YSoft BE3D™ EDEE CASE STUDY
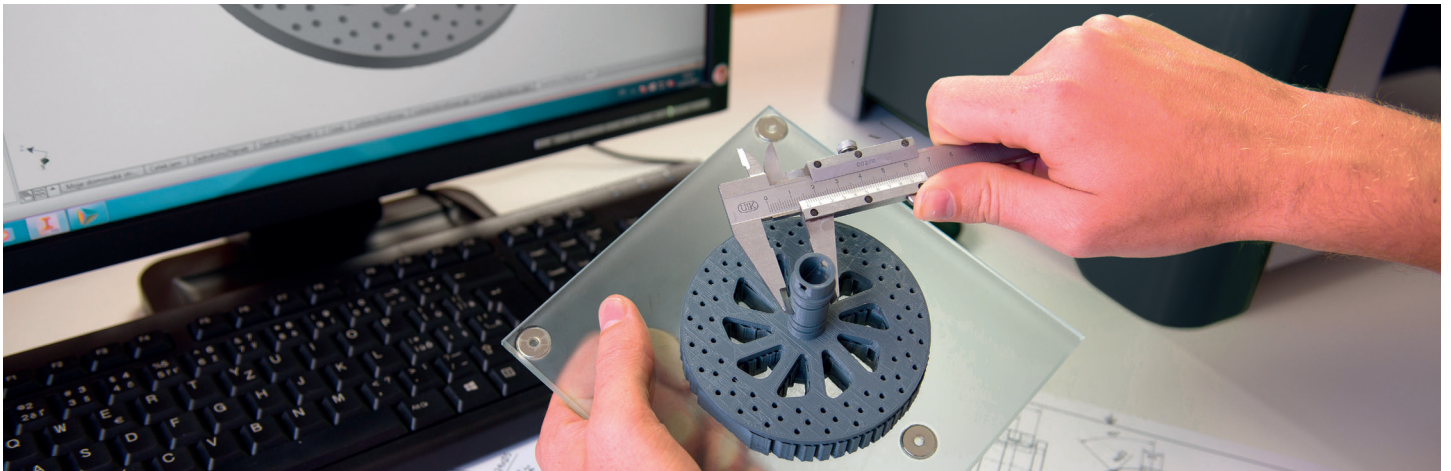
LOOKING FOR THE PERFECT WAY TO USE 3D PRINTERS IN SCHOOLS

Technical School Prosek, Czech Republic creates a specialized 3D printing classroom as a pivotal part of its curriculum.

INTRODUCTION

For years, Lukas Prochazka, Deputy Headmaster in Secondary Technical School in Prosek (Prague, Czech Republic) focused on keeping pace with the dynamic developments happening in technology. His goal is to ensure that his students, upon graduation, have the most modern and technical skills required by employers. A substantial part of having modern technical skills is being able to use 3D printing as he sees employers using 3D printing technology more and more.

Since 2011, when the school purchased its first 3D printer, Lukas Prochazka began to investigate ways to efficiently leverage this technology in the school's educational curriculum and processes. In 2015, the school joined forces with Y Soft to develop a 3D printing classroom equipped with YSoft be3D eDee 3D printing solutions specifically designed for education.

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>
> **— Lukas Prochazka**
> **Deputy Headmaster**
> **Technical School Prosek**

CHALLENGE

In 2010, the school introduced 3D printing to its senior class. It was thought that this was sufficient time to learn how to use 3D technology in time for graduation projects; as a technically oriented school, many students already knew about 3D technology. However, accessing 3D printers in only their senior year didn't allow for effective use of 3D printers in other subjects relevant for 3D technologies (e.g. Computer-Aided Design, Machinery Construction, Vehicle Construction etc.). Therefore, Mr. Prochazka decided to introduce 3D printing technology in the sophomore year as a complementary technology to other subjects and to better prepare students for using 3D printing in their graduation projects in their senior year.

Such an ambition raised some practical considerations. What would be the right number of printers? Would the printers be distributed throughout the school or in individual classrooms? Would they also be accessible to students and teachers outside of classroom assignments? How could the school get the most efficient use of the technology?


SOLUTION SUMMARY

In 2015, the school started a partnership with Y Soft, a global technology company who provides 3D printing solutions for education and manufacturing through its YSoft be3D family of products. The school dedicated one classroom for a field test of a specialized 3D technologies lab that Y Soft equipped with a fleet of 3D printers. The goal of the field test was to find the best way to integrate 3D printing as much as possible into the school's curriculum. Y Soft also leveraged the learnings from the field study in the final development phase of its YSoft be3D eDee printing solution designed exclusively for schools.

SOLUTION DETAILS

Initially, 10 YSoft be3D DeeGreen printers were placed in the classroom lab. Since only one third of a 30-student classroom ever used the lab at one time, this allowed each student to have access to his or her own printer. Printers were placed on each students' desk beside a computer so they could be easily accessed when they finished the 3D computer modeling process.

The classroom lab was accessible to all students and teachers in the school outside of the regular classes. This allowed students and teachers to use the equipment for individual long-term projects and graduation projects as well. Also, students were allowed to use the 3D printers not only for education related projects, but also for personal use and fun.

