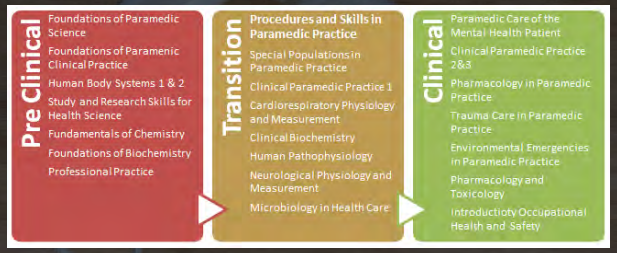
Using 3D Printed Tools and an Augmented Reality Smartphone App to Enhance Paramedic Skill Development

Dr Michael A. Cowling[1], Dr James R. Birt[2], Emma Moore[3]

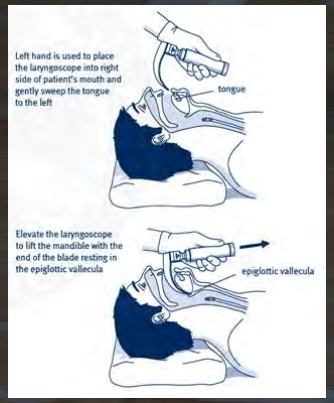
1. School of Engineering & Technology, CQUniversity, Australia
2. Faculty of Society & Design, Bond University, Australia
3. School of Medical & Applied Sciences, CQUniversity, Australia

CQUniversity Paramedics Program



- Three years full time to develop skills in paramedic science
- Graduates need to have developed real world expertise and skills; career options in government ambulance service
- Offered On-Campus and at a Distance

Laryngoscopy Procedure



- Practicing skills can be challenging
- Students have intensive residential schools in 2nd and 3rd year
- Placement with ambulance service
- More opportunities for practice would be desirable

Problem

- *Sample Student Evaluation Comments*
  - *"I believe that because this course is a 'skills' learning course, that there should be a way for us to actually get more time doing skills. I feel that as distance students we are at a severe disadvantage because we spend 5 days doing them in the middle of term and then don't do them again until we hit our placement."*
  - *"There is no substitution for experience. Could the school look into either some kind of software or equipment that we could be supplied with so that we can at least go through the motions of doing the skills?"*
  - *"I believe that my confidence in performing the procedures and skills could have been improved with a little more 'hands-on' time."*
  - *"I feel as an external that I am missing out - they do scenarios every week, I did one or two during res school".*
  - *"Studying by distance you can read the skills and kinda do scenarios but it's hard to get feedback and to know if what you're doing is still right."*

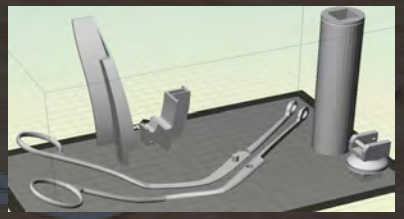
Intervention

Action Research Methodology (Kemmis 2006)

- Modify practice for a subset of students
- Simulate foreign object removal with Laryngoscopy
- 1:1 scale replica of tools needed; addition of AR markers to allowing simulation in a virtual game environment

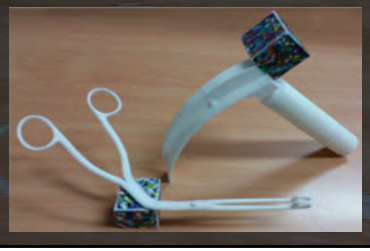
Components:

- Unity 3D
- Vuforia AR Plug-in
- 3D Print of Forceps
- 3D Print of Scope

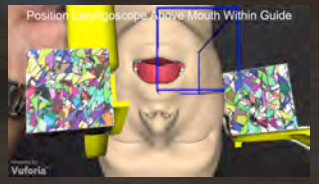


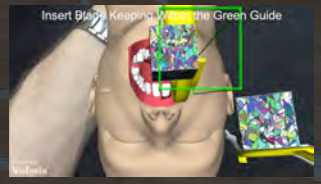
Intervention (cont.)

