

SHINING THE LIGHT ON VISION EDUCATION 2017 CONFERENCE BRISBANE 8TH - 12TH JANUARY



3D Printing For The Classroom

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Presentation Overview

- Who are we?
- An overview of our 3D printing projects
- Preliminary findings on the best uses of 3D printing for Accessible Graphics
- A run through of 3D printers and their costs
- Finding pre-existing 3D models for printing
- Creating your own models
- Where to from here



Who We Are

- We are researchers from Monash University, working on a broad range of research projects, focused in areas relating to information graphics and the use of emerging technologies for visualisation and computer interaction
- Accessible graphics has been a focus of research for a number of years now, especially for Kim and Chatai
- Leona has many years of practical experience in the provision of accessible graphics, at organisations such as Vision Australia



What We Have Been Up To

- We have been engaged in a number of research projects over the past few years, centered around the provision of accessible graphics
- These have included:
 - Exploring the use of tablet technology and haptic devices for authoring, delivering, and interacting with accessible graphics (ARC Linkage)
 - Improving the provision of accessible graphics in the Higher Education context (OLT Funded)
 - Exploring 3D printing and eBooks in the primary school context (with Insight Education)



3D Printing Projects

- These projects have involved a number of aspects relating to 3D printing:
 - Exploring the use of 3D printing to present inherently 3D-based graphics
 - Exploring the use of 3D printing for presenting 2D-based graphics, such as maps and floor plans
 - Exploring how 3D printing can be used to facilitate the understanding of more abstract representations of objects
 - Exploring how 3D printing can be augmented with low cost electronics to facilitate richer interaction





3D Printed Buildings, Mountains, Anatomy, Maps, and Information Graphics



Interactive 3D Printed Campus Maps

How Can 3D Printing Help?

- During these projects, we have observed:
 - Widespread enthusiasm when provided with 3D printed materials
 - Greater tendency to interact with and explore a graphic
 - Ability to better understand inherently 3D-based objects compared with a tactile representation
 - Ability to better understand some traditionally 2D graphics such as maps and floor plans
 - Ability to be a stepping stone in the understanding of tactile abstract representations



How Can 3D Printing Help?

- A formal research study with 12 blind participants was conducted directly comparing tactile and 3D representations of park and train station maps
- It found:
 - The 3D models were preferred
 - 3D allowed better use of iconic representations
 - Resulted in more vivid mental models
 - A number of other informal evaluations have suggested similar outcomes



3D Printing Practicalities

- So how do you get going with 3D printing?
- There are two main areas you need to become familiar with:
 - The 3D printers themselves
 - Sourcing or creating models for printing



3D Printers

- 3D printing technology is becoming increasingly more affordable and usable by non-technologists
- Consumer level printers range in price from \$1000 upward
- Many high quality printers can be obtained for \$5000 or less
- Consumables run at about \$40 for a spool of plastic that can print many objects





3D Printers

- The realities:
 - They are not quite at the levels of reliability of mainstream printers
 - While technology experts are not required, someone with an interest in technology would need to be onboard
 - Initial prices can be considered high, however operational costs (including price of consumables) is relatively low
 - Prices are coming down and hardware is becoming better and easier to maintain



3D Models For Printing

- This can prove more of a challenge for those embracing 3D printing, however things are getting easier every day
- Sites such as Thingiverse provide thousands of 3D models, ready for printing, free of charge
- These can be of varying quality however for well-known places or objects, suitable models are typically found
- Thingiverse Demo: <u>http://thingiverse.com</u>



3D Models For Printing

- Many free software tools exist for doing the modelling, including Tinkercad (very easy to use) and Sketchup (moderately easy to use)
- Free tools for creating 3D models from pre-existing resources are emerging, such as touch-mapper.org
- Thinkercad Demo: <u>http://tinkercad.com</u>
- Touch Mapper Demo: <u>https://touch-mapper.org/en</u>



Where Are We Going From Here?

- We are working on a number of projects continuing this work
 - Continuing our formal study on the benefits of 3D printed accessible graphics
 - Exploring formally how they can be used in tactile literacy
 - Exploring how more meaningful interactions can be integrated into 3D prints through the use of low-cost electronics
 - Establishing a website to house resources for the creation of 3D printed models



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