

TEACHING STEAM SUBJECTS WITH 3D PRINTING



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INTRODUCTION

Key to developing a strong **STEAM** skill set lies in creating a spark and enthusiasm in students. By bringing **STEAM** subjects to life through 3D printing, **learning becomes active instead of passive. This can create opportunities to explore ideas and concepts in new and tangible ways.** 3D printing in education has many proven benefits, but developing lessons to incorporate it takes up precious time. Y Soft has worked with educators around the world to develop YSoft be3D Academy to make teaching with 3D printing in the classroom easier.



be3D Academy, an online library of ready-to-use 3D lesson resources includes a growing selection of teacher-approved STEAM based plans, including:

- ⦿ Curriculum aligned lesson plans
- ⦿ Video instructions
- ⦿ Worksheets
- ⦿ 3D model files
- ⦿ ...and much, much more

The projects available in be3D Academy can make teaching using 3D easier by giving you the tools and resources you need. Let us give you more time to focus on carrying out the important job of teaching.

This eBook offers a quick and helpful guide for teachers looking to transform their teaching by bringing 3D printing into their STEAM classes.

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SCIENCE

Scientists make observations; they are curious and take notice of the world around them. Science is a process of discovery and understanding. However, teaching science in the classroom can be a challenge as children are not born scientists. From models of how nature works through to a collection of facts, students need an intellectual tool kit to make sense of the world, to explain and predict what is happening.

Using 3D printing in science lessons takes students on a journey from WOW to HOW, while fostering a positive attitude toward the subject. 3D printing can be transformational, through harnessing active learning to encourage students to create their ideas and test their concepts, and learn through discovery.



TRANSFORMING YOUR SCIENCE LESSONS WITH YSOFT BE3D ACADEMY

Here are four of our most popular lessons to inspire your budding scientists:

- ① **Classroom repairs:** looks at sustainability when considering simple repairs on items in the classroom.
- ② **Mobility aids:** students learn to work scientifically and pay attention to objectivity, accuracy, and precision as they create solutions to identified problems.
- ③ **Rocket nozzles:** introduces the science behind rocket engines and a rocket engine exhaust nozzle. This lesson covers forces, energy, and measurement.
- ④ **Rubber band plane:** looking at the basic theory of flight principles and simple aerofoil designs. Students assemble and test their designs. Follow up with further developments and discussion to evaluate designs.

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TECHNOLOGY

With technology infiltrating our everyday life, teaching technology has never been more important. Many students are already actively using different tools, applications and devices so the use of 3D printing to teach technology is a natural fit.

From designing, modelling, prototyping, and adapting projects, the potential use of 3D printing in technology lessons is vast. Students can replicate industrial practices and understand new and emerging technology. **3D technology can help pupils realize the far-reaching potential of their imaginations**, as well as providing a vehicle for covering many elements in the technology curriculum. By inspiring creativity and increasing perseverance, children will learn and develop both confidence and skills which will be important for the future.



TRANSFORMING YOUR TECHNOLOGY LESSONS WITH YSOFT BE3D ACADEMY

Here are four of our most popular lessons to take your teaching to the next level:

- ① **Astronaut Toolkit:** Design a screwdriver bit or wrench for an astronaut. Designs are printed and modified using the 3D printer, as well as considering other tools.
- ② **Casting Mold:** Use CAD modelling and digital sculpting to create a casting mold.
- ③ **Cell Phone Stand:** Experiment with demonstration models and make decisions on how to improve the design and aesthetics.
- ④ **Mousetrap Racers:** Design and 3D print components for a Mousetrap Racer. Then make improvements to increase the distance the Mousetrap Racer travels.

