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Impact Of Robotics On The Motivation And Socio-Affectivity Of Secondary School Students

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Abstract: There is broad consideration that ICT is a resource that promotes more meaningful learning, allowing students to acquire a set of skills considered key. These competencies allow him to face new challenges and solve difficulties both associated with the educational process and the context in which this student is located, making him more able to adapt the knowledge, skills and values acquired to reality. This article raises this issue by emphasizing the potentials of ICT in the classroom, in particular robotics, for both teachers and students. This means accepting that ICT has made changes to classroom interaction but, above all, in the methodology that vertebrates the teaching-learning process.

The main objective of this study is to know whether the motivation and interest of students is increased when using robotics in the classroom as a technique integrated into active methodologies focused on digital use and management while knowing more positive socio-affective relationships are established between students.

The methodological process adopted in the study responds to the quantitative paradigm. A sample of 150 secondary school students was used, who were given a questionnaire to learn about their perception of the use of educational robotics. The results have shown how the use of robotics increases motivation in the teaching-learning process and how the relationships between students have acquired positive value.

The results of the study also allow for a broader reflection of the educational community on an issue of interest to adapt teaching-learning processes to current needs: does the implementation of robotics in the teaching-learning process facilitate student training in different areas of knowledge and promote mechanisms that increase motivation?

Key words: education, motivation, robotics, socio-affective relationships, school performance.

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1. INTRODUCTION

The changes that have been produced by the irruption of the Information and Communication Technologies (ICTs), (characterized by the simultaneity, instantaneousness, interactivity, asynchrony and ubiquity that they make possible) have meant new educational opportunities but also constitute an active source of new demands for which teachers must be prepared, such as the need for innovation in the classroom, the awareness of the use of resources that imply more dynamism, the assumption of more active and participatory methodologies, the transversality of ICTs. However, the current academic debate focuses almost exclusively on aspects related to the implementation, optimization and evaluation of the use of ICT in the classroom without paying attention to other aspects that highlight the role of teachers and how they can contribute to the promotion of skills, including digital, to make students more competent (Flores-Tena, 2018).

If the ultimate goal of education is taken into account -to form autonomous, critical, self-thought persons-, the use of ICTs and, more specifically, robotics, is more than justified. Their use promotes individual and social development. The first one makes it possible to provide them with a compendium of knowledge, skills and values that puts them in a position to use tools to achieve their objectives. The second, the constant adaptation to new forms of production and management, more global and participatory, resulting from social, cultural or economic changes. This means understanding how the needs of citizens have also changed giving way to a profile of the citizen in which the qualification is important but also the collaborative capacity, the transversality or the proactivity, among others.

The inclusion of educational robotics in the classroom begins to be a widespread behavior among teachers being significant as they begin to use it at younger ages. In this case, the activities they use contain highly motivating aspects that promote the achievement of learning on which other future ones will be based. In addition, robotics makes it possible for students to apply knowledge in the area of mathematics, logic or design, working in teams, on projects, working cooperatively and collaboratively, as well as solving problems (Karim, M. E., Lemaignan, S., & Mondada, 2015).

In the educational field, the use of robotics has spread in Asia, Europe, America and Africa (Moreno, Muñoz, Serracín, Quintero, Pittí & Quiel, 2012), giving rise to a more global perspective of the potential of the tool and its standardization inside and outside educational centers; India and Korea use it outside the classroom as the positive results for the population have been demonstrated, countries that included it in their education laws.

For Alsina and Acosta (2018), robotics is used as the main tool for problem solving by encouraging reasoning, interaction and dialogue and making connections between knowledge from different areas by using and developing meaningful learning.

The Institute of Educational Technologies and Teacher Training (INTEF) presents in 2019 the results of a large-scale study called Survey of Schools: ICT in education. This study has been promoted by the EU and integrates a series of activities to know the level of digitalization of education. It is the first study at European level that includes 31 countries to know the availability and use of ICT in learning centers. The study is focused on observing the digital competence of students and the attitude towards ICT, their use and the attitude of teachers (Pérez Escoda, 2017).

