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The Virtual Teaching Material Driving the Meaningful Learning of Engineering Students in Unidad Profesional Interdisciplinaria De Ingeniería Campus Guanajuato Del Instituto Politécnico Nacional

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Abstract

One of the challenges of higher education focuses on the improvement of personal and professional skills of students, with the aim of strengthening strategies that include cutting-edge resources in the learning process. The appropriate use of Information and Communication Technologies (ICTs) in teaching work as support in face-to-face mode, has a significant impact on engineering professionals. With the correct handling of instruments, strategies, evaluations and educational materials mediated by technologies, which provide great advantages, where the student can work at their own pace and improve the synchronous and asynchronous communication channels with the teacher and their classmates to develop skills and acquire experiences. This work presents the incorporation of educational resources in virtual scenarios as support to the learning units taught in face-to-face modality in the Interdisciplinary Professional Unit of Engineering campus Guanajuato (UPIIG), with the purpose of reinforcing in the student self-management of knowledge to discover new teaching experiences and motivate them in the achievement of meaningful learning.

Keywords: ICT's; Didactic resources; Virtual learning environments; Significant learning.

1. Introduction

The use of educational resources in the virtuality that exists in the Institutions of Higher Education (IHE), is a tool that has gained ground and prestige, for the improvement of the teaching-learning process in higher education, in this sense Ausubel (1976). cited by Díaz Barriga (2003) stated that "The apprentice relates the new information with his previous knowledge and experiences. The learner's disposition is required to learn significantly and the teacher's intervention in that direction. The way in which educational materials and experiences are raised". In this sense, it is a challenge for IHE teachers to design educational experiences and in order to achieve this, the following aspects must be taken into consideration: "meaningful learning transcends the repetition of unconnected contents and, in constructing meaning, making sense to what has been learned, and to understand its scope and relevance in academic and daily situations" (Díaz Barriga, 2003). Learning must move deductively from general knowledge to individuals, hand in hand with the necessary motivation of the student.

The National Association of Universities and Institutions of Higher Education (ANUIES, 2000) mentions that the higher education system can take on the challenges presented by the environment, if it evolves in depth, modifying traditional paradigms to move to flexible, quality, innovative and dynamic methods that respond to new forms of organization and work.

The integration of Information and Communication Technologies (ICTs) is a tool that encourages self-learning, which has the challenge of creating new learning experiences. However, introducing new technologies will not be sufficient without profound changes in the academic and administrative structure that enable the integration of the previous models with the future ones. Thus, "The technological plan should contemplate both infrastructure and teaching with technology" (Bates, 2001).

The National Polytechnic Institute (IPN) implemented an educational model (Instituto Politécnico Nacional, 2003) based on competencies. This institution promotes that teachers develop strategies and methods that impact on the improvement of educational quality. The model involves the use of ICTs as part of the comprehensive training of the future graduate, which forms it to be successfully incorporated into the globalized labor field.

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Faced with the task of designing new teaching alternatives with the appropriate support of ICTs, the use of virtual teaching materials has a substantial role as support for the activities developed in person in the learning units of the various academic programs of the engineering offered at UPIIG.

In context, the didactic material is the set of media that improve the face-to-face and virtual teaching-learning process, which increase the interest and attract the attention of the students, modernize the teaching, favor the retention and understanding on the part of the learner, facilitate the teaching work and improve the synchronous and asynchronous communication channels.

The importance of the didactic materials lies in the fact that they are the means or resources that are applied to a specific technique related to a particular learning method, understood as a learning method: the way, path or sets of rules used to obtain a change in the behavior of the learner and in this way strengthen the level of competence in order to play a productive role (Muñoz, 2012).

With the use and proper management of virtual teaching materials, the teacher and student improve and strengthen the teaching-learning process, as well as communication, to eliminate distance and time barriers.

The use of different teaching alternatives such as virtual materials, the use of platforms such as Moodle and tools such as Google Drive and forms leads students to enhance their learning at various levels and with it, significantly improve the teaching-learning process achieving a better use. A relevant peculiarity of the instructional materials used in virtual education is the level of pedagogical structure with a logical order, because its purpose is to reinforce learning. To be effective, the variants to be fulfilled are shown in Table 1

Table-1. Variants of the pedagogical structure.

Variants	
Acces	Currently, young people have the electronic means to access knowledge (educational platforms and smartphones).
Offer	The services of the electronic schools and universities are available.
Knowledge	Bringing the student population to the study through the use of ICT
Effectiveness	It can be used as an indicator of the didactic resources that its users get to use them in a simple way.
Confidence	The information widespread about the materials is reliable.

The present investigation was developed with two purposes:

a) Design and develop teaching materials to support the learning unit that allows teachers of the Humanities, Languages and Methods academy to make use of modern means of information and communication.

b) Provide the student with a series of tools that benefit the construction of meaningful learning, without the restriction of a specific time and space.

2. Material and Method

The methodology used is based on a diagnosis of the impact of the incorporation of virtual environments into the learning process using the data obtained through the application of individual surveys to UPIIG students who attend the first semester of different academic programs, in the period from August 2017 to July 2018 and with an age range between 18 and 21 years.

The survey was carried out on the UPIIG virtual campus platform at the end of the semester corresponding to the period January to July 2018, applied to 178 students enrolled in the academic program of Industrial Engineering, in the Professional Communication learning unit that is taught in the first semester. A questionnaire of 13 questions was generated, taking advantage of the Likert scale to measure user satisfaction.

