



Innovative Teaching and Learning Method Using Information and Communications Technologies

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Abstract: *The paper provides an overview of digital technology integration in education, from computers to other more advanced forms of Information Technology, through which teachers and students use innovative methods in the educational process. The schools and universities use a diverse set of Information and Communications Technologies (ICTs) solutions to communicate, create, store, and manage information in any contexts. ICTs have also become intrinsic to the teaching-learning interaction. In this digital era, ICTs are essential for giving students opportunities to learn and apply the required 21st-century skills. ICTs are essential for teachers in performing their role of maker of pedagogical environments. The advantage of ICTs in education is that students can learn from extracurricular materials. ICTs develop higher-order thinking and reasoning skills.*

By integrating ICTs into education, students become more interested in learning, thanks to new technologies that make learning amusing and creative, improving learning in many ways. ICTs encourage collaboration when students work as a team and improve communication skills when students discuss and study together.

In this paper, one proposes a new teaching-learning methodology based on ICTs. This methodology consists of the transmission in advance to the students of the course support to inform them about the topics to be addressed. At the time provided for the respective lecture, one will present to the students the course support using the video projector, and one will comment/analyze the content of the course, bringing clarifications and additions. This educational approach combines digital components on-line with face-to-face learning instruction. With the proposed methodology one can plan such courses to increase motivation, provide more feedback and help students learn on their own. ICTs help the teacher to present his teaching attractively.



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1. INTRODUCTION

Information and Communications Technologies (ICTs) can assist students when teachers are digitally literate and understand how to incorporate them into the curriculum. Teachers demand specific professional development opportunities, to increase their ability to use ICTs and to encourage student interaction and collaboration.

Without this support, teachers are inclined to use ICTs for skill-based applications, limiting student academic thinking.

Schools use a diverse set of ICT tools to communicate, create and manage information. ICTs have become integral to the teaching-learning interaction, using students' own devices for

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learning during class time. At home, the students can watch lectures on the computer and they use classroom time for more interactive exercises.

ICTs can have positive effects on student learning when used appropriately and effectively. There is a need to assess the potential of ICTs to enhance it and empower students with the knowledge and skills they need to understand the course. When students are trained to use ICTs, these techniques can lead to higher-order thinking skills and can furnish students with creative and personalized options for their understanding of various course topics (Ghory & Ghafory, 2021).

2. COMMON EDUCATIONAL APPLICATIONS OF ICT

Common educational applications of ICTs include:

- One laptop with Bluetooth and WiFi connectivity, per student. Laptops combine numerous of the input/output components and capabilities of a desktop computer into a single unit. A laptop includes a display screen, small speakers, a keyboard, and a pointing stick. Most ultramodern laptops include a built-in webcam and microphone, and a touchscreen.
- Tablets: Tablets are small personal computers with a touch screen, permitting input without a keyboard or mouse. Cheap learning software (“apps”) can be downloaded onto tablets, making them versatile for learning. The effective apps develop advanced order thinking skills and furnish creative and personalized options for students
- Smart Boards: Interactive whiteboards permit projected computer images to be displayed, manipulated, or copied. At the same time, handwritten notes can be interpreted on the board and saved for future use. Interactive whiteboards are connected with whole-class instruction instead of student-centered activities. Student engagement is in general higher when ICTs are accessible for students throughout the classroom.
- E-readers: E-readers are electronic devices that can hold numerous books in digital form, and they are more and more utilized in the delivery of material support as tutorials. Students use e-readers for independent reading.
- Flipped Classrooms: The flipped classroom model, refers to lecture and practice at home via computer-guided instruction and interactive-cooperative learning activities in class.

3. THE INFRASTRUCTURE FOR ICTS

ICT infrastructure refers to the accessibility of computers, access to the Internet, and all other correspondent facilities that are associated with the use of ICTs. Digital learning materials include all the digital educational content and tools that teachers use in their educational practice. The fundamental elements to support teachers’ pedagogical use of ICTs are infrastructure, digital learning materials, expertise, and imagination.

These elements are given from the “technology-driven” innovation approach:

- ICT infrastructure - the availability of computers, interactive whiteboards, and Internet connection;
- Digital learning materials - their use of computer programs in teaching and their use of digital learning materials from various sources;
- Expertise - their familiarity with ICTs, level of skills for utilization, and pedagogical ICT skills;
- Vision - their pedagogical vision of using ICTs for knowledge creation and transfer of knowledge.

