

INTEGRATION OF ICT IN EDUCATION: CURRENT SITUATION AND OUTLOOK

*INTEGRATION DES TIC DANS LE DOMAINE D'ÉDUCATION : ÉTAT DES LIEUX ET
PERSPECTIVES*

*INTEGRAÇÃO DAS TIC NO CAMPO DA EDUCAÇÃO: ESTADO ATUAL E
PERSPECTIVAS*

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Abstract. Information and communication technologies (ICT) are present in all areas of social, cultural, and economic life. These tools are now essential for successful social and professional integration. Over the past four decades, Moroccan universities have had to adapt to a rapidly evolving higher education environment, and more recently, to globalization and the Internet. The integration of ICT into Moroccan schools has become one of the strategic levers of the Ministry of National Education to improve the quality of teaching and learning. These technologies are of paramount importance in higher education for both university students and professors. Thus, teacher training on the use of ICT in the classroom, the creation of institutional structures, and the introduction of incentives for ICT innovation have represented the initiatives taken by the Ministry of National Education to support teachers and help them adopt ICT tools and incorporate them into their courses. Our study offers some reflections on the use of ICT in the Moroccan education sector. It highlights the current state of ICT use, shedding light on the opportunities and challenges encountered, such as the lack of teacher training and the absence of technological infrastructure. The lack of consideration of the contribution of ICT in defining educational objectives in various academic programs and the lack of guidance and support for the transversal and disciplinary skills students acquire through ICT in their personal spheres constitute one of the major barriers to the integration of ICT in education. The study also demonstrates the positive impact of integrating ICT into education, leading to improved teacher performance and increased student engagement. The findings emphasize the importance of quality training, accessible ICT resources, and effective school policies as key factors for the successful integration of technology in education.

Keywords: ICT; integration; education; teacher; learner.

Résumé. Les technologies de l'information et de la communication sont présentes dans tous les domaines de la vie sociale, culturelle et économique. Ces outils sont désormais indispensables pour une insertion sociale et professionnelle réussie. Au cours des quatre dernières décennies, les universités marocaines ont dû s'adapter à un environnement de l'enseignement supérieur en rapide évolution, et récemment à la mondialisation et à Internet. L'intégration de ces technologies de l'information et de la communication dans les écoles marocaines constitue l'un des leviers stratégiques du ministère de l'éducation nationale pour améliorer la qualité de l'enseignement et de l'apprentissage. Elles sont d'une importance primordiale dans l'enseignement supérieur pour les étudiants universitaires et pour les professeurs également. Ainsi, les actions de formation des enseignants à l'usage des TIC(s) en classe, la création de structures institutionnelles et l'introduction d'incitations à l'innovation dans les TIC(s) ont représenté les actions menées par le MNE pour accompagner les enseignants et les aider à s'approprier les outils TIC et à les utiliser dans leurs cours. Notre étude apporte quelques réflexions sur les usages des TIC(s) dans le domaine d'éducation marocain. Elle met en évidence l'état actuel de l'utilisation de TICE en mettant en lumière les opportunités et les défis rencontrés tels que le manque de formation des enseignants et l'absence d'infrastructure technologique. Ainsi, Le manque de prise en compte de l'apport des TIC(s) dans la définition des objectifs pédagogiques dans les différents parcours dispensés dans l'établissement et le manque d'orientation et d'encadrement des compétences transversales et disciplinaires de l'étudiant acquises par les TIC(s) dans sa sphère personnelle, constitue



l'un des freins majeurs de l'intégration des TICE(s). L'enquête démontre aussi, l'impact positif de l'intégration des technologies de l'information et de la communication sur l'enseignement, conduisant à une amélioration des performances des enseignants et à une augmentation de l'engagement des étudiants. Les résultats soulignent l'importance d'une formation de qualité, de ressources TIC accessibles et de politiques scolaires efficaces comme facteurs clés pour une intégration réussie des technologies dans l'éducation.

Mot clés : TICE ; intégration ; éducation ; enseignant ; apprenant.

