Robotics for Young People in AZORESminiBOT

Ana Isabel Santos*, Dora Pereira, Nanci Botelho, Paulo Medeiros, and José Manuel Cascalho

***Abstract*—This paper intends to analyze the implementation of the Festival de Robótica - AZORESminiBOT, a robotics festival for the young which purpose was to create learning experiences that lead to the utilization of robots, promoting coding skills and computational thinking, as well as cooperative problem solving and with the mobilization of knowledge from specific curricular areas. At the same time, we intended to sensitize teachers to the relevance and comprehensiveness that robotic and coding activities can have in an educational environment. The festival took place in a school located at São Miguel Island, Azores. The proposed activities and the participation of the children in the four stations available were evaluated using direct observation and surveys by questionnaire. From the observations made by the researchers and the answers to the questionnaires of the 155 children who participated, 11 teachers, and 22 collaborators who facilitated the activities, it was concluded that the activities implemented were of interest to the children and were considered relevant by the teachers, but some aspects concerning the operation of the robots and the scenarios created should be taken care of in the future so that the pedagogical component is effective and of quality.**

***Index Terms*—Computational thinking, educational robotics, programming, primary education.**

I. Introduction

Nowadays, the presence of technology from an early age, the relevance that its use has had in various facets of human action, including learning, and the need to bring this field closer to the pedagogical work that takes place in schools, are the main points for the paper here presented, which aims to show the work that was implemented in the context of the Robotics Festival - AZORESminiBOT, developed over two days in a school on the island of São Miguel, Azores, where there were about one hundred and fifty attendees.

In a recent study developed in the Autonomous Region of the Azores [1], the use of technology and the focus on digital still seems to be far from what would be desirable in the Region's schools, with textbooks and work focused on paper continuing to be predominant in the design and implementation of the activities that take place in the schools' daily routines.

These data alerts to the need to start introducing robotics, programming and computational thinking in the classroom, in a broad manner at all educational levels, being certain that it is in the early years where there is still a long way to go and where, in the near future, there will be areas of compulsory exploration since primary school. In that respect this paper seeks to contribute to an exploration and deepening of the work that can be developed, theoretically contextualizing the proposal, and presenting the results of the activities carried out, envisaging recommendations for future pedagogical interventions in the area.

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II. Programming and Robotics in Childhood

Currently, with technology so present in children's lives from an early age, it is unquestionable the role that programming and robotics have come to play in their daily lives, not forgetting, of course, the educational context, where they spend a considerable amount of their time. With the massive use of tablets or smartphones from the earliest years of life, within the family environment, [2] alerts us to the urgency of thinking through important issues related to the use of digital technology with children from three to eight years old, including the needs of using technology to serve children's own needs. On the one hand, to envision better ways for educators to be able to understand, evaluate, and integrate technologies in developmentally appropriate ways with children in their classrooms.

In this context, and in particular regarding the use of robotics and programming, there is a great deal of research that shows the potential for children, even the very young.

First, from an early age, children have the ability to lead to the mobilization of computational thinking skills, especially for problem solving, the improvement of logical reasoning and the development of analytical thinking [3], [4]. J. Wing [5] driving computational thinking as a cross-cutting capability that goes beyond the boundaries of computing, "computational thinking is a fundamental capability for anyone, not just computer scientists. To reading, writing, and arithmetic, we must add computational thinking to each child's analytical competence" (p.2).

Second, as a tool that enhances skills and knowledge in STEM areas (Science, Technology, Engineering and Mathematics), with direct impact on students' attitudes towards learning in these areas [6]-[8].

Finally, by promoting other aspects related to children's development and learning that are favored by the introduction of robotics and programming in educational settings, far beyond technical and digital skills [9], [10], such as social interactions, collaborative learning and communication [11], playfulness and creativity [12], the promotion of learning in specific knowledge areas [13], [14], or even as an aid to learning for children with special educational needs [15], [16].

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Recognizing its relevance, it is important to explore how robotics and programming can be valuable pedagogical tools to enhance all these skills among children.