School policies need to provide schools with acceptable infrastructure for ICTs, including stable and inexpensive internet connectivity and filters and site blockers such as security measures.

Teacher policies demand to target basic ICT literacy skills, their use in pedagogical settings, and discipline-specific. Successful implementation of ICTs requires their integration in the curriculum. Technical, human and organizational support are needed to ensure effective use of ICTs.

Numerous digital learning programs and platforms have been developed and made independently available to teachers and students. The availability of Internet, hardware, and software is initially necessary but needs to be complemented by empowered schools.

The use of ICT equipment implies into professional development of teaching staff, school goals, teachers' views on ICT outcomes, and their self-efficacy with ICTs. ICT infrastructure is a necessary condition for teachers' ICT use.

Teachers need to have prompt access to the necessary technology, and they need to have the time and possibility to use this infrastructure in their practice. When delivering ICTs into classrooms, policies should establish infrastructure and bring in sustainable and easily upgraded ICTs. Some schools allow students to bring their mobile technology, such as laptops, tablets, or smartphones into class rather than providing such tools to all students. This practice is called Bring Your Own Device.

It allows students to use their own devices at school for educational purposes with the permission of the classroom teacher. This practice increases the amount of technology available in the classroom, giving the students more access to technology devices for learning. This allows students to manage their time to access the online learning environment during class (Moşteanu, 2021).

Using ICTs is understood as technological development in pedagogical methods for education (Limniou, 2021). ICTs use tools such as telephone, fax, computer, data projector, and smart board based on various software such as word processor program (MS Word), calculation and table program (MS Excel), presentation preparing program (MS PowerPoint), website designing programs. Mobile devices can also offer programs ("apps") that provide extra support to students.

4. COMBINED LEARNING AS PEDAGOGICAL METHOD

Teaching-learning methods are the methods that are put into practice in the teaching and learning processes. The teachers need to be well aware in terms of the teaching methods. These are regarded as the key factors in the transmission of knowledge and understanding to the students in terms of academic concepts and lesson plans.

Combined learning is used to make higher education more accessible to students. The online activities allow students accessibility to the learning materials, when and wherever they want. In addition to this increased accessibility, combined learning offers opportunities to provide students' individual needs and attain real personalized subject matter.

For example, the popular flipped classroom approach proposes a combined learning method to reserve the necessary time for student questions, in-depth discussion, and personal feedback. Students will prepare in advance for learning activities online, according to their levels of understanding.

The implementation of combined learning in higher education is increasing, with the aim to offer flexibility for study, in terms of time and place, for varied student populations. Student populations in higher education are becoming more and more diverse. However, specific attention to the diversity of this group, and how to provide individual needs, is still necessary (Rugube & Govender, 2022).

The combined learning methodology presented in this paper consists of the transmission in advance to the students of the course support to inform them about the topics to be addressed. At the time provided for the respective lecture, we will present to the students the course support using the video projector, and we will comment/analyze the content of the course, bringing clarifications and additions. This educational approach combines digital components online with face-to-face learning instruction.

This approach helps students learn on their own and be better able to integrate new information. The teacher designs such courses to increase student motivation, and to receive more feedback from students. ICTs help a teacher to present his teaching attractively, for the learners at any level of educational programs.

Combining face-to-face activities with online activities thus holds great potential for organizing differentiated instruction in higher education. Such learning methods typically involve differentiated instruction, which provides different paths to learning concerning students' individual needs.

5. INNOVATIVE METHOD IN LEARNING-TEACHING PROCESS FOR PRACTICAL PROJECTS

The innovative combined learning methodology proposed, suppose also the use of ICTs in practical projects that accompany the theoretical courses. In this article, one analyzes an example of the architectural design. A building is a perfect example of such a project. In architectural design, modeling is a process of translating conceptual ideas into visual forms. From its origins, the idea of modeling has been the same, but it has taken on many forms of expression. These expressions are principally the result of technological advances in producing imagery, using ICTs in the thinking process of the project (Drossel et al., 2020).