Resumo. As tecnologias de informação e comunicação (TIC) estão presentes em todas as áreas da vida social, cultural e econômica. Essas ferramentas são agora essenciais para uma integração social e profissional bem-sucedida. Nas últimas quatro décadas, as universidades marroquinas tiveram que se adaptar a um ambiente de ensino superior em rápida evolução e, mais recentemente, à globalização e à Internet. A integração das TIC nas escolas marroquinas tornou-se um dos eixos estratégicos do Ministério da Educação Nacional para melhorar a qualidade do ensino e da aprendizagem. Essas tecnologias são de extrema importância no ensino superior, tanto para os estudantes universitários quanto para os professores. Assim, a formação de professores sobre o uso das TIC em sala de aula, a criação de estruturas institucionais e a introdução de incentivos à inovação em TIC representaram as iniciativas tomadas pelo Ministério da Educação Nacional para apoiar os professores e ajudá-los a adotar as ferramentas de TIC e incorporá-las em suas aulas. Nosso estudo oferece algumas reflexões sobre o uso das TIC no setor educacional marroquino. Ele destaca o estado atual do uso das TIC, lançando luz sobre as oportunidades e os desafios encontrados, como a falta de formação de professores e a ausência de infraestrutura tecnológica. A falta de consideração da contribuição das TIC na definição de objetivos educacionais em vários programas acadêmicos e a falta de orientação e apoio para as competências transversais e disciplinares que os alunos adquirem por meio das TIC em suas esferas pessoais constituem um dos principais obstáculos à integração das TIC na educação. O estudo também demonstra o impacto positivo da integração das TIC na educação, levando a uma melhoria no desempenho dos professores e a um aumento no envolvimento dos alunos. As conclusões enfatizam a importância de uma formação de qualidade, recursos de TIC acessíveis e políticas escolares eficazes como fatores-chave para a integração bem-sucedida da tecnologia na educação.

Palavras-chave: TIC; integração; educação; professor; aluno.

1 INTRODUCTION

As in many other sectors such as engineering, business and science, education is also confronted with the role of new information and communication technologies. It is not just a set of new technological practices that are being brought to education through information technology, but also new pedagogical approaches and methods of teaching and learning. Many countries around the world are joining this technological revolution because of its guarantee of high-quality education.

In Morocco, the GENIE program, which was set up in 2005, attaches great importance to integrating ICT into education. The aim of this program is to incorporate information technologies into the field of education, by defining four distinct axes: the improvement of infrastructures, content, training and the development of best practices in ICT. The aim of these areas is to encourage the use of information technologies by Moroccan teachers and to incorporate them into their teaching.

The incorporation of information and communication technologies into education is not just a new trend that is transforming the outward appearance of educational practices. Rather, it is a recent technological advance that ensures high-quality education.

However, even though many efforts have been made to integrate ICT into education in Morocco, several challenges remain. The difference in access to technological infrastructure between urban and rural areas remains a major issue. In addition, the GENIE program focuses on teacher training, but there are difficulties in mastering technological tools and adapting

traditional teaching practices to the new digital requirements. It is also crucial to create digital educational content that is relevant and accessible to all levels of education.

From this point of view, this move towards technology-mediated communication raises questions about pedagogical effectiveness, student involvement and the quality of interaction between teachers and learners.

It is vital to consider the current state of integration of ICTE into the education system in Morocco in this context. The aim is to understand the progress made, the obstacles encountered and the future prospects for effective and fair integration of information technologies in education. The aim of this article is to take stock of this integration, identify the major issues and suggest ways of improving educational communication in the digital age.

2 LITERATURE REVIEW

2.1 ICTE on a global scale

Nowadays, new technologies operate in various fields and ICT practices are undergoing a process of standardisation. In education, Pelgrum (2001) explains that "la croyance actuelle est que les TIC ne sont pas seulement les piliers de la société de l'information, mais aussi un catalyseur et un outil important pour induire des réformes éducatives". In this respect, many countries in the Arab world, such as Syria, Saudi Arabia, Qatar and Jordan, are concerned about the technological revolution.

In Syria, "l'adoption mondiale des technologies de l'information et de la communication (TIC) a constitué un jalon sur la scène éducative au cours des deux dernières décennies" (Albirini, 2004). Saudi Arabia is one of the countries that attach importance to the integration of ICT in education in general and in particular in the teaching of English as a foreign language (Alkahtani, 2001).

In Qatar, the Supreme Council of Education is introducing technology into education in order to improve it. In 1989, Qatar's Ministry of Education launched the Computer Technology Centre (CTC), which is based on teacher training and the use of computers in the administration of all state schools (Al Ammari, 2004).

