



**FACTORS AFFECTING THE EFFECTIVENESS OF ICT IN LEARNING TECHNOLOGY  
MEDIATION**

**FACTORES QUE DETERMINAN LA EFECTIVIDAD DE LAS TIC EN LA MEDIACIÓN  
TECNOLÓGICA DEL APRENDIZAJE**

**FATTORI CHE INFLUENZANO LA EFFICACIA DELLE TIC NELL'APPRENDIMENTO  
MEDIAZIONETECNOLOGIA**

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**ABSTRACT**

This article aims to analyze the factors that determine the effectiveness of ICT in learning technological mediation. The same is supported by the ideas of Moscardini (2015) MEN (2013); Yanes (2011), Tobon (2010); MEN (2012), Tedesco (2008), Martin (2008); Burbles (2008), Morrissey (2008) Heep (2008); Brunner (2008); Hard (2008) among others. It was developed following the methodology of the documentary analysis. In this logic, scientific documents such as text, peer-reviewed articles and reports of international conferences to identify experiences resulting from the application of ICT in various educational contexts

around the world, drawing from them some common factors that determine its effectiveness in education were analyzed. Finally, based on the observed coincidences various factors, economic, technological and cultural social order were analyzed. After analysis, it was concluded that the mere provision of technological resources in educational institutions does not guarantee the effectiveness of ICT in mediating learning. In this sense, the formulation of a strategic plan that takes into account the above factors in order to achieve effective technological mediation is considered essential.

**Keywords:** ICT, effectiveness, mediation, learning, effectiveness

### RESUMEN

El presente artículo tiene como propósito analizar los factores que determinan la efectividad de las TIC en la mediación tecnológica del aprendizaje. El mismo está sustentado en las ideas de Moscardini (2015), MEN (2013); Yanes (2011), Tobón (2010); MEN (2012), Tedesco (2008), Martín (2008); Burbles (2008), Morrissey (2008), Heep (2008), Brunner (2008), Duro (2008), entre otros. Se desarrolló siguiendo la metodología del análisis documental. En esa lógica, se analizaron documentos científicos tales como textos, artículos arbitrados y memorias de congresos internacionales para identificar experiencias derivadas de la aplicación de las TIC en diversos contextos educativos del mundo, extrayendo de ellas algunos factores comunes que determinan su efectividad en el ámbito educativo. Finalmente, partiendo de las coincidencias observadas se analizaron diversos factores de orden social, económico-tecnológico y cultural. Luego del análisis, se concluyó que la simple dotación de recursos tecnológicos en las instituciones educativas no garantiza la efectividad de las TIC en la mediación de los aprendizajes. En este sentido, se considera fundamental la formulación de un plan estratégico que tome en cuenta los factores antes mencionados a los fines de lograr una mediación tecnológica efectiva.

**Palabras claves:** TIC, efectividad, mediación, aprendizaje.

### RIASSUNTO

Questo articolo si propone di analizzare i fattori che determinano l'efficacia delle TIC nell'apprendimento mediazione tecnologica. Lo stesso è supportato dalle idee di Moscardini (2015) MEN (2013); Yanes (2011), Tobon (2010); MEN (2012), Tedesco (2008), Martin (2008); Gorgoglia (2008), Morrissey (2008) Heep (2008); Brunner (2008); Disco (2008) tra gli altri. E 'stato sviluppato seguendo la metodologia dell'analisi documentaria. In questa logica, documenti scientifici quali testo, articoli peer-reviewed e rapporti di conferenze internazionali per identificare le esperienze derivanti dall'applicazione delle TIC nei diversi contesti educativi in tutto il mondo, traendo da essi alcuni fattori comuni che determinano la sua efficacia in materia di istruzione sono stati analizzati. Infine, in base alle coincidenze osservati vari fattori, l'ordine sociale economico, tecnologico e culturale sono stati analizzati. Dopo l'analisi, si è concluso che la mera fornitura di risorse tecnologiche nelle istituzioni educative non garantisce l'efficacia delle TIC nel mediare l'apprendimento. In questo senso, la formulazione di un piano strategico



che tenga conto dei fattori di cui sopra, al fine di ottenere un'efficace mediazione tecnologica è considerato essenziale.