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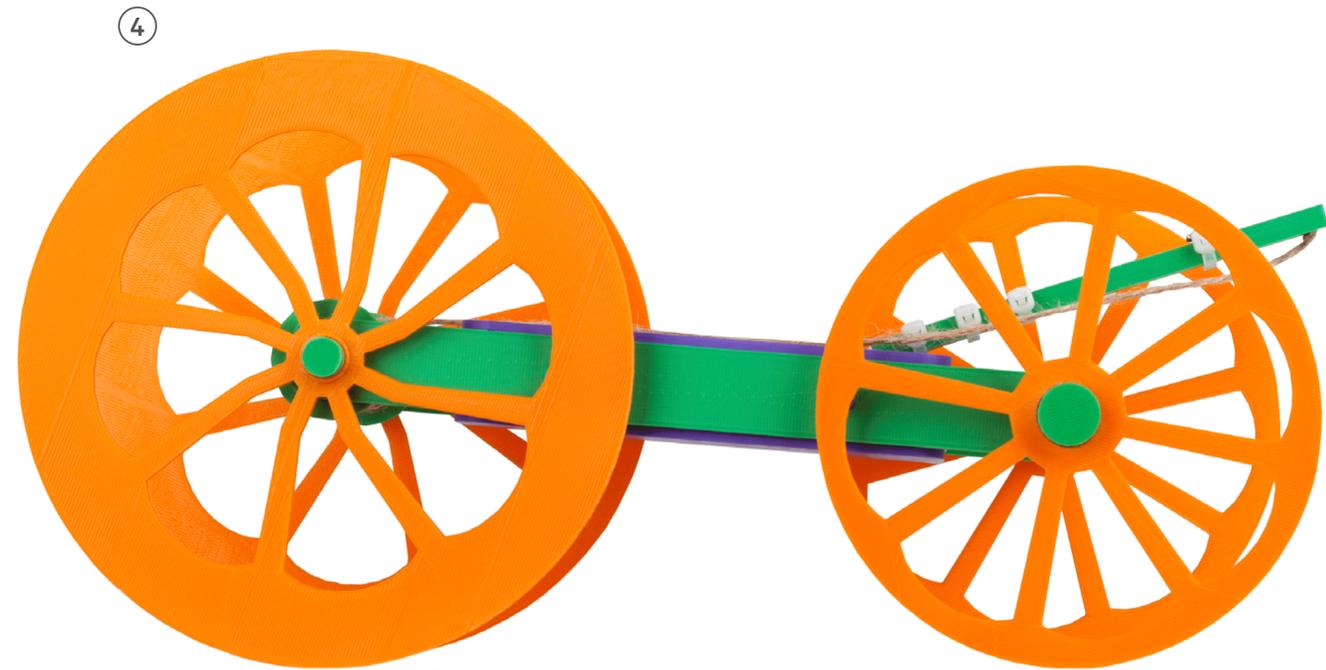
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ENGINEERING

We want our students to be confident creators, inventors and designers. To do this, we need to move teaching engineering from theories and facts into practical lessons that bring the subject to life.

3D printers can inspire future generations of engineers by being part of the engineering process, to challenge curious minds and encourage hands-on experimentation in the classroom. **Teachers can engage and inspire students** to build 3D models to assist their approach and enhance their ability to problem-solve. As with other skills, 3D modelling requires learning and honing. Students can design, model, prototype, and adapt their projects by using 3D printing technology.



TRANSFORMING YOUR ENGINEERING LESSONS WITH YSOFT BE3D ACADEMY

Here are four of our most popular lessons to take your teaching to the next level and inspire the engineers of tomorrow:

- ① **Da Vinci Bridge:** Assemble a model of Leonardo da Vinci's bridge. Design and 3D print a set of beams and test the completed bridge to discover its load bearing capacity.
- ② **Digital Lathe Printing:** Explore different types of lathes and their applications. Design and print an ornate leg for a piece of furniture.
- ③ **Robots on Mars:** Design a tool or piece of equipment to aid the 'Mars innovation'.
- ④ **Rubber Band Plane:** Design and 3D print wings and horizontal stabilizers for a rubber band-powered plane.

