3D Printing Exploration Kit

Overview

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What's in the Kit?

Welcome to the **Library of Inspiration 3D Printing Kit**—your gateway to the exciting world of 3D printing! This kit is designed to spark your creativity and help you explore the endless possibilities of designing and printing your own 3D models.

Kit Contents Checklist:

Before and after using this kit, double-check the following items are included. Report any missing or damaged items to the person you borrowed the kit from.

List of Material in the Kit

- Example Models   - Workbook

Tip: *Take some time to play with the pre-made models. They can give you ideas for your own creations!*

What you will need!:

- **Any Device** with an internet connection or app store

Sites:

TinkerCAD: Visit: www.tinkercad.com

- **Create an Account:**
    Click on "Join Now" or "Students Join Class."
    Use your school email or class code provided by your teacher.

- **Explore the Home Page:**
    Familiarize yourself with the interface.
    Access tutorials and start new projects.

Cool Fact!
TinkerCAD is used by designers of all ages, from beginners to professionals!

What is 3D Printing?

3D printing turns digital designs into physical objects, layer by layer, using materials like plastic. It's like drawing in 3D: you design something on your computer, and a few hours later, you're holding your creation in your hands. This kit helps you master the process of creating and refining your designs for printing at school.

Cool Fact!
The concept of 3D printing was first introduced in the 1980s, and it's evolved dramatically since then! Now we can print car parts and even houses!

What is Library of Inspiration?

Girls, young carers and children from underrepresented backgrounds in engineering are being offered educational kits as part of an Edinburgh Napier University (ENU) project designed to bring STEM-related subjects to life.

Library of Inspiration aims to empower 11 to 13-year-olds to become future leaders in STEM fields by demonstrating how science, technology, engineering, and mathematics shape the world around them.

Staff & Students at ENU, with your help, have created 10 kits that explore Virtual Reality, Robotics, AI, Sound, and much more. Each kit highlights an inspirational person to learn about and maybe connect with. We hope you enjoy using these kits as much as we have enjoyed creating them with you!

Before you Start!

Follow these steps for a smooth setup:

Prepare Your Workspace:
Keep your area tidy to stay organized.

Gather Materials: Ensure you have the device, the pre-made 3D printed models from the kit, and a reliable internet connection.

In Case of Breakage:
Don't worry if a part breaks — keep any broken pieces in the set and inform the person who lent you the kit. They'll handle the rest!

Inspiration Before You Begin
Explore the following repositories to find pre-made 3D models, which can help spark your own creative ideas:
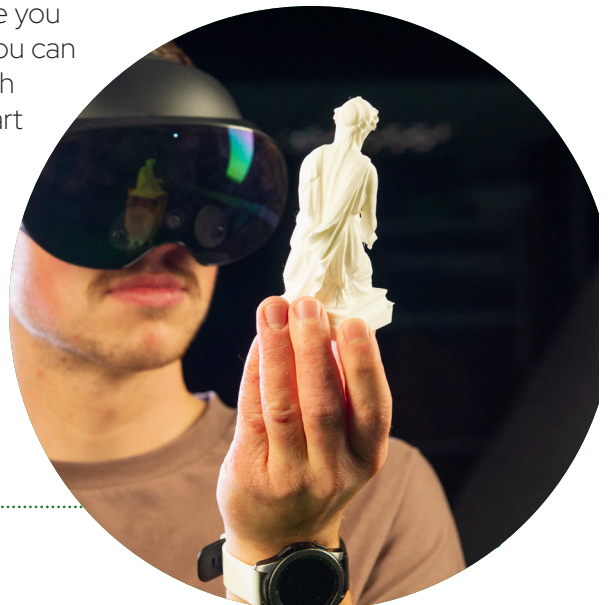
Maker Worlds:
Browse a variety of designs created by the maker community.

Printables:
Discover thousands of models ready for printing or customization.

Reviewing these resources can give you insights into the types of models you can create and help you get familiar with 3D design concepts before you start working on your own projects.

Inspirational Project:

Iron Man
Prosthetic Hand
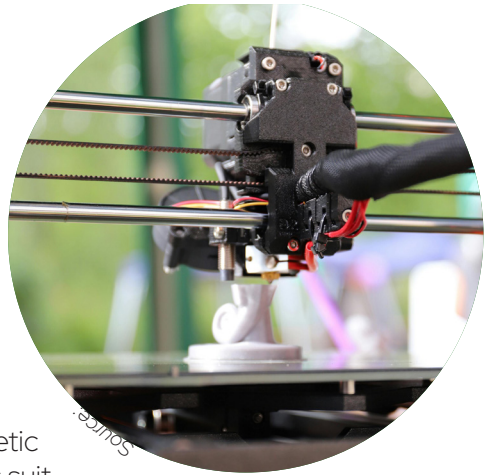
An inspiring project where 3D printing was used to create affordable, functional prosthetic hands for children, modeled after Iron Man's suit.

