

Using robotics laboratories like support of the teaching and learning methodologies

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ABSTRACT: The Robotics has become a sign of progress and countries or companies that make use of it through robots manage to improve their productivity and efficiency; taking the view that in the future there will be a high consumption of these technological elements in society this document assesses whether the implementation of a robotics lab will create a learning environment based on student activity. An investigation instrument like the survey was used to ninth course of introduction to robotics in order to find the causes that hinder learning by the theoretical excess of knowledge and lack of practice. Definitions of robotics, educational robotics, methodologies and applied studies are briefly outlined. Finally the results of the analysis of the instrument by which students are motivated with the use of robots for collaborative learning complementing teacher teaching are presented.

KEYWORDS: Robotic, Teaching and learning process, Methodology, Didactics.

1 INTRODUCTION

Training in different educational fields has been considered as a transfer of knowledge, however in higher education it is intended that students construct knowledge in order to that the university system of quality samples and competitiveness and simultaneously incorporate active and collaborative methodologies that provide certain specific skills, complemented by the demand of society and the business sector [3].

Teachers handle very well the art of their specific science, however it is important the management of educational psychology, in other words as the student learns. Therefore David Ausubel, Joseph Novak and Helen Hanesian specialists in educational psychology from the University of Cornell, they have as precedent to Vigotsky, They have designed the theory of meaningful learning, long-term learning or the constructivist theory, whereby to learn it is necessary relate new learning from previous ideas of students [13].

To achieve the meaningful learning the teacher must link the previous knowledge gained by the student with the new ones, thus achieving real learning where they are concatenating with each other. Importantly, with this type of learning students they increase their self-esteem and feel motivated to learn.

We can say, therefore, with respect to materials and resources for learning, meaningful learning occurs if the material is related not arbitrarily in the peculiar cognitive structure of students [13].

Considering these aspects of the use of resources within the teaching work is essential to know how students learn and otherwise learning can be affected and not the objectives will be met.

Research present improvements in the interrelationship of Teacher-Student, inside and outside the classroom to use robotics laboratories either in person or online, serving as a tool to support the process of teaching and learning, stimulating their cognitive development and developing creativity for search for solutions.

2 DEVELOPMENT

According to the experts we all have within us the ability to create or invent, so it is essential to use and enhance the potential of students through meaningful learning where the variety of resources and technological elements such as robots are quite appealing to them causing additional motivation and raising interest in learning something new taking in some cases as a challenge. [2]

Within this context meaningful learning plays a key role in the transmission of knowledge sharing experiences with students in turn provide them the confidence to play a more active role in the educational process feeling the satisfaction of having achieved a recognized achievement both individually and in groups, arising out of the inner creativity that we are individuals and not as liabilities in their interests and forget their fears and insecurities.

Robotics has progressed rapidly both naturally and support in developing education based on cognitive theories of Jean Piaget. The mathematician and psychologist Seymour Papert developed within a stream called constructionism Constructivism [8] that lies at the heart of any learning process the learner, giving it a fully active role, expanding their knowledge through manipulation and construction of objects.

To this point it is involved in education appears as a new element called robotic education [9] covering multidisciplinary topics such as IT, electronics, physics, mechanics, among others, for that reason involves the design and construction of a robot to work in the student basic skills that are needed in society [4],[5],[7].

Building a robot involves the integration of some areas, first structural and morphological part requires knowledge of mechanics, some movements require knowledge of electricity, management interfaces robotic elements with the computer requires notions of electronic ; [12] and to control robot programming knowledge is needed in any language [6],[10],[11] all these disciplines are integrated but not separately from cognitively and technologically where students develop their own strategies for solving problems .

Currently what makes versatile robotic projects is the Arduino board which is a microcontroladora platform of free hardware with its own development environment designed to give ease the student in regards to electronics, so the most used was the Arduino Uno; but as projects increased complexity gave rise to different models as:

- Arduino Leonardo
- Arduino Due
- Arduino Yún
- Arduino Robot
- Arduino Esplora
- Arduino Mega ADK
- Arduino Ethernet
- Arduino Mega 2560
- Arduino Mini
- Arduino Nano
- Arduino Pro Mini
- Arduino Pro
- Arduino Micro
- Arduino Fio
- LilyPad Arduino USB
- LilyPad Arduino Simple
- LilyPad Arduino SimpleSnap
- LilyPad Arduino.