From M. U. Bers's [17] perspective, following Jean Piaget's constructivist and Seymour Papert's constructionist proposals, for younger children it does not seem sufficient to copy the models developed for older children based on the STEM perspective, but rather to look at computer science as "another language", based on the principle that learning to program involves learning to use a new language and other skills beyond those more directly related to programming, calling his perspective "Coding as Another Language".

In this context, it is considered that, for these learnings to take place in an active and meaningful way, transforming what is traditionally done on the computer, in a physical, interactive and constructive learning experience [11], [12], developmentally more suitable for younger children, it is essential to use tangible programming languages (TPL) [9], active learning environments with tangible robots [18] or, as proposed by M. U. Bers *et al.* [2], a tangible curriculum. This approach with younger children will allow their progressive introduction to robotics and programming, in an engaging and developmentally appropriate way, using resources and software that allow them to create programs to control their robots from concrete objects, such as wooden blocks or cards, or from graphic icons on a tablet or computer screen, such as Scratch [2], [19].

Further, this work with robots and programming gains if, as pointed out by Y. H. Ching *et al.* [6], it appears integrated into the school curriculum, because robotics activities and their potential to be meaningful for learning, foster student understanding and facilitate the creation of connections between multiple content from different subject areas. Furthermore, S. Pöntinen and S. Räty-Záborszky's study [20] suggests that in order to effectively promote the evolution of students' skills, teachers need to consider the use of technologies in a holistic and long-term way, using diversified working strategies (individually and in groups, in the classroom and in other contexts, etc.).

At the same time, designing a work that is intended to be pedagogically sustained, it is also necessary to consider how children "use" the technologies. Some studies point to different ways and different purposes in their use by boys and girls. In the study by Y. Yücel and K. Rızvanoğlu [21], for example, gender-related differences are identified in aspects such as " the perception of computer competence, the perception of coding difficulty, identification, the perception of game difficulty, the perception of success, the level of enjoyment, the level of anxiety, and the likelihood of playing another time or the likelihood of trying new features again". These differences seem to lead girls and boys to get involved in different ways, which simultaneously implies considering the type of tasks that may be designed, trying to meet their preferences. There are several studies that report these gender differences in the preferences and attitudes of children towards the types of games or tasks that are proposed, generally more exploratory and active for girls and more strategic for boys [22]-[24].

Finally, there is a need for teacher training to further deepen and develop good practices in the use of robotics and programming in the educational context [25].

M. Bevčič and J. Rugelj [26] state that there is a need for the "development of teacher competencies and the profile of the teaching profession, empowering educators to effectively develop the desired computer skills among their students" (p.576). Among the internal and external factors that influence the integration of technologies in educational settings, listed by N. Eteokleous [27], teacher training emerges as a key external element, going beyond a merely utilitarian perspective of using technology in the classroom context, and, as C. Chalmers [28] states, "greater awareness of concepts, practices, and perspectives on computational thinking would increase teachers' understanding of and confidence in integrating computational thinking and robotics into classrooms" (p.99).

III. THE ROBOTICS FESTIVAL FOR YOUNG PEOPLE

The AZORESminiBOT Robotics Festival for the youngest is part of the Regional Festival of Robotics - AZORESBOT, during which children and teachers of primary education had the opportunity to experience a set of diversified activities, some of them linked to subject areas that are covered in schools and others intentionally designed to promote computational thinking and programming skills.

This event, with objectives clearly aimed for children to seek a first exploration and use of robotics and programming, also did not neglect an awareness-raising aspect for the teachers that accompanied them, so that they could envision the use of robotics and programming in the classroom context, which is why a series of activities related to different subject areas were planned and carried out. In this respect, the event sought to: offer a space that promotes contact with technology, particularly robotics; familiarize children with the use of robots for their meaningful learning; promote programming and computational thinking skills, allied to cooperative problem solving; promote equal opportunities in the access to programming and robotics for girls and boys; enhance creativity, innovative and entrepreneurial spirit of children through the use of robots; motivate teachers to approach the use of programming and robotics in the educational context, enhancing their potential.

