

# ECOLOGICAL FOOTPRINT AND WAYS WE CAN HELP GIFTED STUDENTS

Mladen Šljivović

Dragana Sekulić Pilipović

Zaječar Grammar School , Zaječar, Serbia

One of the problems that occurs in education, along with the advancement of technology, is the growing number of students whose knowledge or abilities exceed the current knowledge of teachers. This means that teachers must constantly improve in order to keep up with modern technologies. However, with the faster growth of new digital tools, it is clear that teachers will sooner or later meet students whose talent exceeds their knowledge. It is absurd to expect a teacher to be an expert in 3D printing, Android programming, Arduino...

This paper will present several examples that Zaječar High School have conducted in its work with talented students. This time the school turned to outside mentors for help, while the teacher took on the role of *project manager* who was in charge of communicating with the mentor and students, organizing the work and logistical assistance. As a special example, we will present the work on the development of an application for an Android mobile phone, which was done by third-year students, under the mentorship of Iva Stojković, a JAVA programmer. The project was implemented within the Erasmus project Ecological footprint: Think, Choose and Reduce.

Transferring part of the responsibilities to other users is something that is known in the economy as outsourcing. The results achieved during the use of this model in school irrefutably indicate the growing need to include members of the local community and the skills they possess in teaching.

*Keywords: talented students, mentors, local community, mobile phone apps*

## Introduction

Working with gifted students represents a special challenge. Although they are recognized and included by the school system in Serbia as Individualization of the educational program 3 (IOP3), the program itself is rarely applied. One of the reasons lies in the increased bureaucracy that precedes the introduction of IOP 3 in teaching, but also in monitoring the progress of these students. This means that teachers are giving up on introducing systematic work within the system with these students, since that means increasing the already extensive documentation.

The first step in working with these students is identification (Škoda et al, 2020). Individual work is mentioned as the most common method of work, but various dynamics that depend on students and teachers are also emphasized (Fulir, 2021). However, it is not uncommon for teachers to admit that they lack the time and energy in working with gifted students

(Borković, 2017). Nikolić (2019) also talks about unsystematic work with gifted students, pointing out in her work a very small number of works for recognizing gifted students as well as insufficient commitment by society to these students.

This is especially true for working with students with special aptitudes in computer science and informatics. New technologies are introduced every day and it is necessary to select those that would be useful, but also to train teachers to work with them. If we look at the conclusion of Borković (2017), the question arises to what extent can a teacher follow the needs of talented students and is he doomed to his enthusiasm as the only support? Seminars for professional development of teachers are accredited every three years, but in 2020 the competition was postponed until further notice, and it is clear that new technologies are being introduced faster than that. A large number of teachers turn to non-accredited seminars such as those organized by Science on Stage Serbia. However, when we talk about IT technologies today, we are talking about such a wide area that it is simply unbelievable to expect that one teacher will be able to become an expert in 3D printing, Arduino platforms, Android programming, solving algorithmic tasks...

A solution that is often used in the business world is outsourcing in which the business of one company is transferred to a third party, who then performs tasks on behalf of the company that hired it. This method is often used for product promotion, application development, support and the like. Using this idea, Zaječar High School turned to mentors from abroad with the intention of helping gifted students in their development.

## **Method**

In 2018, Zaječar High School enrolled the first generation of students with special abilities in computer science and informatics. That year, this department was also approved in high schools in Bor, Negotin, Knjaževac and Sokobanja, but groups were formed only in Negotin and Zaječar. From 2020, the only department in eastern Serbia is in Zaječar. One of the main problems in these classes is the lack of professional staff who are willing to do additional work with students. In addition to this, we are facing a still insufficient awareness of the local community about the importance of such a department.

Even before that, Zaječar Grammar School met with students whose abilities are far above the average level and for whom it was necessary to find an appropriate way of working. It was then that we used the outsourcing method using available outside resources to create a stimulating environment for these students. On the example of students P. and B. in cooperation with universities, private organizations and clubs, we carefully followed every opportunity that arose. Whether it is seminars, competitions, courses, public classes or competitions, we would encourage P. and B. to apply and find ways to cover travel and accommodation costs.