In Jordan, King Abdullah II is encouraging the development of ICTs in an attempt to make Jordan the computer center of the Middle East, and in 2003 the "Education Reform for Knowledge Economy" project was launched to improve the education system and, above all, prepare young learners for the knowledge society (Abuloum & Qablan, 2008).

2.2 The impact of ICT on education

In recent years, substantial technological advances have had a profound impact on various facets of our daily lives, as noted by Sungur and Ateş (2023). This technological evolution extends to the field of education, where the integration of innovative tools has become crucial to enhancing learning experiences.

By highlighting the vital role of teachers' attitudes and innovative tools, it becomes clear that their collaboration is integral to the successful implementation of technology-enhanced learning experiences (Kianinezhad, 2023).

Furthermore, the impact of technology on education is reflected in its ability to improve the quality and quantity of teaching and learning. According to Choi and Joo (2021), technology contributes by providing dynamic, interactive and engaging content. This, in turn, fosters a proactive teaching-learning environment, ultimately improving the overall educational experience. The interaction between technology, teacher attitudes and innovative tools is emerging as a driving force in reshaping and improving the educational landscape worldwide.

Also, the integration of technology in education has proven to be a powerful tool to achieve efficiency and effectiveness in teaching (Taghizadeh and Basirat, 2022). Over the past two decades, "les programmes en ligne ont connu une croissance rapide à l'échelle mondiale et les universités ont adopté des systèmes de gestion de l'apprentissage pour proposer des cours flexibles et en ligne" (Son, 2019, p. 35). Among these advances, it is crucial to recognise the central role played by both teacher attitudes and innovative tools in the successful delivery of technology-enhanced courses in learning experiences (Koh et al., 2022). As online environments continue to evolve, recognizing and addressing the concerns of instructors becomes essential to fostering a positive and effective transition to online educational structures. The incorporation of information and communication technologies (ICTs) have the potential to not only inspire, but also motivate students in their learning endeavours (Tran, 2020).

This is particularly relevant in the context of the unexpected shift to online formats by universities following the suspension of face-to-face courses. Instructors found themselves grappling with unforeseen changes and began to explore innovative strategies to effectively connect with students and deliver high quality instruction in this new educational landscape (Nartiningrum and Nugroho, 2021).

On the impact of technology on education, Elder and Etta (2005) argue that "de nombreuses nouvelles technologies sont interactives, ce qui facilite la création d'environnements dans lesquels les élèves peuvent apprendre".

In this way, ICT is shaping education and providing new opportunities for teaching and learning. "L'objectif fondamental est de donner aux apprenants la possibilité de devenir des penseurs critiques, des résolveurs de problèmes, des citoyens compétents en matière d'information, des gestionnaires de connaissances et, enfin, des membres d'équipe capables de collaborer avec les autres" (Ibid, 2005, p. 163). This explains why the new technologies are giving students new roles, allowing them greater independence and more freedom in their learning.

Barnet (1993) explains that technology fosters learner autonomy by focusing learners' attention on certain metacognitive strategies such as planning, directing attention, self-monitoring, self-assessment and so on. There is no doubt that the use of ICT in education influences learners, who become more motivated and more committed to learning.

It is very important to note that ICT is also having a considerable impact on teachers' roles and practices.

Today's teachers face challenges in terms of technical skills, knowledge and expertise (Levin and Wadmany, 2008) in order to change the old approach to education and offer new opportunities and perspectives to the learner.

In this way, the old teacher-centered approach to education is evolving into a new student-centered approach. In other words, technology is determining new roles for both teachers and students, to minimize control and consequences for teachers and maximize manipulation and ease of use for students. With the use of technology, teachers have less power over teaching practices and are transformed into monitors and facilitators rather than holders and regulators of knowledge. This in no way negates the importance of teachers; the role of teachers is as important as ever, except that it takes on a different dimension in the new age of new technologies.

3 THEORETICAL FRAMEWORK

Information and communication technologies are mainly correlated with the second industrial revolution, which was based on electromagnetic technology associated with photography, integrated circuits, microchips, fiber optics and satellites. All these technologies

combined are called information technologies, which are represented in many advanced industries (Salam, 2003) such as the computer industry, the communications industry, etc.