Design thinking is an iterative process that design teams use to understand the needs of beneficiaries. The design thinking process is a collaborative process by which the designer's sensibilities and methods are employed to answer people's needs by redefining the project data. Design thinking converts needs into demands which helps designers become more innovative and more creative.

Currently, the technical development of a product begins with the numerical analysis and simulation of the product, carried out in a virtual scenario using ICTs (Chu & Kao, 2020). An intelligent design needs to start with a complete virtual model. Three-dimensional modeling and visualization in motion introduce a new dimension to the architectural representation of an intelligent building Jiang (2021), used to make optimization decisions.

The main distinctive feature of Virtual prototyping is its capacity to create realistic scenarios, and its "openness", to perform experimental research regarding intelligent buildings (Brocca, 2023). It is important to note the contribution of Virtual prototyping for the activities related to the new architectural model development for intelligent buildings.

The virtual prototype of a building starts with the virtual model of basic structures and lead to more complicated cases for an intelligent building, which must include the components for automation (Tai, 2023).

In our example, from rendering in numerous scenarios of building, a frame is shown in Figure 1, which presents a virtual model of an intelligent building.

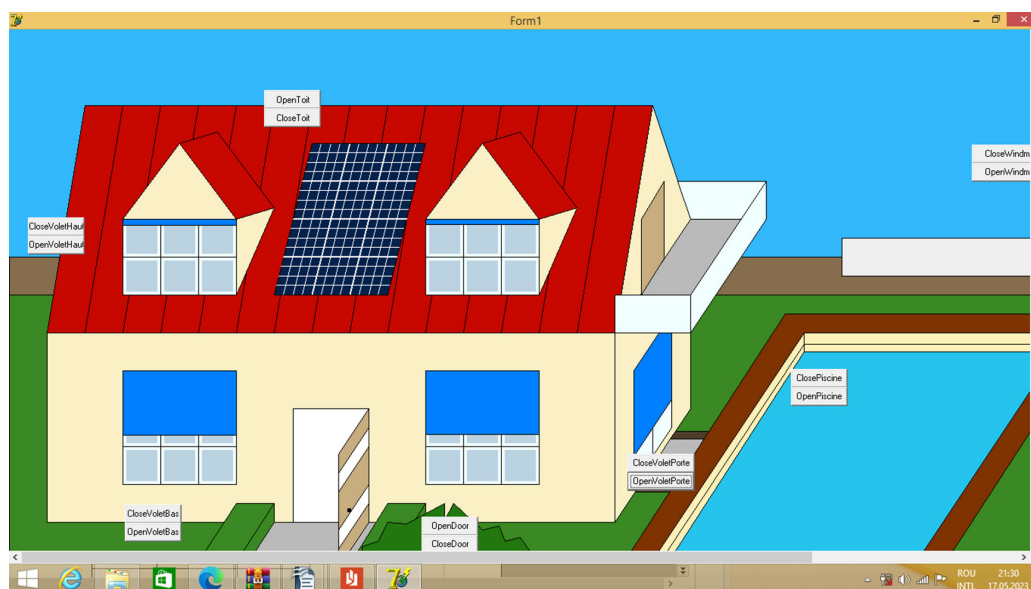


Figure 1. Using of virtual prototype for evaluation design in an intelligent building – virtual model with control systems

Source: Own elaboration

The virtual system makes it possible to design different housing plans and to adapt these plans to changing needs. Any construction modifications can be made in the design stage. The users (buyers) can become involved just before the project's completion to declare their preferences. Inevitably, traditional ways of thinking and working had to make way for more innovative approaches such as virtual prototyping.

6. CONCLUSION

In the teaching and learning process, using ICTs are capable of supporting the process of sharing experience and information with others. Computer access, internet access, technology competences and preferences of students, regarding online learning, are the major factors that have been predicting the intention of teachers regarding the use of “ICTs in the teaching and learning process”.

Using ICT equipment efficiently is a challenge for teachers as it requires knowledge at a high level of technology but it improves the teaching process and that has a positive influence on the learning process.

Implementation of ICTs makes the teachers capable of motivating students and developing an interest in the learning process that can serve a better result at the end of the entire educational system. In addition to that, ICTs are engaged in promoting technology literacy and supporting the distance learning process. Digital technology integration in education is one of the helpful teaching-learning techniques, able to prepare the learner for the competitive real world.

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