3D Printing Induction- Printing the Battery holder for Diorama

Date:	Class/Group:	Time: Room: Fabrication Lab

Topic: 3D Printing Induction

Specific Objectives/Learning Goals:
- The intention of the 3D induction is to enable participants to become familiar with the practical use and basic theory behind the use of the UP 3d printer.

Learning Outcome:
- Modify and embellish the battery holder 3d model in Tinkercad.
- Become confident with terminology around the machine
- Become familiar with the safety procedures in the workshop and with the use of the machine.
- Successfully print the 3D model.

Prior Learning:	Resources/Materials required:
- No prior learning required - Experience with the use of tinkercad or other 3d modeling software is advantageous	**-Secure a HOT WORK PERMIT** - 10 pens - 10 laptops - 10 USB sticks with files for lesson - 4 working UP 3d printers - TV + facilitators laptop - 10 print outs of of the 3d printing induction paperwork - Sample prints. - Extra printed copies of the power-point for inductees to seek answers for their paperwork. - Kit to repair the 3d printers - Spare spools of UP ABS

Lesson Steps

Time:	Procedure	Comment
	1. Pre-Lesson **Secure a HOT WORK PERMIT** Prepare Television + Computer link up at the front of the class. Open the 3D printing pdf induction. Ensure each participant has a laptop, USB stick with appropriate 3d modeling files	*Visit the ESO's in the facilities department near the museum and pick up a hot work permit for the duration of the induction 38407243* *The password the facilitator laptop is facilitator.*
12.00	**2. Introduction/Motivation** -Introduce the inductees to yourself. Give participants a brief background on your experience with 3D printing. - House keeping- Toilets + Fire evacuation. - Take participants on a brief tour of the space to familiarise them with the Fab Lab and the facilities available to inductees. Make the last machine that you visit the 3D printers	

12.10	**3. Facilitator Input** **4. Stand around the machine and show a few prototypes** - Give an overview of the project you will create on the 3D printer today. - Give a brief overview of the machine. -Limitations of size, materials and speed of printing. -Uses for the machine- repairing broken product parts + prototyping 3D concepts. Prepare participants for the machines to break + explain they are temperamental. **5. Class Discussion** Answer any question and get inductees to sit at a laptop.	
12.15 *12.30*	**6. Facilitator Input + Activity- Tinkercad Introduction** - Get inductees to sign up for a tinkercad account. - If there are delays with logins, encourage participants to start off by undertaking some of the tutorials in tinkercad. - Create a new design - Show participants how to navigate the space + the 3d model - Adjust the grid size to fit the 3d printer bed size 140 mm x 140 mm - Place some geometry into the grid, play with adjusting the dimensions of the piece through the placement of the ruler over the piece. - Play with the nodes, showing how you can scale the model + shift it off the bed. - Place multiple shapes together overlapping one another. Group the shapes together. - Scale the geometry to fit inside of a box and place this model over the shape. Click on the 'hole' to create a negative impression on the model. - Draw another piece of geometry and play with importing text, re-orientating it onto the front face of the piece and embossing the work 2 mm. - Demonstrate how to Import the .STL battery folder. Outline that vectors drawn in illustrator etc can be	*The password the bank of laptops and the 3D printer laptops is edgeuser.* *Use the whiteboard to write up the tinkercad web address.* *www.tinkercad.com* *https://www.tinkercad.com*

	imported. - Emboss the piece with your intials. - Save your work in the program and then demonstrate how to download the work for 3D printing.	
12.40	**7. Facilitator Input** Show the pdf presentation on the UP 3D printer. Cover the following information- - ABS vs PLA - FDM printing vs SLS - Orientation of your model for strength. - Infill of your model. Time vs strength. - Rafts - Support structures. **The anatomy of the printer-** - Outline the key parts of the 3d printer.	.
12.40	**How to go about printing** - Intializing the printer. - Extruding the filament. - Loading the printing bed - Printing- check your print, but ensure the chamber remains warm. - Removing the print safely from the printing bed - Ways to remove the support structure and raft from your model.	*Bring 3D printing paperwork and pen*
1.45	**Problems that can arise with your print** -Jammed filament spool - Printing lifting off the bed - Dust on the filament clogging the printing head - Slumping and deformities in your model. - extrusion of plastic stops.	
2.00	**8. Inductee Activity** - Allow two participants to start printing, working as a	*-Turn on the extraction fan. Located in the science lab area. Labeled exhaust fan.*

	pair. Use the workflow worksheet as a guide to step participants through the printing process. - For the pair that are unable to print, get them to work through the induction paper work. - Get participants to use the 3D printer job log to log their print job and to document any faults that arise with the machine. **9. Feedback** - Using the powerpoint (need to add some slides) - Work through the answers for the induction paperwork and get participants to peer mark the inductees worksheets. **10. Conclusion** - Thank participants and encourage them to come back with their personal projects soon. - Demonstrate and explain how they would make an online booking in one week when the paperwork has been processed. - Explain the 2 hour book limit per day and courtesy call for cancelled bookings. If you are printing at the end of the day ensure that the print fits into our opening hours. - Explain that the raft and model will be weighed in the future and you are charged 15 cents a gram. - **11. Pack Up-** -Ensure that the inductees paper work is complete, signed by the facilitator, peer and participant. Leave this paperwork for Phil to process. - Generally tidy up the space. - Thoroughly clean the laser cutter. - Leave a note or send and email on any problems you experienced with inductees or equipment in the space. - Check out at reception and let them know you have completed your induction if your are the last person to use The Fab Lab - Return the Hot Work Permit.	*Perhaps have a few copies of the printed induction powerpoint available for inductees to find answers* *-Be proactive as the facilitator to cycle participants through the printing.* *http://edgeqld.org.au/3d-printer-job-log/* *http://edgeqld.org.au* *-Resources Tab* *-Make a Booking* *Mick.byrne@slq.qld.gov.au* *phil.gullberg @slq.qld.gov.au*

Evaluation of Inductees Learning + problems experienced with equipment:		
Self-Evaluation/Reflection:		