There are many forms of information technology, such as satellite communication, radio and broadcasting, digital telephone networks, multimedia computer equipment, interactive systems, videoconferencing, CD-ROMs, local and global computer networks, virtual reality and computerized conferences, etc.

The concept behind integrating information and communication technologies into the learning process is not to add a new course to the curriculum, but rather to create a tool that adds a new dimension to the learning process, helping the learner to build an effective learning pathway for him or her to seek information, develop his or her skills and broaden his or her horizons by interacting in different ways from different sources. Thus, the integration of technology is achieved through the completion of schoolwork within the official curriculum (teaching/learning) using technological tools and methods that would not be possible in traditional classroom contexts (Haddad and Draxter, 2002).

So the principle of integrating modern technology into education is not to :

Teaching a new course on the computer, its program and its applications is mainly about using the skills and knowledge associated with information and communication technologies and integrating them into the learning process.

Train the apprentice in the use of technology once they have graduated and are entering working life, because these tools and resources are developing rapidly, and so they will be confronted with more advanced systems and applications. The aim of integrating ICT from the earliest stages of learning is to develop skills and behaviors, and a certain way of thinking capable of helping the apprentice to understand technology and facilitate their integration into the digital technological system.

The integration of information and communication technologies in education is represented in the following practices:

The use of modern information and communication technologies as a means of learning;

The use of computers as an administrative tool in educational establishments;

Provide additional resources for better understanding (multimedia: text, images and sound, etc.);

Students take on more responsibility, particularly in terms of acquiring knowledge, self-assessment and self-confidence;

Developing awareness to review, criticize and support research capacity;

Ensuring collective working conditions ;

Enhancing teaching methods ;

Enable learners to be more independent when it comes to seeking information, processing it and implementing it using special tools. This will help them to assess themselves, work on their personal development and be responsible towards their training;

Train learners to work collaboratively, either with a single group or within different groups;

Develop the role of the teacher by adopting a wide range of sources, which requires the implementation of new rules for cooperation between teachers and their environment;

Optimum use of programs and systems.

The education system is experiencing massive use of information technologies through the abundance of digital resources, programs and systems both on web portals and on CD-ROM or DVD. The Ministry of Education, through the evaluation of school results and assessing the management of the administration, has set up various educational programs for a value in both practices and strategies. A prime example is the MASSAR program (Department of Information Systems, 2013).

4 ICT IN EDUCATION IN MOROCCO

The desire to integrate ICTs into Morocco's education system is beginning to be felt, given the close links between the information/communication component and the education system reform workshops. The introduction of new technologies can strengthen both the internal and external efficiency of the entire education system, and the position of the student as the main element in the educational process, as already mentioned in the Emergency Plan implemented by the Ministry of National Education (2009-2012).

Since 2006, ICTs in Morocco have focused on a more gradual integration strategy, based on infrastructure, training and the development of digital content. Many schools were equipped with computers, multimedia rooms, interactive whiteboards and Internet connections available equally to educators, administrators and inspectors.

In recent years, the evolution of the integration of information and communication technologies (ICT) into the Moroccan education system has been characterized by strategic initiatives and significant investments. The GENIE program, launched in 2006, constitutes the cornerstone of this transformation. Between 2006 and 2016, approximately 85% of schools were equipped with foundational multimedia infrastructure. As part of pilot projects, 6,500 primary schools were provided with multimedia kits, and 100 schools were outfitted with interactive whiteboards. Furthermore, nearly 60% of educational institutions now benefit from secure internet connectivity.

With regard to professional development, all Moroccan educators have undergone training aligned with UNESCO's ICT competency standards. In addition, initiatives such as the IT Academy and the Microsoft Office Specialist certification program have enabled more than 100,000 teachers and administrators to obtain certification in advanced digital tools. Simultaneously, 148 GENIE training centers have been established across the country's regions to support this trajectory of progress.

Recent efforts have further accelerated the integration of ICT, particularly through innovative partnerships such as the "Code 212" program. This initiative aspires to train 1,000 next-generation doctoral researchers and establish 18 specialized centers by 2026. To support these ambitious goals, a budget of 68 million dirhams has been earmarked for 2024.

In conclusion, the major obstacles preventing ICT from being more effective in the educational process in Morocco is the fact that schools are not sufficiently equipped technologically, as is the case in many African countries (Karsenti, 2009) and the worst is the lack of teacher training. The percentage of trained teachers is 18% for basic training and 33% for in-service training (Collin & Harpper-erett, 2011).