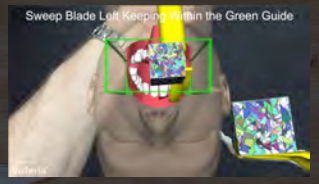
- 3D Stereoscopic Headset for mobile phone
- Virtual objects overlay 3D prints
- App uses audio cues and bounding boxes to simulate procedure
- Tools and app provided to students ahead of the residential school



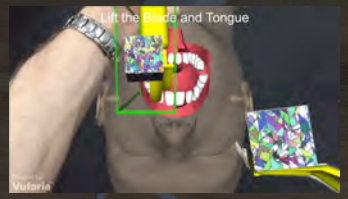
Intervention (cont.)

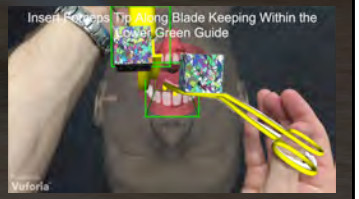


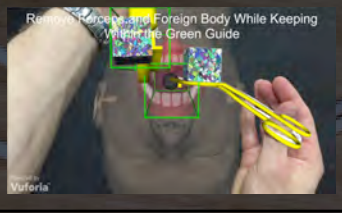




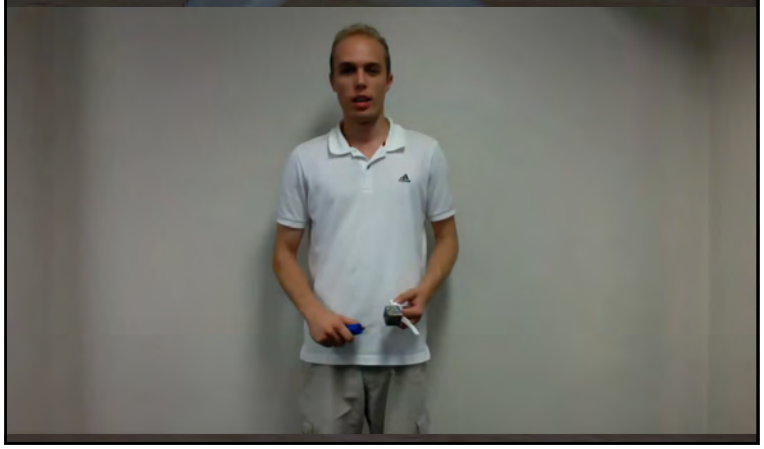
Intervention (cont.)







Demonstration



Research Foundations

- Digital Native (Prensky 2001)
  - born and bred in a world immersed in digital technology
  - "Today's students are no longer the people our system was designed to teach"
- Use of visualisation as positive learning support well accepted (Mayer 2005)
  - medicine, chemistry, geography, game design etc
- Sometimes inconsistent – some learn better through non-dynamic media, others through virtual dynamic nodels
- Assessment of multiple modes of visualisation is required (Mayer 2002; Kozma 1994)

Research Method

- Stratified sample of 30 students (out of 120)
- Pre-test of all students on arrival at res. School
  - Extra training with 3D tools provided to non-selected students
- Post-test of all students conducted
  - Correlations between pre-test and post-test conducted
- Survey to assess how they felt about the tools
  - Data from tests and survey analysed using SPSS and NVIVO for cross-tabulations and for coding/categorisation

Expected Results & Conclusions

- Expected that students using the 3D printed objects and AR simulation will perform better on the pre-test
  - More time on task will result in better skill development
- Future work will report on the results of this study and provide correlations of factors related to student performance
- Through this work, a greater understanding of the use of innovative technology tools in education will be obtained
- Could also be used to train practicing paramedics at a distance to assist with skills retention

Questions and Hands-on

- Questions?
- Feel free to have a look at the tools
- Hands-on for the Simulation with the 3D Printed tools available