Perceptions in students of degree in computers on the use of Robotics in the teaching processes

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Abstract. The teaching of robotics in a properly planned and controlled environment has allowed its incursion into academic stages both in secondary and higher education. So it should be added that the teaching process in this area, motivates and enhances the creativity and cooperative work of the students, connecting it directly with mathematics, physics, computers and electronics, I feel this the foundations that underpin and consolidate as you progress in the teaching process. Therefore, one of the objectives of this tool is to create an interest in science and engineering in students. This study was carried out to answer the question: How do professors and undergraduate students describe the usefulness, effectiveness and efficiency of using a robot as a face-to-face education technology for a learning experience? Therefore, one of the objectives of this tool is to create an interest in science and engineering in students. This study was carried out to answer the question: How do professors and undergraduate students describe the usefulness, effectiveness and efficiency of using a robot as a face-to-face education technology for a learning experience? For this study, two surveys developed by researchers were conducted to evaluate the perceptions of professors and undergraduates in computer science in a learning experience. The results of this study indicate that the teachers and students of degree in computer of the University of Magdalena, consider the use of robots as a facilitator of teaching processes as a highly motivating tool to undertake new teaching strategies and suggest a greater exploration due to the versatility that Robotics offers today.

1. Introduction
The innovative transformation of the modern technical environment and the updating of the technical activities of society must be reflected in the content of school education. Teaching should focus on developing the knowledge, skills and competencies that allow younger generations to successfully integrate into modern social and technical systems, maintain and efficiently develop the scientific and technological potential of society. The content of higher education in this regard should include sections on areas of technical innovation. One of those areas is robotics; Robotics has been operating in the world education system for more than 15 years [1].

Robots have become an integral part of society; Its production demonstrates an eminent development and the massive introduction of robotic systems takes place in various spheres of social practice (industry, military science, science and culture, service and life). The inclusion of the field of robotics in education is progressive and comparable to that of the scientific and technological revolution of the 20th century, which determined the beginning of the information age. A new perspective of robotic infrastructure is currently being formed, resulting in a global socio-cultural transformation [1, 2].
The aforementioned frames the responsibility that the Higher Education Institutions have today, in the training of students and their preparation to successfully articulate the changing dynamics of robotic technology in the life of the humble being as an element that stands apart from their environment. For which, guidelines should be defined that support this work in university education scenarios such as: 1) updating the content of professional careers, taking into account areas such as robotic technological innovation, 2) Targeted training of future consumers of services robotic environment and 3) Introduction to the preparation of future manufacturers of robotic systems. (research engineers, design engineers, planning engineers). Knowledge of the concepts of robotics must become a fundamental element of the curriculum at the university level [3].

At present, the development of this area must take into account the specific nature of robotic systems as new and significant in the scale of the objects of the technical environment, of distribution, of opportunities for interaction of various areas of knowledge in the field of study; as well as particularities [4]. that transcend an object-oriented behaviorist teaching and learning process and transcend a student-centered teaching and learning process; where the development of computational thinking becomes meaningful and manages to transfer and integrate knowledge into their daily lives.

This initial research has indicated regarding the incursion of educational robotics, that there may be potential benefits such as: development of scientific and engineering intuition, research skills, problem solving, as well as reading, writing, presentation skills and creativity among others. The study proposes to address, these two limitations in the literature focused on the perceptions of teachers and students on the value of the integration of robotics based on activities to develop student computational thinking skills. It is concluded that more research is needed in this field to identify the possible effects of educational robotics on student learning and teacher perceptions.

2. Robotics in the field of education
The literature review reveals that educational robotics is a growing field with the potential to significantly impact the nature of scientific and technological education at all levels, from kindergarten to university education. Educational robotics has become a unique learning tool that can offer practical and fun activities in an attractive learning environment that fuels the interest and curiosity of students [5]. In higher education, robotics is mainly used in courses for areas related to computer science engineering [6, 7, 8].

There is no doubt that the principles, methods and processes of constructivist education occupy an indispensable place in educational institutions and adequately complement the other concepts generally used. However, reasonable preparation of trainers, educators and students is a necessary condition (for those who are willing to use this approach). All education participants who wish to use this educational method can benefit from the potential of ICT and robotics, with the help of which it is easy to perform many activities more easily and with exceedingly better results.

The course of such teachers, educators and students, on the use of robotics in constructivist education [9, 10, 11, 12] has offered the possibility of learning more about the theories of constructivism and constructionism. For the latter, the evolution of constructivism to constructionism also represents the passage of the subject to the community, from the person to the community. Therefore, constructivism and constructionism are centered on the person and advocates critical thinking, the priority of learning over teaching, the empowerment of learners as responsible for their own process, and especially for the meaning given to the new information that is permanently received from the near and remote environment.

