Information technologies inside and outside the classroom

Tehnologiile informaționale în interiorul și în afara sălii de clasă

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DOI: 10.46728/c.18-06-2021.p157-163
CZU: 37:004

Rezumat: *Tehnologia este un mijloc de îndeplinire a unei sarcini, în principal prin utilizarea de procese, metode sau cunoștințe tehnice. Importanța tehnologiei în legătură cu orice tip de dezvoltare este recunoscută pe scară largă, mai ales dacă se ia în considerare contextul mondial actual Covid-19. Tranziția de la procesul de predare-învățare standardizat la cel digitalizat nu a fost ușoară.*
Tehnologia informației și tehnologia educațională sunt acum utilizate pe scară largă în școli și se referă la o multitudine de software și hardware utilizate în timpul lecțiilor. Învățarea devine eficientă atunci când elevii sunt implicați activ, colaborează, sunt responsabili de procesul lor de învățare, devin gânditori critici și rezolvă probleme creativ. Gândirea științifică apare atunci când se combină gândirea despre conținutul științei și setul de procese de raționament care pătrund în domeniul științei: inducția, deducția, proiectarea experimentală, raționamentul cauzal, formarea conceptelor,testarea ipotezelor s.a.m.d. În același timp, profesorii își continuă online procesul de învățare pe tot parcursul vieții, proiectează lecții digitale, gamifică lecțiile, obțin rezultate în timp real, fac parte din colectivul de cadre didactice de la școală și,de asemenea, dintr-un colectiv mai mare, mai divers, un colectiv virtual de cadre didactice. În concluzie, scopul utilizării tehnologiei în interiorul și în afara sălii de clasă este perceput ca o modalitate de individualizare a educației și de dezvoltare a competențelor și abilităților cognitive ale elevilor.
Cuvinte-cheie: *inovație, tehnologie, proiecte de cercetare etc.*

Abstract: *Technology is a means of accomplishing a task mainly by using technical processes, methods, or knowledge.The importance of technology in connection with any type of development is widely recognized, especially having considering nowadays’ worldwide Covid-19 context.The passage from standardized to digitalized teaching-learning process hasn’t been easy. Information technology and educational technology are now extensively being used in schools and refer to a wide multitude of teaching-and-learning–related software and hardware used during the lessons. Learning becomes effective when the students are actively engaged, are collaborating with one another, are in charge of their learning process, become critical thinkers and creative problem-solvers. Scientific thinking appears when thinking about the content of science and the set of reasoning processes that permeate the field of science: induction, deduction, experimental design, causal reasoning, concept formation, hypothesis testing, and so*

on, are combined. Simultaneously, teachers continue their lifelong learning process online, design digital lessons, gamify lessons, obtain real time results, are part of the staffroom at school and also part of a larger, more diverse, virtual staffroom. In conclusion, the goal of using technology inside and outside the classroom is perceived as a way to individualize education and to develop students' competences and cognitive skills.
Keywords: *Innovation, technology, research projects*

Technology, the educational system and COVID-19

Technology is a means of accomplishing a task mainly by using technical processes, methods, or knowledge. The importance of technology in connection with any type of development is widely recognized, especially having considering the impact that technology has on the success of any activity, process, business or fields of work.

In the context of today's rapid changing society and with the worldwide spread of the COVID-19 pandemic, technology has become an essential tool in continuing the educational, the social, the religious and the economical processes around the world.

In 2018, the whole educational system from kindergarten to elementary and to higher education has collapsed during the lockdown period. According to UNESCO, in 2017, approximately 264 million children and adolescents were not attending school and the pandemic made this situation even worse during these two years in which the world almost shut down. As the COVID-19 pandemic spread, because of the shutting down of schools, colleges and universities for an indefinite period time, the world has experienced a sudden transition from traditional teaching, in schools, to teaching online, in front of computers and smartphones, as this was the only option left. The passage from standardized to digitalized teaching and learning hasn't been easy, but the educational system managed somehow to recover.

Nowadays, an increasingly important role is played by information technology, that is the use of computers, tablets, laptops, storage units, networking devices and other electronical gadgets, and of various processes to create, store, secure, process, and exchange all forms of electronic data. Whilst new information technologies occupy an increasingly important place in our lives, as we become more and more 'connected' to our devices, we try to understand how the use of these tools can help us develop our teaching-learning methods and techniques, as well as our digital competences, on a professional level.