5 CONCEPTUAL FRAMEWORK

5.1 The concept of ICTE integration

In education, a number of studies have looked at the phenomenon of integrating ICT into schools to study the role of ICT tools in teaching and learning, and analyze the process of integrating them into practical teaching.

Thus, the concept of ICT integration has been associated with various meanings, including that which we have found in the continuous and regular use of ICT tools in the classroom by teachers rather than by students.

In addition to regular use, Dias suggests a context that will encourage active learning and support teaching.

In addition, some studies have dealt with the integration of ICT in terms of the change brought about by technological innovations. Thus, ICT integration has been seen as the process

of achieving changing levels of ICT use in teachers' personal, professional and educational practice.

5.2 The concept of education

In Morocco, there are pre-school, primary, secondary and higher levels of education. The Ministry of National Education oversees school education, with a high degree of devolution to the regional level. Responsibility for higher education lies with the Ministry of Higher Education and Executive Training.

School attendance is compulsory up to the age of 13. Around 56% of young people attend secondary school and 11% higher education (Dupont, 2023). The government has launched several policy reviews to improve the quality of and access to education, in particular to combat the persistent problem of illiteracy.

5.3 The historical context of the education system in Morocco

It is worth mentioning that an inclusive national education system did not exist before the French protectorate in 1912; prior to French control, schools in Morocco were limited to madrassas (Koranic schools) open only to men (Freeman, 2010). During the French protectorate, schools were renovated to follow the French model: education system, curriculum expansion, attendance and number of schools. After independence in 1956, Morocco maintained the education system followed by the French.

Education was made compulsory in 1960 and reformed in October 1999 when the Ministry of Education published the National Charter for Education and Training. The latter declared 2000-2009 the "Decade of Education"; the reform focused mainly on school enrolment and literacy, but also mentioned methodological innovation.

The general organization of Moroccan education is the same as that of the French system; there are four main schools: nursery school (aged four to six/seven), primary school (aged seven to eleven), secondary school (in French: collège, aged twelve to fifteen) and lycée (in French: lycée, aged sixteen to eighteen). Schooling in Morocco is compulsory only up to the age of 15, and pupils choose whether or not to sit an entrance exam for the lycée (baccalauréat programme) (Ameziane, 1983).

5.4 The notion of ownership

When the notion of appropriation is associated with ICTs, it has a positive connotation in the literature, as it is generally desirable to try to appropriate ICTs in order to make the best possible use of them.

However, while the positive connotation of ICT appropriation does not seem to be uncontested, a common definition of the concept is as follows: far from being achieved.

Some describe it as the fruit of a process, like Proulx, who sees appropriation as the fruit of a sequential process, requiring, like Breton and Proulx, three social conditions: to appropriate a technical object, the individual must show a minimum technical and cognitive mastery of this tool.

Current practices will be creatively integrated into this mastery. In addition, it is essential that appropriation opens up opportunities for diversion, reinvention and direct user participation in the design process.

While other researchers see appropriation as the process itself, for example, De Vaujany sees appropriation as a long process that begins well before the phase of using the technical object and continues long after an "initial routinization of use".

He divides the appropriation process into three phases: 'pre-appropriation', which refers to the initial discussions on the evocation of a technical object, followed by the 'original appropriation' phase in which multiple socio-political and psycho-cognitive processes are active in the organization, with the possibility of the emergence of a tense relationship, then attenuated by the introduction of new routines, and finally, the final phase of the process with the final installation of routines.

6 TEACHERS' ATTITUDES TO THE INTEGRATION OF ICTE

Among the factors likely to influence the use of ICT in education are teachers' attitudes to technology. If teachers' attitudes are positive towards the use of educational technology, then they can easily provide useful information on the adoption and integration of educational technology.

Demirci (2009) conducted a study of teachers' attitudes towards the use of Geographic Information Systems (GIS) in Turkey. The study revealed that although obstacles such as the lack of hardware and software had disappeared, teachers' positive attitudes towards GIS were a determining factor in the successful integration of GIS into geography lessons.