Likewise, it directs its interest to the way in which information is filtered, processed or reactive from what is already known to build and reconstruct knowledge, attribute meanings,
Figure 1: (Color online) A group of computer science students is shown doing a robot construction workshop whose objective is that future graduates become familiar with scientific and technological concepts, develop critical thinking, perseverance, learn to learn, develop work collaborative and develop cognitive skills.

Figure 2: (Color online) Results of the robotics workshop, opportunity to learn to build simple robots guided by teachers with experience in teaching robots, the built robot was adapted to the level of these students, where they tested their knowledge in anatomy, physics, electronics and programming. The idea is that these students not only be mere consumers of technology, but also know how to be creators of technology.

and to integrate it as its own and root it in previous knowledge [13, 14, 15].

The exploratory pedagogical results have allowed robotics to be considered as a special teaching technology in which three components in particular are identified for the use of educational robotics in the academic process: 1) as a method of teaching, developing and educating students, 2) As a tool for cognition, 3) as an object of study. This pedagogical experience consists of educational modules that incorporate determining teaching and study
materials: 1) for the study of the fundamentals of the robot; 2) set up the demonstration of the experiment with the robot; 3) for the demonstration of robotic models of technical objects; 4) perform robotic laboratory work of different levels of complexity; 5) for the organization of the student’s project. Robotics in each module is presented as an area of technique towards the applications of the foundations of science-physics.

![Figure 3](Color online) Analysis of perceptions of the teachers about the Robotics in the teaching processes. Questions 1-6.

### 3. Results and Conclusion

The results show the favorable perception of educators, more than 90%, consider robotics as an effective teaching tool; they conceive it as a pertinent tool for learning because it fosters a teaching process that mediates the resolution of problems that make it possible to exercise autonomy in the process of knowledge development by 88%. From the perspective of meaningful learning, the Ausbelian vision of linking the new concepts with the previous experiences and knowledge of the student is established. 90% educators consider robotics as a didactic tool that focuses on a real interconnection of the members of the educational community that enhances the student’s abilities at the time of learning, which enables autonomous and cooperative learning: However, in a minimum proportion of 12%, still remain rooted in traditional teaching schemes. In equal proportion, the results of the study show a clear picture of the teachers’ opinion about the need for constructivism as a theory that underpins the educational model, appropriate for teaching with this type of technology. They believe that educational robotics enhances the cognitive skills that allow students to develop new knowledge by manipulating objects; They also highlight that it is the students of the degree in technology and computer science, who have to use their ingenuity to find a solution and, if necessary, correct errors to arrive at an answer for one or several problems. The study shows that in the community of teachers the consideration of robotics as a teaching tool prevails, it encourages the development of creativity. University educators agree that educational robotics is not simply an instrument to reinforce old ways of teaching; but on the contrary a tool that contributes to an interdisciplinary teaching that promotes the development of skills and competencies in university students. Similarly, they agree that most of the uses of robotics in schools today are not compatible with the development of learning skills such as: scientific reasoning, critical thinking problem solving; for what they consider necessary to encourage its use in the pedagogical field.
Higher education teachers mostly consider that it is not strictly necessary for students to have prior knowledge of science to participate in robotics projects, they are emphatic in stating that linking educational robotics as a didactic tool with the experiences of the context makes possible the significant learning development. The results of the study show that university students in the undergraduate program recognize educational robotics as an empowerment tool in the preparation of a teaching role in computer science. In conclusion, both teachers and students show that they have a positive perception of the implementation of robots in the educational field. In particular, in the university faculty, it is considered that the development of robot-related activities in the technology and informatics program allows science concepts and theories to be put into practice. University professors consider that theoretical-practical methods allow the linking of sciences and technologies in a biunivocal way. This perception
is totally in tune with that of university students who think that the development of robot activities in the disciplinary subjects of the program allows them to put concepts and theories into practice. Robotics as a tool allows you to develop tools and materials handling skills; They also encourage motivation and prepare you for your role as a professional in technology and information technology.

Figure 6: (Color online) Analysis of perceptions of the teachers about the Robotics in the teaching processes. Questions 7-12.

Educational robotics is based on a paradigm shift where the student must develop skills that allow him to generate his self-learning. Based on the results obtained, it is established that the perception of educators and students consider positive educational robotics in the teaching-learning process; Thus, according to the results and the opinion of the educational community, it can be affirmed that it is viable for learning to include educational robotics in the area of technology and information technology at the University of Magdalena, since it incorporates a new pedagogical tool that increases skills, knowledge and application of hardware, software and other technologies in students.

Acknowledgments
This work was financed by the University of Magdalena (Fonciencias).

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