INTERDISCIPLINARY EDUCATION WITH SCRATCH IN PRIMARY SCHOOL

Margarita Gerdanikova, Gencho Stoitsov, Ivan Dimitrov

Abstract. *This article presents the interdisciplinary application of Scratch during the education in subjects Bulgarian language and literature, Mathematics and Arts in primary school. Scratch is associated with the school discipline Computer modelling which is a part from the mandatory subjects for students in third or fourth grade. Different works on Scratch used as interdisciplinary elements of the traditional lesson structure aiming to make lessons more attractive and entertaining are presented.*

Key words: interdisciplinary education, Scratch, computer modelling.

1. Computer modelling and Scratch

The fast development of hi-tech technologies and their implementation in real life oblige people to know how to use them. Consequently, this imposes the need for hi-tech learning since early childhood to develop necessary digital knowledge and skills for working with high technologies. Students, who tend to develop high digital competencies, want to understand the functional logic of high technologies. Learning informatics and computer science allows the development of algorithmic, analytical, modelling and intuitive thinking [2]. For this reason, the new law for early childhood education and school education, which is in force since August 1, 2016, requires the introduction of a new school subject Computer modelling in the mandatory curriculum for students in third and fourth grade of the study year 2018/2019 [3].

Computer modelling is a new and basic subject for acquiring digital competency. In the first place, the features of computer science suggest that an emphasize should be put on its application aspect, which also presents the basic concept for book structuring and content [1].

Along with the confirmation of the study programs for the new school discipline omputer modelling in 5th, 6th and 7th grade of this study year 2021–2022, the learning of computer modelling continues in the next degrees of bulgarian education.

The main visual programming environment in the classes of computer modelling in 3rd and 4th grade is Scratch. It has easy and intuitive working interface which is suitable for the formation of basic knowledge and skills in programming.

Since January 2019 Scratch 3.0 is the new version of the visual programming environment. It can be used online or installed offline. Version 3.0 allows working with files, created with the version 2.0. The installation of the program can be done from `https://scratch.mit.edu/download` [4].

2. Interdisciplinary education with Scratch

In this work, Scratch is reviewed as a part of the teaching method in the subjects Bulgarian language and literature, Mathematics [6] and Arts in primary school. Students accept the classes as exciting experience and they manage to comprehend more effectively the study content when the teacher interconnects the topics not only in an interdisciplinary way but also with the real spacetime [5, 8].

The application of the visual programming environment Scratch in the classes of the mentioned subjects successfully transforms to a new organization method for active and meaningful student work which makes the classes more interesting and intensive.

3. The application of Scratch in the Bulgarian language and literature education

The main focus of the suggested and realized interdisciplinary connections in the direction of Bulgarian language and literature – Scratch is on the application of communicative-speaking skills in speaking or writing communication by effective participation in communicative-speaking situation, created by students in Scratch.

The software options for writing lines and thoughts for the main characters, for creating a dialogue between two characters, for putting waiting time for a reply present one different and entertaining study environment for exercising (Figure 1). The work aiming the affirmation of the knowledge in writing a dialogue continues during the topic "Writing a text based on series of pictures" accompanied by the skills needed for following the logic of applied actions and for relating a given action to an already developed code or picture (Figure 2).
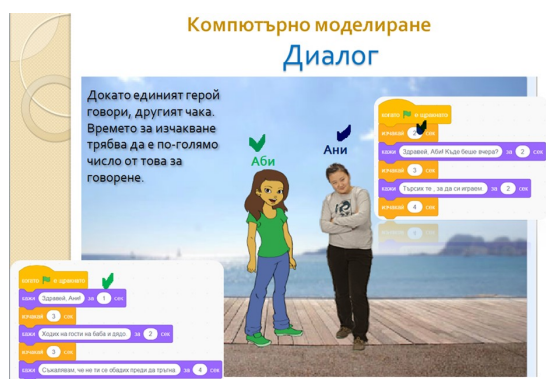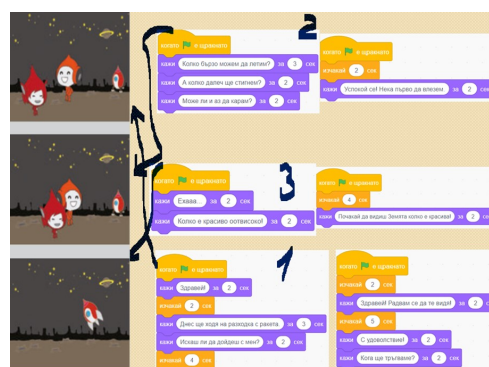
Figure 1. Dialogue code

