3D Printing Lesson Plan #2

(Developed by Evan J, SHLC, Dec 2019)

Notes:
This lesson plan has quite a wide time-frame. Times extend drastically if Option B is undertaken, and depending on the size and complexity of the 3D object.

	Programs and Hardware	Actions
1. Option A: Choose pre-designed 3D object (5-20mins)	Computer Internet access Thingiverse website	● Start with an overview of the entire 3D printing process. ● Introduce Thingiverse website and have learners explore it. ● Learners choose a time-appropriate 3D object and download it to the computer. ○ Teach learners that complex designs take more work to print, and consequently, more time (any maybe also more problems) ○ Teach learners about scaling, and how skinny objects might break when scalled down to a small printable size.
1. Option B: Design custom 3D object (15-90mins)	Computer Internet access Tinkercad program	● Prep: create Tinkercad account for everyone to use. ● Start with an overview of the entire 3D printing process. ● Introduce and provide overview of Tinkercad website and software. ● Learners experiment with software, then choose a design, create the design, and download it to the computer.
2. Print (30mins+)	Computer 3D printer 3D printing software specific to printer Pliers and knife for removing supports	● Prep: 3D printing software downloaded to learner's computer. ● Have learners set up the 3D printer, load filament, and connect it to the computer. ● Open 3D printer software, and upload 3D object. ● Arrange, scale, redesign, or re-choose object in order to acquire appropriate print-time. ○ Every 3D printing software estimates print-times in different ways. M3D software only tells print time once you clock to begin the print, which you can then promptly cancel before the print actually starts. ● If necessary, choose desired print characteristics (raft base, supports, wall thickness, infill, etc.). ● When print is complete, remove object from print-bed and remove scaffolding/supports if needed.

Debrief of Learning Goals:
"What real-world skills did 3D printing teach you?"

- How to use new software and hardware.
- How to troubleshoot tech and digital problems.
- Taking, transferring, and adjusting physical and time measurements.

Troubleshooting Tips:

(The most useful skills that this lesson can teach is software and hardware troubleshooting and tolerance. So while I do list some useful tips below, expect more problems, and use these opportunities for engaging learners in practical, contemporary, real digital world learning).

1. 3D printer filament can be tricky. Make sure not to leave filament in printer when not printing, and store filament roll in a plastic bag so it doesn't dry out.
2. Thingiverse is the best site for finding 3D printable objects (because all objects on the site are free, and the objects with start * are vetted), but other sites do exist. If looking around the internet for a specific 3D object, it must be an .OBJ or .STL file.
3. Objects from Thingiverse and Thinkercad download in .ZIP folders because of there big size, so they must be extracted from the folder (simple drag and drop) before you can find/use them in your 3D printer software.
4. When finished using Tinkerad to create an object, the download button is called "Export," and on the next pop-up you likely want to select "Everything in the design."
5. Always print with a raft.

OALCF Components Checklist

Find and Use Information	- Watch tutorial and extract information on how to use the Thingiverse and/or Tinkercad and 3D printer software.	
Communicate Ideas and Information	- Debrief reflection on learning. - Choose a 3D object reflective of interests, or create a personalized 3D object.	
Understand and Use Numbers	- Measure size of object on software and appropriately converted it to physical 3D printer while cognisant of print times.	
Use Digital Technology	- Learn new software and hardware.	
Manage Learning	- (If session is undertaken over multiple days)	
Engage with Others	- (If working in groups, or sharing a 3D printer).	

Suggested Milestones:

M14: Extract info from Film (3D Printing Overview Video)