Digital Dentistry
Online Symposium

Continuing to Bridge the Clinical Gap

4th November 2020 @ 19:30 London time
Digital Dentistry
Online Symposium
Continuing to Bridge the Clinical Gap

Programme

Welcome and overview of the Bridging the Clinical Gap working group and outputs
Dr James Field
5 Minutes

An introduction to how simulation is used at The University of Sheffield to Bridge the Gap
Mr Ashley Towers and Mr Jonathan Dixon
10 Minutes

Redefining simulation, with meaningful clinical feedback
All partners
20 Minutes

An introduction to DigEdDent: an online resource for dental educators
Dr James Field
5 Minutes

Questions and Answers
10 Minutes

Closing remarks and close
10 Minutes
# Digital Dentistry Online Symposium

## Continuing to Bridge the Clinical Gap

### Programme

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How Simulation is used at The University of Sheffield to Bridge the Gap

Continuing to Bridge the Clinical Gap - 4th November 2020

Mr Ashley Towers
University Teacher in Dental Skills Simulation & Informatics

Mr Jonathan Dixon
Clinical Academic Fellow in Restorative Dentistry
VR Teaching Team

Roles

- Project Lead
- Curriculum Integration Lead
- Technical Lead
- Research Team (optional)

Diagram:

- Clinical
- Educational
- Technical
- Research
VR Teaching Team

Project Lead

- Senior level driving force
- Enthusiastic lead with vision for how it will support L&T
- Able to allocate resources to project
VR Teaching Team

**Curriculum Lead**

- Integrate teaching across curriculum
- Educationally focussed - able to spot opportunities for appropriate use of VR
- Organise the teaching team and resources

Mrs Rachel Martin
Curriculum Integration Lead
Technical Lead

- Collaborate with curriculum lead to integrate into teaching
- Local support for teaching and keeping the suite running
- Technical background for effective liaison with manufacturer
VR Teaching Team

Research Team (Optional)

Prof Nicolas Martin
Overall Project Lead

Mrs Rachel Martin
Curriculum Integration Lead

Mr Ashley Towers
Researcher/Technical Lead

Mr Jonathan Dixon
Clinical Researcher

Dr James Field
Senior Clinical Researcher
(Now at Cardiff University)
Curriculum Integration
Curriculum Integration

Guiding Principles

Tutor Led Sessions

Complimentary to Phantom Head teaching

But… offering something different

Reflective practice
Curriculum Integration

Introduction

- Posture
- Finger Rest
- Handpiece Control
- Shape-cutting exercises

Core Clinical Skills

- Re-enforce Phantom Head Teaching
- Case studies
- Small-group discussion
- Focussed tuition

Consolidation

- Explore complex concepts
- Case studies/Simulated Patient Cases
- Small-group discussion
- Focussed tuition
A Focus on Core Skills
Core Skills

Develop and Reinforce Fundamental Skills:

- Operating Posture
- Instrument Selection
- Establishing a Finger Rest
- Indirect Vision/Working in a Mirror
- Growth as a Self-directed Learner
- Reflective Practice
Educational Initiatives
Multi-Modal Simulation of Complex Operative Procedures with Patient-Specific Models

Senior students undertaking clinical patient care

“Gap” between pre-clinical simulation and clinical practice

Stress, low confidence

Can students practice their real patient case before performing the treatment?
Multi-Modal Simulation of Complex Operative Procedures with Patient-Specific Models
Educational Initiatives

**Educationally-focused Core Operative Skills Exercises with Clinically-relevant Assessment and Feedback**

Current assessment methods by dental VR simulators are quantitative

“Your preparation is 63% accurate, you still have 11% of the target material to remove”

Is this useful?

This does not mirror the feedback we give students on clinics…
The Impact of the COVID-19 Pandemic
Simulation after COVID-19

Dental students are seeing less patients and are carrying out fewer clinical procedures.

Quality over quantity, improving the quality of each educational experience.

More simulation-based operative skills training.

