Challenges on applying Technology to transform Learning

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Abstract: There are great possibilities to improve children’s learning utilizing the integration of Information Technology (IT) in school environments. Researchers have created and tested, with proven success, a variety of educational software and hardware. However, even in times when technology has become less expensive, the use of technology in school systems isn’t widespread. There is a gap between research and classroom practices. The author presents a hypothesis for cases of frustration on integrating IT in schools which presumes that this happens because the focus is given to teachers’ professional development and little or no attention is given to the whole process of IT adoption as a comprehensive and complex transformation process inside the school. Based on management practices, it is suggested that a more comprehensive way for schools to plan and implement this transformation process is required. It further suggests that the creation of an “IT for children’s learning” framework to facilitate understanding for school’s stakeholders is required, and that the creation of knowledgeable organizations to guide and support associated schools to adopt IT and transform children’s learning is also necessary.

Keywords: History of Educational Computing, Integration of ICT, Teaching Methods

1. Authors Introduction

Marta Voelcker is a Brazilian social entrepreneur that believes that information technology can greatly improve children’s education. As co-founder and Executive Director of Fundação Pensamento Digital, she coordinates projects in Brazil to promote ICT access and professional development for educators from telecenters and schools. Since 2004 she has been a research collaborator at LEC UFRGS, and is currently a PhD student in Information Technology for Education. Since 2007 Marta has integrated the research team from UFRGS that works with OLPC’s XO laptops to guide and analyze the use of one to one computing at
Luciana de Abreu School in Porto Alegre. She also integrates the Board of Squeakland Foundation and FIJO – A Foundation that supports the Catholic University in RS State – Brazil.

2. Introduction

The use of IT can bring wonderful results to schools. Much has been written about theories, methodologies, software, and hardware specific to improve children’s education. There are successful cases that sound like magic; children that used to be shy and have low self-esteem and those who used to miss classes, become active learners that cooperate with teachers and classmates when they have the opportunity to use computers. At Luciana de Abreu School in Porto Alegre where each child has their own XO laptop, there is one teenager that has a serious dyslexic problem. As he learned to use Squeak Etoys (a rich media authoring software designed for math and science learning), he became a mentor for younger children (and displayed less difficulties with his learning). As he reports his activities in his blog in AMADIS (a virtual learning environment), it becomes evident that he experienced significant progress in his writing skills. In this context, teachers started recognizing him by his skills to use and teach Etoys rather than by his disability. Information Technology gave him another way to register his knowledge and now teachers can better evaluate him because they realized that even though he is not a proficient writer, he is capable of learning. This is just one example among many others (Author’s observation 2007, 2008).

Kids with their own laptop computer become fluent in the new medium, they do more and better writing, more and better projects, more and better presentations, more collaborative work (at school) and more independent learning (at home)... Children with learning difficulties gain self-esteem from their work because it looks just as good as everyone else’s. (Johnston, 2003 p.1)

This paper presents a global context where several schools could be taking advantage of Information Technology to improve learning, but are not. It further explores possibilities based on the recent history of IT for education and states that there is a gap between research and classroom practices. The author states the importance to consider schools as learning organizations and suggests a schema to stimulate school stakeholders to get involved with authorship and interaction to plan and execute activities related to IT adoption.

3. A Challenging Reality

So, we come to the principle question: Why aren’t schools using computers?
Although there are a variety of successful case studies about schools that use PCs in a specific IT lab, adopt the one laptop per child approach, or use laptop charts; there are also a variety of cases that report frustration and failure. There are cases of explicit failure where schools that adopted intense use of technology gave up using it, and there are countless cases of frustration where the use of technology did not bring the desired improvement of learning. Unfortunately, educational researchers don’t write much about this, but the evidence is clear: technology has become less expensive but schools are not using it as much as they possibly could. A case in point is private schools in Brazil attended by medium and high socio-economic children. Their monthly tuition is equivalent to more than half of a regular laptop’s cost; and the most elite schools charge a monthly tuition that is equal or greater than the cost of a laptop. However, none of them adopted the one laptop per student approach. This is certainly more evident in the northern hemisphere where technology is less expensive and state departments of education can afford to acquire laptops for children attending public schools.

Evidence of frustration with intense adoption of technology is also evident through the mass media. “Seeing No Progress, Some Schools Drop Laptops” was a recent headline from an article published in The New York Times which reported numerous cases of schools in United States where students using laptops have not improved scores in standardized tests and because of this, schools finished their laptop programs (The New York Times, 2007). Articles such as this greatly influence parents, teachers, school administrators, and decision makers from State education departments.