**Parole chiave:** ICT, l'efficacia, la mediazione, l'apprendimento, l'efficacia

## INTRODUCTION

In its constant concern to innovate and live up to the demands of the new knowledge society, many educational organizations make substantial investments to incorporate ICT in their management. However, in the process of defining strategies for its use; application and generation of knowledge, many myths arise that necessarily need to be identified and discarded, in order to ensure that such investment is not in vain. This logically would allow for reliable and timely information to ensure successful decision-making in relation to the design and implementation of strategies aimed at making its application effective in the technological mediation of learning. Although, in various contexts, debates have emerged as a result of questions raised by educational actors about their effectiveness; however, they constitute a great opportunity to analyze what the factors that guarantee their effective use are. The following is a theoretical construct based on the analysis of several conclusions generated in scenarios of scientific debate that seeks to warn some of them to conclude with some final considerations that guide the decision making in the design and implementation of strategies that are supposed to guarantee the effective incorporation of these technologies in the educational context.

## FACTORS DETERMINING THE EFFECTIVENESS OF ICT IN THE TECHNOLOGICAL MEDIATION OF LEARNING

The process of technological mediation generated from the incorporation of ICT in the educational fact, constitutes an innovative challenge that although it must be assumed with courage, it is no less true that its implementation requires a professional work that demands a process of making decisions where it is necessary to analyze information to formulate, implement and evaluate the strategies that are supposed to guarantee their effectiveness in the educational contexts where these technologies are incorporated.

In that logic, the analysis of information seeks to diagnose the educational environment and value diverse experiences resulting from the application of ICT in other contexts. This

process, in addition to noting the myths that emerge about the incorporation of these technologies, would allow obtaining truthful and timely information to identify the factors that determine its effectiveness when incorporated in the educational field.

Likewise, it is deduced that the realities and myths regarding the effectiveness of ICTs in the technological mediation of learning are determined once the information on these factors that may be of social order has been analyzed; economic-technological and cultural; in addition, articulate each other to make effective the incorporation of ICT in educational processes.

In fact, UNESCO - OREALC, (2007) cited by MEN (2013), considers the professional development of the teacher around ICT as a process where several efforts are articulated, among which the technological infrastructure is highlighted; educational materials design; the construction of innovative didactic proposals, school management, curricular adaptation and the construction of evaluation models. However, based on these points, it is easy to understand how the aforementioned organization according to Yanes (2011) defines ICT as:

"... a set of scientific, technological, engineering and management techniques used in the management and processing of information; their applications; computers and their man-machine interaction; and the associated social, economic and cultural content. " (p.33)

Therefore, it is important to note that these disciplines constitute a valuable tool for achieving the educational quality demanded by the world population, as long as they are duly articulated with the factors that make it possible to be effective and which are mentioned below:

### **SOCIAL FACTORS**

The social factors are those that guarantee the effectiveness of the technological mediation of the learning creating the necessary conditions for the correct interaction of the man with the ICT. This interaction involves the development of a set of strategic actions that seek to strengthen the social processes implicit in the exercise of effective

technological mediation. In light of the findings of the analysis of various conclusions generated in scientific debate, the following stand out: 1. Implementation of a system of coherent teacher training that includes strategies for dialogue with the scientific community; 2. Exercise of a technological mediation of effective and affective learning; 3. Development of social policies aimed at stimulating investment (public and private) in ICT as a tool for educational innovation.

### **IMPLEMENTATION OF A SYSTEM OF COHERENT TEACHER TRAINING THAT INCLUDES STRATEGIES FOR DIALOGUE WITH THE SCIENTIFIC COMMUNITY**

This factor ensures training for mediation; that is to say, it seeks to train teachers in the didactic management of ICT, materialized in the design and use of digital resources for learning and training in subjects of mediation such as commitment to education, didactics, pedagogy, diagnosis, planning and evaluation of learning. According to Martín (2008), training for technological mediation must necessarily enable teachers to take advantage of ICTs to plan in a strategic and non-technical way.

In light of these considerations, two indicators emerge from these processes and can be useful for measuring their impact on education; the first is student learning and the second; the transformation of teaching praxis. Nevertheless, this last indicator does not necessarily guarantee student learning, however, it makes possible the assessment of the impact that ICTs cause in the educational fact.

In this sense, the importance of these formative processes is deduced, so that Tedesco (2008, p.29) warns about the need to be accompanied by "instances of experimentation and evaluation", that is, to conceive training for Technological mediation as a complex and integral process, implies that it must be carefully monitored by experts in the field, in order to ensure an efficient process of incorporation of ICT, and efficient use of these technologies.