Figure 2. Picture-code relationship

4. The application of Scratch in Mathematics education

In the Mathematics education in 3rd grade except the standard teaching method [7], Scratch can be used for demonstration and practical applicability of the knowledge for the geometrical object angle and its elements, as well as for the skills for recognizing and drawing different types of angles and triangles according to the angles.

Exactly like spectators during a football match, students manage to affirm the knowledge in Mathematics with their familiar characters from Scratch while they track the ball movement which has the role of a main character (sprite). The ball movement sequentially describes all terms: ray, vertex, lever, right triangle, acute triangle, obtuse triangle and triangle perimeter (Figure 3, Figure 4).
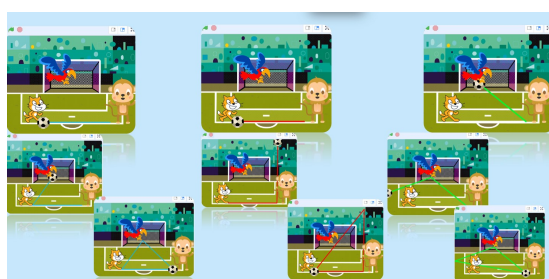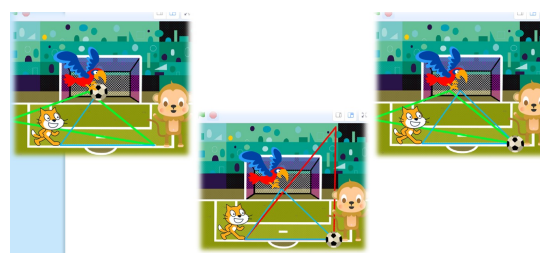

Figure 3. Project Footballers

Figure 4. Different types of triangles according to angles

If they decide, students have the option to stop the project during its performance, to see the different types of triangles in a different way: trace, described by the ball movement. This provokes their geometrical thinking and makes them search for similar analogues in the environment around them.

5. The application of Scratch in Arts education

Here the activities, associated with the writing of codes, the matching of decors from the library of the software with those made by the students during the Art classes, improve the knowledge students already have for developing computer models of familiar objects, processes and phenomena (Figure 5).

Based on the students' draws on the topic "Summer story", students manage to use the draws as decors by editing them in the graphical editor of Scratch. In this way, they create their own interactive stories and animations, which makes their projects interesting and unique (Figure 6).
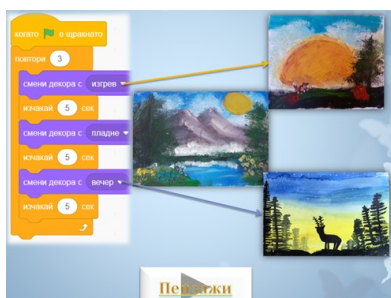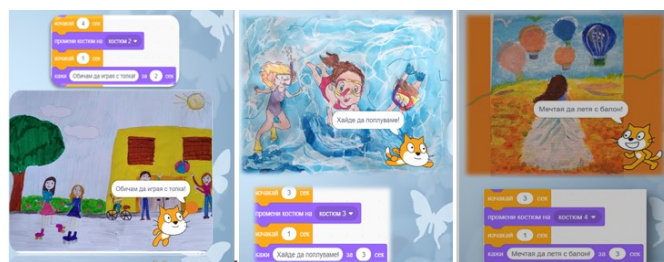

Figure 5. Code for
changing decors

Figure 6. Codes of projects with decors on topic
"Summer story"

6. Conclusion

The application of the visual programming environment Scratch in the Bulgarian language and literature, Mathematics and Art education in primary school guarantees acquiring and integration of study content, motivation and desire for learning. Long-term benefits from the visual programming are bigger than expected, because students are not only active participants but also they are creators.

Acknowledgments

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