

# An Overview of 3D Printing in the Classroom

Presented by Polar 3D



## What is 3D Printing?

3D printing is an additive manufacturing process. This means that very small layers of print material are built on top of each other to form 3 dimensional objects. Each object can be created and designed using any type of CAD (computer aided design) software. Many CAD programs are available at no cost to students and teachers such as TinkerCAD, BlocksCAD, OpenSCAD Sketchup Make, Fusion360, and Onshape to name but a few.

Since its invention in 1986, 3D printing has been widely used in the development and production of consumer products, medical devices, and industrial technologies. Many of the products we use today were either designed or actually manufactured using a variety of 3D printing technologies. In schools, 3D printing allows students to develop, build, collaborate, and communicate using design tools. 3D printing incorporates creativity, design and problem solving giving students a hands-on and engaging learning experience.

## Polar 3D



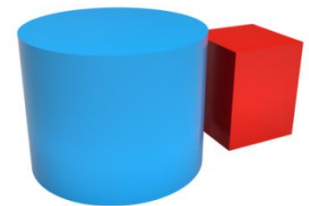
Since our inception in 2013, we have shared the same mission: to introduce and expand 3D printing in education and inspire students to think like engineers and entrepreneurs. Polar 3D is 100% focused on education. More than half of our employees are current or former teachers and professors. We designed our 3D hardware and software to be classroom friendly, easy to use, and reliable. We supplement our printers with engaging curriculum and a deep level of training and support. We truly believe that when 3D printing becomes as easy to use as any other classroom tool, the possibilities for student creativity, learning, and learning outcomes increase dramatically.

Polar 3D has a complete 3D printing solution for schools including

- ✓ 3D printers
- ✓ Cloud-based software to facilitate collaboration and management
- ✓ K-12 curriculum
- ✓ Professional development

## Polar 3D Printer

The Polar printer is the world's first 3D printer to use polar coordinates (0 to 360°) instead of Cartesian coordinates (X, Y, and Z). With an 8" round build plate we can print an object up to 314 cubic inches with the Polar 3D printer. Compare that to the 80 cubic inch build volume from a typical Cartesian coordinate printer with a 4" x 4" build plate. The unique design of the Polar printer also has 30% fewer parts than a traditional 3D printer. Fewer parts result in a simplified operation and fewer components to repair.



We designed the Polar printer for the classroom. In addition to reliability and ease of use, safety was a top priority. 3D printer nozzles get hot and reach temperatures of 350° F. The Polar 3D printer keeps the hot "business end" of the printer protected from little hands. We don't use a heated build plate for safety reasons. The Polar uses non-proprietary 1.75 mm filament and a wide variety of build materials are supported including PLA, ABS, Wood, Carbon, etc. For more information please visit: <http://about.polar3d.com/printer/>

## Polar Cloud

Every Polar printer includes networking and a high resolution video camera built in. Other 3D Printers require a dedicated computer to control it and that someone learn and manage new slicing software too — not so with a Polar printer. A smartphone, tablet, Chromebook or any device with a browser can control a Polar printer. Load design files, position the build plate, manage print queues and settings—you can even watch live video of the print from any browser. With the free Polar Cloud connectivity built into every Polar printer, you can control and print from anywhere in the world.

The Polar Cloud is also an online social platform that encourages collaboration and sharing in the 3D printing community. This allows students to communicate and collaborate on design projects. In addition, it enables teachers to collaborate and share lesson plans, content, and projects. Integration with Google Classroom, Google Apps for Education, and Google drive make the Polar printer education friendly.

## STEAMtrax K-12 Curriculum



STEAMtrax is an innovative curriculum that integrates engineering and 3D printing technology with core academic knowledge in science, math, language arts, social studies, and art. In the true spirit of the Framework for 21st Century Learning skills, students are engaged in relevant learning scenarios that encourage the essential skills of problem solving, collaboration, communication, critical thinking as well as developing core academic knowledge. Each lesson imbeds 3D design, printing and scanning technology as an integral part of the STEAMtrax Engineering Process. The STEAMtrax curriculum works with any brand of 3D printer. For more information please visit <http://about.polar3d.com/steamtrax/>

The STEAMtrax curriculum includes 22 modules for Elementary, Middle, and High School. Each module provides an extensive set of instructional materials including: lesson plans, standards alignments, step by step instructions, projects, assessments, and background information for teachers in multimedia and print formats. The curriculum is a school-wide site license to encourage cross curricular integration.

- ✓ Problem-based, thematic storylines make learning relevant and fun
- ✓ Hands-on, constructivist learning stations to clarify science concepts
- ✓ Integration of 3D design, printing, and scanning built into each module
- ✓ Engineering Project Design Process encourages critical thinking
- ✓ Variety of formative and summative assessments, including rubrics
- ✓ Flexible modules easily align to NGSS or state standards
- ✓ Available in digital or print format



## Polar 3D Education Team



The Polar 3D Education Team are actively involved with development and enhancements to the STEAMtrax curriculum as well as providing professional development services to school systems and educators on the Polar 3D curriculum.

Dr. David Thornburg is Polar 3D's Director of Education and is an award-winning futurist, author and education consultant. David uses his expertise to help educators build the skills needed to use technology as a tool for understanding. Dr. Thornburg is a veteran of Xerox PARC, where he invented numerous devices, including touch screen technology used in smartphones, PDA's and interactive white boards. Dr. Thornburg wrote the book on 3D printing in schools "The Invent to Learn Guide to 3D Printing in the Classroom: Recipes for Success".

## Professional Development

Dr. Thornburg and his team provide comprehensive professional development services encompassing STEAMtrax modules, 3D printers, CAD software, design process, as well as customized topics. A variety of delivery formats are available including on-site workshops and virtual web seminars.

## For more information

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