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The Use of a Bee-bot in Pre-primary and Primary Education

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Abstract

Modern teaching aids are part of the daily education process. Children, pupils use them to deepen the acquired knowledge. A teacher tries to alternate the teaching methods in an interesting way. The Bee-bot, a didactic toy, has been used in education for several years. The teacher decides at what intervals and in which subject he or she can use the Bee-bot. In this article we present one of a group of micro-outputs. Here we used a heuristic method, a method of discovery and observation. Also, we used the cooperation in the application of a robotic toy.

Keywords: child, robotic toy, pre-primary education, primary education

Introduction

At present, the use of modern didactic teaching aids is done to a great extent not only in primary schools but also in kindergartens. Unlike our first efforts to implement a classic personal computer into the teaching process, which was relevant in the past, now we can use such means that support the motor skills of children.

It is important to use the interactive whiteboard, interactive rugs and other technologies in order to convey the children the image in a “more tangible” form.

A Bee-bot can be ranked among our relatively new means. Although it is a technical device, it has been used in schools in the United Kingdom since the beginning of the third millennium in the form of a turtle. It helps pupils with simple programming.

The Bee-bot seems to be an ordinary toy; however, it is a toy with didactic use, thus reflecting Comenius’s motto “school through play”. We see it with

children in pre-primary and primary education and it is used for non-violent teaching of algorithm development, while its principle and use are very important for children. The ability to think ahead is a preparation for everyday life and by acquiring that ability, it is easier to solve problems.

Bee-bot is a popular didactic toy in pre-primary and early primary education.

The importance of didactic play and toys in the life of a child – through play to learning

Play is one of the basic activities of children. In the school environment, we focus mainly on didactic play. A child attending both kindergarten and primary school enjoys playing. By means of play, a child learns both spontaneously and intentionally. During pre-primary and primary education, a teacher integrates the didactic play into the educational process. A didactic play helps a pupil to understand the presented curriculum in a better way. The child is educated by means of fun. Through the didactic play, a child acquires new knowledge, skills and habits. “Play as a method evokes the activity, fulfills the basic functions of a method, i.e. educational and developing. Because children are very close to play, it creates a favorable atmosphere if applied constantly” (Šimová, Dargová, 2001, p. 15). A child is active in the play and the play conveys knowledge to a child. This can be proved by the research on the didactic play done by Podhájecká (2011), Fülöpová, Zelinová (2003) and others.

A suitable completion to the play is a properly incorporated didactic aid – a toy, which children consider interesting and unusual. We pattern on the well-known fact that a child likes to play. If a teacher properly implements the play into the motivational or fixation part of the teaching process, it is much easier for a child to understand the presented problematic tasks.

As the teacher knows the pupils, he or she should look for such implementation of the didactic play to arouse interest in the pupils and achieve the desired effect (Chanasová, 2013).

Bee-bot as a didactic tool and its control

At present, the topic of children’s skills is highly discussed. Studies confirm the need to develop these skills in children from an early age.

The Bee-bot belongs to a group of robotic toys for preschool and young school children. It is used in plays, either for individuals or teams. First, preschool children learn to control the Bee-bot by command buttons and they can send it where they want as it is placed on the ground. Subsequently, a square net is added and children use commands to make it move in a square net, which means they plan the exact path from start to finish, or the Bee-bot moves by making long steps.



Picture 1. Bee-bot (author's photo)

The Bee-bot can also be used in performing various tasks that are prepared ahead at the place where the Bee-bot arrives. It is difficult to use two or more Bee-bots at the same time because they might crash into one another. Hereby, we develop imagination and cooperation among children.

As we see in the Picture No. 1, there are 7 basic control buttons on the robotic toy. Two straight arrows for the direction of movement, two curved buttons for 90° rotation, then a pause button that allows the robot to pause one step. Also, there is a GO button which makes the robot move according to the program and the X button, which deletes the previous program. By pressing a straight arrow, the Bee-bot makes one step, which is at a distance of 15 cm. The Bee-bot informs children with the sound or the light of its eyes about finishing the step. At the end of the program, it again makes an audible signal and its eyes flashes.

From an educational point of view, we can use Bee-bot robotic toy to develop algorithmic competencies of a child (Vaníček, 2016):

- verification that the program works properly,
- suggesting a solution (to choose the appropriate path to reach the goal),
- determination of the final destination where will the given program import the Bee-bot,
- determination of the starting point from which the Bee-bot starts, so that it would come the given place through the given program,
- finding the flaws of the program (during its realization),
- testing the program (find a way to verify that the program works as it is expected),
- optimizing the program (simplifying the program or its modification so that it would respond correctly in different situations),
- writing a program (e.g. using paper arrows),
- reading the program and inserting it into the robot,

- searching for an error in a written program (arrows on paper),
- optimization (consideration of the shortest program or the shortest path to a given place),
- repetition (what happens if the program is realized two times in a row).

