
# MakerBot 3D Printing for Education

# MAKERBOT 3D PRINTING FOR EDUCATION

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## CASE STUDY / MAKERBOT REPLICATOR AT WHITBY SCHOOL

**Where:** Whitby School in Connecticut

**Grade Levels:** 6-8

**Subject:** Design Technology

**Learning Objective:** Understand the design process and product development cycles

**Process:**

- Design in 3D using Tinkercad
- Prepare for printing in MakerBot Desktop
- Print on the MakerBot Replicator Desktop 3D Printer

## CASE STUDY / MAKERBOT REPLICATOR AT A. MACARTHUR BARR MIDDLE SCHOOL

**Where:** A. MacArthur Barr MS, New York

**Grade Levels:** 6-8

**Subject:** Technology

**Learning Objective:** Design, test, and iterate on real parts using existing C02 Car Project.

**Process:**

- Design in 3D using Tinkercad
- Prepare for printing in MakerBot Desktop
- Print on the MakerBot Replicator
- Test for weight and strength, iterate

## CASE STUDY / MAKERBOT REPLICATOR 2 AT BROOKLYN TECH HIGH SCHOOL

**Where:** Brooklyn Tech HS, New York

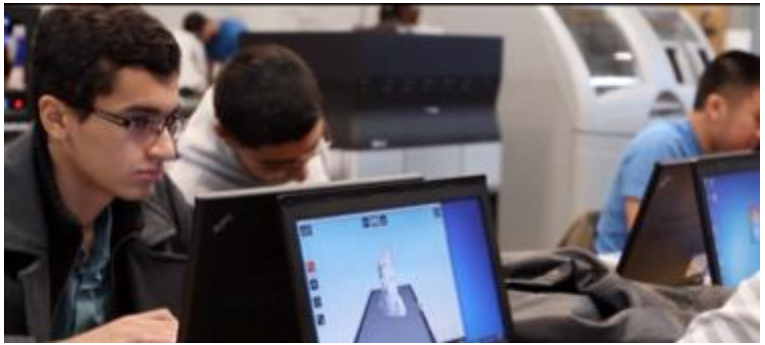
**Grade Levels:** 9-12

**Subject:** Design and Drawing for Production

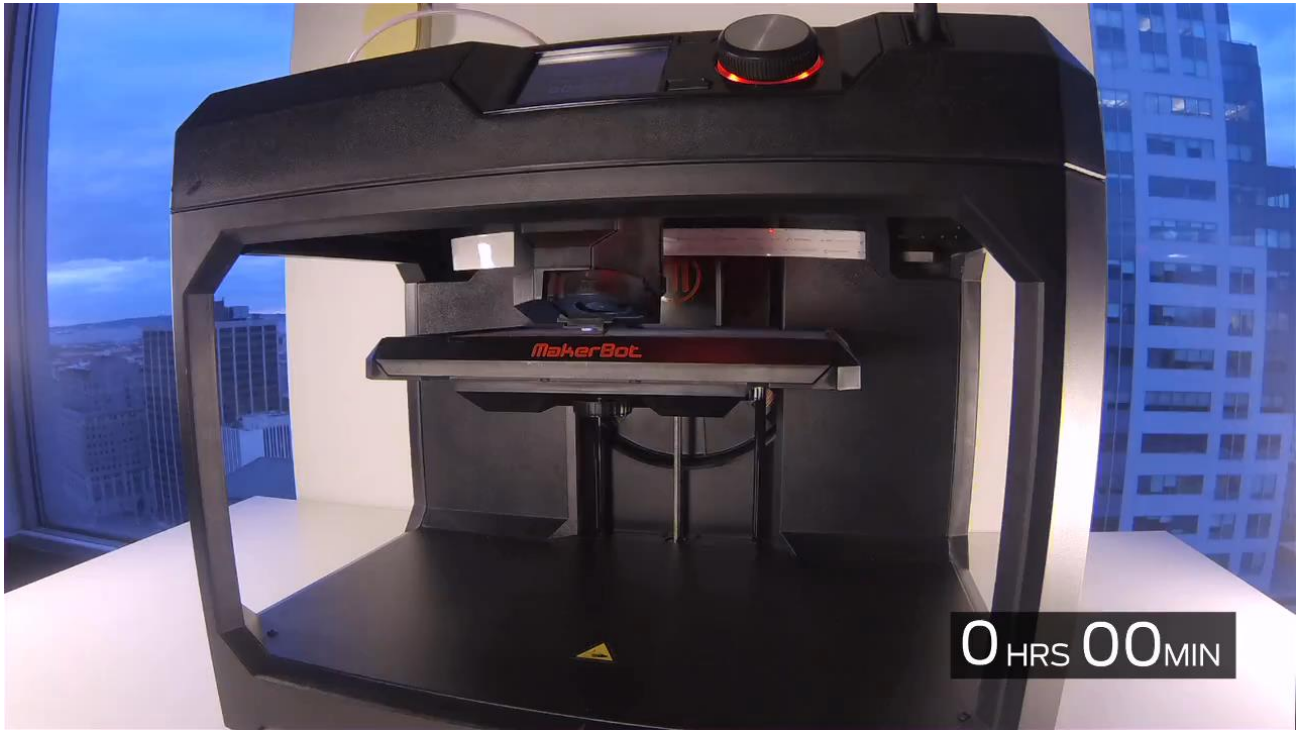
**Learning Objective:** Learn to accelerate the design process, Visualize complex principles

**Process:**

- Introduce 3D printing into required freshman course
- Allow access to senior-level design students
- Support Robotics and other extracurricular activities



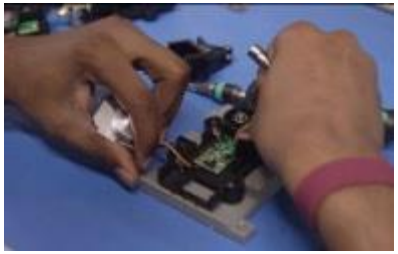
## WHAT IS 3D PRINTING?




