.

In these cases, there is usually little one can do to change the situation. However, this is not reason enough for not engaging the rest of the parents who are eager to help their children improve themselves.

A typical scenario: a parent sits with his child to observe the lessons of the day, offering help and/ or advice while showing that he/she cares for the child's development. In many cases, parents feel frustration for not being able to help their children in specific assignments. In other cases, they need to be informed more often on the progress of their children, or just learn about school events or activities.

Parents in the Mood(le)!

The model we propose requires each child to have his/her unique account on the classroom's LMS. That way, each child can record its own data including grades, reports, comments and any other useful information for its progress. Parents, at any time and from any place, will be able to log into the system using their childs account to review their progress. Teachers can even use seperate accounts for parents, so that messages not meant for the child can reach the right recipient.

Such a system would allow any parent to have a clear idea, on a daily basis, on how his/her child is progressing in school and cope with any difficulties/ problems immediately.

The use of Forums and other synchronous and asynchronous means of communication, can help parents come in contact with the teacher and other parents. If a question arises, a parent can send an email to the teacher or post a question in one of the Forums. The teacher will either reply to the email or post an answer to the Forum. The beauty of using forums as a means of communication is that parents can be engaged in collaborative work between them, to answer or solve common problems (ie how do you cope with the rising costs of using the school bus).

We are confident that this model will help improve the relationship between parents and teachers and between parents themselves. It may also provide the basis for the development of a more suitable learning environment in the classroom, with the entire school ecosystem working together.

One to One Computing: Evaluation

Regardless of how powerful or exciting any new technology is, before we accept it for total implementation, we have to make a thorough evaluation of the benefits it will offer. Otherwise we might end up with another 'DDT'

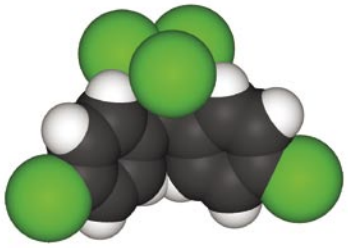
Every few years, in almost every area of our lives, a new technology or product is invented that promises to change our lives for the better. Although we are very excited with the Laptop, our position is that we still have to seriously evaluate it before we move to an all-out implementation. The last thing we need is another 'DDT'.

Real Evaluation

One to one computing is a tremendous change. If we want to do a thorough evaluation we must make sure we got all bases covered. First of all, we have to make sure we select a proper number of schools (representative sample) in which we will perform a Pilot Study. Prior to the pilot study, we should perform pre-pilots to make sure we resolve any issues that have to do with technical problems. Simultaneously, we have to adequately train the teachers who will participate in the Pilot Study. Educational content has to be developed and tested before we move to the pilot study. The true evaluation will not be made on the platform itself, but on the content. Regardless of the platform - be it MacOS, Windows, Linux, OLPC or Solaris, if the content is good then (maybe) the results will be good as well.

Qualitative & Quantitative

We tend to measure success in schools by looking at grades. When it comes to an all-out implementation of technology, we have to take other factors into account. Using quantitative methods, we should measure the change in learning that occurs for selected grades. This will be made possible with special tools developed by our (or other) associates that deal with Quantitative Research and Educational Evaluation. At the same time, we should also perform Qualitative Research. Maybe the end result will show that there is no significant change in learning when using the computer as opposed to traditional learning. But maybe by engaging students using computers, we make them feel happier and they actually feel better when in school. This would constitute a significant impact of ICT in ecucation and it might be worth the investment on its own.



The 'DDT' Factor

Mosquitos used to be a menace to many countries since they carried diseasses that caused thousands of deaths. In the 1940s, a miraculous solution was found in the form of DDT, an insecticide that helped elliminate millions of mosquitos and their nests around the world. However, 14 years after is creator was awarded the Nobel prize for his discovery, another scientist realised that DDT was actually causing much greated harm: not only it was the reason why many bird species were facing extinction, but it was also causing cancer. Therefore, it was banned from use.

Editor's Notes

Isaac Newton once famously remarked that "If I have seen a little further it is by standing on the shoulders of Giants". Significant creations are almost always the result of many people's vision and hard work. The Laptop is no exception!

"It's chilling to recall how this cast of young and inexperienced people who cared more than anything about doing great things created what is perhaps the key technology of our lives. Their own words and images take me back to those rare days when the rules of innovation were guided by internal rewards, and not by money."
-- Steve Wozniak, Co founder of Apple Computer

Parenthood of a Laptop

The original team that created the Mac, with the exception of such figures as Alan Kay, mostly consisted of young and inexperienced people starving to change the world. The parents of the Laptop might not be inexperienced, since most come from MIT's Media Lab, but they share one thing in common with the spark that excites Steve Wozniak, a legend in his own right: **they are guided by internal rewards, and not by money**.

The names behind the machine are many, and almost every single one of them has contributed a great deal to what we experience now as personal computing. Great yet controversial figues such as Steve Jobs of Apple Inc has praised them, quoted them (Alan Kay and his famous '...the best way to predict the future), even attempted to work with them. The fact, however, remains that these people are creating a tremendous ripple effect that can shake the entire computer industry and maybe- if they are lucky enough- rewrite the book on computing in education.

Founder of OLPC is Nicholas Negroponte, the co-founder of MIT Media Laboratory. Significant figures include Michail Bletsas, former director of computing at the MIT Media Lab and one of the chief architects of the Laptop. Extremely important is the contribution of Mary Lou Jepsen, responsible for the development of the revolutionary screen used in the Laptop. Many more important people are of course associated with the Laptop, and it is not within the scope of this article to mention them all. Either way, probably an entire issue could be dedicated to each one of them. We feel the need to mention two extremely important names, that of Alan Kay and of course Seymour Papert.

Kay & Papert

Alan Kay has a long history in the field of personal computing. A visionary who predicted the Laptop as early as 1960s with his Dynabook vision. He later on contributed to the development of the XEROX Star, before working at Atari and then contributing for the development of the original Macintosh. Alan Kay is responsible for the Squeak environment included with the Laptop. Squeak eToys is a revolutionary product influenced by such prominent scientists as Bruner and Papert. He firmly believes that tools should be given to children to enable them to learn better.

Alan Kay was also influenced by Seymour Papert, a former student of Piaget. Papert's revolutionary 'Mindstorms: Children, Computers & Powerful Ideas' has been an inspiration for every educator using computers as a learning tool. Papert and Kay are proponents of the idea that people learn effectively through making things. In their own words, they believe that there is no such thing as a student who is unable to learn (ie Mathematics). What is wrong is the system and not the child him/herself, therefore a drastic change must be made to the educational process.

For more information regarding the people behind the Laptop, visit
http://www.laptop.org/vision/people/

Alan Kay Links:
http://www.squeakland.org/community/biography/alanbio.html
http://en.wikipedia.org/wiki/Alan_Kay

Seymour Papert Links:
http://www.papert.org/
http://en.wikipedia.org/wiki/Seymour_Papert
http://www.mamamedia.com/areas/grownups/people/seymour.html

"Any sufficiently advanced technology
is indistinguishable from magic."
~ Arthur C. Clarke

| One | Laptop | Per | Child |

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