Ability to tailor the exercise to fulfil specific educational goals.
**Programme**

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Redefining simulation, with meaningful clinical feedback

Continuing to Bridge the Clinical Gap - 4th November 2020

Dr James Field
Mr Jonathan Dixon
Mr Ashley Towers
Mr James Markey
Mr Pierre-Jean Petitprez

Cardiff University
The University of Sheffield
Virteasy Dental
Virteasy Dental
Importance of Feedback
Target Based Feedback

- Most common approach in the literature
- Progress calculated from percentage or mm$^3$ removed
- Iatrogenic damage measured
- Accuracy Score
Limitations

• Doesn’t provide insight in to the “why”
Limitations

• Doesn’t measure the “why”
• Different to tutor provided feedback
Limitations

- Doesn’t measure the “why”
- Different to tutor provided feedback
- Can “punish” desirable behaviour
Limitations

• Doesn’t measure the “why”
• Different to tutor provided feedback
• Can “punish” desirable behaviour
• Doesn’t provide advice on how to improve
Target Based Feedback

Limitations

• Doesn’t measure the “why”
• Different to tutor provided feedback
• Can “punish” desirable behaviour
• Doesn’t provide advice on how to improve
• Does it actually teach dentistry?
Design of the exercise

- Does the preparation follow the prescribed outline?
- Is the preparation an appropriate depth?
- Does the preparation have enough undercut?
- Is the floor of the preparation relatively flat?
- Is the preparation smooth enough?
Validation Process
Validity: “The extent to which an assessment instrument measures what it was designed to measure” (Van Nortwick et al. 2010).

Concurrent validity: comparing the assessment instrument to an externally validated measure of the same performance.
A series of attempts of the exercise were carried out in order to demonstrate a range of good and bad performances based on the identified assessment criteria.

Does the preparation follow the prescribed outline?

Is the preparation an appropriate depth?

Does the preparation have sufficient undercut?

Is the floor of the preparation relatively flat?

Is the preparation smooth enough?
Measuring Concurrent Validity

The exercise attempts were saved, along with the simulator assessment responses.

Each exercise was subsequently 3D printed in the same dimensions.
Clinical teachers were asked to assess the preparations, using the same criteria as the VR simulator.

Clinical teachers were equipped with a straight probe and a transparent template to demonstrate the ideal preparation outline.

- Does the preparation follow the prescribed outline?
- Is the preparation an appropriate depth?
- Does the preparation have sufficient undercut?
- Is the floor of the preparation relatively flat?
- Is the preparation smooth enough?
Inter-rater reliability for assessment scores between clinical teachers was measured using the free-marginal multilateral kappa.

To validate the VR simulator assessment, both pooled and modal clinical teacher response were compared to the VR simulator assessment, percentage agreements were calculated.
# Measuring Concurrent Validity

<table>
<thead>
<tr>
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<th>Pooled clinical teacher agreements with simulator</th>
<th>Pooled teacher disagreements with simulator</th>
<th>% agreement with simulator</th>
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<tbody>
<tr>
<td>A</td>
<td>56</td>
<td>4</td>
<td>93.33</td>
</tr>
<tr>
<td>B</td>
<td>49</td>
<td>11</td>
<td>81.67</td>
</tr>
<tr>
<td>E</td>
<td>41</td>
<td>18</td>
<td>68.33</td>
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<td>F</td>
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<td>G</td>
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<tr>
<td>I</td>
<td>24</td>
<td>36</td>
<td>40.00</td>
</tr>
<tr>
<td>J</td>
<td>47</td>
<td>13</td>
<td>78.33</td>
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**Average % agreement with simulator**

70.83
Re-defining the virtual reality dental simulator: Demonstrating concurrent validity of clinically relevant assessment and feedback

Jonathan Dixon¹ | Ashley Towers¹ | Nicolas Martin¹ | James Field¹,²

¹Academic Unit of Restorative Dentistry, School of Clinical Dentistry, The University of Sheffield, Sheffield, UK
²School of Dentistry, Cardiff University, Cardiff, UK

Abstract
Introduction: Virtual reality (VR) dental simulators are gaining momentum as a useful tool to educate dental students. To date, no VR dental simulator exercise has been designed which is capable of reliably providing validated, meaningful clinical feed-
The Future
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https://adee.org/projects/digedddent-digital-education-dentistry