**3D printing is the process of taking a digital model and making it a physical object.**

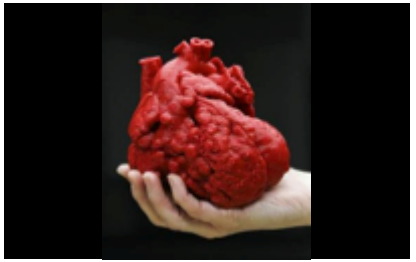
## WHO USES 3D PRINTING?

Engineering



Manufacturing

Architecture

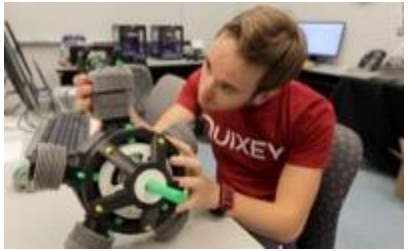


Medical

Design

Entertainment

Primary Education



University

## WHAT VALUE DOES 3D PRINTING HAVE IN EDUCATION?

### Satisfy Curriculum

- 3D printing and design offer a rich way to enhance and reinforce science, technology, engineering, art, math, and design skills already being taught in the classroom.

### Engage Students

- 3D Printers engage students in the process of design and making all while enhancing their ability to solve problems through creative and collaborative solutions.

### Prepare students for STEAM degrees and careers:

- Today's professionals use 3D printing to advance product development cycles.
- Provide students with tangible, hands-on experience in STEAM subjects and engineering fundamentals.

### Involve the community

- 3D printing is an excellent way to reach out to the community (i.e. student project showcases, fundraisers, student-run classes)

## MakerBot connects educators to the largest 3D printing community with the tools and know-how designed for the classroom, transforming today's learners into tomorrows problem solvers

**Largest 3D Printing Community**

- Currently 100,000 3D Printers in the world, over 5,000 in schools
- Over 1,000,000 free downloadable things through Thingiverse.com

**MakerBot is committed to education**

- Published MakerBot in the Classroom - Free 150 page teacher handbook
- Jumpstart - free 3D design tutorials and information
- Thingiversity - Community, resources, and tools to bring 3D printing to the classroom

**Safe and easy to use for both teachers and students**

- Designed for no maintenance (magnetically swappable extruder)
- Products are safe to use in classrooms, non-toxic materials

## HOW MUCH WILL IT COST?

### Replicator Essentials

**$3,487.99**

1 MakerBot Replicator Desktop 3D Printer
1 MakerBot Smart Extruder+
10 Pack of MakerBot PLA Filaments in Large Spools
1-year MakerBot MakerCare Protection Plan
Build Plate Tape

### Educator's Bundle

**$6,999**

2 MakerBot Replicator Desktop 3D Printers
2 MakerCare 1-Year Plans, for Each 3D Printer
2 Smart Extruder+
10-Pack of PLA Filament in Large Spools
1 MakerBot Digitizer Desktop 3D Scanner
1 Copy of MakerBot in the Classroom

### Starter Lab

**30 – 40K (request quote)**

4 MakerBot Replicator Desktop 3D Printer
1 MakerBot Replicator Mini Compact 3D Printer
1 MakerBot Replicator Z18 3D Printer
1 MakerBot Digitizer Desktop 3D Scanner
80 spools PLA Filament in Large Spools
MakerCare coverage plan for all hardware
Accessories: Rack, Smart Extruders, Z18 cart

## WHAT IS THE RETURN ON INVESTMENT?

### K–5

- Inspire curiosity in STEAM
- Create tactile learning models for complex concepts
- Establish spatial reasoning
- Early engineering concepts and process

**Students at the Whitby School moved through the design process by turning a fictional city into a scale model.**

### 6–8

- Develop design thinking skills
- Learn through iteration
- Hands-on engineering principles
- Deepen history lessons through re-creating artifacts

**Students at MacArthur Barr Middle School iterated and optimized 3D printed wheels to improve their CO2 powered cars.**

### 9–12

- Learn professional 3D design skills
- Simulate real-world engineering problems
- Develop college-readiness through advanced design thinking
- Unlock critical thinking skills required to bring an idea to reality

**Students at Brooklyn Technical High School collaborated to demonstrate complex Calculus principles with 3D printed parts.**

## HOW TO ENSURE SUCCESS?

### Provide resources & support to teachers to get started:

- Professional Development opportunities
- Estimated time to learn 3D Printing basics = 10 - 20 hours dedicated
- **MakerBot in the Classroom** handbook (digital version included)

### Start with 1–2 classes as a pilot program, identify “champion”

- Test timing and integration before larger scale rollout
- Identify “champion” teacher to build program
- Recommendations: technology, science, art & design, robotics, engineering

### Budget for ongoing costs

- Filament, supplies and accessories ~**$500** per printer per year
- Protection plan for all 3D printers = **1 year included in bundle price** (MakerCare coverage)

### Physical Space

- Table space for printer and materials (floor space if Replicator Z18)
- Electrical: 100 - 350 W per printer
- Networking (optional): Wifi and/or ethernet port on each printer

### Computer Software

- Required Software: MakerBot Desktop (free)
- Recommended Software: Tinkercad (free), 123D Design (free), Sculptris (free), Autodesk Suite (paid**), Solidworks (paid)