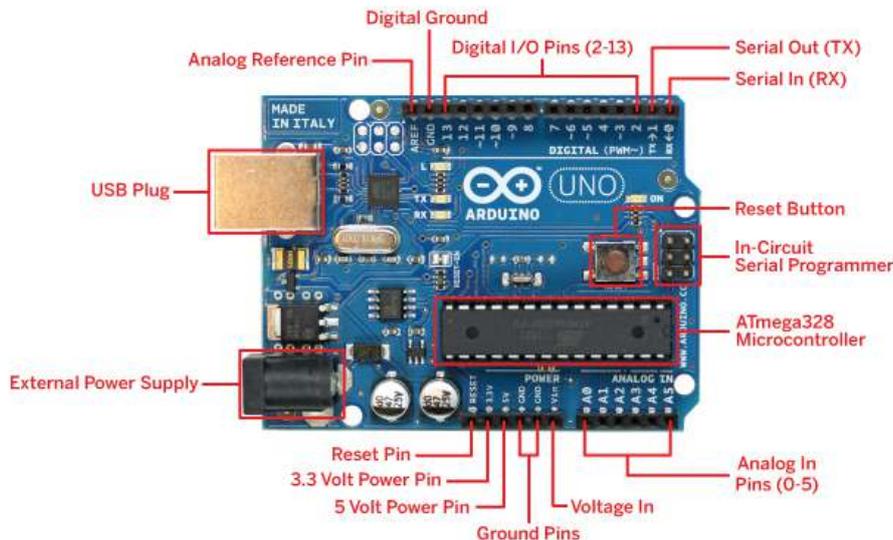


Fig. 1. Arduino Uno microcontroller
 (Source: *Arduino Microcontroller Based Online Ambient Monitoring Using Internet of Things.*, Page 13)

Depending on the complexity of the project is chosen Arduino model facilitating the management level components hardware and software which makes educational projects are feasible in a laboratory [14].

By using robots practical experimentation that helps students in the assimilation of knowledge in a theoretical way would not be so clear understanding creating confusion in the conceptualizations is done, besides the analysis of reality is reinforced by observing the different behaviors that can get to have robots with their environment and through the development of different applications to analyze the problems existing in the same.

In most cases, the implementation of robotics laboratories arises from the momentum of technological advances or a need to insert innovative technology to gain social recognition.

No doubt we must not forget that all these changes go hand in hand with the policy of free admission to college, and you need an organization of activities to account for professionals will play the leading role in demands society on the one hand, and the demands of the State on the other, knowing the investment made in general terms in Higher Education.

3 PROBLEMATIC

There is currently a high degree of concern about the system of teaching and learning ,so that some countries have taken measures for urgent change because problems arise in different strategic areas and quality of professionals is far from able to provide some optimal solution.

Actualmente existe un alto grado de preocupación por el sistema de enseñanza y aprendizaje, de tal manera que algunos países han adoptado medidas de cambio urgentes ya que se presentan problemas en diferentes áreas estratégicas y la calidad de profesionales dista mucho de poder brindar alguna solución óptima.

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The opinions and shared experiences in different fora at national and international levels indicate a marked trend where actions to train students are not going to carry out one hundred percent in the classroom, but appear new learning environments ranging consistent with the objectives of a knowledge society.

Changes that may occur in the educational system have to be permanent to smaller or larger scale, but above all that is required elements of the educational process: teachers, students and administrators involved from the outset in planning.

4 PURPOSE

Today has become a priority to improve the quality of teaching in universities and has been a concern on a large scale even considering initiatives European trends, however is taking a worried look more significant to university teaching, which by the way is nothing new as it did not consider teaching practices or serious improvements were established.

Teachers for the classroom and laboratories are equipped with projectors and computers have become a cold tradition where each imposes its rules and way of working.

Fueling the traditional part, it is achieved with a laboratory Robotics handle a dynamic methodology for collaborative learning by creating a pleasant working environment, allowing personal and professional development of students within a framework of competitiveness.

5 MATERIALS AND METHODS

This research work required a field research conducted by [1] in major cities (Quito, Cuenca and Guayaquil) where an overview of the situation of Robotics was established in Ecuador presenting a summary of the developed most significant achievements in universities such is the case of the National Polytechnic School, Catholic University of Ecuador, University of Espiritu Santo, Guayaquil Headquarters Salesian Polytechnic University, among others.

