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DIDACTIC PROPOSAL BASED ON FLIPPED CLASSROOM AND LEARNING OBJECTS

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Abstract: Second semester students of the Business Management Engineering degree at the ``Tecnológico Nacional de México``, Campus: Instituto Tecnológico de Aguascalientes and, in particular, those who take the subject of Executive Application Software, present an area of opportunity in the use of ICT in their learning process. The objective of this research project was to implement the innovative teaching strategy of the Flipped Classroom and Learning Objects (LO) as a technological tool to determine its impact on learning and encourage the active participation of these students. This proposal was applied in two stages and with a sample of 27 students who make up the group of the Executive Application Software subject.

In the first stage, a survey was applied to the entire group to determine their preference in the use of ICT in their teaching-learning process. In the second stage, the group of students was divided into two subgroups, one of 14 students and another of 13 students. The innovative teaching strategy of the Flipped Classroom and the use of a Learning Object on the Internet topic corresponding to Unit 4 of the previously mentioned subject was applied to the subgroup of 14 students with the objective of determining the academic performance of the students under this proposal and with the use of game-based learning; while the traditional teaching methodology was applied to the subgroup of 13 students. The results obtained within this second stage were satisfactory for those students who have gone through the ICT-based learning process than those who have had a traditional learning process. It is concluded that, with the systematic use of innovative teaching methodologies in the ICT-based classroom, students' academic performance will increase.

Keywords: Flipped Classroom, Learning Object, Information and Communications Technologies, Game-Based Learning.

INTRODUCTION

Teaching has become more personalized with the use of adaptive technologies and virtual classrooms have expanded the possibilities of interaction and participation. In addition, Information and Communications Technologies (ICT) have promoted the acquisition of digital skills essential for success in today's society. Despite the challenges, the positive influence of ICT in education continues to grow, contributing to the formation of more skilled and connected students in this digital century [19].

Likewise, ICTs have radically transformed the current era, triggering significant changes in various aspects of society, and education is no exception. The integration of ICT in education has democratized access to knowledge, allowing students around the world to access educational resources online, collaborate on remote projects and benefit from digital learning platforms.

On the other hand, teaching work is transformed into a function more aimed at facilitating active learning and promoting key skills, such as critical thinking, problem solving and digital literacy. Teachers must take on a guiding and facilitating role, leveraging technologies to personalize teaching, adapt to individual learning styles, and promote collaboration.

The incorporation of digital tools and online resources is essential, and teachers become curators of information, teaching students to evaluate and use resources critically [9]. Teaching becomes more student-centred, encouraging autonomy and creativity, preparing students to face challenges in an increasingly digital and changing world.

With the implementation of innovative teaching strategies, such as the Flipped Classroom, in combination with ICT, such as Learning Objects (LO), skills and abilities can be developed that could allow students to

students take an active role in their learning and academic training beyond the classroom context.

The main objective of this research project is to determine the academic performance of the students of the subject Executive Application Software, of the Business Management Engineering program belonging to the Tecnológico Nacional de México Campus Instituto Tecnológico de Aguascalientes, through the combination of the approach Flipped Classroom pedagogy and LOs with emphasis on an evaluation based on digital games.

The content of this research project begins with the relationship that exists between teaching strategies and didactic strategies, then the active learning methodology of the Flipped Classroom is addressed along with the ICT that complements it.

The results section demonstrates the increase in students' academic performance thanks to the application of the Flipped Classroom pedagogical approach, LOs and learning based on digital games. Finally, the conclusions and bibliographic references consulted are presented.

THEORETICAL FUNDAMENT

TEACHING STRATEGIES AND TEACHING STRATEGIES

Teaching strategies refer to the planned actions and decisions made by the teacher to achieve educational objectives in a broader context. It includes aspects such as the organization of the curriculum, the selection of general methodologies, classroom management and learning evaluation.

On the other hand, teaching strategies focus on the specific actions that the teacher implements to facilitate student learning in a more immediate context, that is, in the classroom. It includes specific techniques and

methods, the choice of teaching resources, the application of activities and adaptation to the individual needs and characteristics of the students.