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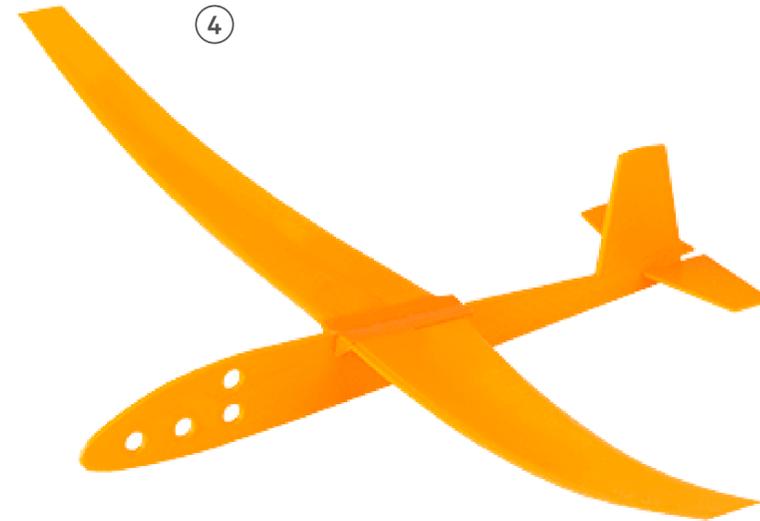
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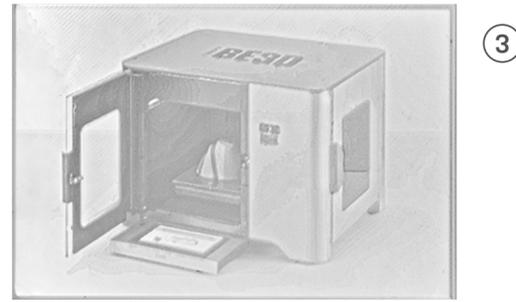
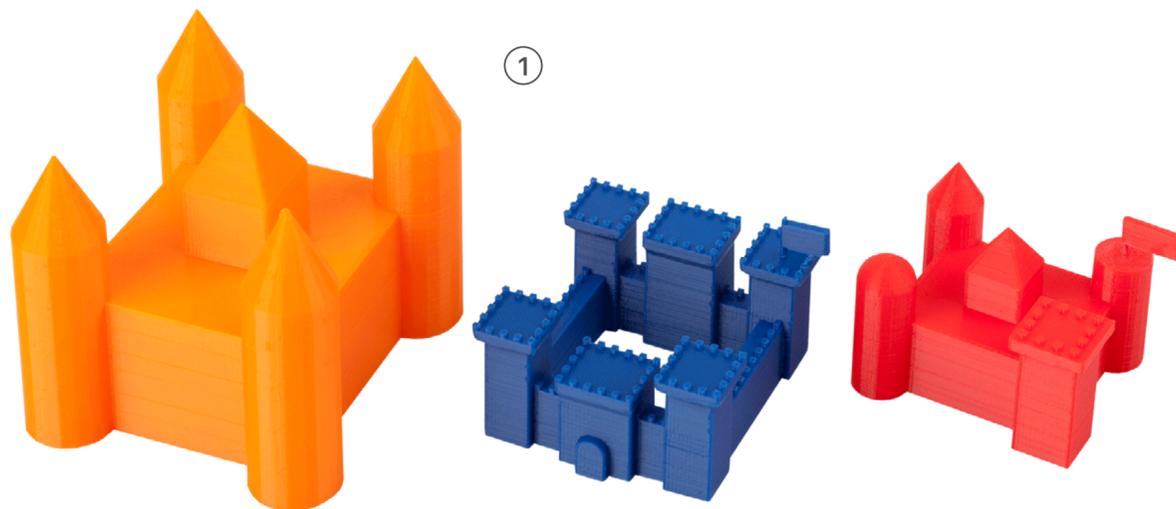
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ART

Renowned for creativity and innovation, art education encourages students to develop their motor skills, language skills, social skills, decision-making, and risk-taking.

Introducing 3D printing helps artists transform their ideas into tangible works of art while enhancing key skill development. From creating abstract sculptures, to mechanical artwork, from casting molds to embossing, 3D printing can broaden perspectives and be used in a wide number of ways. Works of art can be reproduced in 3D, with the likes of Van Gogh being brought to life in a new tangible and achievable way. **With a 3D printer, an artist can create anything they can imagine.**



TRANSFORMING YOUR ARTS LESSONS WITH YSOFT BE3D ACADEMY

Here are four of our most popular lessons for teaching creativity:

- ① **Castles:** Experiment with different types of towers and turrets and work on ways to improve the design and aesthetics of the model.
- ② **Digital Sculpture:** Creating 3D art using CAD modelling and digital sculpting tools. Handling different materials and discovering the history of art, craft, design and architecture.
- ③ **Pictures in Plastic:** Bring a 2D photo to life. Practice photography skills and convert images into a lithophane before printing. Use a range of techniques to record observations in sketchbooks, journals and other media.
- ④ **Vessels:** Design and 3D print vessel models. Produce creative work, exploring ideas and recording experiences of working through the design process.

