LOGIC THROUGH ROBOTICS FOR DEVELOPMENT

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ABSTRACT

With the advancement of technology, electrical devices and robots have become fundamental elements in everyday life and various sectors of society. Since the creation of "Unimate", the first industrial robot, robotics has shown its potential in transforming environments, automating tasks, and optimizing processes. Currently, its presence extends to domestic, commercial, and educational contexts, with emphasis on the use of robotics as a pedagogical tool. The insertion of this technology in the school environment can enrich the teaching-learning process, stimulating logical reasoning, computational thinking, and interdisciplinary learning. Given worrying indicators, such as the low results of the municipality of Santa Rita (PB) in the Basic Education Development Index (IDEB), it is necessary to seek innovative methodologies. Educational robotics, in this context, emerges as a viable alternative to promote digital inclusion, improve the quality of teaching, and prepare students for the contemporary job market.

Keywords: Robotics. Education. Apprenticeship. Teaching.

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INTRODUCTION

Electrical devices have become indispensable in our daily lives; they automate countless crafts, and they also save a lot of time. With the constant evolution of technology, it didn't take long for the first machines called "robots" to appear. The first to appear was the "Unimate," created for industrial purposes by American inventor George Devol, according to the LMLOGIX website (2022). The Unimate was a leap in innovation in technology, this invention was able to revolutionize the industrial scope of the time, and also showed that a robot is capable of assisting and helping in different ways and different sectors.

Therefore, applying robots in scenarios other than industrial ones is becoming more and more common, such as the presence of robot vacuum cleaners in domestic environments or automated assistants in supermarkets and hospitals, having said that applying robotics in the educational environment is not a difficult task or a very distant reality, but an opportunity to help and sophisticate the lessons, In this way, positively adding to the teaching-learning process, students can learn programming logic and solve interdisciplinary exercises, stimulating various areas of knowledge.

The Basic Education Development Index (Ideb) was created in 2007, with a focus on disseminating the quality of public education in Brazil, working as an indicator of results related to averages and school flow. The municipality of Santa Rita, Paraíba, figured in the final positions when compared to the country and the state (IBGE, 2023). These data are worrying for the future of public education in Santorita, so this whole situation needs special attention, whether changing the methodology or applying investment. Thus, robotics as a teaching tool comes in as an aid for teachers and aiming at improving the teaching and learning process. It also prepares students who regularly do not have access to technologies for the current job market.

METHODOLOGY

The project was carried out in four phases over approximately six months, to apply and improve the methodology used, to significantly add to the quality of teaching. More specifically:

1st Phase - Knowledge of the Class and Difficulties: The initial phase included a visit to the school, where the proposal of the classes was presented to the students, directors and pedagogical team, this phase was extremely important for the continuity of the project, since it was possible to visualize some difficulties such as the absence of a computer lab. Visits were also made to the classes where it was noticed that the students were not

familiar with terms related to robotics. This whole process helped in the planning of classes and the methodology applied.

2nd Phase - Introductory classes and Basic concepts: classes were held introducing the basic concepts of logic, programming and robotics, so that students could gradually absorb concepts related to the area. The material used was also presented. Edison robots[4] (EdisonRobots) was a choice made to teach robotics playfully, since they have an appearance similar to toys, and also allow assembly starting from the simplest levels, to the most advanced, covering all audiences, thus becoming the most didactic, attractive and simple material to use.

3rd Phase - Assembly, programming and use of robots: With the students already familiar with the basic concepts and materials, practical lessons using the students' knowledge were carried out. In the exercises, the students were able to assemble the robots that would be used, encouraging not only fine motor coordination, but also socialization among classmates, since the assembly was carried out in groups. After the robots were assembled, the programming part began. In the exercise, one of the buttons on the remote control was linked to a specific function in the robot, which moved in all directions through commands sent by the control. At this point, the robot was programmed most simply, by passing it over a barcode. In this way, the students were motivated to solve problems. Soon, the ability to put into practice the phases of a project for solution was executed. They were able to plan, execute and test the solutions to the proposed problems. Later, logical programming blocks were used. They have several types of blocks such as choice and repetition functions, and others focused on specific actions such as walking, changing direction, responding to an environmental stimulus. This encouraged students to solve each challenge differently, aiming to solve them efficiently, practically and proactively, developing logical reasoning through programming.