The use of standardized tests as the only tool to evaluate IT adoption in schools is dangerous and might prevent the majority of schools from the vast benefits that IT can bring to education. I am not totally against standardized tests and I understand that state educational departments and society need tools to assess schools’ performance. These tests might be appropriate to assess traditional schools, but when it comes to successful cases of IT integration in schools, they all involve learning transformation. A careful look at this transformation process is needed. There are many important questions to be addressed. Is transformation desired by all school stakeholders? How can this be effectively implemented? How can it be assessed? How long would it take to see the first positive results? Like in other types of organizations, transformation might be necessary, but there is stress to go through it and it takes some time until the first positive outcomes appear.
4. IT as the Resource and the Necessity to Transform Learning Environment

Information Technology is both a resource and a necessity to transform current schools. Resources like desktop computers, laptops, connectivity, educational software and virtual learning environments can be used by teachers and children to transform learning. Information Technology also implies a necessity for school transformation because while it has already changed the world, it has not changed schools so far.

When it comes to introducing intense use of IT in schools, success comes not from training teachers to be effective in the use of technology and keeping everything else the way it was. This is not the way IT was introduced in other types of organizations, but it is probably what happened with schools mentioned in the New York Times article. The fear to fail in standardized tests prevents schools from attempting a deep transformation process.

Since the beginning of IT use in Education in the 1960s, it was realized that instead of playing the role of an electronic teacher, the best use for computers would be as a new medium for learning. The first researcher to investigate this was Seymour Papert, a mathematician that after four years of study with Piaget (the great psychologist and epistemologist), became a professor at MIT Media Lab. While involved with Artificial Intelligence studies, Papert created many IT applications including Logo which is a child friendly programming language and educational software designed to enable creative ways to use computers in the classroom. In his book Mindstorms, Papert states that children can learn to use computers in a masterful way and that learning to use computers can change the way they learn everything else. The Mindstorms foreword found in the second edition (1993) is written by John Sculley, then Chairman & CEO of Apple Computer, Inc:

Seymour was among the first to see that massive change was needed in the education system, particularly math and science education, and to recognize the role that technology could play in learning. (…) Like the group who founded Apple, Seymour Papert saw the potential of a computer to transform fundamentally the way people think, work, learn and communicate. (John Sculley, 1993)

Alan Kay, a computer scientist from California- USA, known for his early pioneering work on object-oriented programming and the windowing graphical user interface design, met Papert in 1968 and learned of the Logo programming language, which let him to learn from Piaget, Bruner, Vigotsky and constructivism, which deeply influenced his views. Kay wanted to make “A Personal Computer For Children Of All Ages” that led to the development of the Dynabook. The hardware industry at that time was not able to produce it, but the
Dynabook concept described what is now known as a laptop computer. In the 1990s, Kay’s team created Squeak (an object oriented programming language) and later Etoys (a child friendly rich media authoring environment) built upon Squeak. Later in 2005 Nicholas Negroponte leaded a group of highly recognized researchers including Kay and Papert to create the One Laptop per Child Foundation. This group developed new software and hardware based on Papert’s and Kay’s concepts and making possible the delivery of low cost devices to improve children’s education mainly for the developing world.

Based on Piaget’s epistemology, these leaders have developed software and methodologies to improve education through the use of technology in order to enable the “learning by doing” approach and stimulate children to: do their own research, build concepts, structure their knowledge, and simulate things, bringing to the classroom options beyond teachers lecturing and bored students listening. Piaget’s theory states that children build their knowledge by interacting with the environment that surrounds them and understanding through the environment things built by humans, ideas, values, human relations, nature, culture and history. For Piaget, knowledge is the result of the interaction among the learner and the environment, and the action “to know” means to organize, to structure and to explain, when things are done based on what the learner has experienced (Chiarotino, 1998). Human beings do not need to be cognitive scientists to see that computers can be of a great use to increase a learners’ experience on interacting with the world, and to organize structure and explain the results from these interactions. Although Piaget’s theory is recognized around the world as scientific knowledge, methods to implement that theory in schools with the use of computers are still under construction. Children with limited access to computers (usually located in computers labs), the not so friendly older software tools, frozen institutionalized rules inside schools, and the prevention of innovations on the use of times and spaces, all have contributed to limit the adoption of educational practices suggested by Seymour Papert and his fellows.

The current context with better and more affordable hardware and software should have promoted massive adoption of computers in schools willing and seeking to improve education. Current versions of rich media authoring environments and the unlimited access to information and communication through the Internet are excellent resources to enable children to interact with a much wider environment (beyond classroom walls), and stimulate them to organize, structure and explain what they learn in those experiences. In a context where children and teachers have a laptop 24 hours a day, there is a situation where much better digital fluency is built by each learner, allowing more complex simulations and better use of rich media resources. But unfortunately, the so desired transformation in learning is happening almost only in schools with special advise from researchers.
5. There is a Gap between Research and Classroom

Although researches have shown us the potential of the one laptop per child approach, education systems are not taking advantage of it. There is a huge gap among research and classroom practice. Attention must be taken to rethink things like: how to reorganize the school; how to match children’s learning by doing methods with national educational standards; how to organize data bases of activities for different ages and curricula; the creation or validation of new methods of evaluation; new ways to organize times and spaces inside schools and so many other challenges. Some of these points must be planned and customized by each school according to local community motivations and possibilities.