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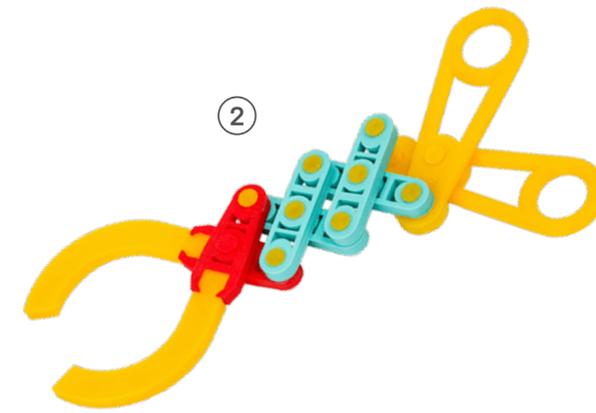
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MATHEMATICS

Helping to develop reasoning and analytical skills as well as logical problem-solving dexterity, mathematics is a crucial subject. Taking abstract mathematical concepts and ideas and presenting them to students in an engaging way can be made easier by using 3D printing.

By demonstrating numbers, shapes and structures in 3D, **ideas are brought to life**. Through visualization and observation, 3D printing allows fresh insight and depth to everything from basic geometry to fractals. **Concepts can be converted from theoretical models into physical ones**, enabling students to visually and tangibly experiment get to grips with them.



TRANSFORMING YOUR MATHEMATICS LESSONS WITH YSOFT BE3D ACADEMY

Here are four of our most popular lessons for you to pass on your passion:

- ① **Gearing Up:** Understand ratio, proportion and rates of change with different gear ratios. Design and 3D print a gearing system. Test the effects on a gearing system's rotational speed when changing the number of cogs in a gear.
- ② **Mini Grabber:** Select and use appropriate calculation strategies to design and create a mini grabber. Carry out mathematical functions and measurements.
- ③ **Tidal Defenses:** Discover how shorelines and riverbanks are protected from hydraulic erosion. Develop fluency, reason mathematically, and problem solve.
- ④ **Loaded Dice:** Design and 3D print loaded dice using CAD. Explores the concepts of probability and ratios.

