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Didactic Strategies Used From The Remote Presence For The Subject Of Process Control With Labview At The UFPSO University

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Abstract

The teaching-learning constitutes the evaluation of its components that are closely related to the rest of the process, teaching with remote presence is developed from activities that can be synchronous and asynchronous, which must be properly planned. This article presents the didactic strategies used from remote presence for a process control module with LabVIEW, of the Industrial Automation specialization program at the Universidad Francisco de Paula Santander Seccional Ocaña. Some of the experiences included are: a) the Moodle virtual classroom; b) the uploading of complementary audiovisual material including external courses, technical standards and selected codes to reinforce concepts and illustrate professional applications; c) the use of Google Meet virtual platforms to teach synchronized classes, and d) the use of programming software such as LabVIEW for problem solving.

Keywords: Educational strategies; Learning; Remote attendance; Teaching strategies

1. Introduction

Education at all levels faced a sudden transition from traditional face-to-face teaching-learning to Remote Teaching or simply online teaching during the COVID 19 pandemic (Seaman, Allen, and Seaman 2018). For this transition education focused on the use of learning management systems (LMS)

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and communication platforms to ensure that all members of the academic society had access to learning resources in the absence of physical teaching spaces (Kosanke 2022).

Broadly speaking, the methodologies that enable remote teaching can be classified as synchronous or asynchronous depending on whether all those involved (both teachers and students) in an activity must perform their part at the same time. Tools that enable synchronous communication with students allow live classes to be delivered, much like face-to-face classes. Alternatively, the generation and availability to students of audiovisual materials, such as videos, allows for completely asynchronous teaching, in which communication between students and teachers is necessarily deferred. Figure 1 shows the comparative diagram of the synchronous and asynchronous learning process (Romero-González et al. 2021).

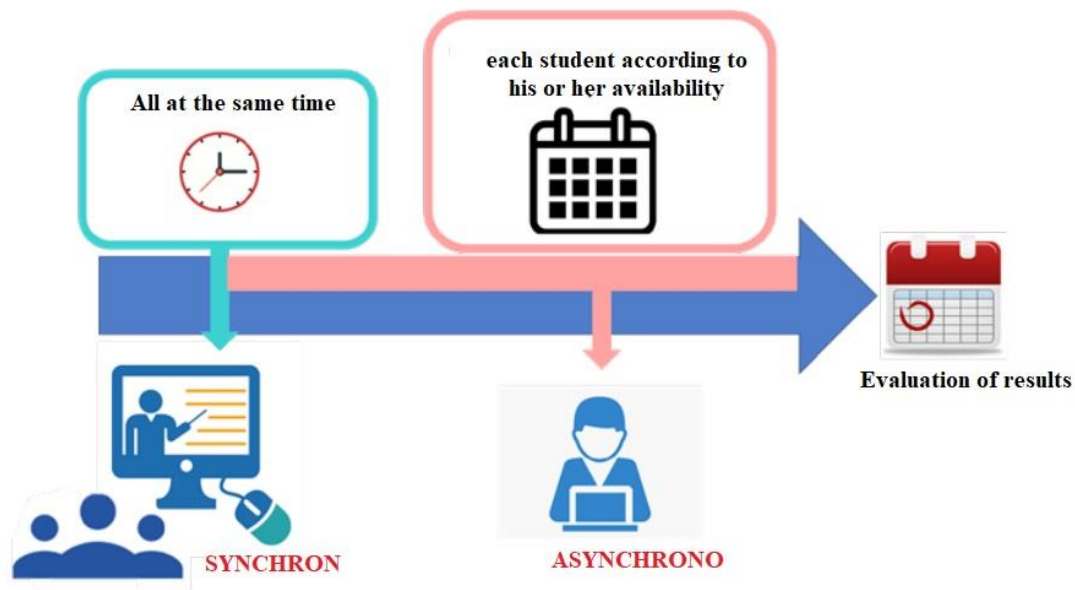


Figure 1. shows the comparative diagram of the synchronous and asynchronous learning process.