As far as education is concerned, the new 'digital age' determined a new type of approach to the educational phenomenon, through new communication and information technologies. Thus, a new kind of education that could be defined as 'media pedagogy' emerged. After almost 2 years of extensive online teaching and learning, the analysis of the virtual/ online education led specialists to the conclusion that a new perspective of approaching the educational process was born, in the conditions of postmodern society.

Educational technology, Information technology and scientific thinking

Educational technology is a general term used to describe a wide multitude of teaching-and-learning–related software and hardware that's increasingly being used nowadays in the classroom. The aim of educational technology is to create an improved, active, modern learning environment which facilitates collaboration and development in all aspects of the educational process for both teachers and students. It provides them with the ability to learn and grow in an environment that now uses now-common devices such as smartphones, laptops and tablets, in the detriment of traditional paper-based textbooks, notebooks and pens.

Information technology has influenced and continues to influence our world. Its ubiquitous presence changed and continues to change the process of teaching and learning in our education system. Teachers now use technology both inside the classroom, working face to face, or online with the students, and outside it, by preparing, planning, designing materials or by

researching and working together with other teachers in order to develop or to adapt their scientific thinking and their teaching style.

Scientific thinking refers to both thinking about the content of science and the set of reasoning processes that permeate the field of science: induction, deduction, experimental design, causal reasoning, concept formation, hypothesis testing, and so on. Scientific thinking is comprised of more complex operations than the empiric thinking. We might label a preschooler's curious question, a high-school student's “because..” answer to a problem-solving activity, and scientists' progress in mapping the human genome as instances of scientific thinking. Broadly defined, scientific thinking comprises the skills involved in inquiry, experimentation, evidence evaluation, and inference that are done in the service of *conceptual change* or scientific *understanding.*

Recent trends mention an increased focus on metacognitive and metastrategic skills and explorations of different types of instructional and practice opportunities that are necessary for the development, consolidation and subsequent transfer of such skills.

Phases of scientific thinking: inquiry, analysis, inference, and argument

The *inquiry phase* of scientific investigation is an essential one in which the goals of the activity are clearly formulated, the questions that are to be asked identified, and the remaining phases thereby shaped.

The *analysis phase* of scientific inquiry is made up of productive analysis; some part of the database must be accessed, attended to, processed, and represented as such.

When shifting from the analysis phase to the *inference phase*, a transition from procedural strategies to declarative claims is made. This phase involves inhibiting claims that are not justified, as well as making those that are.

A final *argument phase* of scientific thinking consists of debate of the products (claims) of the earlier phases, in a framework of alternatives and evidence. Acknowledging the centrality of argument to scientific thinking extends scientific thinking beyond traditional science and into the everyday thinking.

Preschool children for example are capable of coordination between a simple event claim and evidence regarding its truth, (e.g. they can verify whether the claim that ‘A lollipop is in the schoolbag’ is true or false). More complex claims, however, which presume greater resemblance to genuine theories, poses problems to school-age children. One such form of elementary theory is the imposition of a categorization scheme on a set of instances.

Information technologies inside the classroom

The use of information technologies gives the student, as the center of the educational process, a unique opportunity to increase his level of personal and professional development in point of computational, graphic and/or algorithmic culture, in the development of spatial reasoning and critical thinking skills, in the processes of perception, understanding, representation, etc. The goal of using technology in the classroom is perceived as a way to individualize education and to develop students’ competences and cognitive skills.

From the point of view of the educator, traditional teaching is to simply transmit the information, whilst new information technologies provide him with the opportunity to create personalized, digital content that can enable both the teacher, as creator of content, and the learner, as the direct beneficiary of it, to delve into its depth in a more creative, fun, interactive and collaborative way.

Learning becomes effective when the students are actively engaged, are collaborating with one another, are in charge of their learning, are critical thinkers and creative problem-solvers. The teaching-learning activities designed by the teacher should therefore use technology appropriately and should be competence-based. Digital technology, the internet and cloud computing, in the skillful hands of a well-trained and creative teacher, can easily lead

to innovative and interesting ways of learning such as active, learner-centred pedagogy. Therefore, the teacher should research, think, plan, design, adapt, create suitable, learner-centered, attractive activities that would develop his students' scientific thinking skills.

