Promoting Occupation for Food-Growers with Three-Dimensional Printing

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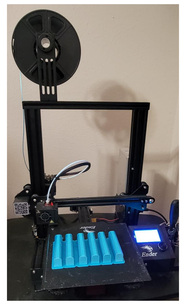
3D Printing: Creating a Solid Object from a Digital Model



- Application of thin layers of material to form a shape to allow manipulation in a digital format and create unique shapes in a physical form. (Strikwerda en Dehue, 2022).
- Becoming lower cost and easier to use (Turney, 2021).
- Prints in a variety of materials: plastic (PLA), powders, resin, metal, carbon fiber, graphite and graphene, nitinol, paper, and building materials (eg. clay) (SPC Surface Treatment Experts, 2018).

Three-Dimensional Printing (3DP) has been shown to offer opportunities for customization items to improve independence such as with orthoses and Assistive Technology (Patterson et al. 2020, Lundsford et al, 2016).

3D Printing and the Benefit to Food-Growers

3D printing may make farm operations more efficient.

- Scan broken parts and duplicate new ones onsite with no shipping delays or costs.
- Personalized 3D printed horseshoes for horses suffering from laminitis to support recovery.
- Creating parts for farm machinery and infrastructure, and even for studying landscapes and waterways. (Rural Industries Research & Development Corporation & Australian Government Rural Industries Research and Development Corporation, 2016)
- Custom handles/tools

Cost of 3D Printing

Printer	Cost	Other Information
Dremel DigiLab 3D45 3D Printer 	$1,969.13	For professionals and small businesses Has very good print quality, can use USB, wifi, USB drive, or ethernet, and is relatively quiet.
Original Prusa i3 MK3S+ 	$999.99	For serious hobbyists and makers Has easy-to-use software, multiple filament types, and an improved bed leveling system.
Creality Ender-3 V2 	$279.00	Budget printer for beginners This is an open-framed printer that you build from a kit, manual leveling, good size build area, above average print quality and supports a variety of filament types.

Start-Up Costs:

- Printer
- Scanner
- Software
- Filament
- Tools

Recurring Costs:

- Filament
- Software
- Tools
- Printer heads

Step-by-Step Process

Step 1: Modeling

- Obtain or design a digital model of an object in a variety of software or downloaded from open-sources (.stl files).

Step 2: Slicing Software

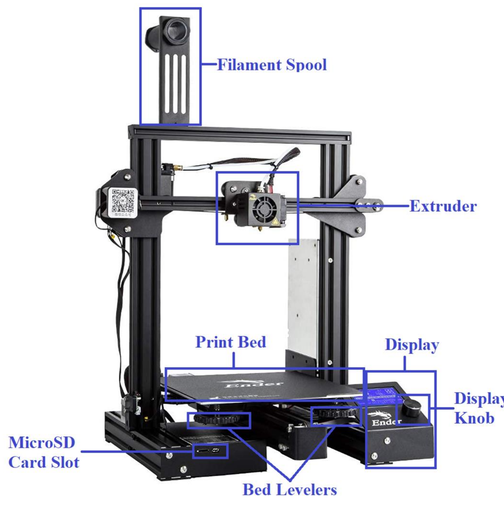
- Calculates the route, quantity of filament, and amount of time for the print.

Step 3: Printing

- Upload the file for printing.
- Calibrate the extruders and printing base, prior to printing
- Warm up the base and extruder to begin printing.

Step 4: Post-Processing

- Remove the object from the base and if there are any supports they will need to be removed.
- Optional steps may include, sanding the object to make the model smoother, coloring or painting, polishing, and welding or assembling parts into a larger model. (Raise 3D Technologies, Inc., 2022)



Software Options

Software

Design Softwares:

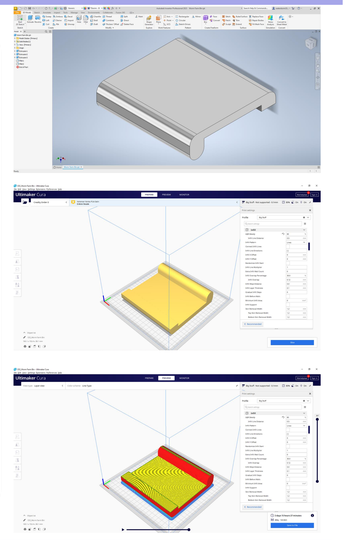
- Autodesk Inventor
- CAD
- TinkerCAD
- Blender
- Fusion 360
- Sketch Up Free

Slicing Softwares:

- Cura
- ideaMaker
- PrusaSlicer

Open-Sourced Models:

- Thingiverse
- Pinshape
- Cults 3D
- Repables
- YouMagine



3d Printing at AgrAbility

UNM OT student team designed and fabricated a custom-built vermiculture table to support the needs of a person with mobility limitations. 3D printed handles provide one-handed access to the worm composting bins. Additionally, 3D printed bumpers were designed to be placed on food-scrap collection buckets so that they could be opened and closed one-handed, independently by the user.

NM Community Resources

- Classes at University of New Mexico- Introduction to 3D Printing (ARTS333) and more
- Autodesk offers educational access to products, free to students
- Studio G Arrowhead Center free for New Mexico Tech students offers access to equipment and software
- Use a local store to print items for you! Such as “Print a Thing” located across New Mexico. upload an STL 3D file, customize the type of material used, get a quote, purchase, and it ships directly to you
- Watch online videos that talk about specific 3D printers, the software, and how to print
- online guides such as, “The Free Beginner's Guide” by 3D Printing Industry
- **Coming Soon: Public use 3D Printer at New Mexico Technology Assistance Program**

References: Scan the QR Code

Disclosure: This project is a collaboration with the University of New Mexico, New Mexico State University, National AgrAbility, New Mexico AgrAbility and Mandy’s Farm. The presenters have no financial interest with any assessment/intervention strategies or products discussed in this poster.