From that perspective, MEN (2012), in its experience of considering the consolidation of a system of training of educators that includes strategies for dialogue with the academic and educational community, confirmed the relevance and pertinence of these processes



when noticing the interest of the participants in relation to the subject, generating a climate of trust, co-responsibility and cooperative work.

Finally, the aforementioned Colombian educational institution asserts that this factor allows generating "autonomous and collaborative work scenarios" between managers and teachers, therefore, these scenarios become advantages that create the necessary conditions to assess and gradually improve the experiences generated by the incorporation of ICT in the educational event.

### **EXERCISE OF A TECHNOLOGICAL MEDIATION OF EFFECTIVE AND AFFECTIVE LEARNING**

This action seeks to guarantee effective learning from the incorporation of ICT in the educational fact; to achieve this purpose, it is necessary to consider the characteristics, interests and needs of the mediated subjects (skills in the management of ICTs, attraction for some technological resources and / or topics of interest, affective and pedagogical needs). In this sense, according to Burbules (2007), these aspects are connected and articulate among themselves in the process of mediated learning; that is, a process of technological mediation is effective only if based on the characteristics, interests and needs of students, can make them aware of their limitations, potentialities and possibilities in relation to their learning process.

However, these actions certainly assign a strategic nature to the technological mediation that requires commitment and creativity on the part of the mediator; nevertheless, it is feasible to apply them considering the interest of children and young people in ICT and the wide possibilities they offer in development of cognitive abilities.

Hence, Morrissey (2008) affirms that ICTs, as motivators, enable a more active and creative learning for both students and teachers. In this sense, they make possible the metacognition in these educational actors, defined by Tobón (2010) as the knowledge that has on knowledge itself; that is, from the incorporation of ICT in mediation processes, both students and teachers benefit from a series of stimuli that develop multiple cognitive skills; or what is equal, multiple intelligences.



In this same line of thought, Morrissey (2008, p. 88) in relation to an experience of incorporating ICT in educational institutions in Ireland states: "... the increase in motivation and use by advanced students is really significant, given that there is usually an apathy, even resistance of students to speak Irish ... ". To put these statements into context, it is important to note that this experience is part of a strategy that sought to stimulate students' motivation to speak their mother tongue through ICT. In this context, the author makes a positive assessment of the experience of incorporating these technologies.

These results coincide with the findings of Moscardini (2015) who, after conducting a research entitled Multiple Intelligences Development, incorporating information and communication technologies in universities, concludes that ICTs encourage students towards participation, work collaborative and interdependence between teams.

This reality inevitably leads to much more demanding challenges in terms of technological mediation, hence Burbules (2008) considers:

"... on this topic, students are often experts. There probably has not been a period in history when such an important aspect in education was more under the control of pupils than of teachers ... the interests, activities and ways of learning of young people are changing and guiding the path. And it's us who have to hurry to be with them." (p. 40)

The above statements justify the prevailing need to improve qualitatively and quantitatively the processes of technological mediation as preparation to adapt to the new knowledge society whose impact on education causes new forms of learning to emerge that at the same time demand new forms of teaching.

However, in this dynamic of adaptation Brunner (2008) warns of the risk of increasing the gap of inequality in the most vulnerable social sectors, therefore considers it important to know the socio-cultural characteristics of students to be considered in the process of technological mediation, in order to guarantee the equitable treatment in the approach of these processes. All these aspects are indicators that need to be considered in order to

increase effectiveness in schools, especially knowing that technologies alone will not improve student performance.

In this context, Heep (2008), being even more specific in relation to the above, considers that teachers should move from the administrative use of ICT to a more pedagogical use, considering the attitudes and skills most likely to be taught with ICT. It also recommends a comprehensive diagnosis to identify the possibilities offered by these technologies in each subject; this will obviously allow the development of effective strategies to organize the class and evaluate learning.

On the other hand, for Martín (2008) affirms that it is about using ICTs efficiently in the classroom. Therefore, within the framework of such a diagnosis, to know the meaning of these technologies for students; and above all, with which of them they have in their homes, in order to choose and contextualize the IT resources for technological mediation.

Finally, all these actions are aimed at achieving the cognitive independence of the mediated subject; This implies the transition from a style of technical learning to a more strategic one, adapted to the new knowledge society, which according to Morrissey (2008) makes them students for life. In addition, the aforementioned author states that what is involved is to take advantage of technological mediation to develop higher-level competencies that allow them to search sources, assess relevance, analyze, synthesize and reformulate data from the provision of any information. Now, starting from these ideas, educational managers need to question the extent to which it is appropriate to reformulate the policies and norms of educational institutions that prohibit the use of cell phones and other electronic devices that can be strategically harnessed in technological mediation.

