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# Challenges of Educational Robotics: A Perspective from the Teacher's Home

**By**

**Conde-Hernández, Marcial**
Departamento de Humanidades, Universidad de la Costa, Barranquilla, Atlántico, Colombia

**Sánchez-Montero-Edgardo**
Departamento de Humanidades, Universidad de la Costa, Barranquilla, Atlántico, Colombia

**Rico-Ballesteros, Reinaldo**
Departamento de Humanidades, Universidad de la Costa, Barranquilla, Atlántico, Colombia

**Garcia-Leyva, Diana**
Departamento de Humanidades, Universidad de la Costa, Barranquilla, Atlántico, Colombia

**Bolaño-Truyol, Jorge**
Departamento de Humanidades, Universidad de la Costa, Barranquilla, Atlántico, Colombia

**Fruto-Silva, Erick**
Departamento de Humanidades, Universidad de la Costa, Barranquilla, Atlántico, Colombia

**Esquiaqui-Gonzalez, Marisel**
Departamento de Ciencias Naturales y Exactas, Universidad de la Costa, Barranquilla, Atlántico, Colombia

**Martinez-Moreno, Sonyer**
Colegio Biffi LaSalle, Barranquilla, Atlántico, Colombia

**Charris-Angulo, Felix**
Colegio Nazareth Olaya, c

**Miranda Acosta, Rober**
Institución Educativa Politécnico, Soledad, Atlántico, Colombia

**Diaz-Jimenez, Arnold**
Institución Educativa Técnico Agropecuaria de Tubará, Tubará, Atlántico, Colombia

**Ladróndeguevara-Sanchez, Henry**
Institución Educativa Distrital Concentración Cevillar Barranquilla, Atlántico, Colombia

**Torres-Catalan, Luis**
Institución Educativa Liceo Mayor de Soledad Rafael U. Lafaurie Rivera, Soledad, Atlántico, Colombia

**Mercado-Cruz, Alvaroo**
Corporación Universitaria Americana, Barranquilla, Atlántico, Colombia

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# Introduction

At present, education is a key piece in the development and growth of a nation; research in recent years shows that it is impossible to think of an educational process without the use of different technological tools and that, in turn, these link to the Main actors of the educational community.

The Casa Del Maestro Research Center, given its trajectory and creation since January 30, 2019, has promoted research in education, seeking to strengthen research and give recognition to teachers as an active part in the development of the country with a view to the integration of project management and being recognized by the Ministry of Science, Technology and Innovation, the mission of the center is oriented to "the production of scientific knowledge" and "the improvement of the quality of education, through intervention processes, research, technological development and interdisciplinary innovation," which is under the contextual challenges, it aligns with the social purpose that is defined as a means to "configure social, pedagogical and educational management solutions demanded by the new orders of society" and with the vision of the center that proposes "to have an innovative Teacher, in each Educational Establishment of the Caribbean Region."

Educational robotics is adaptable in school not only as an end but as a means for the acquisition of other objectives through which the student acquires creative capacity, inquiry and manipulation, as well as being able to make applications in real cases to solve problems, and in this way it is possible to improve the competences and skills in each of them. It is necessary to consider an initiative focused on the intellectual development of children that, through the practical teaching of basic concepts of science, technology and mathematics, the student makes his ideas his own and internalizes them using his creativity and putting into practice concepts learned from other subjects without hardly realizing it (Hervás-Gómez et al., 2018).

In all fields, it is important to clarify, as expressed by Vivas Fernandez & Sáez López (2019), that the potential provided by educational robotics is evident and that it should not focus on believing that it is a simple circumstance but that it must look for the best methodologies and justifications to integrate it into the educational process.

Modern devices invite to delve into the world of programming and perform routines that many times, in daily life, are simple, but from the action of robot allow to create more complex sequences. In this sense, robots are the ideal connection between programming with a playful imprint and the representation of instructions on a real context. Initially, they have the potential to facilitate the learning of a programming language, encourage experimentation and stimulate the skills associated with problem-solving (Willging et al., 2017). In this way, it is possible to have a different view of the potential to be developed, strengthening the resolution of everyday problems.

It is possible to notice how practices with electronic elements are incorporated from an early age, integrating computational logic taking into account that research in Early Childhood education is presented as an alternative proposal, which motivates students and teachers to participate spontaneously and invites to explore the environment, cultivate scientific attitudes, acquire values inherent in social development, the development of multiple inteligences and to the integration of ICT (Quiroga, 2018).

In Casa del Maestro, the current needs are identified with new technologies incorporating educational robotics as a fundamental pillar in teaching practices and generating an impact on theory and practical experiences from different fields.

That is why, in the educational system, there is a growing phenomenon, the use of robotics to develop skills in children and adolescents for the benefit of learning. Since its applicability, they have detected several approaches, including using the robot as a tool for the student to develop construction and programming skills and thus generate new prototypes. All this for the development of logical-mathematical thinking skills, algorithmic, creativity, collaborative work, and communication (Gonzalez-Fernández et al., 2021).

