

Influence of information and communication technologies (ICT) in the teaching learning process: improving digital skills.

Influencia de las tecnologías de información y comunicación (TIC) en el proceso enseñanza-aprendizaje: una mejora de las competencias digitales *

Recibido: 20 de junio de 2015 • Aceptado: 7 de octubre de 2015

Paola Marcela Hermosa Del vasto¹

* Research article derived from the master's thesis ICT in the teaching-learning process of school: improving digital skills associated with the research in Business Economic from the Complutense University, Madrid, Spain.

¹ Public Accountant, Central University. Diploma of Advanced Studies (DEA), Universidad Complutense de Madrid. Teacher Training Máster in Compulsory Secondary Education, Vocational Training and Language Teaching; Full Time Faculty of Management, Economics and Accounting, Central University. Bogotá, Colombia. Contact: pmhermos@ucm.es

Abstract. Great efforts are made to attend to the needs of a technological society, based on the use of information and communications technology (ICT) in the classroom, by identifying the factors that influence the teaching and learning process (students); in two bilingual spanish-english public institutions, dependant on the Madrid community Ministry of Education, from an analytical-descriptive approach. Structural, behavioral and instrumental variables are examined for the study. Additionally, this article includes a review of the state of the art related to the educational use of new technologies, as well as it measures the perceptions of teachers and students about the use of technological resources, facilities and equipment, along with the support that the educational institutions provide in the institutes under study, which can be taken as a starting point for further research.

Keywords. E-learning, Education, New Models of Teaching-Learning, Information and Communication Technologies (ICT).

Resumen. Se hacen grandes esfuerzos para atender las nuevas demandas de una sociedad más informatizada. Se parte del uso de las tecnologías de la información y la comunicación (TIC) en el aula de clase, identificando los factores que influyen en el proceso enseñanza-aprendizaje; (alumnos), en dos institutos públicos bilingües español-inglés, dependientes de la Conserjería de Educación de la Comunidad de Madrid, desde un enfoque analítico-descriptivo. Se examinan las variables estructurales, comportamentales e instrumentales para el estudio. Además, este artículo incluye una revisión del estado del arte, relacionado con el uso educativo de las nuevas tecnologías, al igual que mide la percepción de profesores y alumnos acerca de la utilización de los recursos tecnológicos, instalaciones y equipos, junto con el apoyo que brindan las entidades educativas en los institutos objeto de estudio, los cuales pueden ser tomados como punto de partida para investigaciones futuras.

Palabras clave. Aprendizaje electrónico, educación, nuevos modelos de enseñanza-aprendizaje, tecnologías de información y comunicación (TIC).

Introduction

The dramatic impact of information technology, globalization and the rapid growth of economies has generated concern for economic efficiency in the framework of education policy, that emphasizes the development of multiple intelligences of students in the classroom. As a result, students learn, represent and use knowledge in different ways and with a variety of techniques to solve problems and transform education.

For this reason, the majority of developed countries are working hard to meet the demands of a new education, through the use of ICT. Organization for Economic Cooperation and Development (OECD, (2010)). These should be an integral part in the teaching-learning process, which allows to transform the dynamics in institutions, teachers, and students. According to data compiled by research, by studying two educational institutions in Madrid, Spain. Nearly 98% of students have a computer at home and 97% have internet at home and on the mobile phone, thus, teach with advanced technological forms, is the current reality.

Information technologies in education, according to the experts, are a phenomenon of great social importance, to enhance the education from which the read-write process can be strengthened, given that today students are more sensitive to a digital environment. This is because it enables a greater degree of interaction with electronic devices, mobile phones, digital television, video games and the regular use of the internet.

Its impact has been recognized in relation to academics, according to the issues raised by Diaz (2014); Gil and Berlanga (2013); Bebell (2005); Rockman (2004); Ross and Strahl (2005); Russell, Bebell and Higgins, (2004), among others. In this respect, new possibilities are opened, but; in turn, they will have different requirements, leading to a potential that can be made, to a lesser or greater extent depending on the context.