We can also state that this type of robot contributes to the development of the following mental abilities of a child:

- spatial orientation (movement to the left, right, forward, backward),
- imagination (the ability to think over the movement of the toy, where it will be located, how many steps it must take to reach the goal; delaying the realization of the command when the movement of the toy is not seen at once and the result can be seen only after launching the whole program),
- expressive skills (children describe the movement of the toy, create the story to describe the movement of the toy, graphically record its movement),
- visual perception,
- time perception,
- communication skills (children explain, evaluate, communicate with friends),
- creativity (children create tasks for other classmates, involve the Bee-bot into their plays),
- memory (they must remember which key they pressed and how many times).

1. The use of the Bee-bot in children in pre-primary education

Many children have problems with the right-left orientation. In order to fortify it, we use contact plays in which children try to navigate each other in pairs. The same can be applied in the forward-backward directions. Also, each child can try it individually by means of the Bee-bot. A simple picture plan can motivate the child to be independent and confirm what he or she has already learned.

Spatial orientation is not the only one that is being developed through the robotic toy in the young children. The child thinks ahead about the subsequent steps to plan the direction. In this process, a child's imagination is being developed and he or she tries various possibilities and directions. A child accompanies his or her steps by a verbal description – a child can explain why he or she chose this path. Last but not least, a child can be the creator of the images on which the robotic toy moves.

A child is happy if he or she can cooperate on the creation of aids. The pad is part of the play. It can be used for mathematical concepts, but also in the field of science and language.

2. Observations from working with the Bee-bot in primary education

The Bee-bot robot was used in the educational process with children in the first grade of primary school who had not encountered this robotic toy before.

Here we used the heuristic method, i.e. the method of gradual discovery of the child by means of set tasks within the teaching process.

First, the pupils had to figure out how the Bee-bot works and what it can do. It was performed in a small school with a class of 18 pupils. We used a set of 6 Bee-bots, so the teacher formed three-member groups. The teacher tried to make groups homogeneous.

The groups worked in one classroom and the atmosphere was not competitive, but rather cooperative. Thus, there was mutual observation among pupils also in other groups.

There was no problem for pupils to accept and understand the basic intuitive use of the toy. There were only two groups of pupils to which we had to tell the functions of deleting the program by a cross.

This introduction was followed by the sequential fulfillment of particular tasks with increasing difficulty – from a simple task of going straight to moving on a square grid using rotation to the right and left. The final task was to find the way from the drawn start to the finish on a square grid with 10x6 squares measuring 15x15 cm. There were stones on the net, which presented the real obstacles that the Bee-bot had to avoid. First, pupils agreed on the path the Bee-bot would go and then programmed the Bee-bot, placed it at the start and watched the Bee-bot move. Out of six groups, three groups of pupils managed to navigate the Bee-bot from start to finish flawlessly. In the remaining three groups, there was either a collision with a rock or an incorrect direction at the target. These pupils corrected the program and then the Bee-bot successfully managed the path.

The task reinforced the divergent thinking and problem solving in children. Pupils realized that there are multiple paths leading to the same goal. They also considered which paths were the shortest.

Our research was done in the autumn of 2019 in cooperation with pupils of a small class at elementary school with a kindergarten in Křešice (Czech Republic) in the subject of mathematics, within the thematic unit “Orientation in space – movement on a square network”.

We see a great contribution in such a use of the didactic robot, because the pupils learned algorithmization, spatial orientation, cooperation within a group and a class. We repeated similar types of micro-outputs several times.

As stated in Maněnová and Pekárková's publication (2019), also we can confirm some of their results based on our research:

- first let the children press the buttons randomly, without using a pad. It helps them remember better the use of individual buttons,
- problem – right-left orientation in some children,
- at the beginning, it was necessary to point out to the children not to forget to delete the old program before setting a new one,

- it was great help for children if they discussed particular tasks and drew them or drew the arrows,
- boys were more interested than girls.

Conclusion

If a didactic play is used during the educational process, it becomes more effective and interesting for pupils (Palásthy, 2009).

With the basics of literacy, the use of plays gives children the opportunity to work according to the instructions, but, at the same time, to use their own creativity in every activity they perform. The impact of satisfaction from the work that was carried out and the desire to know something new is an integral part of a child. Through play and toy, a teacher can develop every aspect of a child. The only necessary thing is to incorporate it properly. "The play has a great impact on the quality of learning and work in later periods of a child's life. It is the play that impacts whether a person will be as an adult balanced, clear in his or her actions, judgments and opinions. Play, as well as learning and working process, is the right of an individual, and, at the same time, a responsibility to one's life" (Waloszek, 2006, p. 260).

VEGA 1/0748/20 Research reflections on digital literacy of teachers in primary schools in the context of undergraduate training process and educational reality.

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