For their part, Drent & Meelissen (2007) conducted a study of the attitudes that influence the innovative use of ICT by teacher educators in the Netherlands. A sample of 210 teachers was used for the study. Their findings revealed that a student-centered pedagogical approach; where the teacher educator's positive attitudes towards computers, computer experience, and personal entrepreneurship have a direct positive influence on teachers' innovative use of ICT.

Furthermore, a comparison of these factors in predicting computer use revealed that attitudes towards computers played a greater role in explaining teachers' use of ICT. In addition, educational theorists and researchers have realized that an important factor in the implementation of computers is users' acceptance, which is in turn influenced by their attitudes towards these media (Koochang, 1989). Teachers' attitudes have been found to be important indicators of the use of new technologies in educational contexts (Almusalam, 2001).

The successful use of technology in the classroom depends to a large extent on teachers' attitudes towards these tools (Lawton and Gerschner, 1982). In another study, Teo (2008) investigated pre-service teachers' attitudes towards computer use in Singapore. A sample of 139 pre-service teachers were assessed on their attitudes towards computers using a questionnaire comprising four factors: affect (liking), perceived usefulness, perceived control and behavioral intention to use computers. He found that teachers were more positive about their attitudes towards computers and their intention to use computers than about their perceived usefulness and their control over computers.

In fact, it has been suggested that attitudes towards computers affect teachers' use of computers (Kluever, Lam, Hoffman, Green and Swearinges, 1994).

Harrison and Rainer (1992) found that participants with negative attitudes towards computers were less proficient in computer use and therefore less likely to accept and adapt to the technology than those with positive attitudes.

They concluded that changing people's negative attitudes is essential to increasing their computer skills. Therefore, if teachers want to use technology successfully in their classrooms, they need to develop a positive attitude towards its use. Such an attitude develops when teachers are sufficiently comfortable with the technology and have mastered its use.

Research has shown that teachers' attitudes towards technology influence their acceptance of the usefulness of technology and its integration into teaching (Huang and Liaw, 2005).

7 THE ROLE OF ICT IN EDUCATION

7.1 ICT improves constructive learning

The use of technology enables university students to construct and direct their learning. According to constructivism, knowledge is considered to be socially and individually constructed.

In this field, learning is seen as the construction of meaning rather than the memorisation of facts. Teaching methods using modern information and communication technologies offer multiple opportunities for constructivist learning by proposing and supporting resource-centered and student-centered environments, thus encouraging learning linked to context and practice. This means acquiring meaningful skills in a realistic context, and doing so through authentic, interactive experiences that match the student's interests. Teaching must therefore focus on developing an environment conducive to the construction of knowledge rather than its transfer.

Today's students are different from those of the previous generation because the world in which they live has become an information-rich environment, thanks to the rapid development of ICT.

Students now play a leading role in their learning. They are keen to learn in the real world and to learn from real situations. The use of ICT in learning contexts supports various aspects of the construction of knowledge and, as more and more students use ICT in their learning, the impact of ICT will increase accordingly.

Universities therefore need to think globally to meet students' needs, create new relationships, design new programs and rebuild their understanding of the characteristics of fast-changing learning environments in order to encourage innovation, experimentation and facilitate the acquisition of relevant knowledge.

The collaborative nature of technology-enabled learning can provide opportunities for students to demonstrate their strengths and achieve class status, which would be difficult in traditional competition-based classroom environments. Through collaborative learning software or active learning, students can get involved in finding and presenting solutions to their own local concerns. In this way, technology can simulate real environments and promote learning by doing.

7.2 ICT reinforces egocentricity

The use of ICT in higher education has an immense power to promote egocentricity. It has considerably altered the role of the teacher, transforming him or her into a facilitator in the learning process.

Student-centered learning as a new pedagogical approach has been shown to be effective in teaching students. Its implementation is shown to be strictly emphasized to ensure that students "... sont responsables de leur apprentissage dans lequel ils peuvent construire leur apprentissage en recherchant activement leurs propres information".

ICT is potentially a powerful tool for widening educational opportunities as it encourages students to take responsibility for their own learning and offers problem-centered, inquiry-based learning that provides easy access to information-based resources. From this perspective, e-learning empowers individuals in an ever-changing society and fosters lifelong independent learning skills, not least through access to a wide range of up-to-date materials.

7.3 ICT improves design creativity

One of the most interesting aspects of technology in education is that it is used to enhance creativity.