Depending on the way how it is implemented, ICTs can impact facilitation or restrict its use; specifically in cases where students have a digital divide, it becomes a factor of inequality. This leads to reflect on the way how should be reflected ICT, so that these measures be implemented in favor of the community and not against it.

In contrast to traditional education, pedagogical and didactical support options with support in ICT have greater impact, making it more efficient than traditionally has been done related to the provision of a service in lowering the cost to achieve the objectives from the perspective of economic efficiency (Yin Kwok and Magdalena, 2002). However, the use of ICT in schools is still limited by factors such as access to resources, incentives for change, fitness knowledge, motivation, collegiate politics, among others. Coll (2007) indicates that the penetration of technologies in schools are finding more difficulties than expected.

Hence the question arises: can the use of ICT in the classroom be considered. And, if so, what are the factors which have promoted or hindered the use of ICT? Thus, this paper is intended to characterize the contextual and behavioral variables from the use of ICT in the classroom, at the undergraduate level. It is based on the methodological procedures for the design of a survey in two publicly owned bilingual, Spanish-English, institutes dependent on the Concierge of the Community of Madrid in Spain; and review of the literature associated with the role of new technologies in education. The revision mentioned institutes constitute a case study that can be used, depending on the context, as a basis for research who want to delve into this topic.

In order to respond to the questions, research is supported by the Pentagon of ICT (Unesco, 2004) competitions.

The document structure includes six sections. First: introduction; Second: the approach of the education ICT system to the traditional approach, where the most significant aspects are collected; Third: compilation of methodological details; fourth: the results of the ICT survey; Fifth: discussion and finally Sixth: conclusions.

The traditional approach to the new model of teaching and learning

In this millennium, education is associated with the training strategy based on the transfer of skills and knowledge through digital media e-learning and, therefore, is required of all actors involved in it: teachers, students and the school itself must act in the projection of learning.

The use of ICT in an educational scenario, has resulted in the change of its processes, their impact recognized in relation to the reforms, thus we know that the

impact of any technology depends on how it is used, in what context, and with what purpose, since it opens possibilities to new requirements (Bebell, 2005). In this scenario, educational institutions are committed to contribute to the transformation of teaching and learning.

The system has abandoned memorizing typical illustrations, which are the challenges of a fast time of technological and scientific transformations.

With the particularity that begins to increasingly demand digital audiovisual experience (Tripero, A., 2010, p. 9) learning is an essential factor in sharing the experience. Adapting to technological progress in the field of education translates into improved, making the educational process more attractive.

Unesco published in January 2008, that the ICT competency standards for teachers aim to guide teacher training institutions (training programs). This project presents a number of approaches to reform education through ICT literacy and deepen knowledge.

Therefore, according to Unesco standards, competencies for the development of educational innovation supported by ICT are technological, communicative, educational, and a part of research and management. From this perspective, ICT can help students acquire the skills needed to be:

- competent to use information technologies.
- seekers, analyzers and evaluators of information.
- problem solvers and decision makers.
- creative and effective users of productivity tools.
- Communicators, collaborators, publishers and producers.
- Citizens informed, responsible and capable of contributing to society.

Educational ICT competencies for teachers are: explorer, integrater and innovator. In Figure 1 these ideas are outlined.