#### **DEVELOPMENT OF SOCIAL POLICIES AIMED AT STIMULATING INVESTMENT (PUBLIC AND PRIVATE) IN ICT AS A TOOL FOR EDUCATIONAL INNOVATION.**

This factor, while not directly impacting the technological mediation of learning, is a dynamic aspect to improve teacher training in the use, application and generation of knowledge in relation to these technologies. However, experts in the field warn of the need for these policies to be guided by a coherent plan, with well-defined objectives and





strategies that facilitate the evaluation of their educational impact in the short and medium term. In this context, Brunner (2008), regarding the conditions required to incorporate ICT in schools, emphasizes that it requires:

"... the formulation of a national (or lower administrative level) strategy of introduction and innovation plans for schools; the identification of leaders at both levels (macro and micro); a favorable climate for innovation (...); sustained support for early adopters and innovators; opportunities for meaningful use and incentives for use. Clarity regarding the objectives sought (at the upper, intermediate and school levels). (p. 51)

In relation to the above, it can be concluded that the conditions for incorporating ICT in the school are based on the formulation of a coherent plan at national level, which should be properly articulated with other factors associated with the culture and the commitment of the actors involved. All these conditions should be considered in the framework of the development of social policies aimed at stimulating investment (public and private) in ICT as a tool for educational innovation. In addition, they ensure both the efficient use of these resources, and the return of economic investment materialized in educational quality.

In this context, the author believes that many ministers of education around the world, relying on the myth that the mere provision of ICT in educational institutions would improve student achievement, made substantial investments in these technologies, obtaining totally adverse results than expected. Hence the importance of incorporating them through a well-thought-out plan in terms of their formulation; duly articulated in its application and efficiently evaluated after its implementation, in order to correct and improve its failures.

Finally, it is important to distinguish between the social and pedagogical benefits that ICTs offer in order not to fall into the disillusionment that generates investing resources without the expected return; therefore, it is important to clarify that it is one thing to consider that the ICT management skills open the doors to the knowledge society and another very different is that they guarantee the students' cognitive development.

## ECONOMIC AND TECHNOLOGICAL FACTORS

These factors guarantee the sources of funding for endowment, maintenance and access to technological infrastructure in the mediation of learning; and according to Duro (2008), are managed based on a criterion of social justice that conceives the democratization of ICT as an action that ensures fundamental rights such as education and information.

In this sense, for MEN (2013) the exercise of these rights materializes with the availability and access of these technologies in educational organizations. Indeed, without the availability of these resources it is impossible to measure the impact of ICT on student learning. On the other hand, for Morrissey (2008) access to them implies having technological infrastructure duly configured to the educational requirements demanded by the educational service.

Therefore, in addition to having digital programs and resources with pedagogical intentionality, it is necessary that these technologies have a degree of complexity according to the abilities of the educational actors, in order to guarantee the efficient use of the same in the processes of mediation. In addition, regarding the classification of ICT resources Lugo and Kelly (2008) state:

"They can be divided into two main groups: 1. Digital educational contents, which are digital learning materials and productivity tools with which students and teachers interact at school (word processors, spreadsheets, etc.); 2. Equipment or hardware, ie computers, projectors, scanners, printers, networks, servers. Within the latter group, the Internet connection is usually included "(p.124)

Finally, the aforementioned author uses the characterization of these resources according to their nature as criteria for their classification. However, knowledge of this classification is important, since those who decide to manage economic resources to invest in technology must do so in the face of a feasible project that establishes priorities in relation to what is really useful.

## **CULTURAL FACTORS**

The cultural factors that determine the effectiveness of ICTs in the technological mediation of learning are those derived from habits, traditions, customs and styles of thought that at a given moment may or may not favor the effectiveness of these processes. In this line of thinking, from the review of several articles and reports of debates in scientific scenarios related to the subject, we could see that these factors are grouped into two large dimensions; those related to thoughts, customs, beliefs and traditions regarding the use of technologies and those related to the coherence between the Institutional Educational Project (Vision, Mission, Objectives, Policies, principles and norms) and the use of ICT. Therefore, in order to expand this information, the following is analyzed:

### **THOUGHTS, CUSTOMS, BELIEFS AND TRADITIONS WITH RESPECT TO THE USE OF THE TECHNOLOGY**

The thoughts, customs, beliefs and traditions regarding the use of ICT are a determining factor to guarantee their effectiveness in the educational fact, since they directly influence the technological mediation of learning conditioning their success or failure. According to Burbules (2008), when incorporating ICT in school, change must start from ideas; that is, the first thing to change is the negative conception of the same; then positive thoughts and ideas regarding ICT should be reflected in concrete social actions and practices that allow them to take advantage of their potential as collaborative tools that facilitate the use, distribution and generation of information.