The importance of technology in education cannot be overstated. Inside the physical or the online classroom, the teacher uses technology to involve his students in engaging activities which are put into practice with the help of the internet, of a computer/ a tablet or a smartphone and sometimes of the video projector and of the speakers. These tools can facilitate the educational process and can be used for various purposes with the accent placed on the students. Young learners for example, when learning a new language, can be involved in: playing online educational games (spin the wheel, the billionaire game, the hangman, guess the word, crosswords, etc), in creating digital projects (digibooks, videos, blogs, plays etc), in doing research on a specific topic (task-based learning, the British culture for example, etc), in creating specific content (a song, a poem, a riddle, etc.), etc.

By making use of educational technology, teachers are able to use interactive textbooks, personalize educational materials, gamify lessons, take attendance, assign homework, create and administer quizzes and/or tests, obtaining real time results/ feedback related to the teaching material, its content, style and/or its format, at the same time, stimulating and developing the teacher's scientific thinking skills as well. But before applying all of these inside the classroom, the teacher has to make use of his scientific thinking skills in order to design digital lessons for his online classes, to create content for the educational games he will use, adapted to the students' age, learning style and learning environment, based on their level of knowledge and on the requirements of the national curriculum; to think of and to create rubrics for the students' oral presentation and/or written work; to collect and interpret results after administering test (charts, tables, matrix, etc.), and then to design remedial measures, etc.

Information technologies outside the classroom

Thanks to technology and to the accessibility and the wide spread of the internet, learning is no longer restricted to hours spent in a classroom, under teacher's supervision. Learning has become ubiquitous. Students can now learn anytime, anywhere.

The teachers now must be knowledgeable about technology and become self-confident enough to integrate it effectively in their work, inside and outside the classroom. In Romania, in order to be successful in their online teaching process, teachers were forced during the Covid-19 pandemic to acquire or to develop their digital skills mostly on their own, without or with little support from the authorities, making the passage from the traditional classroom to the online, virtual classroom even more difficult for them and their students. Both teachers and the Ministry of Education agree that the role of technology in the teaching-learning process and in teacher education is essential especially in today's sanitary context. However, although technology is available, there are still teachers who don't have access to it or are reluctant to use it.

However, most of the teachers use technology extensively outside the classroom for: continuing their lifelong learning process by taking online courses (MOOCs -Massive Open Online Courses), participating to webinars, symposiums, conferences, etc, planning and writing lessons, designing collaborative projects for their students, creating assessment rubrics for their students' examination, doing research and keeping up with the latest news regarding their school subject, taking part in international projects with their students (eTwinning, European Christmas Tree Decorations, etc), enrolling in social media dedicated groups of teachers for the exchange of experience, teaching techniques, educational resources and so on.

Advantages of using the new technologies

For the teachers, the advantages of using the new technologies, outside the classrom, for their own training, are numerous: the reduction of time consumption and of essential costs of continuing their education (commuting to another city for a training course, attending a conference in another country for example), the possibility of adaptating their personal program to an educational event (self-paced courses-MOOCs), the more rapid accommodation with changes and new knowledge in various fields, the numerous possibilities for extended interdisciplinary education and so on.

Teaching aids have evolved and have diversified over time, making the teacher's job a little easier; from printed course support to television learning programs during the Covid-19 spread (broadcasted live on national television or pre- recorded) to real-time interactive multimedia information broadcasted via the internet.

The teacher's role in the educational process

As a whole, the main part of a teacher's job takes place inside the classroom, surrounded by his students who are the focus of his educational process. However, as mentioned above, the teacher's job doesn't end there. The teacher is also part of the school as an organisation, a part of a network of teachers and the basis of education. The teacher interacts, continuously, with his colleagues in the staffroom, discusses with them his teaching practice, connects to senior teachers who serve as mentors, and learns from the experience of his colleagues.

In addition to the staffroom in their own school, the teachers of the 21st century also have a second staffroom. It's in fact a virtual staffroom that each teacher creates for himself, made of a group of teachers working in other schools or simply other people and other organisations working in the educational sector. This network is usually created on social media and it's both personal, each teacher deciding on who is part of this network, and also professional as the interaction is most of the time related to learning and to the job of a teacher.