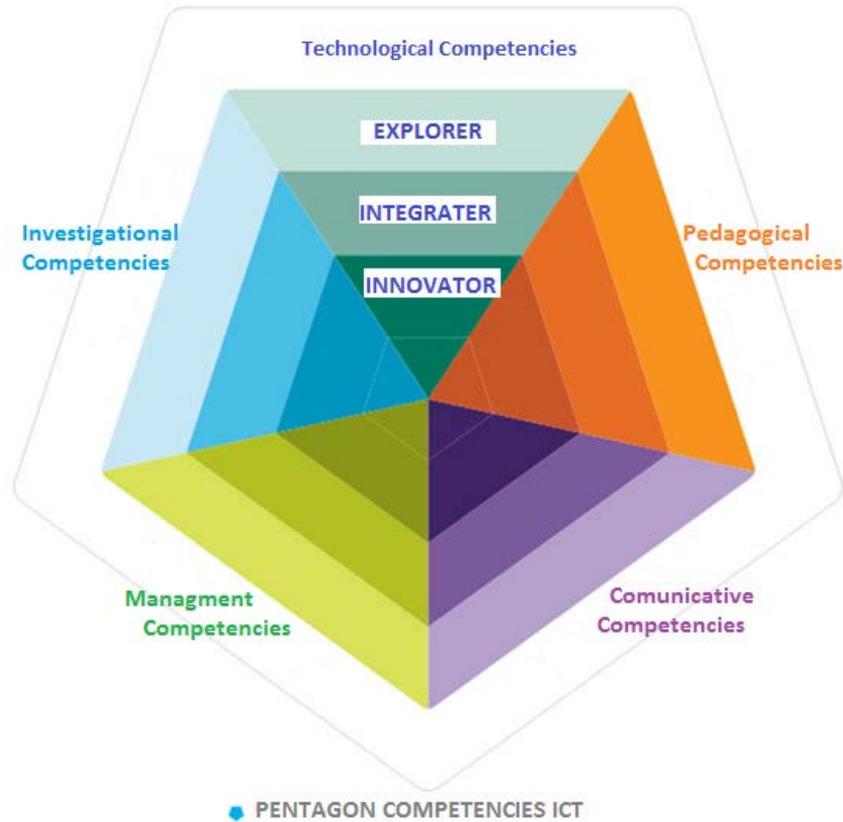


Fig. 1. Pentagon-Unesco ICT skills

Note: These skills are taken into account in the development of several survey questions.

Source: Unesco, 2004

On the other hand, the changes that have occurred in response to emerging needs, have given rise to the so-called new learning models, which involve, actively, to social media and interactivity. These interactive materials, play a crucial role in the skills required in all stages of education, which granted a certain degree of control over the learning process (Gil and Berlanga, 2013). The transmission is via broadband as voice, image, and data.

Some authors make certain features in these models of learning:

- Interactivity. It is defined as the possibility of establishing a dialogue between digital information and subjects that are connected synchronously or asynchronously (Gil and Berlanga, 2013, p. 58).

- Accessibility. This feature has two meanings: one refers to the accessibility of any subject to all content and digital tools or accessibility for people with disabilities to all contents, as noted (Gil and Berlanga, 2013, p. 59)
- The usability. It lets focus on the potential of hearing documents, according to their needs. In terms of navigation, you should arrange the website so that facilitate the search for information.

Evidence in about 1891 schools it have been found of expansion of ICT initiatives, successfully applied in education, at regional level in Spain. The Autonomous Community of Madrid has implemented the educational platform EducaMadrid. The Andalusia pioneered the And@red project and Averroes platform for creating interactive material. The autonomous region of Extremadura has an educational portal EducarEx. The Community of Castilla y León has the interactive teaching tool EducaCyl. Likewise, the Ministry of Education has created the Cnice portal where you can find thousands of educational resources for the teaching community.

A positive factor for the accessibility and use of technologies is the use of the laptop for learning at home, by students, the most important in improving student performance factor. Studies in countries like Chile, Mexico, Colombia, and Spain have concluded that teachers and pupils use ICT to streamline what traditionally has been utilized, allowing the production and dissemination of material in the cloud, so you can be utilized permanently available for consulting students. But the constructive and innovative uses are rarer linked to complex learning, problem solving, generating original knowledge, or collaborative work more (Diaz, 2014).

A new education is the key to facilitating these changes for the future. Educational change requires that teachers have clear learning objectives, and that alone the availability of technology does not have the expected challenge, then, conditions for the use of ICT by teachers in the classroom relate to access, competence, and motivation (Burton Jones 1999), (Ohmae, 2000), OECD (2010).

