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### Using PlanetARy at the Astronomical Observatory - Methodological Opportunities

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**Abstract:** *The article offers an example of using a free product for augmented reality of planetary during outdoor activities in observatories or in classrooms. This approach has been tested among visitors to the Shumen Astronomical Observatory. The idea aroused great interest among visitors of different ages.*

**Keywords:** *augmented reality, astronomy, training, outdoor activities*

#### Introduction

Recently, the idea of outdoor activities in school has been popularized. There are many possibilities to conduct a lesson outside the classroom and there are proper conditions on the Shumen plateau that allow such trainings. The astronomical observatory is a powerful tool in this direction. The observatory can enrich the activities planned outdoor lesson. Students, being among nature, have the opportunity to visit the observatory and combine other outdoor tasks with real astronomical observation. Unfortunately, this is not always possible, due to meteorological conditions, problems with the organization of lessons at a later time, the age-related characteristics of schoolchildren, etc.

Education outside school is a very broad term encompassing a range of activities, some of which more obviously support the objectives of formal classroom teaching and learning than others. In this article we want to show an opportunity that can be used successfully for outdoor activities, as well as in the classroom. The idea is based on the option of using augmented reality as part of a visit to the astronomical observatory.

#### Discussion

According to *Strategy for the effective implementation of information and communication technologies in the education and science of the Republic of Bulgaria* "The main objective of the Strategy is to provide equal and flexible access to education and scientific information at any time and at any place

– in front of a desktop computer, laptop, tablet, mobile phone. For the first time, a unified information environment has been created to serve school education, higher education and science. New technologies in teaching will make the lessons more interesting and attractive, will motivate students and teachers" [2].

In the framework of the scientific program "Information and communication technologies for unified digital market in science, education and security" [3], in which Shumen University also participates, one of the main goals is the introduction of digital technologies in the preparation of special target groups.

The development of information technology has led to the creation of many products in all areas of life including education. There are many advantages that the educational products provide, however for the full development of schoolchildren's thinking, it is essential that training does not depend entirely on technology. Their capabilities should mainly be used to motivate, increase interest, search and process information. The creative and research abilities of schoolchildren should be developed using both modern information, classical methods and teaching aids.

There are two astronomical observatories at Shumen University – one on the campus, and the other on the Shumen Plateau (Figure 1) [4].



**Figure 1.** Shumen Astronomical Observatory

They conduct practical classes with university students as well as with groups of schoolchildren on certain days and if desired by the group leader. As it was mentioned earlier, due to meteorological conditions, it is not always possible to conduct real observations. For these cases, Shumen University astronomers have a set of popular presentations, scientific exposition, etc. In addition, the possibilities of augmented reality can also interest schoolchildren and students and add positive emotions when conducting observations.

For example, the planetARy app, developed in 2017 by scientists from the Houston Planetary Institute, can be downloaded free of charge to a smartphone. Background images that are used to create additional reality are obtained at NASA. For visualization, you need posters, a set of which is available on the official website of the institute – <https://www.lpi.usra.edu> [3].

For users, the following instructions are given:

How to use the augmented reality planetARy?

1. You will need the planetARy app, which you can download for free on your smartphone.
2. Select the button **LAUNCH AR** and point your smartphone to one of the planetARy posters.
3. You can enjoy 3D models, realistic images and lots of interesting information created by NASA / UCLA / LPI.



Figure 2. Instructions



Figure 3. Students using planetARy

During visualization (Figure 3), students will see on their smartphones, images of the type of examples shown in Figure 4.



Figure 4. Screenshots from planetARy application

The algorithm of work is as follows – the posters are printed and positioned in a suitable place – in our case, in the hall for expositions of the astronomical observatory. Students in advance or during a visit download the application on their phones and view images and information using planetARy.

Using this product, you can easily make connections with different academic subjects. For example, to make connection with mathematics, an astronomical guide or the teacher gives additional information to schoolchildren (the size of a planet from its satellites, remoteness from the earth, comments on the scale, comments on the ratio of the sizes of a particular planet and the earth, etc.) All information has a close relationship with mathematics, it's possible to give classical mathematical tasks, for example, if you imagine that the Earth is an apple, then with what fruit can we compare Mars – watermelon, melon, plum or grain of currant? [1].

The same posters can be used as additional didactic material during observations with a real telescope or during observation of the sky during outdoor activity. For this, it is necessary that the posters be placed in areas of outdoor activity. In this case, the quality of the posters should allow their positioning outside the commissioning of the observatory.

Using this feature aroused interest among all visitors to the observatory. After working with planetARy, all visitors replied that they were interested and they will show the product to their friends and relatives.

At this stage, we expect interest from teachers who wish to supplement their training or outdoor activity with a visit to the Observatory. We are ready to work with teachers on the organization of outdoor activities and supplementing them with visits to the observatory.

### **Conclusions**

The opportunity to conduct such classes is endless and depends mainly on the time and desire of the teacher and students.

We can briefly summarize the main methodological possibilities of using planetARy as follows:

- deepening of astronomic knowledge;
- identification of connections with other academic subjects (mathematics, ICT, art, etc.);
- arousing interest of students;
- the opportunity to diversify outdoor activity;
- others.

The ability to combine modern technology and study among nature can give modern students an incentive and desire to do math and science. It is important to use the available educational resources wisely and not to forget that the most important thing is to teach children to think, love science and enjoy new discoveries.

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