Tip: *Open-source designs make it possible for anyone to contribute to life-changing projects!*

Source:

https://www.flickr.com/photos/creative_tools/15150910105

3D Printing in Popular Culture
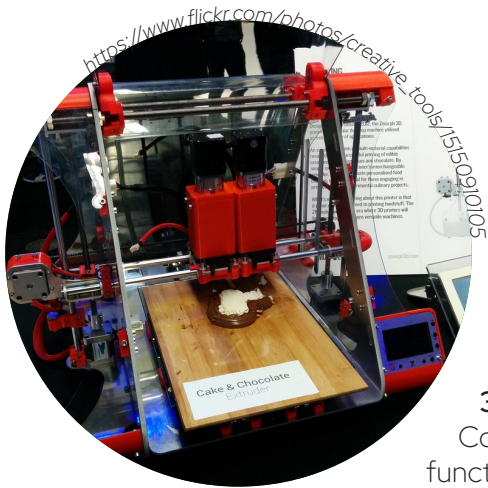
3D-Printed Car:
Companies like Local Motors have created functional cars using 3D printing.

3D-Printed Food:
Chefs are experimenting with printing food, layer by layer, for precise culinary creations.

Cool Fact: The first 3D-printed car was named "Strati" and was printed in just 44 hours!

Inspirational Company

Prusa Research

🌐 https://www.prusa3d.com

Prusa Research is a leader in the 3D printing world, known for their reliable and user-friendly printers. They foster a strong online community, offering tutorials and support.

Cool Fact: *Prusa printers are open-source, meaning their designs are shared freely for others to learn from and improve upon!*

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The Future of 3D Printing

From printing organs for transplants to constructing buildings, the future of 3D printing is limitless.

Tip: *Stay curious and keep learning —the skills you're developing now could shape the future!learn from and improve upon!*

Activities

Each activity is independent of one another. So clear your workspace or create a new one to reduce confusion. Also, save each project once you are finished if you ever want to come back to re-learn, or print it out in the future.

Activity 1:
Getting to know TinkerCAD

Objective: *Familiarize yourself with the TinkerCAD environment.*

Sub-Activity 1.1: Explore the Workspace

Open a New Project: Click on "Create new design."

Navigate the 3D Environment:
- **Zoom In/Out:** Use your mouse scroll wheel or touchpad gestures
- **Rotate View:** Click and drag the right mouse button
  or use the view cube
- **Pan:** Hold Shift and the right mouse button to move around

Identify Key Tools:
- **Shape Library:** Basic shapes and objects
- **Workplane:** The grid where you build your designs
- **Navigation Panel:** Tools for moving around your design

Tip: *Pressing "F" centers your view on selected objects.*

Sub-Activity 1.2: Moving and Sizing Objects

Add Shapes:
- Drag a cube, sphere, and cylinder onto the workplane

Resize Shapes:
- Click on a shape to reveal handles
- Drag handles to adjust dimensions

Move and Rotate:
- Click and drag shapes to reposition
- Use the curved arrows to rotate objects

Tip: *You can input exact measurements by clicking on the dimension boxes while resizing!*

If you get stuck during the first activity watch this video on how to use tinkerCAD

Activity 2:

Building Basic Structures

Objective: *Apply basic tools to create simple 3D models.*

Sub-Activity 2.1: Create a Simple House:

Base of the House
  – Place a cube on the workplane
  – Resize to form the house's main structure (e.g., 40mm x 60mm x 30mm)

Add a Roof:
  – Use a triangular prism or pyramid
  – Position it atop the cube
  – Size the roof how you like

Add Details:
  – Door:
    – Thin rectangle resized and placed on the front.
  – Windows:
    – Small squares or rectangles on the sides.

Tip: *Use the "hole" feature to create windows and doors that go through the walls.*

Sub-Activity 2.2: Grouping and Aligning

Align Objects:
  – Select the house
  – Click "Align" and center them

Group Objects:
  – With both selected, click "Group" to make them one object

Cool Facts!

1.   Grouping objects can help reduce printing time and material use!

2   3D printing can produce moving parts in a single print, like articulated animal toys!

Activity 3:
Designing a simple 3D Object

Objective: *Design a basic object/animal using TinkerCAD.*

Sub-Activity 3.1: Create a 3D Animal:

Choose an Animal:
For example, a turtle
Build the Body:
 – Use a half-sphere for the shell
 – Add a flattened sphere
   underneath

Add Limbs:
 – Cylinders or rounded shapes for
   legs
 – Position them evenly
Add a Head:
 – Smaller sphere attached to the
   front

Tip: Use the "Duplicate" function to create identical limbs quickly!