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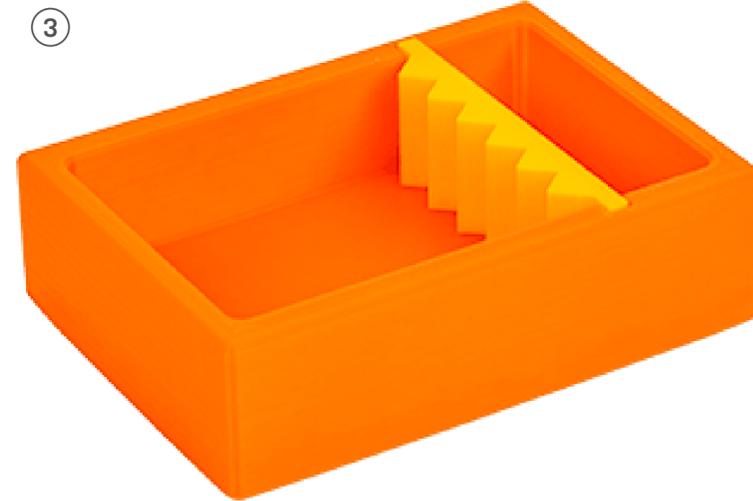
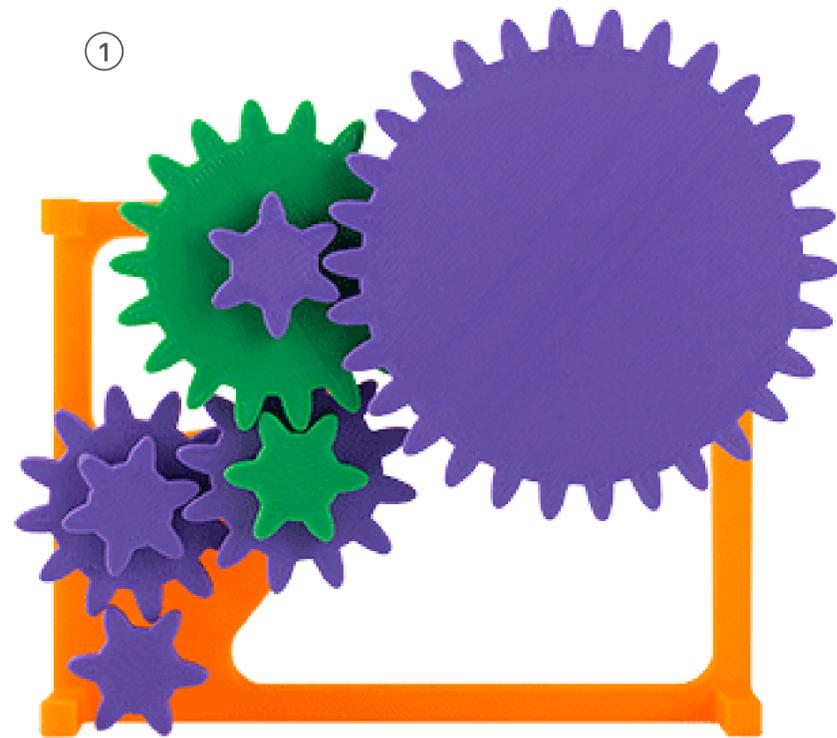
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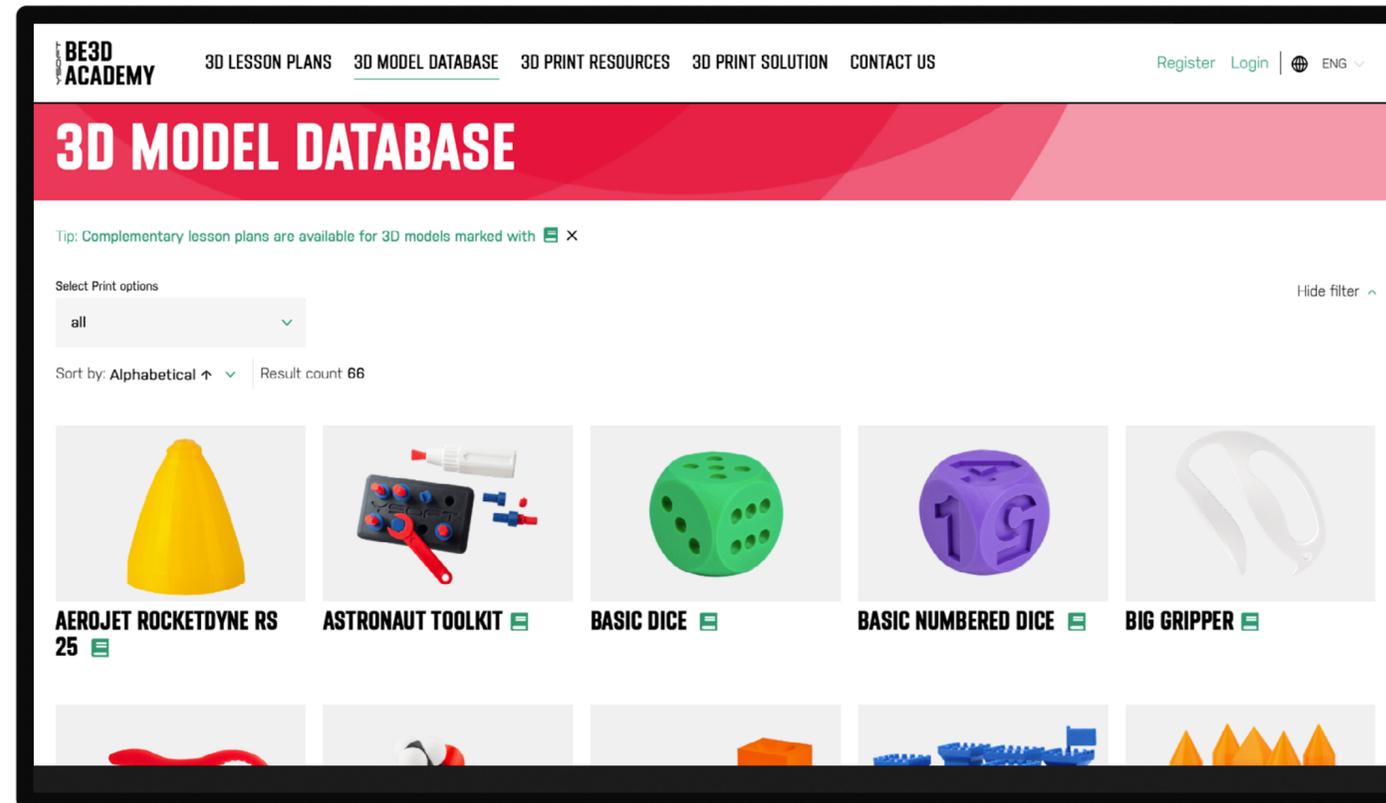
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3D MODELS