Source: (Romero-González et al. 2021)

Faced with this situation, the Universidad Francisco de paula Santander Ocaña sectional has bet in the graduate program of specialization in Industrial Automation to continue with its teaching functions by encouraging the use of technological tools of information and communication (TIC) through the modality of remote attendance, which is based on the realization of direct teaching sessions synchronously through digital media such as the Google meet platform and through teaching asynchronously with the following technologies

- Learning management systems (LMS) are platforms that help create, manage, organize and deliver online learning materials to students. (Díaz, Carbonel, and Picho 2021).
- Among its main advantages is the ability to present information using different modalities, auditory and visual, which reinforce and complement each other, as well as providing an example of the process that is easy to follow and that students can replicate autonomously. (Hernández-Ramos, Martínez-Abad, and Sánchez-Prieto 2021).
- Virtual laboratory practices: A virtual laboratory is a computational system that aims to approximate the environment of a traditional laboratory. Experiments are performed step by step, following a procedure similar to that of a traditional laboratory: instruments and

phenomena are visualized by means of dynamic objects, images or animations. Numerical and graphical results are obtained (Maykop and Martínez 2022).

Some of the synchronous form strategies used in the process control module with labview are described as follows

- The integration of simulation and digital modeling software that allows the development of fundamental technical skills to achieve the competitiveness of future graduates (M 2022),(Pérez 2021).
- Google Meet, make video calls with students, as well as send secure messages for independent learning outside the classroom (Ramírez. 2022),(Salas, Urpy, and Carpio 2021).
- Jam board is an interactive whiteboard developed by Google. It has two variants: a physical whiteboard, which can be purchased, or an application for use on computers, tablets or cell phones. It includes interactive tools that allow the user to write, draw, highlight text, and include images, geometric figures and post-it notes. It can be shared with students through an e-mail link. Several people can work on it simultaneously, making it a collaborative work application (Rodríguez-pedro and Báez-martínez 2022) ,(Angulo 2021).

The Universidad Francisco de Paula Santander Ocaña has the Moodle platform for the creation of virtual courses, which has been designed to create online learning spaces. This platform has widely recognized benefits such as integration with other systems and resources, modular architecture that improves the navigability and organization of academic material, ease of administration, and the availability of multiple pre-designed tools that can be adapted to the needs of the implemented course.

This article presents the strategies and tools used to teach the subject of process control with LabVIEW in the Industrial Automation specialization program in remote classroom mode.

2. Teaching the subject of process control with LabVIEW

The Universidad Francisco De Paula Santander Ocaña sectional has opted for the implementation of the Social Constructivist model in the formation of students within the university campus. In the same way, the Industrial Automation specialization program adopts each of the guidelines established by the institution, therefore, students must be involved with the pedagogical model mentioned above and this implies greater student participation, such as essentially active learning, where the teacher assumes his role as an organizer, coordinator, advisor and director of the process of appropriation of knowledge, establishes relationships between previous knowledge and new knowledge to form autonomous people, responsible for their own learning, capable of undertaking continuous improvement processes.

From the microcurricular model of the subject of process control with LabVIEW, it is established that the subject provides the student with the competences that will be used in the selection, application, and operation for the automatic control and measurement of analog and digital variables existing in the industrial systems of our country, with the consequent contribution to the professional profile of the student of Specialization in Industrial Automation.

This course provides the ability to analyze the fundamental bases that allow the student to interpret and synthesize the characteristics and specifications necessary in a virtual instrumentation system according to the application to which it is destined. By knowing the components of data acquisition systems and defining test procedures, it provides the engineer with the ability to simulate, analyze, design, apply and correctly use the electronic instrumentation elements in an industrial system.

In order to achieve the above, the learning results of the subject are described below:

RA1. Study the LabVIEW development environment as a programming, measurement and control tool.

RA2. Create software applications for Virtual Instrumentation systems.

RA3. Select and integrate data acquisition hardware technology and test benches for measurement and automation systems through LabVIEW software.

RA4. Choose a model of a control system to perform design and simulation using LabVIEW programming language.

The methodologies proposed to achieve these learning outcomes are described in section 3 below.

3. Methodologies

Taking the educational model of the Universidad Francisco de Paula Santander Ocaña, which is social constructivist, and based on learning by competencies and learning outcomes, it was proposed from the curricular model of the subject of Process Control with LabVIEW to work on the use of active methodologies and the model of Substitution, Augmentation, Modification, Redefinition (SAMR).

3.1 Model SAMR

The purpose of the SAMR model is to help teachers evaluate how they are incorporating technologies in their classrooms and, in this way, to know what kind of uses of technology have a greater or lesser effect on student learning. It consists of a hierarchical set of four levels and two layers that describe the use of technological tools.