In an environment of this nature, some studies describe various relevant aspects: how they are using laptops in teaching-learning practices (Rockman, 2004); the use of laptops in selected areas of content (Russel, Bebell and Higging, 2004); the use of

specific technologies such as internet (Silvernail and Harris, 2003); digital literacy (Schaumburg, 2001); the use and ownership of information technology (Bebell, 2005), (Ross and Strahl 2005), (Silvernail and Lane 2004), among others.

The educational use of the new systems adapted to a wide public education should be a key policy instrument to reduce the digital divide. However, penetration of ICT in schools and classrooms is still limited and their incorporation is finding more difficulties than expected. The access of ICT will become a factor of inequality in which many young people currently find themselves in (Diaz, 2014). Consequently, the technological sophistication answered that education should not be contained by accepting the foreseeable future, should allow active student participation in educational tools and contents that motivate them.

Facing this proposal requires countries to optimize the resources allocated to education, many schools aspire to a 1: 1 (one computer-one student) ratio. In this vein, the cost to acquire ICT devices are often high, which requires a substantial budget. The very rapid advance of technology has provided many of the tools obsolete, requiring the updating of equipment and software. A cost-benefit analysis is necessary, but taking into account the social benefit. Many countries are attracted to having to make large investments, especially when the recovery thereof is obtained in the medium or long term. The implementation of ICT in education requires large sums of money, however, the social benefit represented in educational improvement warrants.

You can take the example of Finland, a country with more investment in technological innovation and promotes an atmosphere of permanent evolution under the philosophy of "educated people". Finland's success relies on a competitive, innovation, technologically advanced, investment in research, environmentally sustained, culture. It is the country with better educational outcomes which is considered a world power.

Methodology

The research is quantitative-descriptive, a non-experimental randomized design. It is based on the observation of the way working students in eleventh grade classrooms of two populations, public institutions City IES IES poets and Isaac Newton Concierge Comunidad of Education of Madrid, Spain; the school year (2013-2014) and a survey

applied, allowing data collection specifically and directly under the method of probability-random sampling, from which all individuals in the population have positive probability of being part sample.

Also, the statistical analysis was performed using frequency tables and graphs that were appropriate in situations in which the respondent expressed his opinion through a scale where it assessed the degree of compliance with the proposed formulation. We used univariate exploration, given that the results could be expressed as percentages relative to the total sample and for each criterion of segmentation.

Results

The results presented are general in nature and are the most significant obtained in the investigation. We surveyed a total of 57 students from two public schools. The study revealed a number of components that influenced the decisions of teachers to use ICT in the classroom, such as access to technological resources, ownership and use of technological tools for teachers and students, competition students in ICT skills, perception of institutional resources in ICT, and students' perceptions about the role of technology in education.

Discussion

Based on the results of the work, the analysis focused on the following components: (a) access to technological resources, (b) appropriation and use of technological tools for teachers and students, (c) proficiency of students in ICT skills, (d) perception of institutional resources in ICT, and (e) the perception of the students about the role of technology in education.

(a) The access component is favorable technological resources is manifested in which students have a high degree of connectivity and Internet use at home and on their mobile phone. Allowing them to stay connected, due to the availability of sufficient technological resources, nearly 98% of students have a computer at home and 97% have internet at home and on the mobile phone (see Tables 1 and 2). Additionally, 60% are frequent users using any technological novelty.

Table 1. Availability of computers at home

Row Labels	2.14 Does he/she use a computer a home?
No	1,75%
Male	1,75%
Yes	98,25%
Male	47,37%
Female	50,88%
Total	100,00%

Note: The chart Corresponds to question number 2.14 of the survey. Total (YES- 98.25%) (NO- 1.75%)

Source: Own elaboration

Table 2. Availability of internet on his/her mobile device?

Row Labels	2.15 Does he/she have internet on their mobile device?
No	3,51%
Male	1,75%
Female	1,75%
Yes	96,49%
Male	47,37%
Female	49,12%
Total	100,00%

Note: The chart corresponds to question number 2.15 of the survey. Total (YES- 96.49%) (NO- 3.51%)

Source: Own elaboration

It is a fact that limited resources are a major impediment to integrate the use of ICT in education. The lack of computers and software in the classroom may limit the availability of teaching technologies. Also, institutions give little time to familiarize teachers with ICT, they do not provide network support, even when they are not confident enough in the use of technological tools.