Educational robotics is a technique based on STEM education that focuses on students designing, analyzing and applying knowledge through the use of robots. With it, cooperative work is encouraged, in teams, the assumption of rules and roles to participate in the project of

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building robots, to program them taking into account what it is intended to do and to decide the best way to solve the problems that have been presented (Morales, 2017).

2. METHODOLOGY

For the methodological process, a quasi-experimental research design was proposed, as well as quantitative techniques, since these are the most appropriate ones to analyze the information obtained in an exhaustive and quantifiable way. For the design of the investigation, it was used the independent and dependent variables; considering the activities that were carried out in the classroom about robotics in the areas of mathematics and natural sciences, the independent variable makes reference to the motivation that students have when applying technology inside the classroom.

The main objective of the study was to know if the use of robotics in the classroom with 3rd grade students of the ESO means an increase in motivation and socio-affective relationships, evaluating students through a training program for the development of skills in the areas of natural sciences and mathematics.

Participants

The sample was made up of 150 students in the 3rd year of secondary education from a school in Madrid in the 2019/2020 academic year.

Regarding the total sample and its gender, 43% were boys and 57% were girls. The age of the participants was between 13 and 15 years old.

The sample of the study was composed of 150 students from 3 of the ESO in a center located in Madrid, during the academic year 2019-2020. The students were informed of the main objective of the study, obtaining parental consent by communicating the activities that would be carried out in the classes to carry out the research. The ages were between 14 and 16. The distribution of the students in the different groups was composed of 75 in the experimental group and 75 in the control group. In each group, 55% were women and 45% were men.

Instrument

The instrument used to collect the information was a questionnaire developed specifically for the study. The questionnaire, composed of a total of 10 items, has been divided into two dimensions. The first refers to the motivation of students with respect to the interest shown in learning through the use of robots and their ability to enjoy during the teaching-learning process and was composed of 5 items. The second dimension refers to socio-affective relationships, understood as relationships established with an emotional charge for the group of students surveyed, and has integrated 3 items.

Table 2. Dimensions of the questionnaire used as an instrument for the collection of information

Dimensions of the questionnaire	
Dimension 1	**Dimension 2**
Motivation and enjoyment	**Socio-affective relations**

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Centers of interest addressed and relevant to the study	1.1. . I had fun in class 1.2. Robotics makes you learn faster 1.3. Increased motivation 1.4. Facilitates integration into learning 1.5. I would like to have technology at home	2.1. . I have enjoyed interacting and learning with my classmates 2.2. I have participated in the activity 2.3. I have been angry with my colleagues during the activities

He research questions that were established in the study are oriented to know the effect that it causes, the development of the formative program, in the students who participated of the planned learning activities with programming and robotics challenges. In addition, it is intended to determine the progress of students in the domain of characteristics: algorithmic thinking, abstraction-patterns and debugging. These are part of the computational thinking skills proposed by researchers. Brennan & Resnick (2012). Is it possible that the integration of robotics-based learning activities and programming have a significantly positive effect on the development of computational thinking in elementary school students? Do participants in a robotics training program strengthen their algorithmic thinking by developing challenges on sequence construction to be executed by an educational robot? 3. Do participants in a robotics education program improve their abstraction skills and patterns related to the development of computational thinking? 4. Can participants in a robotics education program strengthen their skills?

The study was structured in five phases over five weeks, each session lasting 45 minutes. The first phase was the contact taking where the characteristics of robotics were contacted. In the second session, a pre-test was carried out allowing the measurement of the variable of motivation through robotics activities. The dimensions that were evaluated for each person were motivation and involvement in the activities proposed with robotics. The third phase refers to the intervention sessions using the learning activities based on robotics and programming working in mathematics the algorithms and equations; and in natural sciences it was developed the abstract thinking working on the themes of the Universe. The fourth phase was carried out working with various activities proposed for students to develop. The last session refers to the fifth one being carried out with the teachers who participated in the research, taking into account the objective for the study.

Finally, a questionnaire was passed to the students who had participated in the research by answering 10 questions with three alternative answers according to the Likert scale to which the following answers were assigned to be chosen: "totally disagree", "neutral" and "totally agree". This type of scale was chosen because many researchers agree that it is the most appropriate instrument for evaluating attitudes and opinions about a given event.