Sub-Activity 3.2: Adding Details Eyes

Facial Features:
 – Tiny spheres or cones
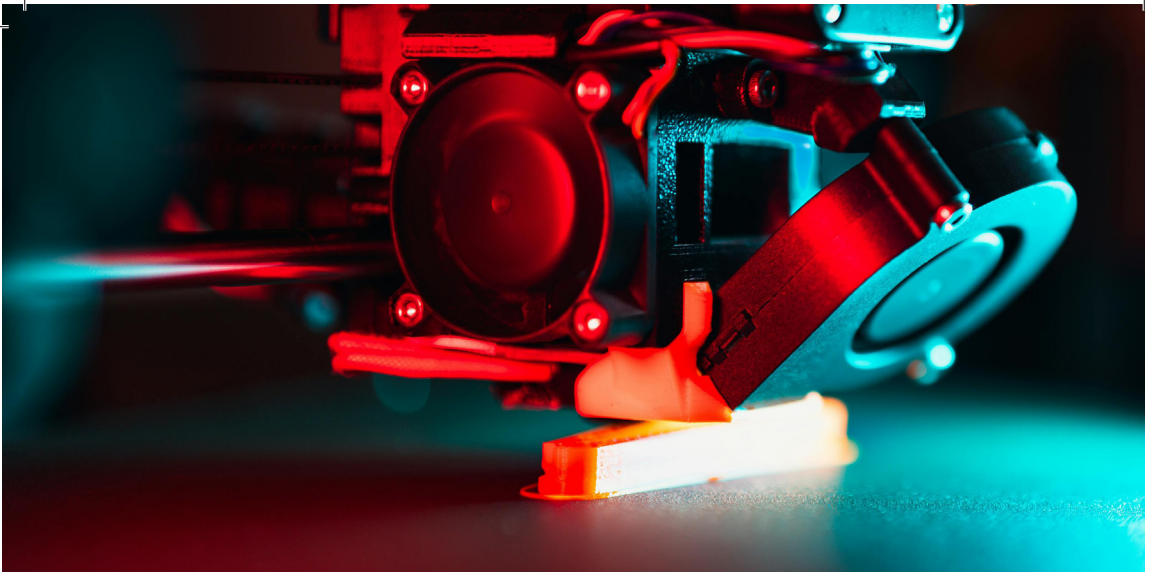Textures and Patterns:
 – Use thin shapes to add shell
   patterns

Finalize Your Design:
 – Ensure all parts are connected

Sub-Activity 3.3: Your Own Animal

Using What you have learned so far:
 – Create your own animal of your choice!
 – Look online for inspiration but try to add your unique twist!

Activity 4:

Designing a custom Name Tag

Objective: *Create a personalized 3D name tag for printing*

Sub-Activity 4.1: Design Your Name Tag:

Create the Base:
Rectangle shape resized to your liking within a 180 x 180 x 180 mm³ dimension
- Width and height are universal per letter you have in your name xyz (L) x 15mm (W) x 3 mm (H). But xyz (L) should be about 10-15mm per letter
- For a 5-letter name:
  Baseplate size: Approx. 58 mm (L) x 15 mm (W) x 3 mm (H)
- For a 7-letter name:
  Baseplate size: Approx. 82 mm (L) x 15 mm (W) x 3 mm (H)

Tip: *Make sure your text and symbols are slightly embedded into the base to ensure they print as one piece.*

Activity 4 / Designing a custom name tag

Add Text:
  – Use the "Text" tool to type your name
  – Adjust size and font.

Personalize:
  – Add symbols or shapes that represent you

Sub–Activity 4.2: Preparing for Printing:

Export Your Design
  – Click "Export" and select ".STL" file format
Save Your File:
  – Name it clearly, e.g., "Alex_NameTag.stl"
Share Your File:
  – Upload to Google Drive or email to your librarian

Cool Fact: *The STL file format stands for "Stereolithography," a technique developed in the 1980s!*

Sub–Activity 4.3: Optional Creative Project

Choose a Project:
Keychain, mini figurine, geometric puzzle, etc.

Design and Prepare:
Apply the skills you've learned. Export as an STL file for printing.

Cool Facts!

1.   The STL file format stands for "Stereolithography," a technique developed in the 1980s!

2   3D printers have been used to create everything from musical instruments to human tissue!

Bonus Activity:

Solving Everyday Problems with 3D Printing

Objective: *Use your 3D skills to find a solution to a small problem around the house.This activity challenges you to think creatively and practically, using 3D printing to make your life a little easier.*

Step 1: Find Something That Needs Fixing or Improving
Look around your home and think about everyday objects or situations where a 3D-printed solution could help. Ask yourself:

- Is there something that's broken or missing a part?
- Do you need a tool, holder, or organizer for something specific?
- Are there items that could be improved with a custom attachment or accessory?

Here are some ideas to get you started:

Broken Drawer Handle: Design a custom handle to replace a broken one.