Similarly to corroborate these statistics, a survey in 2014 was applied to the students last cycle of the course Introduction to Robotics. The questions were designed in simple language with current terminology and varied in the educational and technological fields.

The central points of the questionnaire applied to students were:

- Technical Means importance of teaching for learning subjects.
- The use of means of teaching and learning by teachers}.
- Need for Dynamic Process Methodology for Teaching and Learning that involves the implementation of a Robotics Laboratory.
- Active participation and exchange of information on subjects related events.

6 RESULTS

According to the analysis it concluded that the proposed implementation of a robotics lab is important because according to surveys 100% of students considered that resources are not enough for experimentation of the course Introduction to robotics.

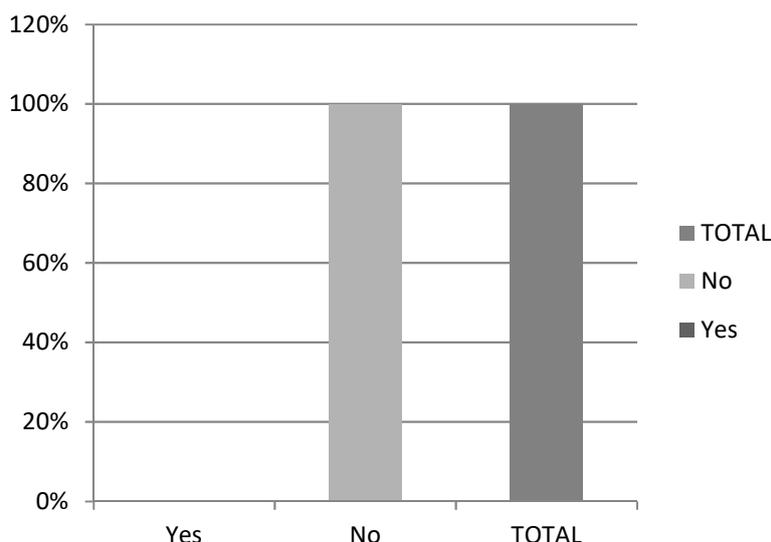


Fig. 2. Stock of teaching materials for experiments on the subject. (Source: Authors)

Considering the methodological and according part of the current program of the subject teachers use traditional methods such as expository and explanatory, the analysis and synthesis, application problems and workshops, showing a lack of practice, this is how students acquire the knowledge, yet 54% of them considered that the method is effective and 41% of students considered poor.

Therefore they propose practices teachers must always aim to verify and illustrate what they learned in lectures and familiarize students with equipment that can be used in real situations, becoming the protagonist of learning.

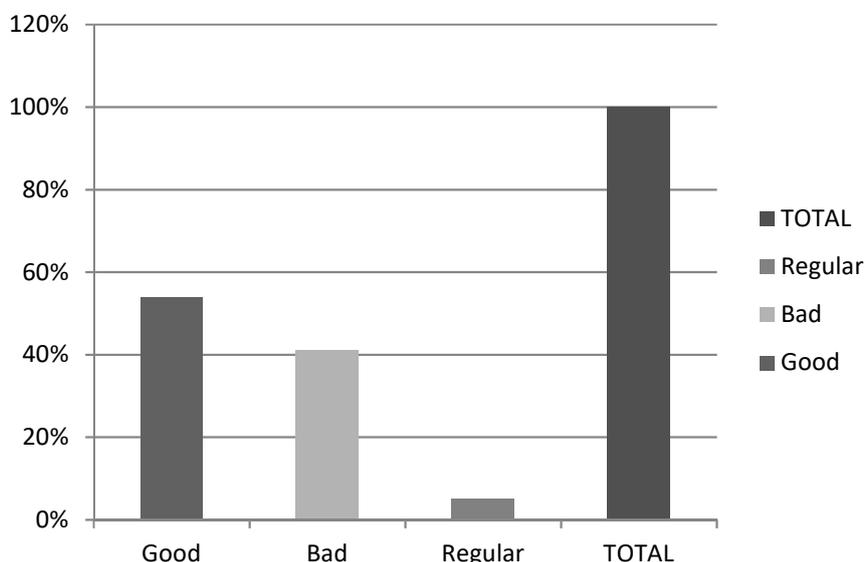


Fig. 3. Current classification method of teaching teachers to improve student participation in the course. (Source: Authors)

As for the study on the need and the impact of a robotics lab is significant positive assessment of students whereas 95% of matches in a process improvement strengthened strategies and encouraged the use of resources and reasoning logical, considering it as a complement to teaching faculty and an efficient way to group and individual learning for students.

