Artistic learning methods for enhancing understanding of reciprocal 2D-3D transitions in anatomy education

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Aims

- Analyse feedback questionnaire data from a previous pilot study.
- Design an educational intervention that utilises artistic methods to enhance reciprocal transitions in understanding of medical students between 2D clinical images and surface anatomy and 3D anatomical structures.
- Prepare a literature review, research proposal and ethical assessment to provide the basis for the design and implementation of the educational intervention

Background

2D ⇌ **3D**

Clinical images Surface anatomy — *Anatomical structures*

- The ability to interpret clinical images and locate surface landmarks is a critical skill for doctors.

Literature Review

1. **How does our brain construct 3D images from 2D images?**
   - View-based approach- store a collection of key 2D views from what we see and compare them to create a 3D image[1]
2. **What is the link between spatial ability and anatomy learning?**
   - Those with greater spatial visualisation ability score better on anatomy exams.[2]
3. **Is art a useful teaching method in anatomy education as a whole?**
   - YES, Active learning method= increased engagement = improved memory retention[3]
   - Balanced division of attention between art and anatomy learning is crucial
4. **Can art be used to improve spatial anatomy learning?**
   - Few studies- Students who did modelling exercises achieved greater exam results on spatial anatomy specific questions only.[4]

Encourage students to rotate their models and focus on key views.

Remind students to think about the anatomy not just the task of modelling

Use artistic learning methods alongside traditional anatomy teaching methods

Future Study

Spotter: Identification of certain anatomical features on prosections/ photographs.

Control Session
The heart in situ and pericardium
90mins traditional teaching
+ 30mins Spotter

Experimental Session
The internal anatomy of the heart
90mins traditional teaching
+ 30mins modelling/drawing

Online Pre-test
- Spatial ability test
- Background questionnaire
- Worded, diagram and spatial anatomy MCQ's (half and half control/ experiment)

Online Post-test
- Feedback questionnaire
- MCQ's as previous (different questions)

Online Delayed Post-test
- MCQ's as previous (different questions)

3D-2D

Prosection/ model	Visualise a specified cross-section.	Draw the cross-section visualised.	Observe the actual CT scan. Edit drawing	Using previously made clay model
Observe	Reflect	Draw/ Do	Edit	Repeat
2D images of the heart	Discuss how to create a 3D model from the 2D images.	Model the heart	Observe an exemplar model and edit own.	In own time but with more accuracy

2D-3D

Figure 4: Drawing (above) and Modelling (below) protocol

Conclusions

- Spatial visualisation ability is fundamental for interdimensional anatomy learning.
- The literature and the pilot study agree that artistic methods are helpful in anatomy learning as a whole.
- ORDER- learning process developed at Newcastle University and based on Kolb's learning cycle.
- New study November 2015- examining artistic techniques and their use in interdimensional anatomy learning by application of ORDER to drawing and modelling with key teaching points devised from literature review.

Pilot Study

ORDER and Clinical Imaging

- **O**bserve, **R**eflect, **D**raw, **E**dit, **R**epeat- cyclic learning process based on Kolb's learning cycle
- **N=151** Stage 1 medical students
- 'Arts and Hearts'- anatomy session incorporating drawing using ORDER technique and clay modeling

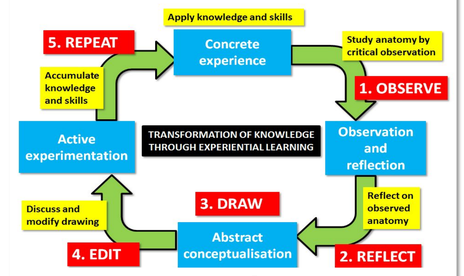

Figure 1: The ORDER cycle[5]

List of key features to identify once the model has been created.

"I spent more time aiming to make the model accurate than learning anatomy"

"Hard to engage in large groups and to get a good view of what was going on"

Small groups so that everyone can engage with task

Figure 2: Pilot Feedback Wordle

On average, the students were positive about modelling, drawing and ORDER and it helping to improve anatomy learning.

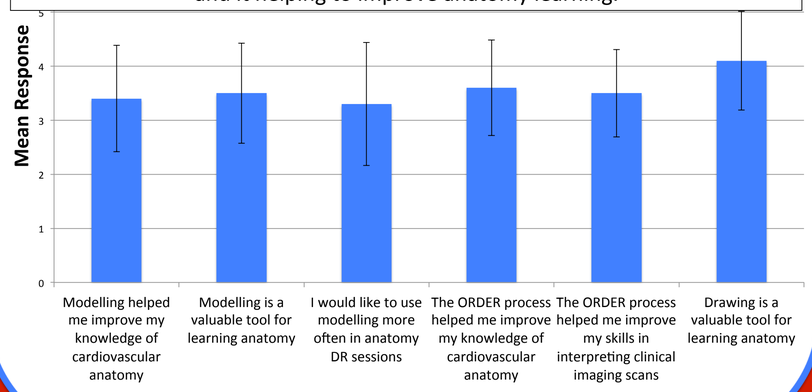

Figure 3: Drawing, ORDER and modelling feedback- Likert scale

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