Over two days, the primary school children were able to participate in activities that were designed for different educational levels:

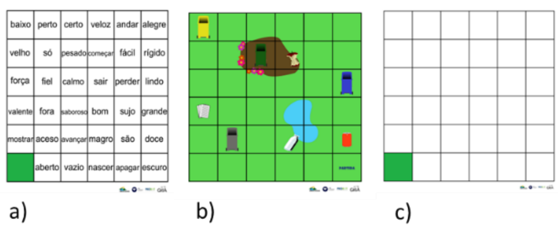

Fig. 1. Scenarios explored with Botley.

1) A first station aimed at 1st and 2nd grade students. In this space, students used the Botley robot to perform three different challenges (Fig. 1), two of which were associated with subject areas - Synonyms and Antonyms in Portuguese (Fig. 1a), Recycling in Environmental

Studies (Fig. 1b) and a third with mazes that could be modified throughout the activities and whose objectives were essentially focused on developing computational thinking and programming skills (Fig. 1c). To help younger children with little programming experience, the cards with arrows were used to help coding in a more tangible way before moving on to the remote control of the robot [29].

The other three stations had activities geared toward 3rd and 4th grade primary school students and were organized as follows:

2) In the second station, using the Bubble robot children could, with the help of a whiteboard, (re)use the robot to perform tasks related to geometry and measurement (math) and drawing, using the code cards that the robot itself comes with or creating their own code to make new figures.
3) At the third station the Edison robot was used and there were 3 activities - follow the light, follow the line and sumo battle (Fig. 2.a); Fig. 2.b)). The students had to program this robot using barcodes for this purpose, depending on the intended activity.
4) In the fourth station the robot used was Thymio, to perform activities related to mathematics (calculation). It was intended that students could find a path on the carpet, whose result of operations corresponded to a certain value (Fig. 2.c).

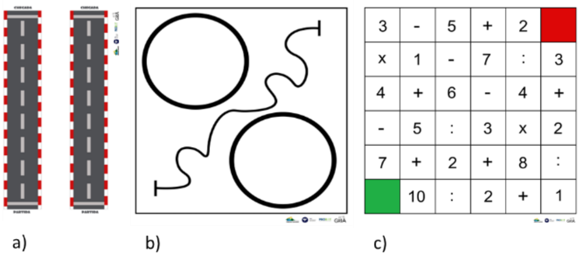

Fig. 2. Scenarios explored with Edison and Thymio.

IV. Methodological Approach

Considering that the objective of this study is to assess the potential of the implemented robotics activities, analyzing positive aspects and what can be improved, the study that we developed has an exploratory, descriptive nature based on the observation by the researchers and the perception of the respondents about some aspects related to the relevance and pertinence of the proposed activities. It also seeks to evaluate, in general, some of the potentialities that the use of robots and code may have, as well as the interactions that are created in a work situation that is intended to be collaborative and aimed at problem solving.

Thus, observations were made by the researchers to analyze the children's ability to use the robots autonomously, to understand their functioning and their use in a cooperative work context. Simultaneously, three short questionnaires were designed to be answered by the children, the teachers who accompanied them and the collaborators who streamlined the activities, which were filled out at the end of each group's intervention.

The children's questionnaire intended to evaluate aspects such as: the interactions, trying to understand if the children solved the proposed tasks alone or with other children; the accomplishment of the task, as well as the reasons why, eventually, the task was not successful; the children's preferences for a particular robot; and the children's general satisfaction with the developed activities.

The questionnaire for the teachers who accompanied the children sought to find out their perceptions regarding: the relevance of the initiative for the children's learning, the relevance and meaningfulness of using the robots in the classroom context, and the connection of the use of the robots to the work in the different subject areas.

Finally, the questionnaire aimed at the collaborators had the purpose of knowing their opinion regarding the relevance of the initiative for the participants and the general assessment of the event, taking into account parameters such as its organization, the number of activities offered, the degree of difficulty of the proposed activities, the relevance of the activities, the suitability of the facilities, and the timetable of the event.