Likewise, these thoughts stimulate the creation of a technological culture that creates a favorable climate to guarantee the effectiveness of these technologies when they are incorporated in the processes of mediation. Such actions in the opinion of Tedesco (2008) must be inspired by an innovative desire for constant experimentation. Logically, this desire allows to overcome the obstacles that impede the incorporation of ICT to the educational fact; These obstacles, according to Burbules (2008, p.38), are the product of "resistance to giving up familiar and comfortable customs" that create in many teaching professionals a zone of comfort from which they are not ready to leave. Within these

negative thinking styles that limit the incorporation of ICTs into the educational fact, the prohibitionist approach to technology, expressed through educational norms and policies that limit or exclude the use of ICTs as an element of distraction that hinders traditional mediation processes.

Finally, in spite of these adversities, for Brunner (2008) the educational challenges posed by the new knowledge society mean that the challenge of fully addressing the concept of school performance from a context-specific political, economic and social perspective remains latent. . Meanwhile, ICT continues to be validated as a proposal to promote these changes; however, Heep (2008) assures that until a technological culture can be consolidated that favors its effective incorporation into the educational event, the promises generated by the implementation of these technologies will continue colliding with an adverse reality to them.

#### **RELATIONSHIP BETWEEN THE INSTITUTIONAL EDUCATIONAL PROJECT (VISION, MISSION, OBJECTIVES, POLICIES, PRINCIPLES AND STANDARDS) AND USE OF ICT**

The relationship between the Institutional Educational Project and the use of ICT is another of the cultural factors that determine the effectiveness of the same in the processes of technological mediation and therefore is considered in the present analysis. In fact, from this binomial depends the transformation of the school through the TIC; which at the same time, according to Morrissey (2008) materializes in the concretion of three fundamental processes as they are, the organizational change, the investment in infrastructure and the teacher training; these constitute an inseparable triad that must be conceived and addressed as such within the organizational philosophy (Vision, Mission, Objectives, Policies, Principles and Norms), in order to create the necessary conditions to incorporate these technologies into the educational fact.

Finally, according to Morrissey (2008), the implementation of the actions mentioned above depends to a large extent on a properly planned, implemented and evaluated process with strict control and discipline, in order to achieve the expected objectives. This implies the deployment of a set of actions that create favorable conditions for ICT to be

successfully integrated into the educational event; these conditions according to the author are: the provision of these technologies to teachers and students; inclusion of ICT in the process of curriculum development and in the evaluation of learning; ICT teacher training; technological support to all educational actors; quality digital resources and finally the socialization of examples of good practices.

## CONCLUSIONS

When analyzing the factors that determine the effectiveness of ICT in the processes of technological mediation, it was found that these are grouped into three categories: social factors, economic - technological factors and cultural factors. Likewise, social factors are those that guarantee the effectiveness in the technological mediation of learning creating the necessary conditions for the correct interaction of the man with the ICT.

These are: the implementation of a system of coherent teacher training that includes strategies for dialogue with the scientific community; the exercise of a technological mediation of effective and affective learning; and the development of social policies aimed at stimulating investment (public and private) in ICT as a tool for educational innovation.

Likewise, economic and technological factors guarantee the sources of financing for endowment, maintenance and access to technological infrastructure in the mediation of learning; and are managed based on a criterion of social justice that conceives the democratization of ICT as an action that ensures fundamental rights such as education and information.

Also, cultural factors on the one hand are associated with thoughts, customs, beliefs and traditions regarding the use of ICT; and on the other have to do with the relationship between the Institutional Educational Project (Vision, Mission, Objectives, Policies, Principles and Norms) and the use of these technologies. These factors are considered determinants, since they condition the effectiveness of ICTs in technological mediation processes.

Finally, the mere provision of technological resources in educational institutions does not guarantee the effectiveness of ICT in the mediation of learning. Hence, it is considered



fundamental to formulate a strategic plan that considers the aforementioned factors in order to achieve effective technological mediation.

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