Thus, teachers are slow in integration and adopt a position of resistance to change, believing in the philosophy of student-teacher-student relationship and no machine. However, some institutions make changes to meet the needs of the community in the use of technologies and increase resources, and that teachers need adequate facilities and training to take advantage of these facilities, in order to incorporate them into their teaching.

(b) The appropriation of technological tools for teachers is adequate, however, institutions may choose to act alone to promote the use of ICT, although largely the level of use of technology in the classroom depends on the sensitivity, skills, and attitudes of teachers towards these. It is evident that the attitude of teachers in the implementation of the educational use of ICT is valued on average at 58%. It is of significant importance of the attitude of management teams and teachers to include ICTs in teaching methods and curriculum, as they can influence when and how they can integrate them into their teaching, seeing them as an opportunity for improvement process.

On the other hand, the appropriation of tools by students is very favorable, 67% use the internet. Moreover, 75% of students have access to computers and, almost always, to technologies such as the Internet home for academic use. 61% frequently employed any technological novelty.

(c) Learning systems are immersed in a constant evolution, it came from an analog culture of paper, pencil, book, slate; There are now digital network environments, working platforms, languages digital books, and type text, numerical, iconic, visual and sound.

Despite these changes, the proficiency of students in ICT skills is favorable, reaching an advanced level in four types of technological knowledge: 50% search for information, 51% for Microsoft Word program, 46% for Microsoft Excel, 60% for Microsoft Power Point. They are experts in three technological fields: 63% in

communication and relationship; 39% in production of information; 63% in management and organization. On the other hand, regarding the knowledge of storage, the basic level is 46% and 40% beginner.

In this vein, 77% of students has an advanced expert-level technological skills, compared to 33% with beginner-basic level. All this implies the possibility of role changes towards a more flexible system for teaching and learning model, which some call the information society.

(d) Overall, the perception of the students about the resources in ICT is normal. They categorized as satisfactory to the facilities of the computer rooms. Other aspects such as the number of posts of computers and computer equipment classroom systems have a normal level of satisfaction. In contrast, the computer equipment of the class is an item that the students assign the level of unsatisfied.

(e) There is evidence that students consider technology as necessary for the process of education, 93% said that the ICT resources favor the acquisition of learning, simulated environments thanks to experimentation and direct contact. 90% say that ICT allow more interaction, equally, 79% of students estimated that the use of technology resources is more favorable to the acquisition of knowledge, compared to traditional teaching.

Regarding the context of the information society, educational models should adjust their learning, developing attitudes and practices that encourage a new educational vision through technology. The impact of ICT on student evaluations show positive results, digital skills are improved with the use of ICT.

Conclusions

The use of ICT allows education to become positive for schools, teachers, pupils, and parents. This paper confirms that the student population integrates technologies to the learning process, there are multiple factors with a higher incidence to enhance education. The technological resources conducive to learning acquisition, thanks to the simulated experimentation and direct contact environments.

New technologies are changing the lives of people, how they work, organize, relate, and learn in this way. ICT represents a significant change in the generation of knowledge for 65% of the student population.

Although this research was developed in Spain, the case study of the two high schools can be taken as a starting point for further research. It should be noted that the case studies have the distinction of serving as a guide for similar work, depending on the context of the same.

ICTs are spreading worldwide, in Colombia the Ministry of Information Technology and Telecommunications was created in order so Colombia as a country does not lag behind in the international arena. That is why within its functions is to increase and facilitate the access of inhabitants of the country in respect to the Information Technology and Communications, as well as its benefits.

In improving the teaching-learning system, involving multiple factors, the proper use of the (ICT) is one of them but not the only one.

