

YSOFT **BE3D™** **IN EDUCATION** **CASE** **STUDY**

**ALL GROUPS BENEFIT
FROM EDEE - TEACHERS,
STUDENTS AND IT
ADMINISTRATORS**



EXAMPLES OF TEACHING IN THE FUTURE

Polička is a small town in the Czech Republic on the border of the Moravian and Bohemian regions. Most people in the world know Polička as the birthplace of the world-famous music composer Bohuslav Martinů. Others know Polička thanks to its preserved medieval fortification or its renowned local brewery. However, in the Czech ed-tech community, Polička is known for its grammar school. Tomáš Feltl, a chemistry and biology teacher, and several his enthusiastic colleagues publish e-Mole, a journal that explores the use of various modern technologies in teaching. At the grammar school, these technologies are introduced into STEM curriculum (Science, Technology, Engineering and Mathematics). In addition to a variety of interactive tools, school measuring systems, kits, and robots, 3D printing also belongs among these technologies.



AT A GLANCE:

Goal:

- Modernize teaching methods in different subjects
- Secure access to 3D printing
- Effective management of multiple 3D printers

Solution:

- YSoft be3D eDee Print Management

Benefits for users:

- Easy to master by teachers, students and IT administrators
- Motivated students and teachers in different educational areas and leisure activities
- A cost-effective source of teaching aids

THE ORIGIN OF 3D PRINTING AT POLIČKA

"I became acquainted with 3D printing by chance. We needed to renew some of our really good teaching aids and my colleagues and I were thinking of either repairing them or buying new ones. Unfortunately, new teaching aids are often very expensive. This was the moment I thought: we could solve our problem using 3D printing technology. I built a RepRap 3D printer and that is how it all started," said Tomáš Feltl.

The first 3D printer, an open source RepRap delta Kossel Mini 3D printer, was soon brought to the grammar school too. Some students participated in its construction and the 3D prints immediately began to attract students and teachers.

Students started to use 3D printing for both school and personal interest projects. Teachers began to realize the potential that 3D printing brought to the school environment in being able to create unique teaching aids and in stimulating student interest in different educational topics in a new, non-traditional way.

INSTALLING NEW PRINTERS

In September 2017, the school installed two YSoft be3D eDee printers which were available to the entire student population. Because eDee printers are connected to the school's network, the 3D printers could be made available to all students from any school computer.

"Frankly, there was no formal plan to implement 3D printing into our school curriculum. Together with two older students who were familiar with 3D printing, we supported other students and teachers. Students also could get familiar with 3D modeling and 3D printing in our MAKERS club throughout the year. Students do not have to pay for using 3D printers and therefore they are interested," adds Tomáš Feltl.

Students used 3D printers not only for school-related projects but also for their own entertainment. For example, some girls have begun to experiment with modeling and printing jewelry. In school subjects, projects in chemistry, physics, biology, geography and mathematics were the areas mostly where 3D printing was used.

Teachers used 3D printing primarily to create learning aids. For example, one teacher has created a simple 3D printed vacuum cannon for a lesson in physics to better understand Bernoulli's equation (a principle that states an increase in the speed of a fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy). When teaching geography, students used a relief map of the Czech Republic that had a lot of detail and attracted students.

"I teach chemistry and I see great potential in 3D printing technology. In chemistry, we often have students who have difficulty with the subject's concepts. Pictures, schematics, animations and 3D models on computers and tablets are pretty, but when you hold the model right in your hand, it is different. It is the 'touching' and 'assembling' that often opens their eyes and gets them through the class with 'Yeah, I get it now!' Good examples might be atoms and their structure, properties and relations in the periodic table of elements, bonds between atoms, chemical nomenclature, isomerism, the relationship between structure and properties of substances, cycle of substances in nature, reaction kinetics, energetics, and so on, and so on," explains Tomáš Feltl.

In other areas of education, 3D printing has also found a place. Awards were created in music class and, in the history of art and architecture, 3D prints of certain typical architectural elements have been used.

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– Mgr. Tomáš Feltl
Teacher

BENEFITS OF 3D PRINTING FOR FUTURE DEVELOPMENT

YSoft be3D eDee printers offer several unique features that are exciting to the school and help to make the introduction of 3D printing into school life smooth. These features include individual users logging in with their own usernames and passwords. They also appreciated the ability to reprint favorite models and that the system sent email notifications to users informing when the print job was completed. Easy printer management was also very important – as a result, the school can keep an eye on individual print jobs, users and material consumption and therefore the total costs of running 3D printers.

"A distinctive additional value of 3D printing is the inexpensive creation of learning aids. I can easily design the aids exactly to my expectations and, thanks to the low cost of 3D printing, they can be produced in larger quantities. I am not just a demonstrator when teaching, instead the entire class is able to work with the models. Thus discovering laws of nature is more interesting for students. In addition, many of the aids/tools I use now are not commercially available. Without 3D printing, I would not have these learning aids," explains Tomáš Feltl.

The introduction of 3D printing was very intuitive. Nevertheless, there were some problems that needed to be solved and which gave us advices for the future. "3D printing would certainly not have been so popular without the enthusiasm of several students and teachers. Even so, success cannot be built upon a few people. All new technologies that have potential in education need long-term support from the top levels. Schools need funding and enlightened and educated people at MŠMT (Ministry of Education, Youth and Sport), at school offices and as school founders. We also need farsighted directors and well-motivated teachers who can not only educate themselves without difficulties, but also have high-quality teaching materials and aids, such as 3D models. I firmly believe that with this, the implementation of new technologies and approaches to learning across schools would be easier," says Tomáš Feltl.

"Technology is moving forward with major milestones. If we are to prepare our students for the world in which they will live, we cannot ignore modern technologies. PC-related skills are matters of course for teachers today, and I think that in the next five years it will be the same with 3D printing, augmented reality and many other technologies that have great educational potential," concludes Tomáš Feltl.

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