SAMR organizes the categories of technology integration into four levels, see Figure 1. These levels from bottom to top on a continuum are Substitution, which is when technology is used to perform a task that can be accomplished without technology. It is acting as a direct substitute. Augmentation provides some additional benefit to learning. Next is Modification, when technology enables significant task redesign. At the top of the framework, Redefinition is when technology is used to learn in a way that could not happen without technology. The bottom two categories enhance learning through the use of technology, and the top two categories transform learning through the use of technology. (Hamilton, Rosenberg, and Akcaoglu 2016).

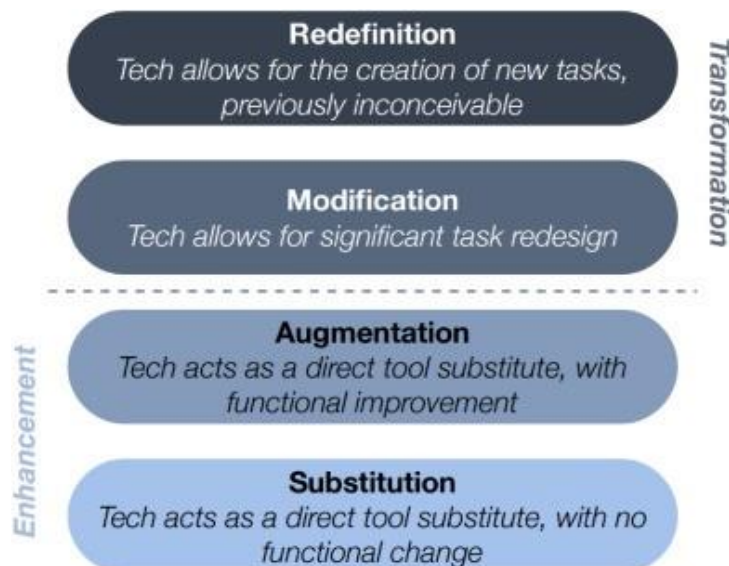


Figure 2. SMAR Educational Model.
Source: (Crompton and Burke 2020)

3.2 Active learning methodologies

By active methodologies we mean those methods, techniques and strategies used by the teacher to convert the teaching process into activities that encourage active student participation and lead to learning (Silva and Maturana 2017). The literature consulted proposes a wide variety of active methodologies, among the most common are: cooperative work, team-based learning, problem solving or problem-based learning (PBL), case analysis, inverted classroom, Table 1 illustrates and defines the main active methodologies used in the process control module with labView.

Table 1. Examples of Active Methodologies

Methodology	Description
Cooperative learning	Cooperative learning is a teaching approach in which students share information and work together in organized groups to achieve a common goal (Hamadi et al. 2022).
Problem-based learning (PBL)	Strategy in which students learn in small groups, starting from a problem, to search for the information they need to understand the problem and obtain a solution, under the supervision of a tutor (Mohd-yusof et al. 2011).
Case analysis	is a methodology that is characterized a detailed analysis of a situation, real or created, but feasible, that recreates the conditions of the working environment of the future professional. future professional. Its format can be written, audiovisual or based on non-participant observation. non-participant observation. For its implementation students are required to analyze the case and observe its different implications, applying principles implications, applying principles, concepts and theories specific to the course. theories of the course. The teacher should pose questions that help the analysis. the analysis.
Exhibition / Lecture	To present information in an organized way (teacher-students; students-students). Activate motivation and cognitive processes. cognitive processes.

4. Results

Among the pedagogical strategies implemented in the process control course with labview, the following strategies were used

4.1. Redesign of the virtual classroom

The virtual classroom implemented in the Moodle platform of the Universidad Francisco de Paula Santander sectional Ocaña was redesigned considering aesthetic and functional aspects. It is structured as follows to standardize the modules offered in the Industrial Automation specialization program.

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- Generalities: where it is described in a short video about the module to be taught.
- Micro-curriculum of the subject
- Pre-saber test
- Content by units
- Communications zone
- Activities Zone

Figure 3, and 4 presents the virtual classroom implemented for the process control module with LabVIEW.



Figure 3. virtual classroom implemented for the process control module with LabVIEW.