Soon 3D printing became an integral part of the sophomore students' curriculum. In addition to teaching 3D printing technology itself, the 3D printers were used for completing complex assignments designed to combine different engineering skills – drawing, 3D modelling, etc. For example, students were assigned to design a suspension mechanism for a bicycle fork and check the viability of their design using a 3D printer and a real bicycle front-wheel fork.
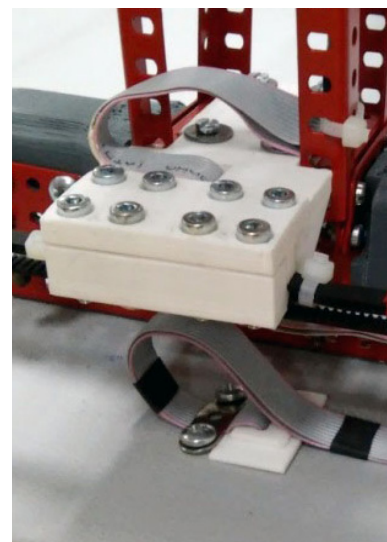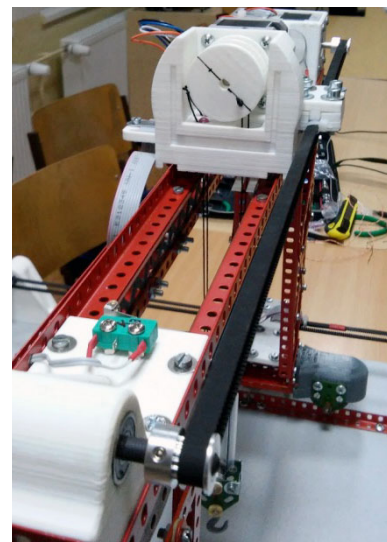
RESULT

For an entire year, the school, together with Y Soft, carefully monitored the interaction of 3D printing in the classroom with students.

As a result of the one-year study, Technical School Prosek made the following observations:
- 60% of printed objects were related to education (40% graduation projects, 12% teaching aids, spare parts etc. and 8% individual education projects)
- 37% of printed objects were for personal and entertainment use
- 3% of all printed objects were printed as part of the school's marketing activities
- 40 filament spools (the thermoplastic material used to print a 3D object) were consumed
- Each printer was in use approximately 5 hours per day

In addition to introducing modern technology into the education process, the school found many key benefits of 3D printing in the classroom especially in strengthening students' motivation to learn. Individual education projects are more entertaining with 3D printers as the technology allows students to immediately see the results of their efforts. Also, the decision to make the classroom lab widely accessible made it easier for senior students to use 3D printers for their graduation projects.

"The high quality of educational projects when using 3D printing really surprised me. Personally, this is the most valuable benefit of using 3D printers in school, especially when it comes to graduation projects. Students have a more innovative approach to them, they are more creative and not afraid to explore and experiment as they can test their designs right away. Once a rather feared experience, the final exam process becomes more fun with 3D printers," says Lukas Prochazka.

The testing period also helped to identify three unique challenges that educational institutions should consider when implementing 3D printing technology:

- **Cost Management and Recovery**
Each object consumes different amounts of filament and it is difficult to set a transparent, accurate and automated payment system that could help recover total cost of ownership for 3D printers.
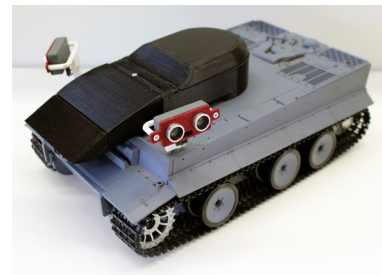
- **3D Print Management**
A fleet of 3D printers is not administered and managed unlike today's current paper printers. This can lead to, for example, late identification of failed prints, refills of filament spools and lack of overall control over who is using the printers and what is being printed.

- **Security**
When 3D printers were used outside of regular in-class assignments, students often interrupted each other's print jobs to start their own print without waiting for the current job to finish. In some cases, the taking of printed objects by students who didn't submit the print job was observed.

These challenges were noted by Y Soft who specializes in workflows, print management and cost recovery for paper printers. It helped the company understand how similar technologies can be used for 3D printers. These observations were key features that were incorporated and addressed in the YSoft be3D eDee solution for education.

By integrating its YSoft SafeQ print management and accounting system with a 3D printer, the YSoft be3D eDee solution enables schools to manage usage, recover costs and lock the printer during the printing process and release it only to its authenticated owner.

The classroom field study was completed before the start of the 2016/2017 school year. Five YSoft be3D eDees have been added to the fleet. To enhance the lab's accessibility, the school created a new set-up for the classroom. Now, it is split into two separate rooms (one for 3D printers and the other houses the computers students use to create their 3D model files). The 3D printers are accessible not only from the computer section of the classroom but also through a hallway door allowing for other students and instructors entry without disturbing the current lecture. The separate 3D printing classroom also insolates the class from the noise made by a fleet of 3D printers in use.

To encourage other educators to learn how to successfully bring 3D printing into the school curriculum, Prosek and Y Soft have partnered further to make the classroom lab available to teachers from other schools.

"Usually acquiring a 3D printer in the classroom leads to a short period of excitement followed by not using the printer at all. This can happen for several reasons – a lack of ideas on how to use it, a lack of technical skills required to operate it properly in the long term, and more importantly, a lack of a systematic approach when deploying the technology in the curriculum. We learned a lot in these areas and are ready help others to find their perfect way of using 3D printers in the classroom," adds Lukas Prochazka.