The validation of the questionnaire was carried out through 10 experts to assess the dimensions and to ensure that the questions were formulated to achieve the objectives set.

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3. PROCEDURE

In each session a robotics kit Ecu RED was used, this robot is capable of performing the tasks of a human being requiring the use of intelligence, dealing with the sciences from which algebra or programming is derived. The students sat in a circle having the robot in the middle of them so that they could see it all and make displacements, obtaining the abilities that were required in each session, the robot would be the didactic means in which they represented the activities proposed for their learning of each session. The data collection information was done through the SPSS 23 program, previously using the Kolmogorov-Smirnov statistics test

4. RESULTS

The following results are presented following the structure established for the construction of the instrument used in the information collection, the questionnaire.

The results appreciate the evaluation of the results obtained by the students of the experimental group. In all cases the results are higher than in the control group.

The first item of the first dimension refers to knowing the degree of satisfaction of the students in the class sessions. The results show that the use of robotics increases satisfaction, with 82.5% responding that through the use of this technique the sessions have been very satisfactory, compared to 17.5 responding that they have not presented any modification in terms of satisfaction (neutral).

The second item of the first dimension refers to whether the use of robotics allows students to learn faster in the subject in which this technique is used. The results show that 75% of the surveyed population answered that they totally agreed with this statement, while 12% answered that they were neutral and 13% disagreed.

The third item of the first dimension refers to emotions and whether they have increased while using robotics in the classroom. The data reflects that 91% have responded that they have felt more motivated against the 9% that have responded feeling the same or have preferred not to respond.

Through the fourth item of the first dimension we wanted to know if robotics with educational use in the classroom facilitates the integration of learning. The results show how 87.5 responded positioning themselves totally in agreement with this affirmation while 11% declared to feel "neutral" before this question and 1.5% responded showing disagreement.

The last item of the questionnaire and of the second dimension has focused the interest in knowing if any difficulty has occurred during the course of the educational robotics activity in the classroom. The results show that 78% have had discussions with their classmates compared to 22% who showed no difficulties, anger.

5. CONCLUSION

Each era has had its own paradigms and educational approaches. And each of these has been conceived according to concepts and methodological and technological instruments available (Flores-Tena, 2018).

This study shows how ICTs have a great impact on education and how their use implies new possibilities for the educational act, in particular, how they increase motivation towards learning and the improvement of socio-affective relationships since they become an individual work tool that facilitates collaborative work spaces in diverse activities (Vergara, 2017).

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The inclusion of robotics in the classroom offers optimal learning with better results, raising motivation in the study, encouraging creativity and the development of problem-solving skills. The new educational challenge is the one that focuses on knowing if the prolonged use of ICTs favors permanent and continuous learning throughout the life cycle. Several studies show how non-digitalization is not only an educational but also a social vulnerability, which prevents the individual from developing in an integral way and, therefore, optimal in the contexts in which he or she interacts. Being aware of this fact, it is the responsibility of the educational community, specifically, of the professionals who are in charge of the teaching-learning processes, to generate new knowledge, skills and attitudes. To this end, digital literacy becomes a tool of primary individual and social need, ceasing to be an option at the mercy of individuality.

Using robotics, students can face the teaching-learning process more motivated, develop their creativity and get involved to the maximum in the proposed tasks. With it, not only will they acquire logical-mathematical and/or computer knowledge, but they will also be able to extrapolate what they have learned to other disciplines whose subject matter has nothing to do with science, and to real situations. In this way, the priority is not the sum of knowledge but its applicability.

Therefore, educational robotics is not only an important contribution in the digital field but it is a learning resource with great disciplinary and personal possibilities suitable for any area of knowledge.

In this sense, teaching teams have to assume new challenges. The new times have shown how there is a need for digital updating in the educational community that must be assumed as a teaching responsibility.

It can be said, then, that the debate on whether robotics in the classroom responds to the social and educational needs of students and those inherent to the teaching function, remains open. The reflection must continue and this study contributes to consider ICTs, and more specifically, educational robotics as a tool for professional use in the educational field.

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