Figure 4. Virtual classroom in the content are

4.2. *Google Meet meetings to have a synchronous class form.*

Figure 5 shows a meet meeting in which the screen is shared and students can see the process to solve a problem, slides are used for the theory, as well as for the analysis of the problem, synchronous meetings are recorded and uploaded to the moodee platform described in section 4.1.

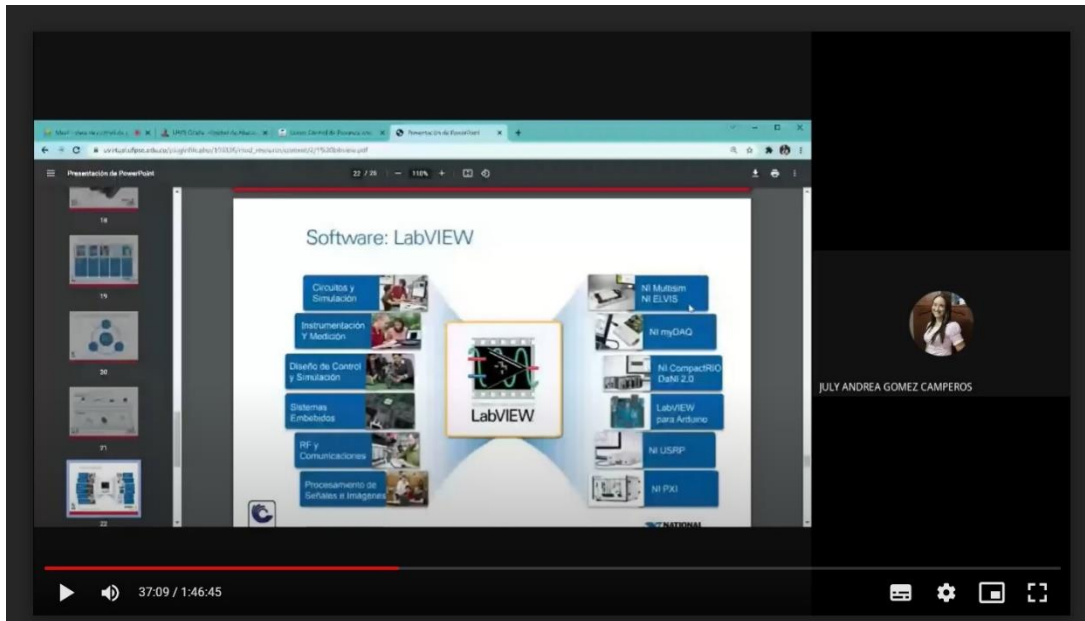


Figure 5. Virtual meetings with students to discuss specific topics of each course

4.3. *The integration of simulation and programming software*

In the case of the subject, programming and simulation in LabVIEW software were used for the development of problems as illustrated in Figure 6.

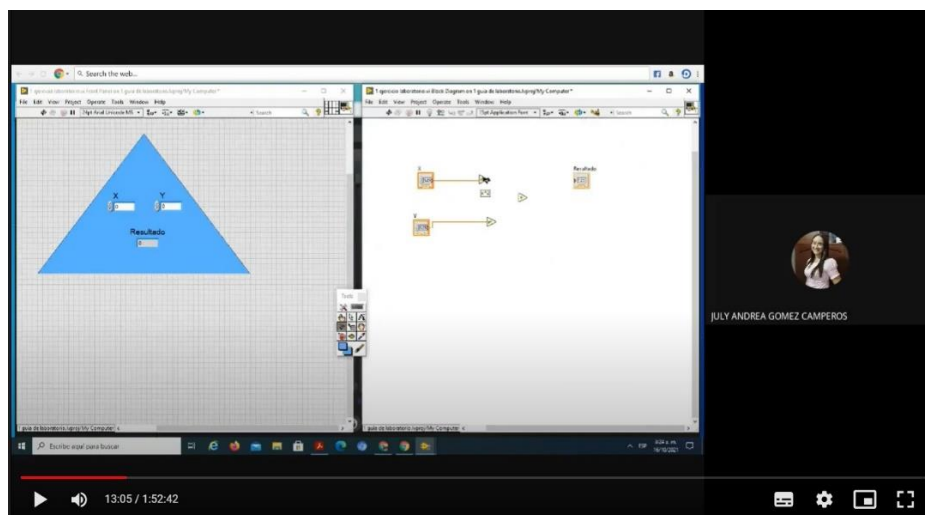


Figure 6. Virtual meetings with students to discuss specific topics of each course

4.4. *Design of exercise workshops with levels of difficulty*

For each of the main contents of the course, workshops were designed using the active methodology of Problem Based Learning (PBL), where the student is given a problem and is guided to obtain the

solution. In the case of the process control course with LabVIEW, the LabVIEW software was used to perform a simulation of an electrolyte process as shown in Figure 7.