Cable Organizer: Create a clip or holder to keep your charging cables neat and tidy.

Phone Stand: Design a stand that holds your phone at just the right angle.

Custom Key Holder: Print a unique key holder to hang your keys on the wall.

Bottle Opener or Jar Gripper: Make a tool that helps you open stubborn bottles or jars.

Lost Game Piece Replacement: Recreate a lost piece for a board game.

Plant Pot Saucer: Design a custom saucer for your indoor plants to prevent spills.

Step 2: Brainstorm and Plan Your Design
Now that you have a problem to solve or an item to create, think about:

- **The Shape and Size:** Sketch a quick drawing of what you want to make. Think about the dimensions and how it will function.

   – Materials and Durability: Will the design need to be strong, flexible, or lightweight? Choose shapes and designs that suit your needs.

## Step 3: Test and Improve Your Creation

1. Print the Model at School:
Once your design is ready, export it as an STL file and print it at school.

2. Test the Printed Item:
See how well it solves the problem. Does it fit? Is it strong enough? Does it look the way you wanted?

3. Refine the Design if Needed:
If your first attempt isn't perfect, go back to TinkerCAD and make improvements based on your observations.
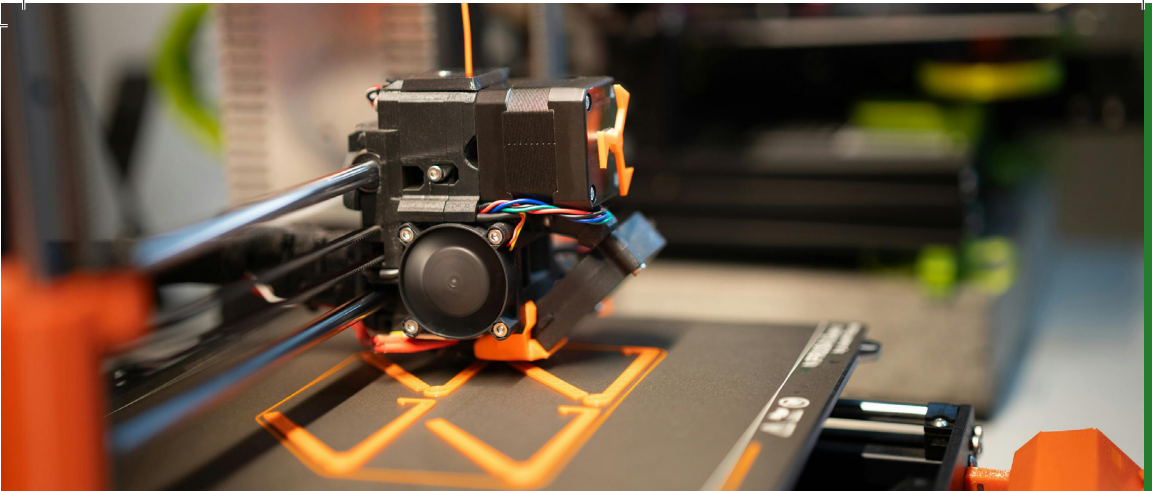
Saving and Sharing your creations!

Save what you made!

Saving your file
- Export from TinkerCAD as an STL file.

Sharing your file
- Upload to Google Drive or email it to your school librarian.
- Alternatively, save to a USB drive and deliver it in person.

Tip: *Always double-check your file before sending to ensure it's the correct version.*

Save and Sound!
You completed this kit!

Here is more about LOI!

Library of Inspiration & this Kit!

Want to become a part of LOI?
We are working on creating a photo gallery of projects have been inspired by Library of Inspiration and if you want showcase your project on our website, please send us pictures of your project to the E-Mail below!

Contact Details:

✉️ TheLibraryofInspiration@napier.ac.uk

🌐 https://blogs.napier.ac.uk/libraryofinspiration/

People working on this KIT:

Students: **Max F.**

Leading- Lecturers: **Hanne W.**
Dimitri D.

Meet all Contributers that are working on LOI:
https://blogs.napier.ac.uk/libraryofinspiration/project-team/

Other LOI Kits:

VR Kit
Ever heard of Virtual Reality? The future is yours to explore!

Sphero Robot
Learn more about robotics and coding with this fun kit

Design it! Deck
Your playful way into the world of User Research

Graphic Novel Kit
Create your own Story and Graphic Novel!

Foley Kit
Create sounds straight out of your favourite movies and games!

EMO Robot
Your social companion. A kit worth exploring!

Stop Motion Kit
Explore the art of stop motion with your own animation puppet!

Mini Arcade Kit
Build and play games on this handheld console!

3D Printing Lab
Ever wondered about 3D Printing? Find out more with this amazing kit!

3D Scanning Kit
Explore the possibilities of 3D scanning!

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