From the above, it can be said that the teaching strategy addresses more general and structural aspects of teaching, while the didactic strategy focuses on the specific and practical actions that the teacher carries out to promote learning in the classroom. Both are complementary and essential for the success of the educational process [16,17].

FLIPPED CLASSROOM

The term “Flipped Classroom” is often associated with the work of American educators Jonathan Bergmann and Aaron Sams, who wrote a book outlining a method for flipping the classroom in which teachers’ traditional oral presentations are replaced by videos that students watch as help outside of class [3].

The teacher can provide videos, texts or any other online help material as a means of establishing a first contact with the information. In conventional classrooms, a student’s fleeting inattention during a teacher’s presentation could be enough to prevent understanding of an explanation.

Alternatively, students can study at home at their own pace in a flipped classroom, where you can pause or rewatch the videos as many times as you see fit. With a change in the roles of the teacher and the student, these exercises encourage interaction between students, as well as between students and the teacher.

GAME-BASED LEARNING

Active learning is an instructional model where students take responsibility for learning. Students must do more than listen to learn: read, write, discuss, or engage in problem solving. “Doing things and thinking about the things you are doing” is what is required in

active learning [4].

Among the different active learning methodologies that have been relevant over time, we can mention collaborative learning, cooperative learning, problem-based learning, project-based learning, game-based learning, among others and, which currently continue being methodologies subjected to constant study [11,21,22].

In particular, game-based learning is a strategy used in the classroom from infancy through elementary school. However, the phenomenon that combines learning with different games has recovered in secondary and higher schools mainly thanks to the introduction of digital games to support and improve teaching, learning and assessment. The concept of game-based digital learning has been created, which is considered “an effective strategy to motivate the student and to engage in active learning experiences”; demonstrating its effectiveness in various studies [2]. Game-based learning has given rise to several areas of research such as “Serious games”, “Edutainment” [5], “Pervasive games” [13], “Augmented reality games” [5,14,15,20].

EVOLUTION OF ICT IN EDUCATION

The evolution of the use of Information and Communication Technologies (ICT) in education has experienced several stages over time [18].

In the 1980s, computers began to be introduced into classrooms, primarily as tools for developing basic programming skills and accessing information through CD-ROMs. In the 1990s, with the growth of the Internet, schools adopted network connectivity. Electronic learning (e-learning) began to gain popularity.

At the beginning of the 21st century, specific educational programs were developed and the creation of digital content was promoted to improve teaching and learning. In the 2010s,

the rise of mobile devices such as tablets and smartphones allowed for more flexible access to educational resources.

In the mid-2010s, online learning platforms emerged and Massive Open Online Courses (MOOCs) gained popularity, offering free or web-accessible courses, providing educational opportunities globally. Currently, ICT education has evolved towards the personalization of learning, using artificial intelligence to adapt to the individual needs of students.

LEARNING OBJECTS

This term was introduced by Wayne in 1992 and has been defined by several authors, which has led to it being used and identified through synonyms, such as learning object, reusable learning objects, reusable knowledge object and knowledge capsule. [12].

In 2001, David Willey defined it as “any digital resource that can be used to support learning.” In the case of the Polytechnic University of Valencia, he defines it as “the minimum unit of learning in digital format, which can be reused and sequenced” [1].

To be considered a learning object, the educational resource must be in digital format, with a pedagogical purpose, with interactive content, be indivisible and independent, and be reusable.

The use of LOs in the teaching-learning process offers advantages for both students and teachers. In the case of students, they can access the content of the OAs regardless of the platform and hardware and at any time they wish. In the case of teachers, it offers other alternatives for learning and programs can be adapted to the specific needs of students, effectively provoking their motivation and, therefore, participating in active learning experiences. [6].

MATERIALS AND METHODS

The group of the subject of Executive Application Software of the second semester has been chosen because they are students who are starting the educational program of Business Management Engineering where the use of ICT in the teaching-learning process is limited, therefore Therefore, it represents an excellent testing scenario for this research project.

The starting point of this research project was to determine the students' openness to the use of ICT in their learning process. Therefore, the Usability of Digital Tools survey was applied with a five-point Likert measurement scale.