Regarding the participants, a total of 155 children filled out the questionnaires, 47% girls and 53% boys, aged between 7 and 12. Almost half of the sample, around 41.9%, attend grade 4; 24.5% attend grade 3; 25.2% attend grade 2, and the remaining 8.4% are enrolled in grade 1. As for the teachers who accompanied them, 11 in total, are between 39 and 58 years old. Among these teachers, who are in the teaching profession for between 15 and 34 years, more than half (54.5%) have already had some training in Education Programming. Regarding the 22 collaborators who promoted the activities, 18 were students of the master's degree in Pre-school Education and Teaching of the 1st Cycle of Basic Education and 4 of the Degree in Informatics.

The data collected was analyzed qualitatively and quantitatively.

V. Results

A. The Implementation of AZORESminiBOT

From the researchers' perspective, the organization, management, and monitoring of the stations was implemented in a logic close to that initially planned and described above. However, during its implementation, we detected particularly successful situations, as well as aspects that could be rethought and improved, with the purpose of developing good practices in future interventions of this type, but which, at the same time, may also be factors that influence their use in classroom contexts, in line with M. U. Bers *et al*. (2014) [2].

The event was organized to provide all students with direct contact with the robots, so they were divided into small mixed gender groups that, for about 20 minutes, tested and explored the various activities/challenges designed for each station.

Thus, in the first station two aspects deserve particular attention. On one hand, the scenarios created, and, on the other hand, the robot used - Botley. Regarding the scenario for the Portuguese activity (search for synonyms and antonyms), the size of the carpet proved to be an obstacle to a deeper exploration of the proposed pedagogical content. Being very large and with many squares, it was not possible to explore, in the time available, all the possibilities that the activity provided, foreseeing the need, in the future, to invest in smaller scenarios for this type of situation. In the classroom context, with more time available, it proved to be an activity that reinforces and complements the content covered without great difficulties for the children.

Also at this station, and for the dynamic scenario, detachable squares were used to offer different route options for the children. However, the material used for the squares was not the best, because they do not stay upright on the carpet, besides being easily dragged by the robot.

Regarding the Recycling scenario, there were no difficulties in carrying out the proposed activity, although some children had to use the cards with arrows to correctly insert the instructions.

For the use of scenarios in activities that involved the mobilization of content from subject areas, in this case, Portuguese and Environmental Studies, the previous approach to these contents in a classroom context is essential for the execution of the activities, which, at times, proved to be an obstacle to the understanding of what was requested.

In general, it was observed that Botley is an easy robot for the children to use and understand, and they were able to program it with relative ease. For children with less programming experience, the cards were a positive help, being used to think about the route and draw it with the cards before programming the robot. This robot proved to be suitable for the age group that used it (6 to 8 years old), considering that it can even be a good resource to be used with children in pre-school education.

At the second station, Bubble was the robot used to experience programming through drawing. In addition to initially experimenting with programming and drawing on a whiteboard, the fact that they could also draw a picture on paper and take it with them at the end of the activity made this activity attractive. The main difficulties that arose in this station had to do with the need for children to register in the robot the junction of the coordinates that the letters indicated (row/column), which was not easy for some of them, because of the task itself and because some revealed difficulties in reading and identifying letters. In general, this is a robot easily manipulated by children, which allows them to be autonomous in the introduction of the code, however it is essential that it is used by literate children.

Regarding the third station, where the Edison robot was used, the most interesting activity for the children was the sumo activity, due to its dynamism, the fact that the robot could be customized with Lego pieces, which led to the creation of very elaborate characters, and the competition created by the situation itself. In this activity, after a few uses, we felt the need to reprogram the robots using the bar code, which may cause some deadlock to the dynamics that are created.

Also at this station, a "follow light" activity was implemented, with a racetrack as the scenario, an activity that proved to be dynamic and whose difficulty for some students was in finding the robot's light sensor so that the robot would follow it.

In the "follow the line" activity, initially it was planned to use only the Edison robot. After identifying some difficulties for the robot to follow the lines of the tracks, we tried Thymio, which revealed the same problem. Not having been tested beforehand in the scenario used, it turned out that the scenario had curves at too sharp an angle, causing the robots to invert the direction. This activity ended up being rethought. Thus, the Thymio robot was used to "follow the hand" and "move away and avoid obstacles", and the goal became to use these functions to follow the line of the scenario.