The great dilemma of some educational institutions is between investing large amounts of money in ICT and the time in which to recover that investment. Many see it only from the monetary standpoint, forgetting that such investment in what must prevail is the social benefit.

More research like this, expanding the view of the influence of ICT in education must be made. Knowing the relevant factors is a breakthrough, however, other studies will delve into new factors and / or programs of higher education, to cite one example.

ICT progresses rapidly, to the point that today the newest soon becomes obsolete, the constant updating in this area should become an ongoing challenge.

The implementation of a program of ICT education requires rigorous training of teachers, especially those teachers who are not very familiar with these techniques. It is to harness the human resources available, for it to be a participant in the process of change. Likewise, it requires analysis of a variety of variables and the participation of all stakeholders in the process: government, educational institutions, teachers, students and society in general.

This research should be considered as a contribution to the scenario described in the preceding paragraph. Everything is made in favor of education will positively impact society.

Bibliography

- Alvira, M. (2011). *Cuadernos Metodológicos*, 35, 2ª. ed. Madrid: Centro de Investigaciones Sociológicas.
- Bebell, D. (2005). Technology promoting student excellence: an investigation of the first year of 1:1 computing in New Hampshire middle schools. Retrieved from: www.bc.edu/research/intasc/PPT/tpse12_1_04.ppt
- Burton-Jones, A. (Ed.). (1999). Knowledge capitalism: Business, work and learning in the new economy.
- Coll, C. (2007, pp. 1-2). TIC y Prácticas Educativas: Realidades y Expectativas, *XXII Semana Monográfica de Educación*. Madrid: Fundación Santillana.
- Comunidad Autónoma de Andalucía. (2014). And@red. Recuperado de: <http://www.juntadeandalucia.es/averroes/impe/web/portadaEntidad?pag=/contenidos/B/ProfesoradoEnRed/TIC/> [2014, 0526]
- Comunidad Autónoma de Castilla y León. (2014). Educacyl. Recuperado de: <http://www.educa.jcyl.es/es> [2014, 0523]
- Comunidad Autónoma de Extremadura. (2014). EducarEx. Recuperado de: <http://www.educarex.es/> [2014, 05/25]
- Comunidad Autónoma de Madrid. (2014), Educamadrid. Recursos TIC. Recuperado de: <http://www.educa2.madrid.org/web/coordinadores-tic> [2014, 05/28]
- Dewey, J. (1916). *Democracy and Education*. The Macmillan Company. Copyright renewed 1944. Jhon Dewey.
- Díaz, F. (2014). Las TIC en la educación y los retos que enfrentan los docentes. OEI, Organización de Estados Iberoamericanos. Recuperado de: <http://www.oei.es/metas2021/expertos02.htm>
- El Instituto Nacional de Tecnologías Educativas y de Formación de Profesorado del Ministerio de Educación, Cultura y Deporte. (2014). Recuperado de: <http://www.ite.educacion.es/> [2014, 05/21]
- Genmagic. (2014). Portal de creación e investigación multimedia. Recuperado de: <http://www.genmagic.net/educa/> [2014, 0522]
- Gil, A. y Berlanga, I. (2013). La interactividad en el aula. Un reto de la escuela 2.0. *Edmetíc. Revista de Educación Mediática y TIC*, 2(1), 56-75.