After measuring the students' perception of the use of ICT in their learning, due to its advantages of personalization, interoperability, immediacy, accessibility, reuse and flexibility, the Learning Object was used as a didactic resource for the implementation of the four pillars of the Flipped Classroom in the development of the content of Unit 4 of the subject Executive Application Software [7].

Of the different options of technological tools for the implementation of Learning Objects, in this project the technological tool eXeLearning was used because it is a free, open, multi-platform computing platform, constantly updated and with technical support [10]. Figures 1, 2 and 3 show the design of the didactic sequence of the general topic, subtopic 4.1 and a game.

Another advantage offered by the eXeLearning platform is the set of components (iDevices) focused on the creation of interactive game activities, promoting game-based learning. To mention just a few of the games, there are Word Search, Guess, Complete, Challenge, among others. For students to participate in active learning experiences and knowledge evaluation, the games Adivina, QuExt, Rosco and VideoQuExt have been selected.

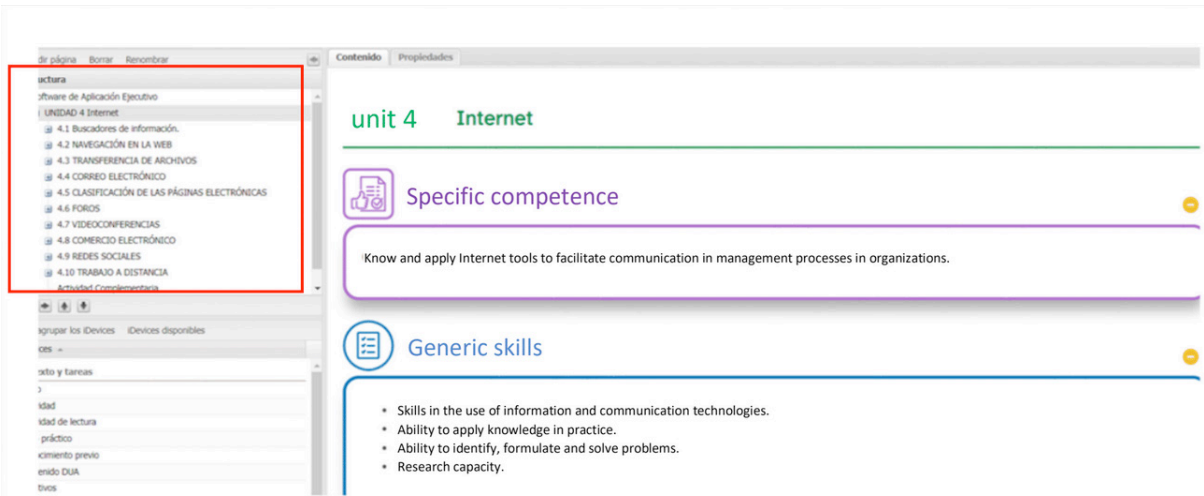


Figure 1. Design of the teaching sequence for Unit 4: Internet.