In the fourth and last station, the Thymio robot was used for a math activity. This was, of the four, the station that posed the greatest challenges to the students and to the leaders of the activities. Because it was a very large carpet, the initial challenge of students drawing a number at random and trying to make a route with calculations, starting from the green square to get to the red square, in order to get the number they had drawn, so that the robot could make this route, proved difficult to accomplish, even leading to the discouragement of students, also because, given the size of the scenario, it was difficult for students to situate themselves and perform the operations without being able to place themselves in the middle of the scenario. Given these difficulties, it was decided to give the students a white sheet of paper and a pencil, placing the robot on a path that they should follow and record on the sheet so that they could make the calculation as the robot moved. At the end, they went to the red square to check the number that had been placed there before the robot started its journey, in order to verify that the result matched the calculation they had made on the sheet. After the strategy was changed, there was a big difference in the students' interest and commitment to perform the tasks, and there were even those who did not want to leave the station. This activity was also adjusted due to time constraints, which, like the Portuguese station, would require more moments of exploration, and was adjusted to the students' difficulties, particularly with regard to calculation skills.

B. The AZORESminiBOT in the Opinion of Its Participants

1) The students

After going through the different activities and trying out as many robots as possible, the students were asked to fill in the questionnaire.

The data collected through the questionnaire revealed that 60% of the students participated in the activities with the Bubble robot, 65.8% in the activities involving the use of Botley, 54.8% with the activities connected to Edison, and 34.8% in the activities streamlined with Thymio. Of the four, the preference was for Botley, which was liked by 32.7% of the children, followed by Edison, with 30.7% of likes, Bubble, with 27.5%, and Thymio, with 9.2%.

When invited to justify their preference for one of the robots, the justifications given were mostly (55%) associated with the fun provided by the activity, with a less positive emphasis on the activities with the Thymio robot, understandable given the degree of difficulty they entailed (Fig. 3).

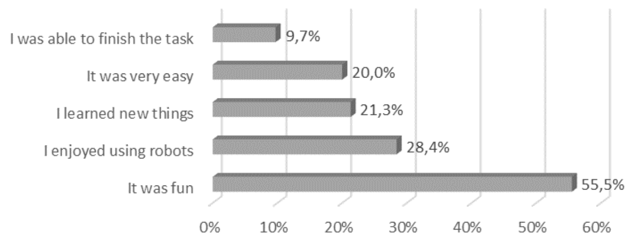

Fig. 3. Reasons for students' preferences.

When we look at this data according to gender (Fig. 4), we see that for boys and girls the reasons for their choices are slightly different. For the boys (27,7%) it seems to have been more important to have enjoyed using the robots than for girls (13,7%) and for the girls (15%) it was more important to have learned new things than for boys (6%). The remaining reasons are balanced between boys and girls, with the reason why it was easy being slightly higher for girls (23,3%) than for boys (18%).

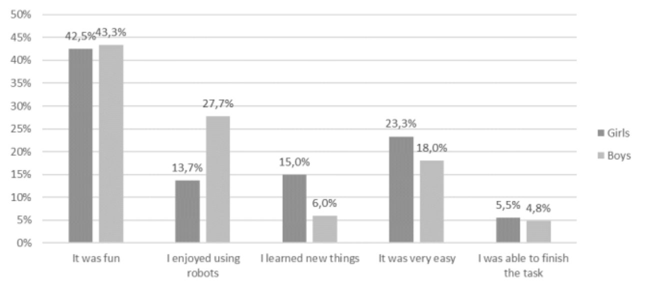

Fig. 4. Reasons for students' preferences by gender.

When asked about how they worked (alone or with others), 48.4% reported having worked with girls and boys, and only 5.2% reported having worked alone (Fig. 5).

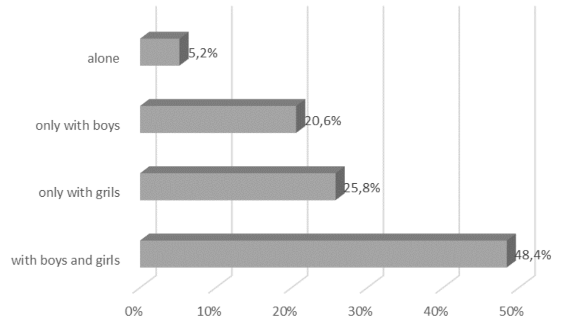

Fig. 5. Working groups.