Transformation is needed, but cannot be imposed. David Cavallo, in his paper *Model of Growth - Toward Fundamental Change in Learning Environment*, proposes that a major reason for the lack of change in education is not due to lack of ideas about learning on a micro or individual level, but rather is due to a lack of models for growth and change at a macro or systemic level. The bottom up model, where school stakeholders, especially teachers, are involved in planning transformation in educational practices seems to be the only way to promote a sustainable transformation.

But again, this is not what is usually being done. Introduction of IT in schools is mostly done based in two steps: acquisition of computers and a professional development course for teachers. Even if teachers attend good courses, when they come back to the school they are not able to, alone, promote such huge desired transformations on their own. These teachers, after one first course, do not have enough knowledge or political power to fight for huge and complex transformations inside their schools. The usual result is that methodologies are partially adopted and outcomes don’t appear. Eventual professional development courses for teachers, printed material and even animated tutorials are not enough to produce the desired transformation in learning environment.

6. Contributions

Thinking about schools as organizations, the transformation process is a complex thing. Administration and psychology have theories and tools to help organizations go through transformation process. Peter Drucker (2001) stated that management is what makes effective all produced knowledge and knowledgeable people; the emergence of management has converted knowledge from social ornament and luxury into the true capital of any economy. Management developed methodologies for groups of people to better work together. Modern administration is not about telling organizations what to do, but about helping people to work together by establishing their mission, objectives, and procedures.
and by helping them gather together periodically to self-assess and rethink their plans, all these with participation of stakeholders and communication with the whole community.

Taking the challenge to apply technology to transform learning environments, it is fundamentally important that each school involves its stakeholders to plan this process. But if a great part of the knowledge about how learning should be, is restricted to researchers, how could school stakeholders make their plans?

The solution suggested is that a group of researchers or people with the desired knowledge, should create a framework to facilitate understanding about how the use of information technology should transform the learning environment. This group would also work as a guiding organization to a network of associated schools. Schools that agreed to work based on this framework and desire guidance from this organization, would have to go through a sequence of planning and communication tasks to make them eligible to integrate this network, receive professional development for their teachers, and proper materials. This sequence of tasks would be related to their own strategic plan to go through a learning environment transformation, based on a given framework. School’s stakeholders would gather together to plan and would clearly communicate their plan. Participating schools would share experiences. This would create a group of schools that continuously learn to improve children’s learning, according to each school’s local context, motivation, possibilities and pace, but always grounded to the given framework.

Being that the plan for IT adoption would be created by each school’s stakeholders, each school would implement IT adoption and learning transformation based on their own motivation and possibilities. Researchers from the guiding organization would respect each school’s pace for IT adoption in a context where schools, as organizations, would learn by doing. This is very similar to the way corporations plan their pathway to meet quality; schools would plan their pathway to meet learning improvement through IT adoption, according to given framework. A guiding organization should play a role similar to organizations like International Baccalaureate (www.ibo.org), an organization that offers high quality programs of international education to a worldwide community of schools. International Baccalaureate guidance is not related to the use of IT in schools, what I suggest is that such schemas to guide schools to quality could be adapted to government agencies or Research Institutes to guide schools desiring to adopt IT and transform themselves thereby improving learning.

7. Conclusion

It is a consensus that Information Technology can improve children’s education if used to empower authoring and interaction among learners. What this article attempts to establish, is the possibility to stimulate and guide school stakeholders
to get involved with activities of authoring and interaction related to the process of how to learn to take advantage from IT. This refers to authoring, the elaboration of their own plan for IT adoption and meaning through interaction, the communication with other schools and with a leading knowledgeable organizations.

This article suggest a schema to introduce intense use of IT to schools, where a Knowledgeable Guiding Organization works with a network of associated schools, sharing materials and offering professional development to meet schools necessities according to a plan designed by school’s stakeholders based on a given Framework (given by a guiding organization); where the Knowledgeable Guiding Organization and associated schools respect and consider any given school’s context, motivation, necessities, pace and possibilities to adopt IT and promote changes in learning (just like good educators consider children’s context, motivations, necessities and learning pace). This schema might work slower than other plans, but is certainly more proper to build sustainable and growing IT adoption and learning transformation, bridging the gap between researchers and real classrooms.

8. References