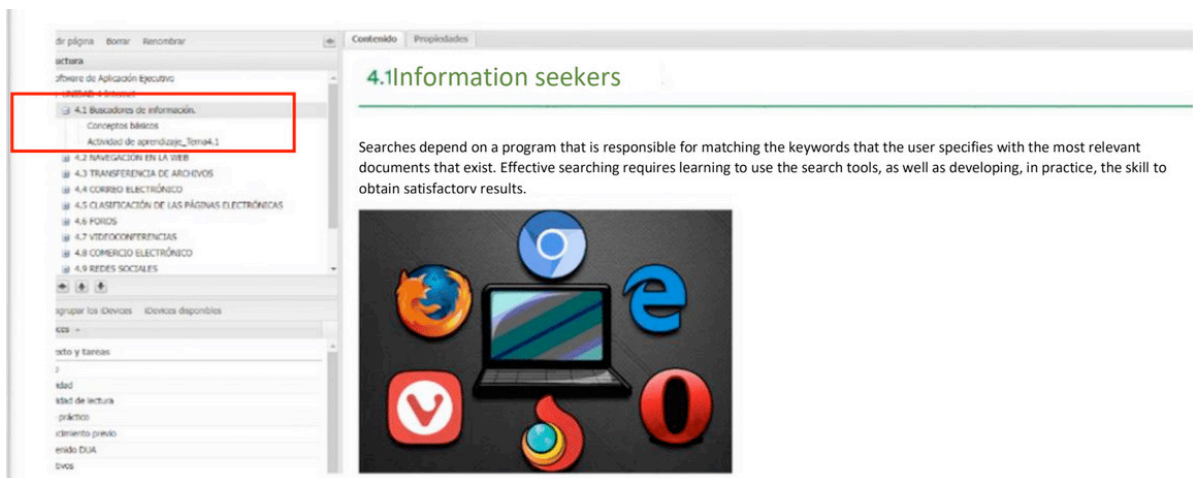


Figure 2. Design of the didactic sequence of subtopic 4.1: Information seekers.

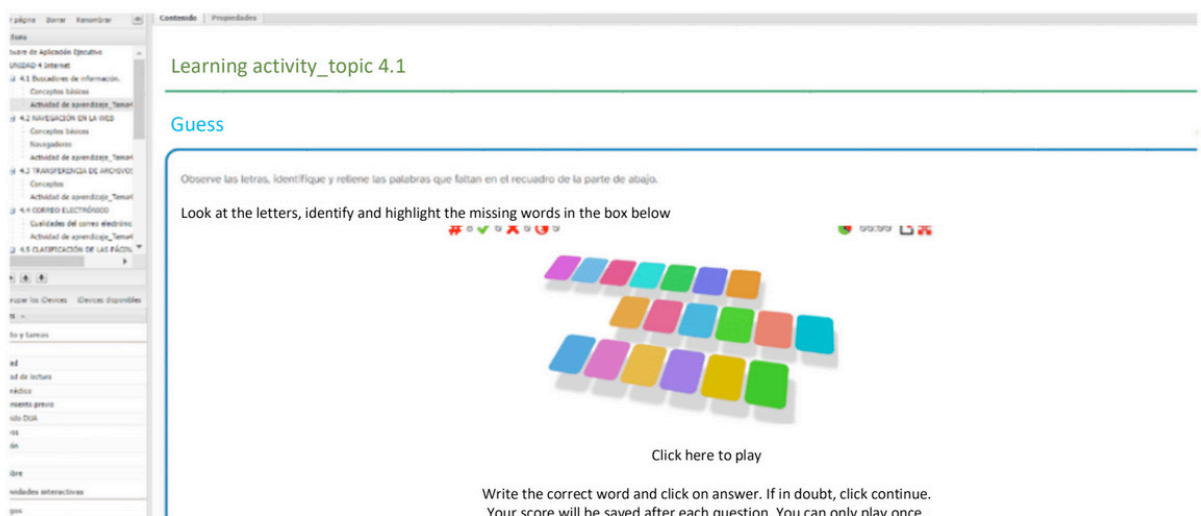


Figure 3. Design of a learning activity based on the digital game Guess.

Finally, to determine the degree of satisfaction of the subgroup of students who used ICT in their learning and evaluation process, the Usability of the Learning Object survey was applied with a five-point Likert measurement scale.

RESULTS AND DISCUSSION

The main finding of this research work shows that the use of ICT in the educational field at a higher level improves the academic performance of the students in the Executive Application Software subject group of the Business Management Engineering program belonging to the Tecnológico Nacional of Mexico/Technological Institute of Aguascalientes.

The starting point was a first stage where the survey “Educational experience with digital tools” was applied to the entire group to determine their preference towards the use of ICT in their teaching-learning process. Based on the Likert scale, the result is a high percentage of students who consider the use of ICT important in their learning process. Figure 4 clearly shows that 44.4% and 40.7% of the students totally agree and partially agree respectively on the use of ICT in their learning.

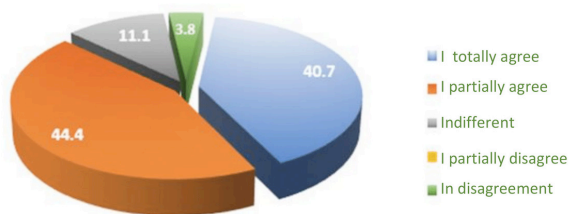


Figure 4. Students’ perception of the use of ICT in their teaching-learning process.