When we analyze the type of gender interaction that the children had with each other during the activities, even when the teachers organized the groups randomly, during the course of the activities, girls and boys exchanged partners (Fig. 6). We realize that, in fact, although a large majority of boys (42) and girls (34) worked together with other boys and girls, it was found that there were some girls who only joined with girls (23 cases) and boys who only worked with boys (20 cases).

Of the total responses, 72.9% of the children said they had completed the proposed activities, 19.4% said they had left the activities halfway through, 5.8% said they had given up, and 1.9% said they had not been able to finish despite insisting.

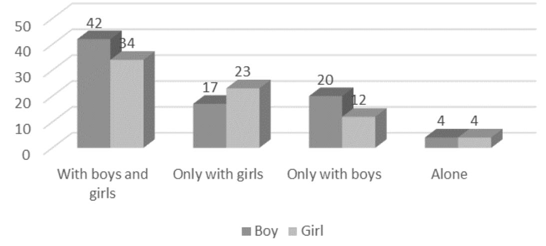

Fig. 6. Working groups according to gender.

Those who could not finish the activities revealed that they did not have enough time (75.4%), that the activity was too difficult (14%), that they were not able to use the robot (7%), and that they did not understand the nature of the task asked of them (3.5%), aspects that should be better reflected upon for future interventions and that are in line with some of the difficulties identified by the research team during the observations.

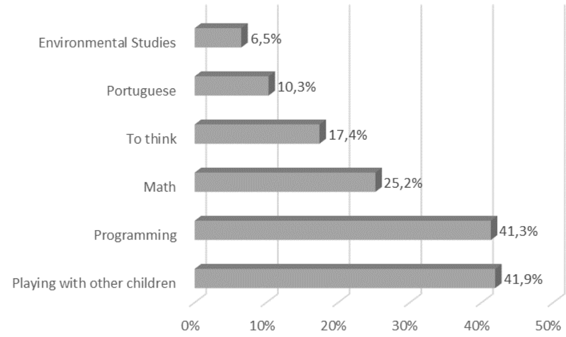

Fig. 7. Learning achieved.

Asked about the learning acquired during the event (Fig. 7), the answers were divided by the various hypotheses presented, however, 41.3% answered that they learned programming and 41.9% learned to play with other children.

Activities directly related to subject areas were not highly regarded by students as learning moments. Overall, student participation in the event was rated with 5 stars by 92.3% of the participants and with 4 stars by 6.5%.

2) The teachers

Accompanying the students to the festival were 11 teachers with an average age of 45.9 years. Among these teachers, who have between 15 and 34 years of teaching service, more than half (54.5%) have had some training in programming in education, and exactly the same percentage say they usually carry out programming and robotics activities in their classroom.

For the 6 teachers who usually perform programming and robotics activities in the classroom, this is considered a strategy for students to learn concepts in a more concrete and direct way (83.3%) and are considered rich learning moments for students (83.3%), because students learn while having fun (100%).

Regarding the 5 teachers who do not usually perform programming and robotics activities in their classes, the main reasons are related to the fact that they claim not to have the necessary resources for this purpose (80%), as well as not to have enough knowledge to implement these activities (80%), a situation that draws attention to the need for training to be provided, including the exploration of programming activities that do not require equipment (tangible resources).

When asked about the event and its benefits (Fig. 8), the teachers stated that it allowed them to have a first contact with robotics and programming for children, as well as being a learning moment for the students. For 10 of the respondents, it was a moment of distraction, for 9 it allowed them to perspective the use of robots in the classroom, and 7 admitted that it was a moment that allowed them to deepen some knowledge about robotics and programming.

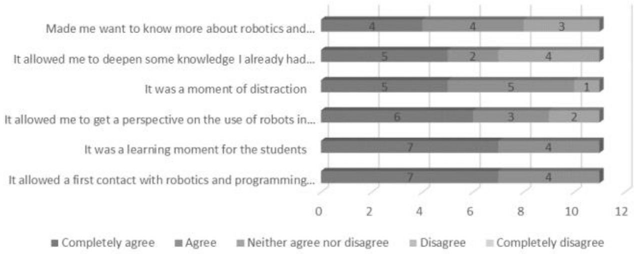

Fig. 8. Benefits from the teachers' perspective.

