

Modern Approaches To The Provision Of Learning Content In Elective Subjects EZR And RGT

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Abstract: *Modern society is looking for modern ways and this can also be recognized in the fields of education. Digital technology, which has evolved over the last 20 years, has given new methods of teaching at just about all levels of education. Thus, even within primary education, we can observe shifts in this direction. There is more and more work with computers, tablets and phones that have programs or applications and with which students can acquire new knowledge in a modern and interesting way. These modern methods of work are also intertwined with actual learning contents and can be perceived in everyday life. One of these areas is definitely robotics and 3d digital printing. As modern technical fields, they also need a more modern approach to methods and other work in classes with students. The paper presents the method of working with students in the elective course EZR (Electronics with Robotics) and the elective course RGT (Drawing in Geometry and Technology).*

Keywords— modern teaching methods, computer, tablet, phone, applications, computer programs, programming, computer design, robotics, 3d printing.

1. INTRODUCTION

The paper presents the method of working with students in the elective course Electronics with Robotics and the elective course Drawing in Geometry and Technology. This way of working is shown through modern approaches or methods of work described below. Modern because the learning content is also current and we perceive it in everyday life. One of these is the field of robotics, which can be found wherever we look (car industry, lawn mowers, other machines, etc.). From year to year, robotics is more widely represented in everyday life, and at the same time it is getting closer to a modern man, who also takes advantage of it. Even the interest in professions related to robotics is growing rapidly.

Another area (which is also related to robotics) is 3d digital printing, which is also on the rise in terms of use (medicine, construction, etc.). Interest in 3d printing, such as printing for home use is constantly rising because we can make many things by ourselves with the help of this technology.

2. MODERN APPROACHES TO WORK IN THE SUBJECT EZR

In the elective course Electronics with Robotics (EZR), the main goal of the teacher is to lead the student through the learning process to understand the operation of a simple robot. This means that he understands its composition (basic components) and how it works (with the help of programming). All this is the essence of the curriculum for this elective subject [2]. There are various teaching aids on the market that enable this learning and are adapted to different age groups. The following are just a few of the possible kits for teaching robotics.



Fig. 1. Wedoo 2 Set



Fig. 2. Example of making a robot

The above examples (Figure 1 and Figure 2) show the LEGO Wedoo 2 kit, which is intended primarily for students in the 1st and 2nd triads of primary education. A huge number of different types of robots can be assembled from the set shown (Figure 1). These can be made according to plans or even according to your own ideas. In this way, the student learns about the various components of the robot (construction, sensors, etc.). The assembled robot then programs in the prepared software environment. The LEGO program is adapted for this kit and can be downloaded by the student to a computer, tablet or phone (Figure 3).



Fig. 3. LEGO software environment for Wedoo 2

In a similar way, more complex robots can be assembled, which can be given more complex tasks (through a programming language). This was also taken care of by LEGO. The latest version is presented below (Figure 4) and is intended for students in the last grades of primary education. Here, real projects can be made, which robots

students make themselves, based on their own ideas, which leads to the project way of thinking of the student, as described by didactic A. Papotnik in his work [3].



Fig. 4. Mindstorm EV3 kit



Fig. 5. Example of robot construction



Fig. 6. LEGO software environment for Mindstorm EV3

We also have other companies that deal with the production of such didactic aids. One of the alternatives I present below.



Fig. 7. Example of an Mblock robot



Fig. 8. Scratch programming

The MBlock robot (Figure 7) also has an open source programming program like LEGO. It is called Scratch (Figure 8).

2.1. EXAMPLE OF A GOOD PRACTICE IN THE SUBJECT EZR

In the following, I would like to present examples of a good practice in the subject of EAW. The contents are adjusted to the level of difficulty for the 3rd triad of primary education (8th and 9th grade). It is a way of working with the help of worksheets, where the student encounters a concrete problem that he has to solve. The instructions on the worksheets should be clear, guided by a motivational story, with added questions, which open up additional problems. The following are some examples of assignments from the worksheets themselves.

The example (Figure 9a) shows the task of how to bring or program the robot to come out of the maze and (Figure 9b) how to make the most powerful sumo robot. All these tasks arouse additional motivation in the student after solving the problem in front of him. This is how to program a robot to solve a certain task.

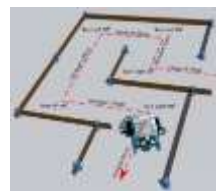


Fig. 9a. Example of a maze game and rescuing from it



Fig. 9b. Example of a sumo fight

The essence of all these didactic aids is that the student, through the game, within the tasks assigned to him, seeks solutions to a given problem. At the same time logical thinking develops which is even more important in the development of the child.

3. MODERN APPROACH TO WORK IN THE SUBJECT OF RGT

We also have a modern approach to drawing an understanding of space in the elective course Drawing in Geometry and Technology (RGT). This is what modern technology allows us to do today. There are a lot of computer programs that allow digital drawing of 3d shapes, but it is necessary to choose the appropriate ones for a certain target group. For the primary school form of work, especially within the elective subject RGT, the Google Sketchup program (Figures 10 and 11) is one of the most appropriate.



Fig. 10. Program logo



Fig. 11. Example of drawing a house shape in 3d digital technique

With students, within the Google Sketchup program, we first learn the basic tools for 3d rendering, and then continue with projects (from simple to more complex). Projects are related to 3d renderings of various objects. All this is the essence of the curriculum for the optional subject RGT [1].

