

Experiences with radiographic simulation software, student evaluation and an overview of simulation strategies for learning: A work in progress

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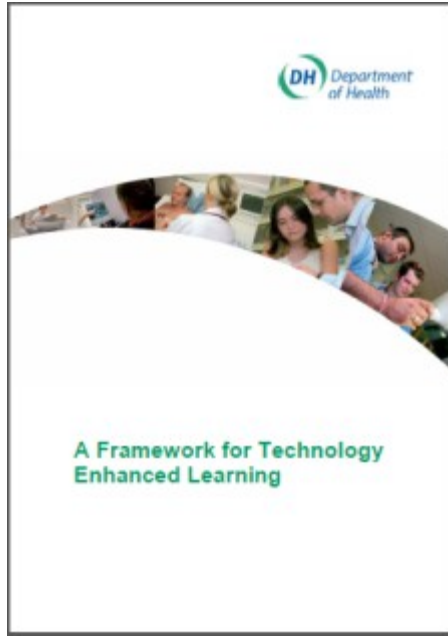
Background

- With only 1 x-ray suite at UWE, the time available per student to get “hands on” is limited.
- Feedback from students is; “more practical opportunities would benefit”

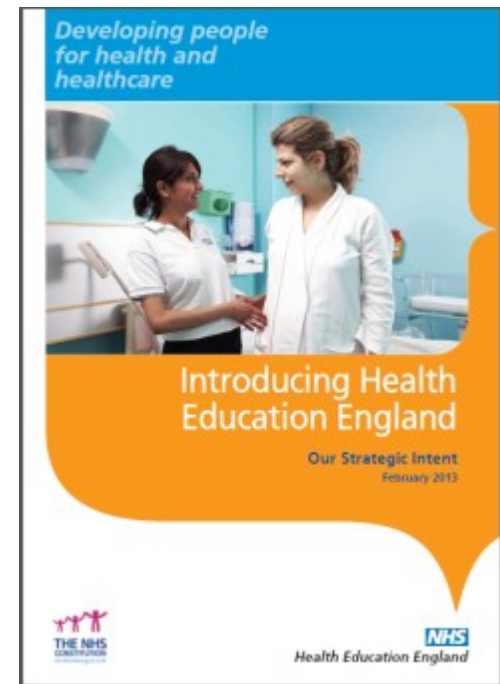
The Proposal

- That a second x-ray suite would be the ideal option.
- Budget considerations and room shortages prevent this from being practicable.
- Simulation of practical aspects of Radiography is a viable alternative, such as VERT.

The evidence



"... healthcare professionals... should learn skills in a simulation environment and using other technologies before undertaking them in supervised clinical practice."



Great Britain: Department of Health, 2011

The Project

- After a moderate literature review and discussion with other UK users of simulation software a business case was produced.
- Other simulators were considered.
- Shaderware was chosen for radiograph quality and physics modelling.

The Project

- Installation on UWE pc's
- 12 concurrent users
- User guides and workbooks on Blackboard modules
- Review of performance and uptake