It is an unobjectionable fact that the development of technology has impacted the history of knowledge. For this reason, in education, it is necessary to take into account the training and appropriate use of robots in a critical, ethical and responsible way so as not to distort the role that teachers have as trainers of the knowledge and doing of the students(González Fernández, 2021). Thus, every day strategies are built and projects are implemented that transcend the current needs directing knowledge in solving problems and improving quality of life. It is perceptible the differential impact that is generated in students through expertise in the application of robotics in areas such as mathematics. As mentioned by Valencia & David (2018), the educational bot influences positively in the learning of regular polygons in students of the second grade of the Educational Institution "Francisca Diez Canseco de Castilla" of Huancavelica; Since the probabilistic value (significance) is 0.000, comparing this value with the assumed significance level of 0.05, it shows the importance of the teacher in knowing the use and implementation not only how to assemble a robotic prototype but how it can contribute to the consolidation of different concepts in this case mathematics.

On the other hand, in the virtual international congress on learning and knowledge technologies, all this incorporation of knowledge is shown from the teacher's point of view. It works from an interactive environment that allows sustainability in the learning of students of different degrees, considering that robots are the ideal connection between programming with a playful imprint through gamification and representation of instructions in a real context.

Initially, they have the potential to facilitate the learning of a programming language, promote experimentation and stimulate the skills associated with problem-solving through the construction of various robotic units generating new knowledge in infants. Teachers Group 2., 2019, the teacher's mediation in all stages is a channel of integration in the application of this knowledge, turning the whole process into a global movement that, from the teacher's house, is envisioned as that collaborative and scalable work over time.

Toledo & Rogelio (2016) state that collaborative learning in education has numerous advantages, such as: activating individual thinking through the construction of knowledge, reducing fear of criticism and isolation due to the common language of collaboration. The achievement of objectives is qualitative and requires the self-evaluation of the work team, in its line of research, mediation for learning with its thesis Educational robotics as a collaborative learning tool in students of Higher Basic General Education shows the favorable teamwork and how from the different roles of students according to their abilities can potentiate each other.

All this gives a step in the inclusive part within the pedagogical framework (Conchinha, 2015), and allows to see how a group of students with different diagnoses and disorders, such as autism spectrum, deafness, bilateral sensorineural hearing loss, showed interest in the assembly activity of a robot. In the implemented activity, they did not show difficulties in

performing the task and managed to mount the Prototype in 62 minutes, in the same way, the teachers had an exemplary performance to initially explaining the activity and let them overcome the difficulties alone, but that the students learned through problem-solving and had to depend on the help of the group or that helped to create a greater spirit of unity and mutual assistance. The activity confirmed to the school team the importance of introducing manipulative materials to the classroom or what can make a difference in promoting knowledge and interaction among students.

In this way, there are benefits of Robotic for education, being implemented by the teachers and with little thematic mastery.

It should be noted that the impact of the transformation can be observed from a specific point, starting from the classroom and generating, according to Carrillo et al., 2017, repercussions on society but also on the economy of the countries that are investing in the development of research for this technology. Robotics, one of the most characteristic areas of Artificial Intelligence, has had a surprising growth from its beginnings to the present, very significant progress has been developed in various fields of application, and for this reason, the master's house focuses an objective and impactful look from the implementation of the project Educational, Robotics to learn from the Casa del Maestro, giving support in the training of teachers and teaching directors of the department of Atlántico, the project seeks to generate tools for teachers for their application in different areas of knowledge.

Gómez Bustamante et al.(2018) illustrate that it is necessary to overcome the traditional educational model to achieve a new one based on the global integration of all pedagogical activities, whose central axis is the strategic vision of learning and that is framed under the application of pedagogical innovations. In this way, the Casa Del Maestro focuses its objectives on bringing in an integrative and satisfactory way the knowledge in educational robotics and generates transversality in the different areas of knowledge. For this, they took into account not only the skills of the teachers but the trajectory and experience in their knowledge, strengthening digital skills and new technologies applied in education.

In the Casa Del Maestro there are intensive workshops of 40 hours, which are subdivided into 8 weeks, each section of 5 hours working 2 hours of tutoring and guidance in specific knowledge and 3 hours of practice where knowledge in robotics is applied with other areas of the Knowledge. It should be noted that the participating teachers carried out a pretest where it is possible to characterize the skills with concepts in different topics such as programming, electronic circuits, interpretation of schematic plans and boards for commercial use such as Arduino.

*The sessions were worked according to the following table:*

| Session | Thematic | Duration |
|---|---|---|
| 1 | Basic Electronics: Protoboard, electronic components. | 5H |
| 2 | Schematic diagrams, integrated 555, automatic sweeping project. | 5H |
| 3 | Tinkercad Simulators, Electric Car. | 5H |
| 4 | Arduino: Sequential Lights project | 5H |
| 5 | Servomotors degrees of freedom, football project managed with joystick | 5H |
| 6 | Ultrasonic sensor and module l298 motor control, obstacle detector robot project | 5H |
| 7 | Plant humidity sensor, smart garden project | 5H |
| 8 | Application of educational robotics to curricular meshes, teaching projects | 5H |

In general terms, the training is oriented towards comprehensive, active, cooperative, integrative and equitable participation. The body of teachers is encouraged to reflect and develop scientific skills and attitudes of critical thinking and reasoning, focused on coeducation and digital literacy.