All this can then be printed, with the help of a 3d printer (Figure 12), which area is also related to 3d design and which printing is very similar to printing, in other current areas (construction, such as the automotive industry).



Fig. 12. Example of a school 3d printer



Fig. 13. Example of a 3d house printing

3.1. EXAMPLE OF GOOD PRACTICE IN THE COURSE OF RGT

It is also possible to show quite a few examples of a good practice in the elective subject RGT. I present one of these below. Pupils were given an airplane plan for the RGT subject, where the parts of the airplane itself were drawn in a 2d view (Figure 14). With the help of the program, it was necessary to draw a 3d digital format. With this task they got the motivation to be able to finally recognize the final appearance of the aircraft with a computer drawing or at least imagine it easier (Figure 15). In the end, the aircraft could be made of plastic (eg XPS foam) and the learning content could also be linked to the processing of materials and the optional subject Plastic Processing [4].

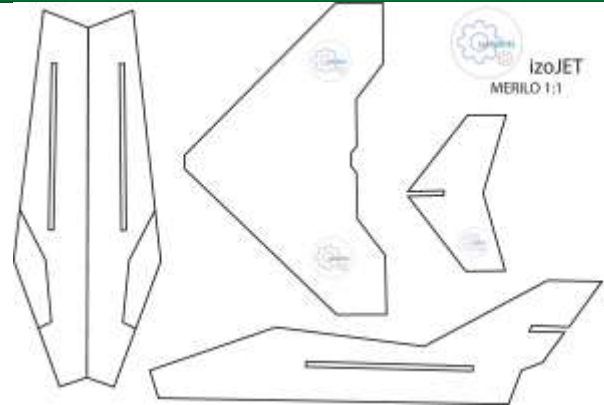


Fig. 14. Example 2d of a jet aircraft plan

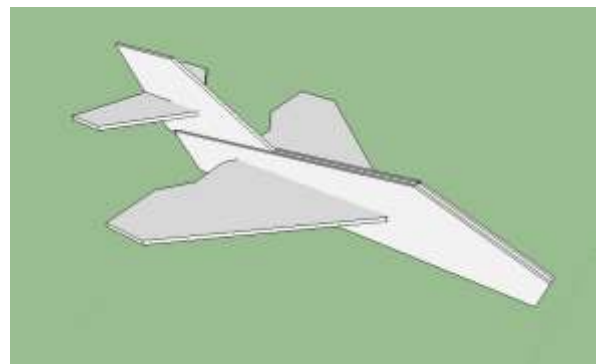


Fig. 15. Example of a 3d digital drawing of an airplane

4. CONCLUSION

The ways of presenting learning content from robotics and 3d printing presented above are the best ways to gain knowledge that can be put into practice. All of these examples of a good practice represent simplified examples tailored to students and are a good guide for continuing within these areas, in terms of potential careers. In any case, through a game with robots, the student develops logical thinking and fine motor skills and with the help of digital 3d design, only a 3d spatial representation.

5. REFERENCES

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6. SOURCES OF PICTORIAL MATERIAL

Figure 1: Wedoo 2 Set (<https://www.lego.com/en-us/product/lego-education-wedo-2-0-core-set-45300>, obtained 21.3.2022)

Figure 2: Example of making a robot (<https://www.google.com/search?q=Lego+wedo&tbm=isch&ved=>, obtained 21.3.2022)

Figure 3: LEGO software environment for Wedoo 2 (<http://stiri.si/z-roboti-se-ucimo-strokovni-clanek-2-del>, obtained 21.3.2022)

Figure 4: Mindstorm EV3 kit construction (<https://www.mall.cz/i/41312594/450/450>, obtained 21.3.2022)

Figure 5: Example of robot construction (https://www.google.com/search?q=ev3+mindstorm&rlz=1C1CHBD_slSI880SI884&sxsrf, obtained 21.3.2022)

Figure 6: LEGO software environment for Mindstorm EV3(<https://www.google.com/search?q=ev3+mindstorm+program&tbm=isch&ved=2ahUKEw>, obtained 21.3.2022)

Figure 7: Example of an Mblock robot (<https://www.google.com/search?q=mboth&tbm=isch&ved=>, obtained 21.3.2022)

Figure 8: Scratch programming (<https://www.google.com/search?q=mboth+PROGRAMIMG&tbm=isch&ved>, obtained 21.3.2022)

Figure 9a: Example of a maze game and rescuing from it (<https://www.google.com/search?q=mblock+labirint&tbm=isch&ved=2ahUKEw>, obtained 21.3.2022)

Figure 9b: Example of a sumo fight (<https://i.ytimg.com/vi/As54R0OjsII/maxresdefault.jpg>, obtained 21.3.2022)

Figure 10: Program logo (<https://www.google.com/search?q=google+sketchup+logo&tbm=isch&ved=2ahU>, obtained 21.3.2022)

Figure 11: Example of drawing a house shape in 3d digital technique (<https://www.google.com/search?q=google+sketchup+program&tbm=isch&ved=>, obtained 21.3.2022)

Figure 12: Example of a school 3d printer (<https://lh3.googleusercontent.com/proxy/7ZvJtc1Dp>

eVYINGexuEeNo8JKotr9iL6F68, obtained 21.3.2022)

Figure 13: Example of a 3d house printing (<https://hypeandhyper.com/en/europes-largest-3d-printer-prints-a-two-story-house>, obtained 21.3.2022/)