4th Phase - Challenges and extra activities: The knowledge acquired was used to solve more complex proposed challenges and simulated problems, such as assembling and moving the robots through obstacles.

THEORETICAL FRAMEWORK

According to Zabala and Arnau (2010), a teaching based on competencies must mobilize content of a factual, conceptual, procedural and attitudinal nature, which can be satisfied with the use of didactic instruments that allow translating the content into situations of reality. This ends up bringing holistic training teaching and punctually focused on

[4] Edison is an educational robot (https://meetedison.com/)

preparing apprentices to solve real cases, using digital technologies. According to Almeida and Valente (2011), such an approach is advantageous because it drives new ways for the educator to be able to teach, so that the student learns and actively interacts with the experiences, allowing him to build and represent his knowledge.

Blikstein (2013) points out that the culture of doing contributes significantly to education, so that the student produces and shapes his knowledge, making the entire academic environment a tool to aid his learning. After all, the process of production and sharing of projects occurs with some frequency in some realities, but they receive different names, they are precisely the exploratory activities. As stated by Campos (2017), regardless of the materials that may be used, they must allow students to engage in constructionist and significant activities from the use of the elements that make up an educational robotics kit. In this context, *EdisonRobots* allow students to evolve by learning by building robots and exercising various areas of knowledge in solving challenges through programming logic. In addition, it is necessary to explore each student as a "unique world", so that every student has a unique and proactive experience, using various resources and knowledge, making them executors of their projects, allowing their protagonism in the process.

Campos (2017) points out that the use of educational robotics makes sense, as it allows the creation of a learning environment in which the student interacts with his environment and works from concrete problems encountered in his daily life. Francisco Júnior, Vasques and Francisco (2010) also contribute that the construction of robotics projects also demands tolerance and persistence on the part of students. It is necessary to establish relationships between proposal, execution and construction of an idea; systematize abstract, logical reasoning; work in groups, with collaboration and negotiation of arguments; actively participate in the formulation of hypotheses, reflecting on and evaluating the different stages and procedures.

Therefore, encouraging teaching and bringing increasingly relevant ways of teaching and learning to the current information society and its productive means, makes the educational system dialogue with the labor market and current needs, thus improving students' ability to face challenges daily and preparing them for daily life. There is also the possibility of transforming the students' experience into something unique, fun and dynamic and relevant, helping to improve the cognitive capacity of those involved.

RESULTS AND DISCUSSION

Among several benefits resulting from the application of the project, it is worth highlighting:

- Improvement in creativity, motor coordination, group communication, proactivity and other interpersonal skills of the students was observed. During the execution of the project, the students were more resourceful to carry out the activities and solve problems in the best possible way;
- It allowed to show, through the application, to the partner the use of a methodology applied in the classroom that aims at the protagonism of students in the execution of projects of their authorship;
- It was possible to establish a partnership with APAE (Association of Parents and Friends of the Exceptional) allowing it to gain more visibility;
- Scholarship holders and volunteers were able to plan, search, learn and teach students diverse knowledge by putting into practice activities related to teaching, sharing acquired knowledge;
- It allowed students to have their first contact with the robotics area, as well as simpler forms of *software* programming .

FINAL CONSIDERATIONS

At the end of the project, it was clear to realize the importance it had for the contemplated students, and also for the responsible students. Everyone was able to evolve their personal and academic part with the lessons and interactions carried out. Throughout the project, there was always a gradual improvement in student learning and communication. On the one hand, the scholarship holders and volunteers learned more about the practice of teaching, on the other hand, the students were able to assemble the robots and simply program them.

It was noticed that these activities added significantly to the teaching and learning process. Although initially the students had many difficulties and several doubts about robotics, with the use of a dynamic methodology, it was possible to teach and learn in a simple way, eliminating the main complexity of the subjects covered. Soon after the closing period, a questionnaire was applied, with questions aimed at evaluating the project. The results were very satisfactory and positive, commenting on how it helped the partner's educational system.

It is expected that this project will continue to contribute positively to the APAE of Santa Rita, continue the project and continue with this partnership of the Federal Institute of

Education of Paraíba (IFPB) campus Santa Rita with APAE, since with the project, many aspects have improved, and the spirit to learn and educate has intensified, but they still have many challenges. Therefore, maintaining this contact with the association is extremely important for the uninterrupted nature of the project, and also for the performance of the students contemplated with the classes, activities and dynamics.

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