Due to the above, it is determined that 85.1% of the students consider that the use of ICT will provoke an active attitude towards learning and 11.1% show an indifferent position towards this teaching strategy and 3.8% disagree.

After capturing the students’ perception of the use of ICT in their learning, in a second stage the original group was divided into two subgroups; one of them with a sample size of 14 students and the other with 14 students.

The Flipped Classroom teaching strategy was applied to the first subgroup along with an LO developed with the eXeLearning computer platform. Figure 5 shows the OA of Unit IV in production.

Once the students have followed the learning path through the previous LO, eleven games were applied to evaluate their learning. Figure 6 shows the final view of a digital game. It is important to mention that the OA designed and developed has been installed in the institutional learning management system Moodle, with the objective of monitoring the score obtained by students in the OA games. Figure 7 shows part of the Moodle rating report.

After the application of the didactic strategy based on ICT, the experience obtained by the students was collected through the survey “Posttest of the educational experience applying the OAs”; The results of said survey are shown in Figure 8.

Name last Name	unit 4
ANGEL YAAZIEL	88.00
ALCOGER RAMIREZ	
PRISCILA EOWIN	86.00
BOLLAS GUEVARA	
DULCE XIMENA	89.00
DAVALOS FLORES	
EVERARDO ESTRADA	96.00
DE LIRA	
ADRIANA GARCÍA	87.00
LARA	
ALONDRA	
GUADALUPE GUZMAN	63.00

Figure 7. Record of some scores obtained by OA students in Moodle.

Figure 8 shows that 71.4% totally agree to work on their learning with the use of LOs and 14.3% partially agree. Therefore, it can be concluded that 85.7% are willing to work with the OAs.

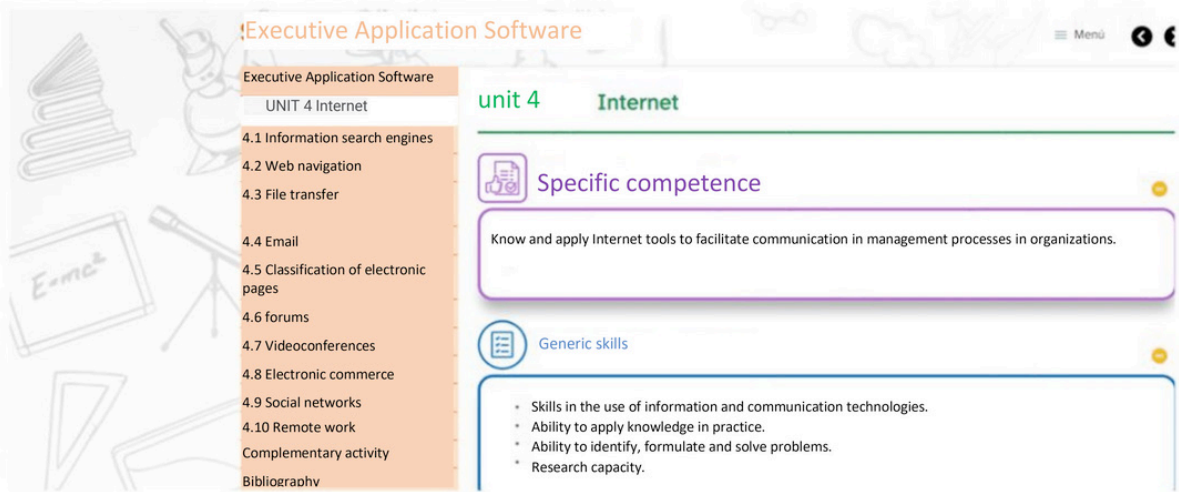


Figure 5. Final view of the LO of Unit IV of the Executive Application Software subject.