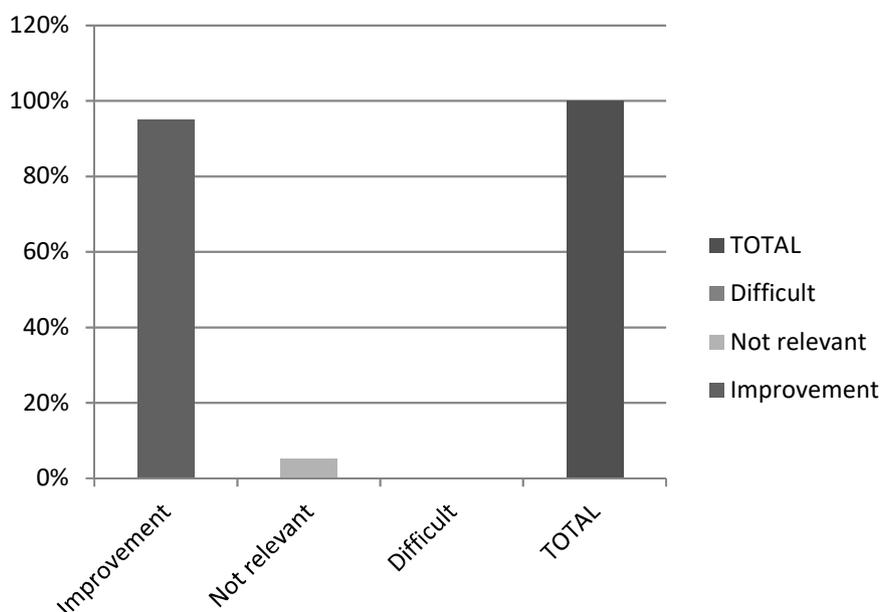


Fig. 4. Contribution of the proposal for implementing robotics laboratory at the teaching and learning process of the course Introduction to Robotics. (Source: Authors)

Similarly with the possibility of access to technological tools or resources such as robots and together with the teaching techniques such as collaborative work and problem-based learning students are motivated and assimilation of knowledge will be carried out effectively, and even more when they learn to build and appropriating it to develop its cognitive part and favoring their learning.

7 DISCUSSION

Information Technology and Communication have been of great importance to the presentation of content through tools and audiovisual resources; however, it is not enough to reach an effective praxis.

For this reason to have qualified materials work will ensure that the student participates in various training areas of information beginning with the identification of requirements to implementation of robotic autonomous systems thereby facilitating their creativity both at the time of construction and the development of appropriate software integrating different environments between robots and various fields of study.

Some students show enough sympathy with the idea of implementing a virtual laboratory that provides a permanent connection at any time of day for practice, however most prefer a laboratory in the university campus, in this part corresponds to a study at the University Alicante in Spain showing an average of 63% of students who performed in the physical laboratory as they prefer to work with the help of peers and teacher support.

8 CONCLUSIONS

The use of robots in the process of teaching and student learning facilitates the development of many and varied experiences improving the level of motivation subjects for that reason the learning environment proposed in this research offers the possibility of learning also of content, different programming languages or reinforce what they have been acquiring experience throughout their studies and also give them the opportunity to contribute new ideas that solve needs of your environment.

Robotics Laboratory will serve for experimentation of theoretical knowledge and at the same time to deepen and also reinforce the knowledge acquired in other disciplines, producing more and better assimilation of learning. With the right facilities you can record a history of tests conducted by project components used, and return equipment purchased for use in another project phase or as the beginning of a new project.

Practices in the robotics lab achieved in students the development of cognitive skills and logical and critical thinking, and social skills to improve communication, inquiry, respect for work teams, self-motivation and safety to create future projects professional level and thanks to past practice knows and knows how to use the various tools at both hardware and software have the ability to make comparisons necessary to optimize costs, time and get better results oriented purpose of your project.

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