3) *The team*

The organization of the event was supported by a staff of 22 people. These staff members, associated with the University of the Azores, had the function of directly accompanying the students in carrying out the activities at the various stations.

When asked which activity they liked the most, 36.4% preferred the activities associated with Bubble, citing the fact that the robot draws very beautiful pictures and, also, because they thought the students liked it a lot, enjoying seeing the students participating in the activity. With 27.3% of the votes, the preference went to Edison, because they considered the activities interesting, easy to program, and the fact that they developed many important skills. However, some collaborators justified their choice by the fact that they had only been to one of the stations and had not had contact with all the implemented activities.

Regarding the participation in the event, the collaborators highlighted as positive the fact that the event allowed students to have a first contact with robotics and programming and that it gave them another look at the use of robots in an educational context. The large majority considered that it was a learning moment for the students, but also a distraction and assumed they wanted to know more about robotics and programming in education and agreed that the participation in this festival allowed them to deepen their skills about programming and robotics (Fig. 9).

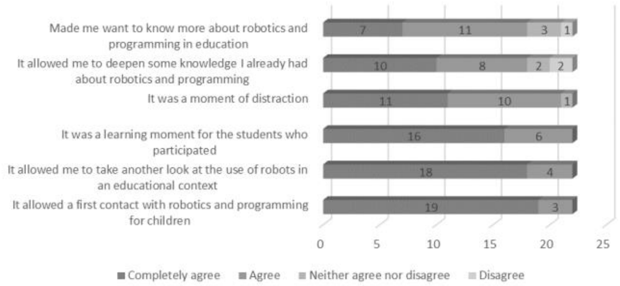

Fig. 9. Benefits from a collaborators perspective.

When asked to evaluate the event, in general (Fig. 10), the great majority of these collaborators (20) considered the organization of the event as good (12 answers) to very good (8 answers). The number of activities proposed was considered good (7 answers) and very good (15 answers); their degree of difficulty was rated good (13 answers) and very good (6 answers) and their relevance ranged from good (11 answers) to very good (10 answers). The suitability of the facilities was rated good (10 answers) to very good (12 answers), and the event schedule was also mostly rated good (10 answers) to very good (9 answers).

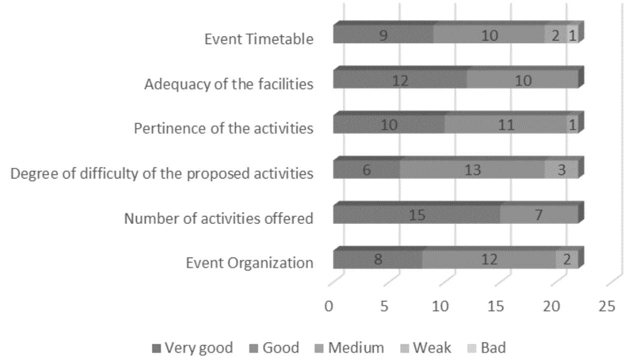

Fig. 10. Global collaborators evaluation.

VI. Discussion and Conclusions

From the observations made by the researchers regarding the implementation of the event, we begin by highlighting the need to rethink some scenarios, materials used and the children's knowledge, despite the explorations previously performed in the laboratory. The practice revealed that some of the scenarios built proved to be less suitable taking into account the time available for each activity and the children's knowledge, fundamental for the tasks to be successful.

Based on the suggestions of the collaborators, as well as the participating students, who claimed not to have finished the activities, in the preparation of this type of learning situations the activity/time ratio should be better adjusted, because "playing is also learning".

At the same time, it is also proposed that, in pedagogical terms, scenarios and tasks should also be more adjusted to the curriculum that is being developed, allowing the contents to be approached and reinforced in an articulated manner that may meet the characteristics of the group of students, as proposed by some of the research mobilized in this paper [2], [6], [19].