The use of 3D models in a lesson can take the intangible and make it tangible. Explaining techniques or specific models, students can see first-hand what you are teaching them. Handling a 3D model can **bring the subject to life and spark the imagination of your students.**

If you simply want to print 3D models as part of your own lesson, we also provide model files for you to be able to quickly print. The 3D model database is part of be3D Academy. This resource includes a growing number of files to support your lessons. We also offer support and guidance for using these models, such as amount of filament needed and whether print supports are needed.



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BE3D ACADEMY PREMIUM CONTENT

Exclusively available for our YSoft be3D eDee customers, be3D Academy hosts premium content. Our premium content consists of 3D lesson plans and models, which offer **depth and advanced STEAM lessons for educators.**

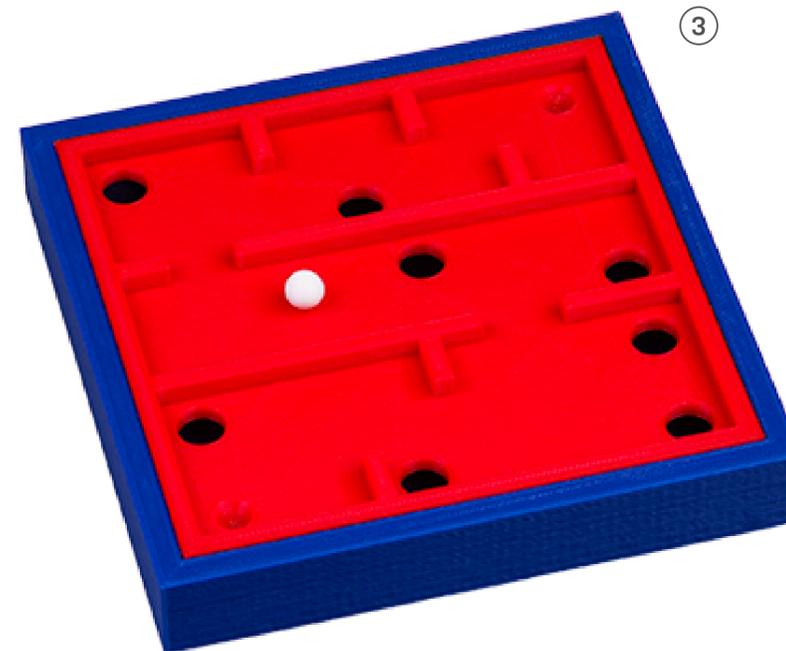
Designed with our YSoft be3D eDee customers in mind, this exclusive range of lessons have been created to help you make the most of your eDee printer.

TRANSFORMING YOUR TEACHING WITH THE BE3D ACADEMY PREMIUM

Our top four premium content lessons for eDee customers are:

- ① **3D Mapping:** Introducing students to the STEAM elements of Cartography, this lesson looks at topography and brings complex geographical concepts to life.
- ② **Geometric Shapes:** Students design and create models to review and understand shapes in greater depth. Tying in elements from Science, Technology, Art and Mathematics this premium content is a popular all-rounder.

- ③ **Labyrinth:** From problem solving to logic, creating this game helps to develop skills from Science, Technology and Mathematics.
- ④ **Flexi-Saur:** Using print-in-place (PIP) hinge designs, students select and design a 3D dinosaur model of their choice. Supporting a range of STEAM subjects, this engaging lesson includes real-life business examples.