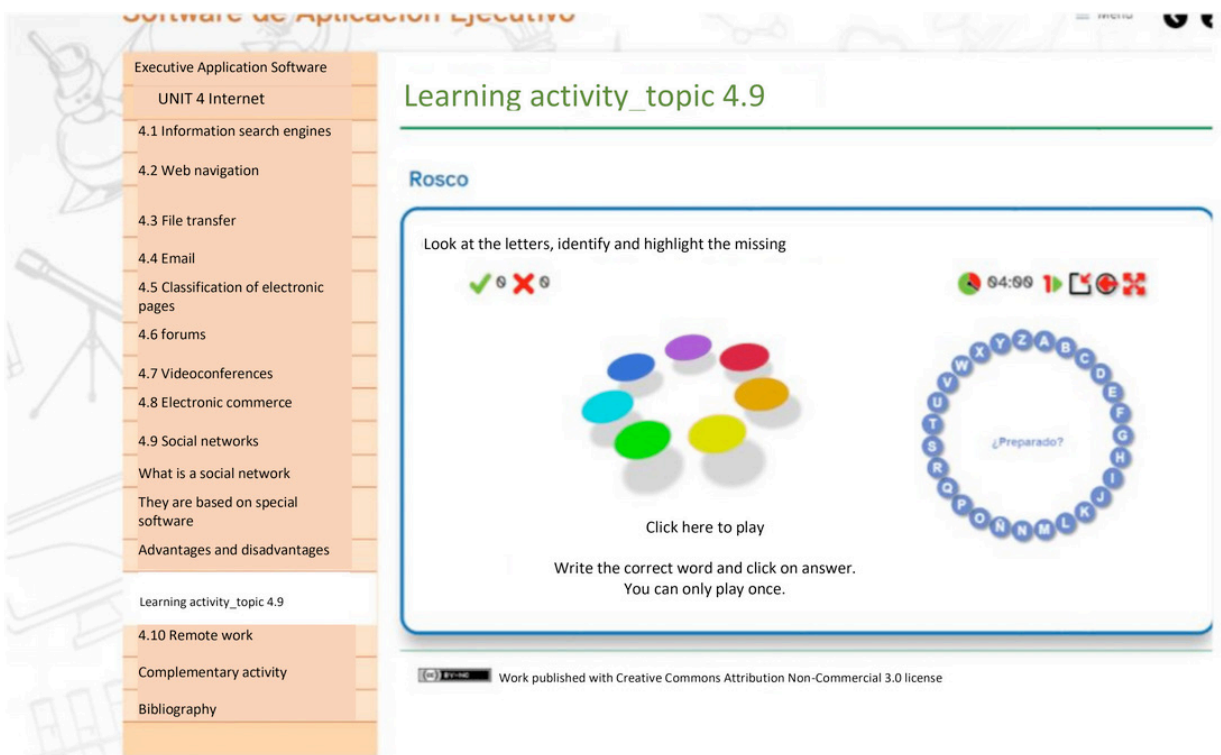


Figure 6. Final view of the Rosco digital game.

CONCLUSIONS

Through this research work, it is concluded that the implementation of the Flipped Classroom pedagogical approach together with ICT in the context of the subject of the second semester Executive Application Software, of the Business Management Engineering educational program, has yielded positive results in the student learning process compared to a traditional teaching-learning process.

The data obtained through the surveys applied to the students allows us to affirm that there is significant substantial support towards the integration of ICT in their teaching-learning process; in particular, the use of digital learning platforms such as Moodle.

Likewise, the subgroup where the evaluation based on digital games was applied expressed having experienced learning in a fun and meaningful way.

As future work, it is intended to evolve towards the personalization of learning using artificial intelligence to adapt to the individual and future needs of students.

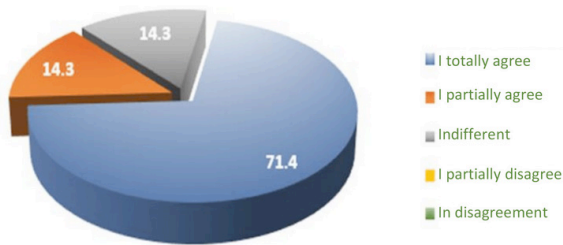


Figure 8. Students' experience on the use of LOs.

On the other hand, the other subgroup of 14 students who took unit IV in a traditional master class and, once evaluated through a written exam, obtained a passing percentage of 43% and a 57% reprobation.

For all of the above, it can be concluded that the academic achievement of the students has been higher with the use of the Flipped Classroom teaching approach supported by ICT. Furthermore, students have shown significant motivation for their ICT-based learning.

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