The Product

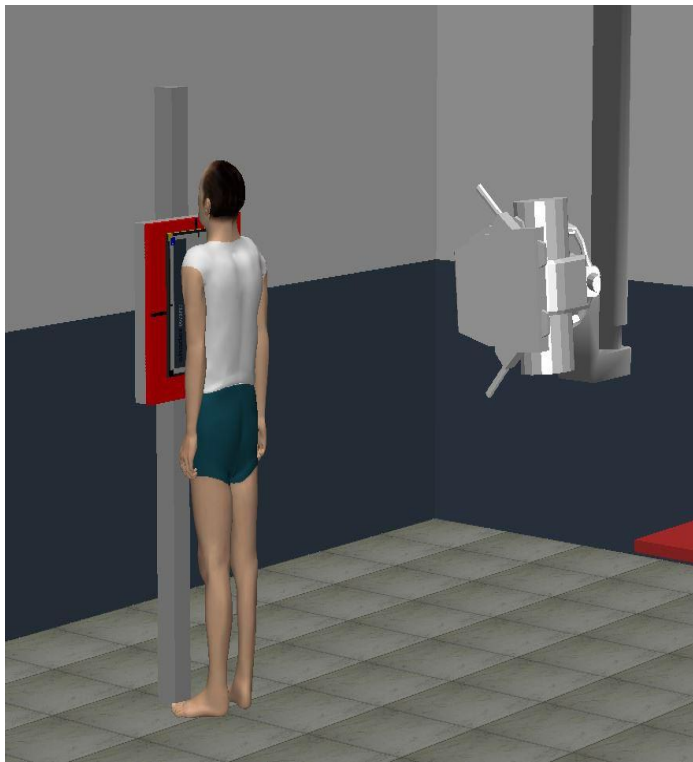
Introduction



This software is used to support radiography education. ProjectionVR™ is a fully featured simulation of radiographic positioning practice. This virtual radiography™ simulator is currently supporting students' studies at over 80 universities in USA, Canada, Sweden, Poland, Portugal, Saudi Arabia, South Africa, New Zealand, Finland, Australia and the UK.