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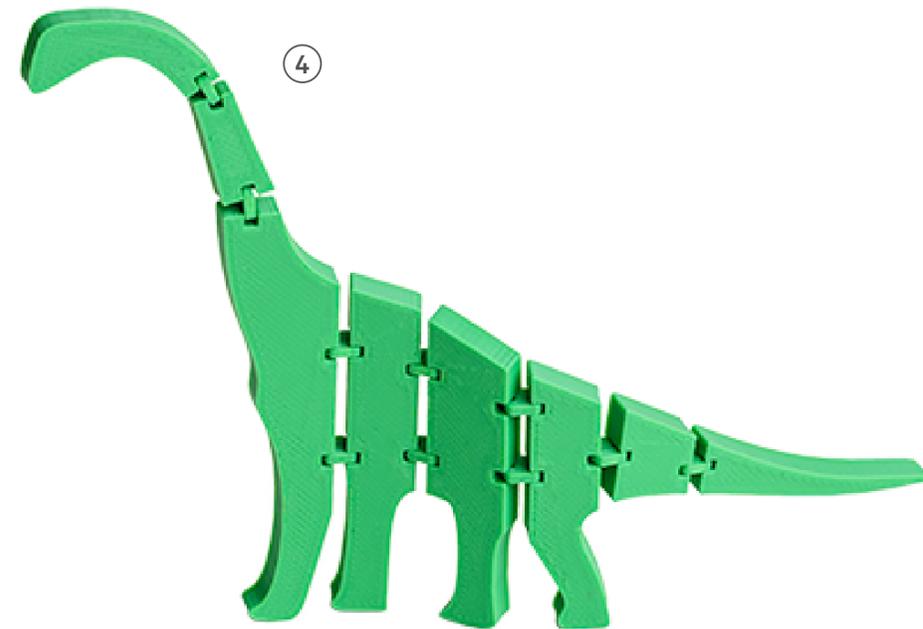
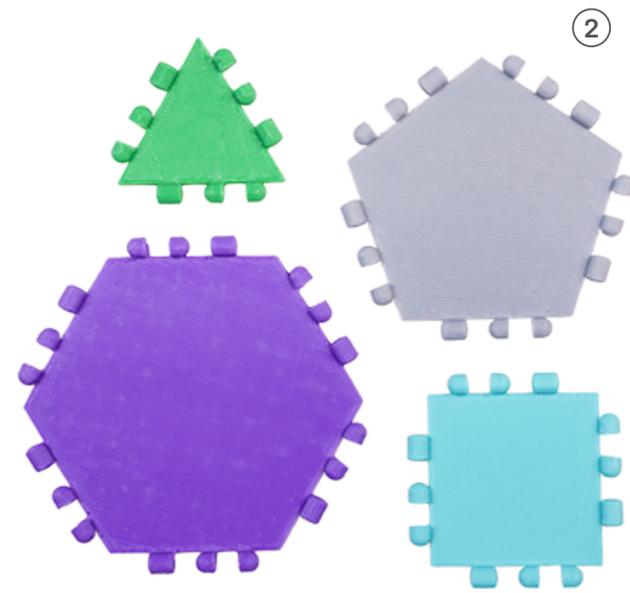
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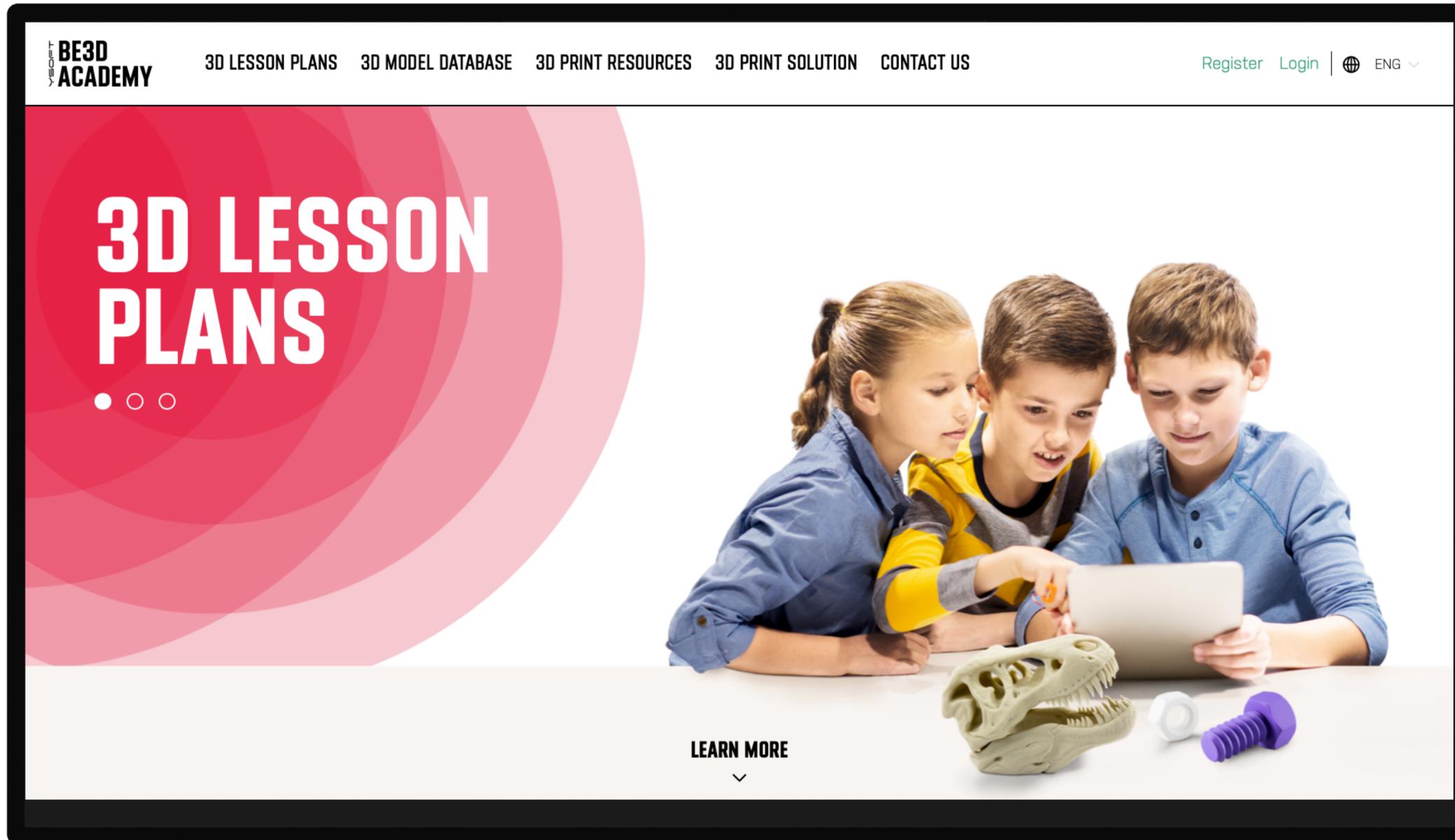
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YSOFT BE3D EDEE