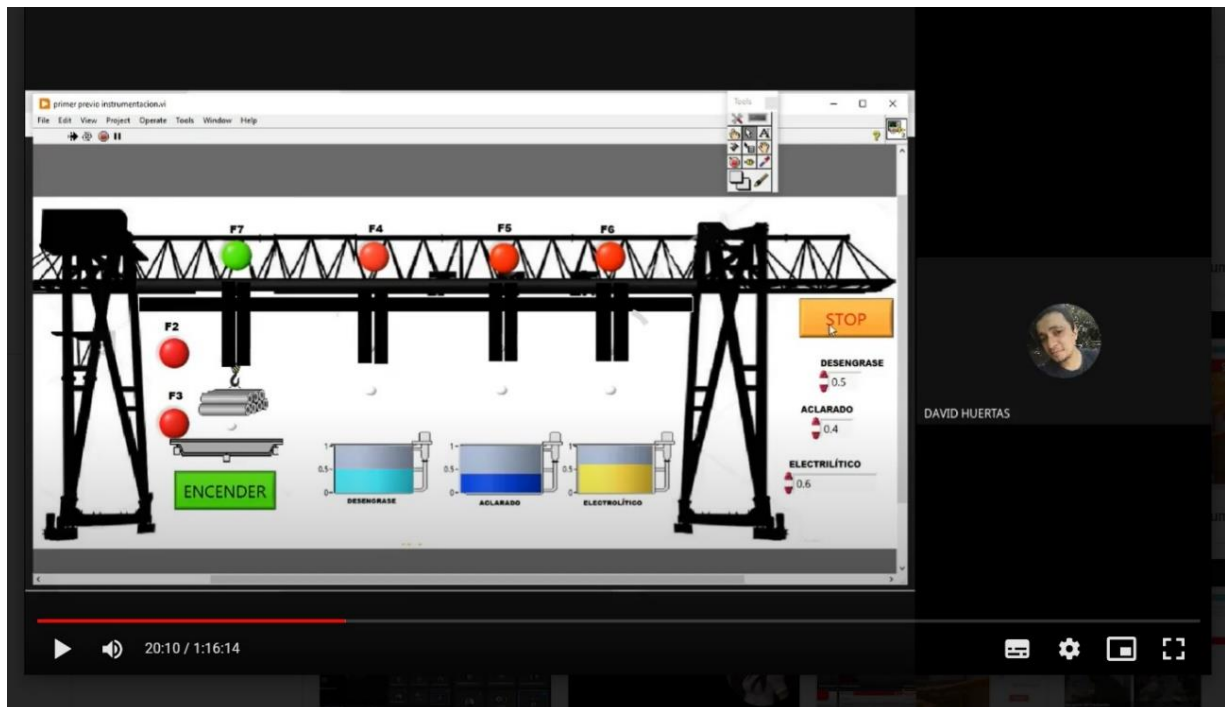


Figure 7. Simulation of the electrolyte process

The implementation of this strategy had a twofold objective. On the one hand, to make sufficient study material available to the students. of difficulty allowed favoring the sequential development of skills in process control with labview.

5. Conclusions

Teaching in higher education requires changes to respond to the current needs demanded by the knowledge society. society. The profile of students entering higher education with a high degree of mediation in their behavior towards studying and learning and learning behaviors of the technologies they use to live and to learn, which they use for living and learning.

With the implementation of active methodologies and the use of ICT in collaborative environments for remote presence in the subject of process control with LabVIEW, it was observed that the student is the main actor of his own learning. It was also observed that the student, being a digital native, is easily able to develop in digital environments and therefore has managed to develop new skills associated with these tools. This is why it is important to restructure the ways of teaching, the contents to be taught, but above all, the organization and type of material to be used during synchronous and asynchronous sections. Such that the time in front of the screen is used to the maximum, while the student works on his own.

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