



LESSON GUIDE

Creature



Level	Advanced
Academic Connections	Design Thinking, Hands-On Learning, Design for Manufacturability
Core Concepts	Computer Aided Design (CAD), Design, Design Optimization, Print Optimization, Post-Processing
Duration	2-3 weeks

Design the head of an original creature. Use clean lines to create distinctive characteristics and build features that add background and depth to your creature's personality. Breathe life into your conceptual character with your design. Post-finish your model with paint of your choice.

LEARNING OBJECTIVES

By the end of this workshop, the student will be able to:

- Identify and apply the steps in the design process.
- Gather and apply information pertinent to design planning.
- Plan and organize the project.
- Create concept sketches of the design idea.
- Use appropriate design tools to create CAD drawings and full-scale 3D printed models.
- Post-process and apply paint to the 3D printed model.
- Report and reflect on their experience with the design process using an oral and/or written format.

ESSENTIAL QUESTIONS

- How did orientation affect your post-processing efforts?
- What might you have to consider if your model were scaled 2 times larger? 5 times larger?

REQUIREMENTS

- Educator PC with access to:
 - Microsoft PowerPoint
 - QuickTime
 - Internet connection
- Projector
- 3D printers
- CAD design tool

PROCESS WORKFLOW

DESIGN SOFTWARE

Digital sculpting, also known as sculpt modeling or 3D sculpting, uses software that can manipulate a digital object as if it were made of a real substance such as clay. Users can push, pull, grab, pinch or smooth a digital object to create defining features. Recommended sculpting software includes:

- Autodesk Mudbox
- Pixologic ZBrush

Remember, digital sculpting files can be extremely large. If your school's computer files lack the space necessary, you may need to find alternative digital file storage.

Finally, the digital sculpting file will need to be exported as an .obj or .fbx file in order to create the .stl file to 3D print.

DIGITAL SCULPTING WORKFLOW EXAMPLE



Add color and/or materials



Add texture



Sculpt

CREATURE

STUDENT WORK

- Concept sketches: pencil or digital
- 3D CAD drawings
- 3D printed models (scaled or actual size)
- Finished painted model
- Final report

DESIGN PROCESS: RESEARCH

To facilitate research, students are encouraged to visit reputable design sites to explore a variety of unique creature designs. The following are excellent examples of resources available online.

TUTORIALS

ZBrush: “Sculpting a Head”

<http://docs.pixologic.com/getting-started/sculpting-a-head/>

ZBrush: “Your First Creature Creation”

<http://docs.pixologic.com/getting-started/your-first-creature/>

DESIGN PROCESS: CONCEPT

Creating initial sketches is vital to design development. Sketching gives you the freedom to explore ideas and create a detailed design. Sketching allows concepts to evolve, giving your creature a chance to take on a life of its own.

Designers should include:

Concept sketches: Refer to the Designer’s Toolkit.

Scaled sketches: Refer to the Designer’s Toolkit.

The Designer’s Toolkit is available in the Getting Started resources at: <http://www.stratasys.com3DLC>

DESIGN PROCESS: DEVELOPMENT

Digital Sculpted Model

All sketches can be used during the digital sculpting stage. The more sketches you have to work with, the more refined and realistic your design will be.



CREATURE

DESIGN PROCESS: FORMALIZATION

The creature project illustrates the benefits of FDM™ 3D Printing using the sparse fill setting. It is important to note that printing the creature **as a solid 3D model is not recommended**. Using the **sparse fill setting** speeds print time and conserves material without jeopardizing the integrity of the final design.



This partially 3D printed creature demonstrates the recommended sparse fill pattern.



The 3D printed creature after support is removed.

CREATURE



The painted final product.

For guidance on painting the FDM part, reference the Best Practices document: Painting FDM Parts available in Advanced Applications at: <http://www.stratasys.com/3DLC>

CREATURE

STUDENT EXAMPLES



These student projects followed the same project workflow.

ASSESSMENT CRITERIA

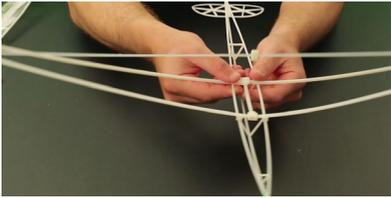
DIGITAL SCULPTING SUGGESTED NEXT LESSONS

LEVEL	LEVEL 1 (50-59%)	LEVEL 2 (60-69%)	LEVEL 3 (70-79%)	LEVEL 4 (80-100%)
Knowledge/ understanding 3D concepts	3D CAD drawings are incomplete. Dimensions are not present; 3D design features and tools have not been used.	Dimensions are used inconsistently. There is limited use of 3D design features and tools covered in class.	Most dimensions are present and meet the design criteria. Most 3D design tools and features have been used properly.	All dimensions are present and meet the design criteria. All 3D design tools and features have been used correctly.
Thinking/inquiry Creativity, originality, color and texture	The student's design is unoriginal, borrowing largely from other sources. Student cannot explain their design decisions.	The student's design is simple and predictable, or borrows mostly from other sources. Student cannot satisfactorily explain their design decisions.	The student's design is unique and demonstrates independent thought. The student can explain their design decisions.	The student's design is highly imaginative. They incorporate surprising or elaborate features that reflect creativity and personality, and can explain their rationale.
Application Use of digital sculpting software	Final product does not resemble original sketches. Digital sculpting tools were used with limited effectiveness.	Final product reflects a few elements in the original sketches. Digital sculpting tools were used with some effectiveness.	Final product reflects most elements in the original sketches. Digital sculpting tools were used with considerable effectiveness.	Final product closely resembles the original sketches. Digital sculpting tools were used with a high degree of effectiveness.

SUGGESTED NEXT LESSONS

GLIDER CHALLENGE

Design a glider composed of several parts, but they must fit within one printer tray.



CAMERA ACCESSORIES

Design gadgets that can help take photos or videos. These can be added to conventional cameras, cellphones and action cameras.



CATAPULT

Design a catapult that can throw a 3D printed ball as far as possible.



To access additional 3D Learning Content and resources, visit:

<http://www.stratasys.com/3DLC>

stratasys[®]

STRATASYS.COM
ISO 9001:2008 Certified

HEADQUARTERS

7665 Commerce Way,
Eden Prairie, MN 55344
+1 800 801 6491 (US Toll Free)
+1 952 937-3000 (Intl)
+1 952 937-0070 (Fax)

2 Holtzman St., Science Park,
PO Box 2496
Rehovot 76124, Israel
+972 74 745 4000
+972 74 745 5000 (Fax)

The information provided herein, including any data, material and/or content ("Content"), is provided for informational purposes only. The Content is provided as is. Stratasys makes no representations or warranties in relation to the Content. Permission is granted to display, copy, distribute and download the Content for your own internal use only. However, you may not disclose, copy, reproduce, distribute, publish, display, transmit, sell or offer for resale the Content, or any part thereof, outside of your organization, without Stratasys' express written permission.

© 2017 Stratasys Ltd. All rights reserved. Stratasys and Stratasys signet are trademarks or registered trademarks of Stratasys Ltd. and/or its subsidiaries or affiliates and may be registered in certain jurisdictions. All other trademarks belong to their respective owners. Product specifications subject to change without notice. LG_Creature_0317a