Just as students are able to express themselves on paper and with a pen, they are able to do so on a computer. Computer technologies such as word processors, photo essays, DJ computer systems and other software allow students to express themselves through writing in a more natural, interactive and comfortable form. Students use a variety of multimedia applications such as a digital camera, scanner, Hyper Card, Hyper Studio, etc., to present their work in a highly professional format and complete a series of projects corresponding to the curriculum. Using these applications, they can generate documents and slide shows to demonstrate what they have learnt, and then share this with other students, with their teacher and even by email with people around the world. ICT therefore allows learners to explore and discover rather than simply listen and memorize or learn by heart.

Blogs are an example of how young people are using technology to express their creativity and be innovative. These applications offer a variety of ways for users to learn 'how to learn', which Rogers (1983) argues is a major component of creativity. The example of blogs shows that there are different ways in which students learn to write for an audience, to link their work to other work, to network with other bloggers and to use the blog for their eventual career path. In other words, it gives students the freedom to publish what they want and to comment on or share each other's material.

In addition, they have the opportunity to express themselves freely on subjects that interest them and to give free rein to their ideas. For example, students can get involved in organizing and managing a shared class blog, which will provide a common source of expression for the whole class. Blogging gives students the opportunity to take charge of their own learning and incorporate creativity into their learning process in a way that has never been possible before. Users can create new and valuable links between old and new knowledge through such activities.

In this respect, all these technological tools are creative triggers that help students to develop creative and critical thinking and other essential skills. They are readily and freely available, and teachers should integrate them into their curricula without hesitation, so that their students are never left behind when it comes to creativity and development.

7.4 ICT improves critical thinking

Students need to develop and refine their specific abstract reasoning skills. Knowledge does not come from dictating information and memorizing by rote, but from the ability to understand, synthesize and evaluate evidence. In this way, the use of ICT enables students to acquire higher-order cognitive skills in analysis and evaluation, helps them to acquire specific abstract reasoning skills and fosters their ability to think critically and creatively.

As a result, the use of technology in higher education has changed the way students think, learn and interact. This results in a more productive learning environment and empowers users as it helps them to develop a deeper understanding of topics relevant to the areas being studied. It allows students to do a lot of research and acquire valuable research skills that lead to higher levels of research. Because it is important that students understand the ethics and principles of using online content and assess the authenticity and accuracy of that content (what to use and what to avoid, where to trust, how to access accredited sources...).

In this vein, Polly says: "Il a été démontré que la technologie influence positivement les résultats des étudiants ; lorsque les élèves explorent des tâches riches en technologie qui nécessitent simultanément d'utiliser des compétences de réflexion d'ordre supérieur (HOTS),

telles que l'analyse ou l'évaluation d'informations ou la création de nouvelles représentations de la connaissance."

7.5 ICT improves collaboration

Research has shown that collaborative learning strategies and opportunities can enhance learner learning. These studies suggest that the introduction of computer-assisted asynchronous discussions as part of course assessment is a natural mechanism for encouraging 'collaborative' learning. The importance of the 'social' element of learning in these environments is substantial.

The application of ICT offers more opportunities for communication between peer learners, who can exchange information in real time, take part in discussions on blogs and forums, work in teams on different projects, exchange emails, search for and disseminate information by communicating with people using email elsewhere, such as students from another university or even another country.

In the educational context, networking could enable individuals to develop collaborative forms of learning.

Collaboration between students is said to be livelier when it is used to develop new ideas or to seek help from other members via an online environment. This translates into spontaneous discussion, collaboration and help from peers.

7.6 ICT and student motivation

Regarding the effects of ICT on student motivation, a number of specific motivational aspects have been identified, including increased engagement in the learning task, increased enjoyment and interest, increased self-esteem and increased independence and confidence. Similarly, there is evidence that the use of ICT can increase learner autonomy and self-regulated learner learning. "Students take greater responsibility for their own learning when they use ICT, working more independently and more effectively... ICT offers learners tasks better adapted to their individual needs and makes it easier for them to organize their own learning, for example through the use of digital portfolios.

Therefore, appropriate use of digital technologies in education can have an explicit impact on both student attitudes and outcomes. In this sense, teachers need to adopt a student-centered and inquiry-oriented pedagogical approach and practices that promote authentic student activities, independent work, knowledge acquisition and student responsibility.

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