By using technology and social media, teachers can follow interesting people or various organisations, they can discover or read about the opinions of different specialists in a certain field of work, they can inspire themselves and/or they can share professional content for other colleagues to use as an Open Educational Resource.

Examples of new information technologies that can be used by teachers and their students

1. **Digital libraries**

At both national and international level, global sources, accessible to everyone, were created from the combined desire of the most important sources of digital information.

Information resources are now perceived as including both the information itself and the information technology. The difference from the "traditional-type" resources and this type of resources is made by the fact that the information presented in this type of educational technology is quickly shareable, expandable/ compressible, easily replaceable, easily transportable, diffusible and intact even after repeatable uses.

2. Electronic journals

Electronic journals are the result of a complex editorial process containing references, or the result of a selection of materials (such as moderate publications within thematic groups), posted on the internet. Some of them are free, some aren't, some are academic and some are informal.

The Internet allows the editing and the fast distribution via e-mail of magazines, journals, electronic publications, etc. which can be automatically shared with a list maintained by a listserver, a list to which a person can subscribe via a simple "subscribe" message.

Advantages of using electronic journals include: the free format (no restrictions in point of the number of pages, size, shape, succession of numbers, etc), the fact that they're cheaper

than paper-based journals, the're faster distributed, they offers more convenient acces, they contain interactive texts which get the reader's attention more quickly, they're easy to transfer, they're accessible, etc.

Disadvantages of using electronic journals include: search results are often insufficient and costly, the cost of licenses, of acces and of information are accessible after paying/ making an account, etc.

3. Electronic books: e-books

With the fast and wide spread of information technology, the concept of ‚book' is being redefined as the dissociation between the content and its material support.

For an increasingly number of readers, the book no longer means the sheets of paper binded together on which it is published, but the content, the information itself, because the reader is now aware of the fact that what gives a book its identity is the universe it opens before your eyes, the feeling it gives you when you're reading it, and not its appearance, the physical representation of it.

E-books are fully interactive on the internet and they can contain links, images, graphics, tables, video files. They can be protected by a password and / or by user ID and you can access them after you pay a small amount of money for example.

Advantages of using e-books include: portablility (100 books can be carried on a readable device), can be downloaded free of charge from the internet or at a price way lower than the price of a printed copy; there are no expenses associated with packing, handling, transportation, etc.

Here are some examples of internet addresses which contain e-books: http://www.folium.ro, http://www.biblioteca.euroweb.ro, http://www.liternet.ro and http://www.e_librarie.ro.

4. Virtual museums

A virtual museum is a digitised version of a real-life museum. Many virtual museums offer free virtual tours, which give you the opportunity to walk through the museum, observe and examine different artefacts as if you were there in person.

The advantages of virtual museums are numerous as well: blended learning with entertainment, resurrection of students' interest and curiosity for places and cultures lost to time, the possibility to explore for free destinations beyond the visitor's wildest dreams, no waiting on line for hours, and so on.

5. 3D printing

3D Printing is the process of transforming a three-dimensional digital model into a physical object, typically by laying down many successive thin layers of a special material. It can bring the digital representation of an object (its CAD representation) into its physical form by adding layer by layer of materials.

Advantages of this new technology: it's easy and fun to use, it stimulates creativity and handiness, it allows for the design and print of more complex designs than traditional manufacturing processes, it minimises waste, it's cost effective and it's made of strong and lightweight parts.

6. Virtual reality

Virtual reality (VR) is a simulated experience that can be similar to or completely different from the real world. Applications of virtual reality include entertainment (example: video games), education (example: medical training) and business (example: virtual meetings).

Conclusions

In conclusion, I can say that, information technology is now an important part of the educational process and, for the teacher, it represents an important tool that helps him transmit,

in a more effective and interactive way, the knowledge to his students. The 21st century learner needs a 21st century teacher!

And I think the best way to conclude this article would be by leaving an inspirational quote by John Dewey – author, philosopher, educational reformer- which states that: „If we teach today's students, as we taught yesterday's, we rob them of tomorrow. How we teach must reflect how our students learn, it must also reflect the world they will emerge into. This is a world that is rapidly changing, connected, adapting and evolving.”

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