In order to evaluate the impact that the use of said resources has on the learning of the students, the following aspects were considered:

Figure-1. Aspects considered in the evaluation.


3. Results and Discussion

The main results obtained in the dimensions of: significant learning, academic performance and knowledge autonomy. Using didactic material in virtual scenarios, such as support for face-to-face classes, contributes to the construction of significant learning, as can be seen in graph 1 with 42% good and 40% very good.

Graph-1. Construction of significant learning.
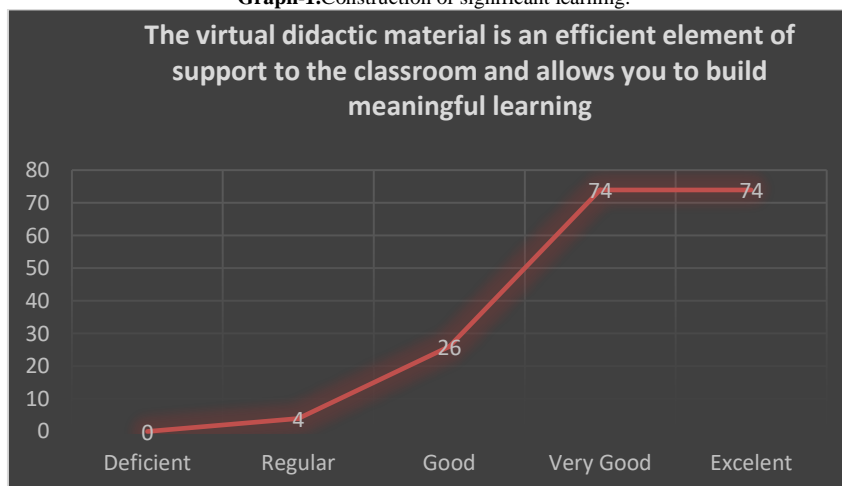
Also, that the design of didactic materials in virtual scenarios, motivates the student and induces him to build meaningful learning. The use of didactic tools mediated by technology and in support of face-to-face classes, was reflected in the academic performance as distinguished in graph 2; with 44% in favor and 37% as convenient.

Graph-2. Results concerning: Academic performance.
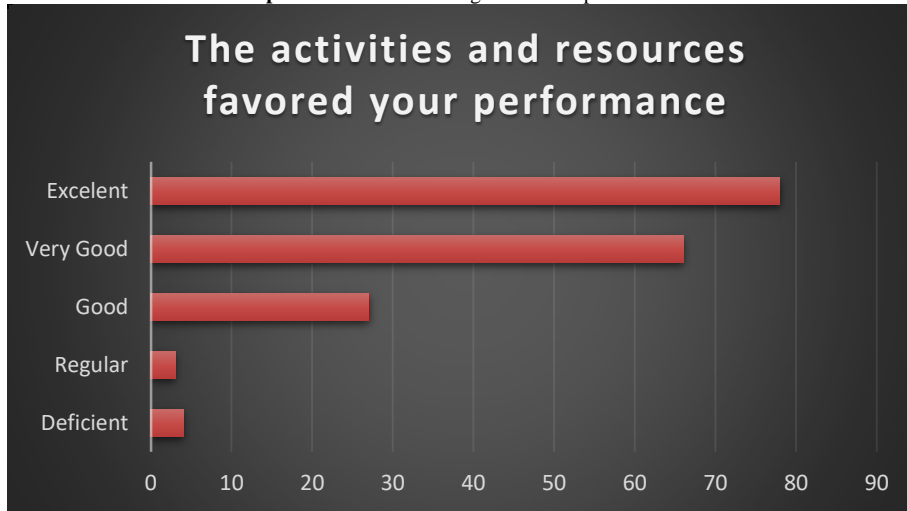
Obtaining independent learning in the students is, without a doubt, one of the main objectives in the development of didactic material in virtual environments.

In this sense, graph 3 shows that 56% achieved it totally and 27% favorably, however, 17% of the students who did not obtain it in their totality are appreciated.

Graph-3. Results of: Autonomous learning

It should be noted that the aspect least valued by the students is that the didactic material in virtual scenario is useful as support in the face-to-face course, however, it is difficult for them to promote an autonomous learning process with a total of 17% (graph 3).

Develop and implement teaching materials in virtual environments to support learning units in face-to-face mode, aims to develop skills in the use of information technology and communication, for the achievement of autonomous learning, improve communication between teacher-student, student-student.

The data obtained from the survey projected as a result that students recognize the benefits of having virtual materials as their support, as they are involved in their learning.

4. Conclusion

The use of virtual didactic materials opens a range of possibilities to improve the teaching-learning process, breaking traditional educational paradigms, but also requires commitment and hard work, in which professionalism and responsibility is required to design strategies that promote self-management, motivation, communication and collaborative work of the students, which will contribute in the successful insertion of the future professional to the labor field.

The diversity of teaching materials facilitates teaching and constitutes an added component in the learning process, acting as a mediator in the training of students. With its use through ICT's, quality education is promoted to a greater number of students with a physical, technical and technological team, capable of facing the challenges of globalization.

The usefulness of the virtual resources, helped the students to break the barriers of time and space, facilitating the learning in any place and time, improved the communication at a distance, promoted new strategies of collaboration and dialogue.

The teacher's main challenge will be to adapt to change, modify traditional educational paradigms, adapt work to the diversity of circumstances that influence the teaching-learning process, develop didactic skills for new forms of education and interaction with students, with systems open, innovative, flexible and dynamic, that respond to the current demands of the social, labor and cultural environment.

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