YSoft be3D eDee is specifically designed for the education market **to support teachers and students in their studies**. Our safe and secure 3D printing solution for schools combines a fast 3D printer with easy-to-use features for a **unique hands-on learning experience**. YSoft be3D eDee features YSoft SafeQ, which provides the print management features, so you can manage and control both 2D and 3D printing.



ENHANCED STUDENT LEARNING EXPERIENCES

Encourages creative thinking and increases student engagement for improved subject matter retention. Prepares students better for future careers.



READY TO USE 3D CURRICULUM

Access to be3D Academy for teacher-tested online lesson plans, 3D models and training resources. Includes 3 years of exclusive access to premium lessons. 15 initial premium lessons with additional sets of lessons added quarterly.



SAFE, EASY TO USE & INTELLIGENT

eDee printer has enclosed chassis that protects from heat and moving parts. Biodegradable PLA material is kind to the environment. Intuitive, intelligent software guides users and has helpful notifications. eDee printers don't require constant teacher supervision and can be left unattended in the classroom, in makerspaces, libraries or anywhere on the school grounds.

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LEARN MORE ABOUT EDEE AND OUR **SPECIAL EDUCATION BUNDLE** BY VISITING WWW.YSOFT.COM/3DEDUCATION

ABOUT Y SOFT

INTELLIGENT ENTERPRISE OFFICE SOLUTIONS THAT BUILD SMART BUSINESS

We create intelligent enterprise office solutions that build smart business and empower employees to be more productive and creative. Our headquarters are in the Czech Republic. We employ over 300 dedicated people around the world; our R&D centers are in Brno, Ostrava and Prague, Czech Republic.

Through YSoft Labs, we experiment with new technologies for potential new products. We accelerate the technology growth of other innovative companies through Y Soft Ventures, our in-house investment arm. We also contribute our time, talent and resources to universities and tech forums.

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