We would like to highlight three competitions:

### **MATF 2019**

This competition is a team competition and is organized by the Faculty of Mathematics in Belgrade. Teams get tasks in one day and try to solve them in the best possible way.

## **Hackathon 2019**

The Hackathon was organized by the Faculty of Organizational Sciences of the University of Belgrade. In this competition, teams of 3 or 4 high school students gather to create the most innovative web application for a problem, in our case it was the environment. They had 3 days of preparation at the university where they listened to lectures on web design (HTML, CSS, PHP ...)

## **Innopolis Open 2020**

This competition is more based on algorithms where each individual high school student competes with his peers from all over the world. Our students had two independent qualifications, and different students were invited for each round of qualifications. They solved more than half of the tasks and were invited to participate in the finals from February 22<sup>nd</sup> to 23<sup>rd</sup> in Innopolis, Russia. The school managed to cover travel expenses with the help of the city, and Innopolis University took over the costs of accommodation and food.

Yet recently another opportunity arose for our students. In 2019, we were approved for the Erasmus+ project Ecological footprint: think, choose, reduce. In this project, our school is a partner in charge of IT support. In addition to our school, the project also includes schools from Denmark and the Netherlands, while the school from Germany is the coordinator. You can find out more about the project at the following link: <http://www.thinkchoosereduce.com/index.php/about-the-project>

One of the tasks that our school took on was to create a mobile application that would serve as a meter for the individual environmental footprint of students.

A team of three students who volunteered for this project was gathered. None of them had experience with JAVA programming or working in the Android studio environment. Mladen Šljivović, a project coordinator in front of the school and a physics teacher, took over the work with them. His task was to provide conditions for working with students, learning materials and to be a support during the development of the application. It is important to note here that Šljivović did not have any experience in creating applications for Android, and that our goal was to try to use a new method in which the teacher is a motivator, someone who moves the group towards the goal, provides information, but does not participate in the work. In the description of one development team, it could be said that the teacher took over the role of a project manager.

By defining competencies for lifelong learning, it envisages that students must be trained in various learning techniques. However, practice shows that a large number of students do not like to use tutorials, but rely exclusively on lectures. This could be a big problem working with gifted students. That is why students are instructed in this way of learning.

In order to realize the project by the end, it was necessary to solve some issues, more of a technical nature. For that reason, a former student of the Zaječar Grammar School, Iva Stojković, was contacted. Please note that his help was used exclusively to solve bugs that appeared in the application.

The project was implemented during two months of "combined teaching", and one part of remote learning.

## **Results**

The mobile application has been successfully created and is planned to be shared on the project website soon.

Three students who worked on this project have gained new experiences.

The method of hiring outside mentors has proven to be an extremely effective method of work, especially in information technology.

## **Discussion**

The method of hiring outside mentors has proven to be extremely effective. Although the example here is given in the IT sector, it is possible to include this method in other areas, especially in vocational high schools.

However, finding adequate mentors is a very challenging process. For adequate mentoring, it is necessary that, in addition to knowledge in their field, the mentor is also didactically well-versed. The goal of this way of learning is not for the mentor to complete the task, but to help the students in the moments when they are "stuck".

At the same time, the teacher gets a new role. He is no longer a "lecturer" but a "companion" who walks the path of learning together with the students. This has facilitated his role. He doesn't have to be an expert, he needs to find an expert.

## **Conclusion**

Education in Serbia is often poorly funded and there is no way to repay mentors. Working with this method is currently reduced to pure voluntarism, as well as the enthusiasm of teachers and members of the local community. One of the proposals for future works is an attempt to provide more permanent funding for such ideas through grants and projects.

It is unfortunate that most members of the local community do not recognize the importance of mentoring high school students in order to be more actively involved in the work of educating the youngest. Reasons for this are often "fear of entering the classroom", lack of time, insufficiently strong connections and a sense of belonging within the local community.

Teachers, on the other hand, cannot be left only to continuous professional development and it is necessary to provide them with other types of assistance. For this purpose, various lectures for students, seminars, courses, research stations and the like can be used.

We believe that in the future, hiring mentors from the local community to work with gifted students will be necessary and that it is needed to introduce the systematization of this work as soon as possible.

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