In this way, teachers articulate the prototypes that help them strengthen and dynamize their educational praxis. The presentation of projects in the last phase, to the application of educational robotics to the curricular meshes from the perspective of teachers in projects that directly impact students and allow them to give a general look from their context and realities generating initiatives in the investigative part, each one exercises a role that can be described as proposed by López Amésquita (2019).

***Role of the teacher***

✓ Generates problematic situations that will give rise to projects.
✓ Raises the conditions and needs of the final product
✓ Provides and recommends information to gather data that serves the job.
✓ Accompany the work that is given in the teams.
✓ Promotes a good working environment in teams

***Student Role***

✓ Give ideas to carry out the project.
✓ Structure teams.
✓ Assumes responsibly the work assigned to him.
✓ Research in different sources the information they need for the job.
✓ You manifest your ideas, reach agreements, make decisions and give solutions to the rules.
✓ Make a final product with your equipment.
✓ Compare your product with the given needs and conditions.
✓ Makes its notes with respect to the processes executed in the development of the project.

The teaching of robotics in a practical way through the methodology of Learning Based on Challenges - ABR allows students to transform their thinking and strengthen it towards innovation and social projection, where it seeks to generate solutions to problems of the region through the use of Information and Communication Technologies - ICT and the implementation of technological artifacts in favor of a social benefit, above the staff (Estrada & Martínez, 2020).

In this way, it is possible to participate in different events as socialized by Chury et al. (2019), in the first international and national congress of educational robotics where they show different types of projects that are triggered by the knowledge acquired in this field of robotics, the implementation of Arduino as an open source electronic platform based on hardware and easy-to-use software. These are aimed at anyone who does interactive projects and contains an electronic board with input and output ports of signals that detect the environment by receiving the contributions of many sensors and interacts with its environment using control lights, motors and other actuators and simulators that allow correcting design and implementation errors promoting comprehensive, innovative and collaborative learning.

Cavero & Roscio (2018), in their scientific inquiry model based on educational robotics, explains that the model's fundamental purpose is to develop scientific inquiry

competencies in teachers, considering the stages ranging from design, construction and testing to the documentation of the research process.

This model is based on theories within the framework of constructivism, such as Maslow, Vygotsky fundamentally, which allows the use of educational robotics to strengthen scientific inquiry.

It also bases on a philosophical and pedagogical way, making a constructive criticism of each aspect developed, which allows showing how each one finds that meaning and that fundamental value for its incorporation in their areas through the different practices with the teachers.

Throughout the process of design and assembly of the projects, different looks are given to the costs of the components, minimizing the investment using everyday materials for the proposals. In addition, the availability of electronic devices, as well as the decrease in their costs and diversity of developments, has strongly promoted the use of Information and Communication Technologies in education.

Technology is much more than an educational resource and can be considered a thought structure (García, 2015); in this way, each teacher can make innovative proposals in the same way from their reality and resources.

This does not distance the possibility of living experiences with different models of robots, and it should be noted that working with prefabricated robots, following assembly manuals inclines the experience towards some of the vertices removing the richness of imagination or design in the most favorable cases.

It may also happen that all the work is reflected in the manuals and that only the indications presented are followed, in which case creativity is prohibited (Garcia, 2015). In this way, the Casa del Maestro develops, from the discipline, the creation of Low Cost prototypes that allow the incorporation of practical learning in students from different economic and cultural sectors.

All processes lead to potentiate the different learning. Usually, in the classroom, students tend to ask very frequently how and why things are in their environment. In particular, with the inclusion of educational robotics, it is intended that the new generations can better understand and answer the questions that may arise inside or even outside their environment.

In other words, learning environments supported by technology allow activating cognitive and social processes while promoting meaningful learning in students and developing the necessary skills to optimize their performance in the diverse and complex context of society (Gonzalez et al., n.d.).

The advances in technology drive to innovate, to generate proposals, so it becomes a great challenge for teachers to be at the forefront of technical proposals and generate strategies for incorporation into the classroom. Robotics in education generates new didactics and power pedagogical ideals that offer students learning environments rich in materials and experiences that captivate their interest. In addition, they grant greater freedom to explore, observe, analyze and build knowledge. They stimulate imagination, creativity, and critical sense, offer multiple sources of up-to-date information, facilitate a scientific understanding of social and natural phenomena, and enable multisensory learning experiences (Castro & Alexander, 2021).

Similarly, Corvera Ormeño (2019) concludes by mentioning that there is a high degree of correlation between attitudes towards the use of robotics as learning and the level of quality of education of participants in the renewal program of the teaching staff of the Inca Garcilaso de la Vega University; it can be evident the importance of directly incorporating practical experience in schools, for this reason, the Casa Del Maestro, through the active role of teachers, finds the balance between research, good pedagogical practices and innovation as foundations in the growth of knowledge.

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