- Hermosa, P. (2014). *Blog Escolar Economía*. IES Ciudad de los Poetas. Recuperado de: <http://fallosdemercadoenyoutube.blogspot.com.es/2014/03/bienvenidos-al-curso-de-economia.html> [2014, 05, 15]
- Hernández, R., y Fernández, C. (1998). *Metodología de la Investigación*, segunda edición. México: Mc Graw Hill.
- Izcara, S. (2007). *Introducción al Muestreo*, Fondo Mixto de Fomento a la Investigación Científica y Tecnológica. Gobierno del Estado de Tamaulipas. 1ª ed. México.
- Ministerio de Educación, Cultura y Deporte Madrid. (2013). *Panorama de la Educación Indicadores de la OECD 2013*. Informe Español. Secretaría de Estado de Educación. Formación Profesional y Universidades. Dirección General de Evaluación y Cooperación Territorial. Instituto Nacional de Evaluación Educativa. Recuperado de:
<http://www.mecd.gob.es/dctm/inee/internacional/panoramadelaeducacion2013informe-espanol.pdf?documentId=0901e72b816996b6>.
- OECD. (2014). Last update. *Education at a Glance. Indicators. 2013*. Retrieved from: [http://www.oecd.org/edu/eag2013%20\(eng\)--FINAL%2020%20June%202013.pdf](http://www.oecd.org/edu/eag2013%20(eng)--FINAL%2020%20June%202013.pdf)
- (OECD). (2010). Organización para la Cooperación y Desarrollo Económico. 1-to-1 in Education: *Current Practice, International Comparative Research Evidence and Policy Implications*.
- Ohmae, K. (Ed.). (2000). The invisible continent: Four strategic imperatives of the new economy. Nicholas Brealey. London. Retrieved from:
http://recursostic.educacion.es/blogs/europa/media/blogs/europa/informes/1a1_en_educación_OCDE.pdf. Working Paper No. 44, pp. 2-23.
- Penuel, W. (2006). Implementation and effects of one-to-one computing initiatives: A research synthesis. *Journal of Research on Technology in Education*, 38, 329-348.
- Rockman et ál. (2004). Kamehameha Schools Maui Laptop Project Findings from Classroom Observations and Teacher Interview. Retrieved from:
http://www.rockman.com/projects/129.pase.maui/maui_laptop1_final.pdf
- Rodhe, B. (1971). New Educational Perspectives. *Religious Education*, 66(6), 429-439.
- Ross, S. & Strahl, J.D. (2005). *Evaluation of Michigan's Freedom to Learn Program*. Retrieved from:

http://www.techlearning.com/techlearning/events/techforum06/lesliewilson_mi_evaluation_brief.pdf

- Russell, M., y Bebell, D. & Higgins, J. (2004). *Laptop Learning: A comparison of teaching and learning in upper elementary classrooms equipped with shared carts of laptops and permanent 1:1 laptop*. Boston: Technology and Assessment Study Collaborative, Boston College. Retrieved from:
<http://www.bc.edu/research/intasc/researchprojects/laptopLearning/laptopLearning.shtml>
- Schaumburg, H. (2001). *Fostering girls' computer literacy through laptop learning*. Chicago, IL: Paper presented at the National Educational Computing Conference. Retrieved from: <http://www.notesys.com/Copies/necc01.pdf>
- Silvernail, D. & Harris, W. (2003). *The Maine Learning Technology Initiative Teacher, Student and School Perspectives: Mid-year Evaluation Report*. Portland, ME: Maine Education Policy Research Institute. University of Southern Maine. Retrieved from: <http://maine.gov/mlti/articles/research/Mid-Year%20Evaluation2003.pdf>
- Silvernail, D. & Lane, D. (2004). *The impact of Maine's to one-to-one laptop program on middle school teachers and students: Phase one summary evidence*. Portland, ME: Maine Education Policy Research Institute. University of Southern Maine. Retrieved from: <http://www.bryan.k12.oh.us/forms/mltiphaseone.pdf>
- TodoEducativo. Portal Educativo (2014). Recuperado de: <http://www.todoeducativo.com/> [2014, 0519]
- Tripero, T. (2010). La Psicología del Desarrollo de la Inteligencia Fílmica, Digital o Multimedia., *Revista Electrónica de Educación e Innovación Multimedia*, septiembre, pp. 1-10.
- UNESCO, Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura. (2004). *Las Tecnologías de la Información y la Comunicación en la Formación Docente. Guía de Planificación*. París. Recuperado de: <http://unesdoc.unesco.org/images/0012/001295/129533s.pdf>
- Yin, C.C., Kwok, H.N. y Magdalena, M.C.M. (2002). Economic Considerations in Education Policy Making: A Simplified Framework. *The International Journal of Educational Management*, 16(1), 18-39.