At the same time, analyzing how the robots were used in each of the activities allowed us to see which characteristics make them developmentally appropriate for the different age groups and preferences of the children. Clearly Botley, due to its ease of use and intuitive character, proved to be suitable for younger children, while the others were appropriate for older children, particularly Bubble, which implies mastery in the use of a double-entry table to enter the code, as well as literacy skills, in line with the analysis developed by M. G. Funk [9]. Also, the use of robots that require the use of a tangible language, associated with the use of cards that make the robots' programming even more concrete, was an added value for the achievement of some activities, particularly those aimed at the youngest [2], [9], [11], [12], [19], [29].

As far as the opinion of the various participants is concerned, for the students, Thymio was the robot less used and the one that was less preferred by the students, there being a clear preference for Botley, information that coincides with that collected by the research team, which is justified essentially by its fun character, as S. Somyürek [12] points out. For teachers and collaborators, if the playful character of the use of robots highlighted by the students is also an important component, the learning that they can convey and the fact that they can allow a first contact with robotics, for many of them, is even more important, coinciding with the results of M. U. Bers *et al.* and L. Muñoz, [13], [14]. In general, it is concluded that the proposed activities using tangible objects in robotics have provided, in a fun way, the acquisition of essential skills in several areas, from social skills to mathematics, portuguese, environmental studies, and programming itself.

Still on the students and how they participated in the activities, despite being randomly grouped in terms of gender, the data reveal that, as pointed out by B. D. Homer *et al.* [22], M. B. Kinzie *et al.* [23], B. Manero *et al.* [24], throughout the activities and the rotation between them there seems to have been a regrouping of many of them and a tendency to come together according to their gender, even though the vast majority worked with heterogeneous groups. Moreover, the data seems to reveal some different ways of looking at educational robotics by children, with boys highlighting the fun and enjoyment component of robots and girls giving more relevance to learning, results that are compatible with others that have been developed in the area [21], [23].

Of concern is the data on the use of robotics and programming by teachers, which shows that almost half of the respondents do not usually perform these types of activities in the classroom because they have no training in the area or resources. These data alert us to the need to invest in teacher training, as C. Campbell *et al.* [25], M. Bevčič *et al.* [26], N. Eteokleous *et al.* [27] have warned, in particular when we talk about primary school teachers who teach all the components of the curriculum in single teaching regime and who have a comprehensive and multidisciplinary training essentially directed towards subject areas.

This situation also resulted in the need to continue experimenting with children using these different robots to understand their difficulties and to design alternative intervention strategies that make the activity and learning successful, looking at its significance for learning, as pointed out by Y. H. Ching *et al.* [6]; as well as the need to give continuity to learning situations of this nature, but also to bring robotics and programming closer to the educational context, seeking its progressive introduction in the classroom context, seeing these tools as enhancers of diverse and rich learning, in particular, by the active and constructive way of learning that they promote [7], [8], [11], [13], [14].

In summary, the data collected through the observation and the questionnaires, although not generalizable and limited to a small sample, allow us to say that this was an experience that effectively contributed to the reflection on the best strategies to introduce less experienced children and teachers to programming and robotics, seeking to raise awareness, at the same time, for its relevance not only to the development of digital skills, but fundamentally of computational thinking, combined with problem solving, in articulation with the subject areas worked in schools.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

The conceptualization of the research was developed by Ana Isabel Santos, Dora Pereira, Nanci Botelho, Paulo Medeiros, and José Manuel Cascalho; the methodology was designed by Ana Isabel Santos, Dora Pereira, and Nanci Botelho, and Paulo Medeiros; the implementation of the research and data collection was carried out by Ana Isabel Santos, Dora Pereira, and Nanci Botelho; the formal analysis was done by Ana Isabel Santos, Dora Pereira, and Nanci Botelho; obtaining the necessary resources was ensured by Paulo Medeiros and José Manuel Cascalho; the writing of the original draft of the paper was accomplished by Ana Isabel Santos, Dora Pereira, and Nanci Botelho; review and editing was done by Dora Pereira, Nanci Botelho, Paulo Medeiros, and José Manuel Cascalho; all authors contributed to the writing of the article, read and approved the final version of the manuscript.

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