Virtual x-ray room

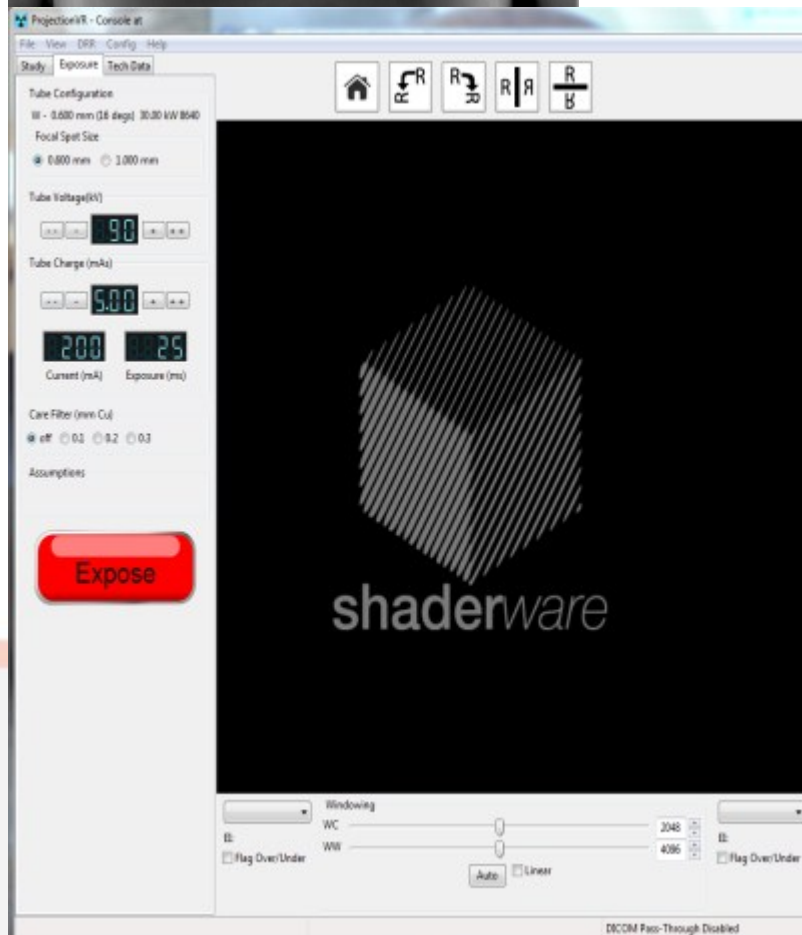




Virtual Positioning



Virtual Chest x-ray



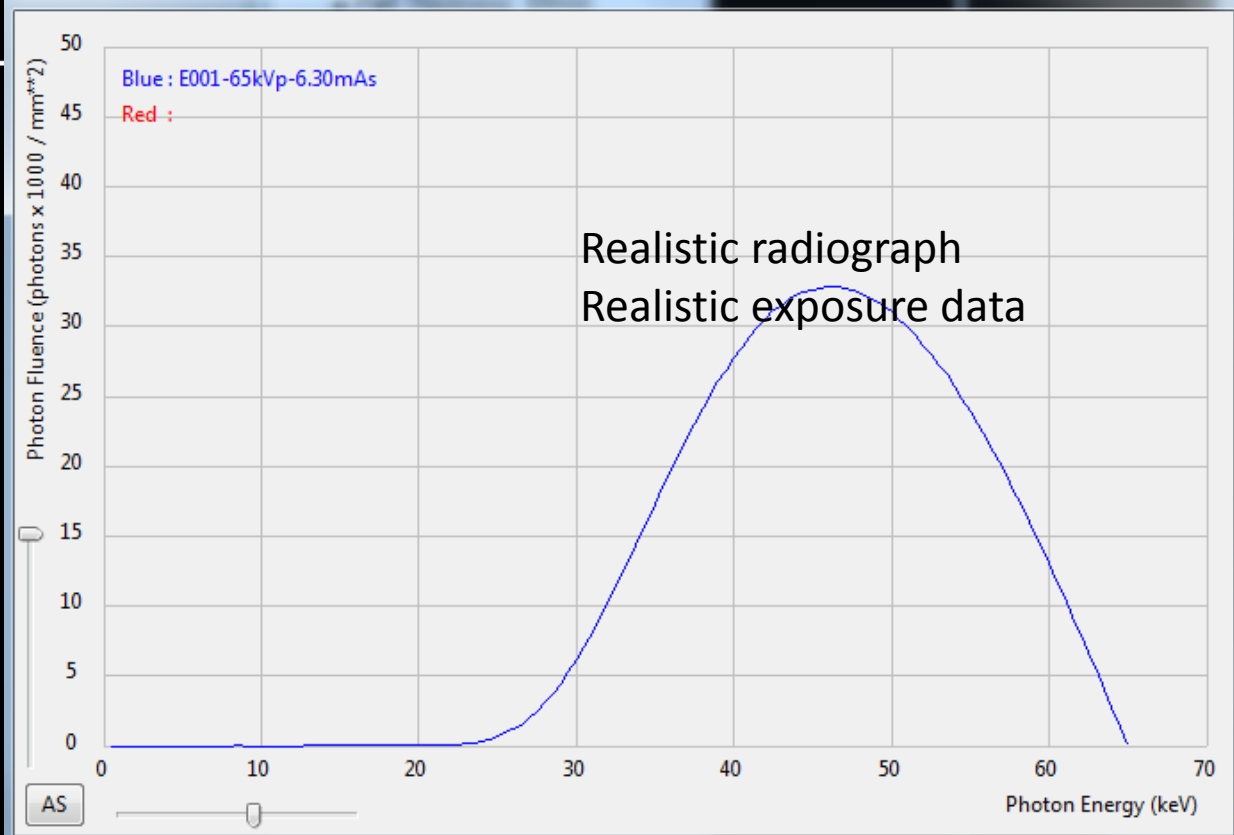
Virtual Control Console with Image preview Monitor area.

E001-65kVp-6.30mAs

- Patient: Simpson^Homer^Jay^Mr
- Cassette: 24CMX30CM
- Tube Voltage: 65 kV
- Care Filter: On (0.30 mm Cu)
- Tube Charge: 6.30 mAs
- SID: 100cm
- Coll: 17cm x 41cm (@ 100cm)
- Part Thickness (CR): 111mm
- Part Thickness: 69mm
- Scatter Rej. Grid: NONE
- Scatter Fraction: 0.46
- DAP: 4.33 cGy cm²
- Incident Dose: 0.079 mGy
- ESD: 0.106 mGy
- Sys Dose(ROI): 10.24 uGy
- Sys Dose(CR): 7.16 uGy
- Sys Dose: 9.43 uGy
- EI: 813
- Agfa IgM: 2.47
- Kodak P: 1969
- Fuji S: 185
- Fuji L: 2.09



VirtualRadiography - X-Ray Spectrum



Realistic radiograph
Realistic exposure data

Student Voice

- Feedback from comments on workbooks
- Survey underway during placement
- Focus group July 2015 from volunteers
- Evidence from Year 3 Dissertation Projects

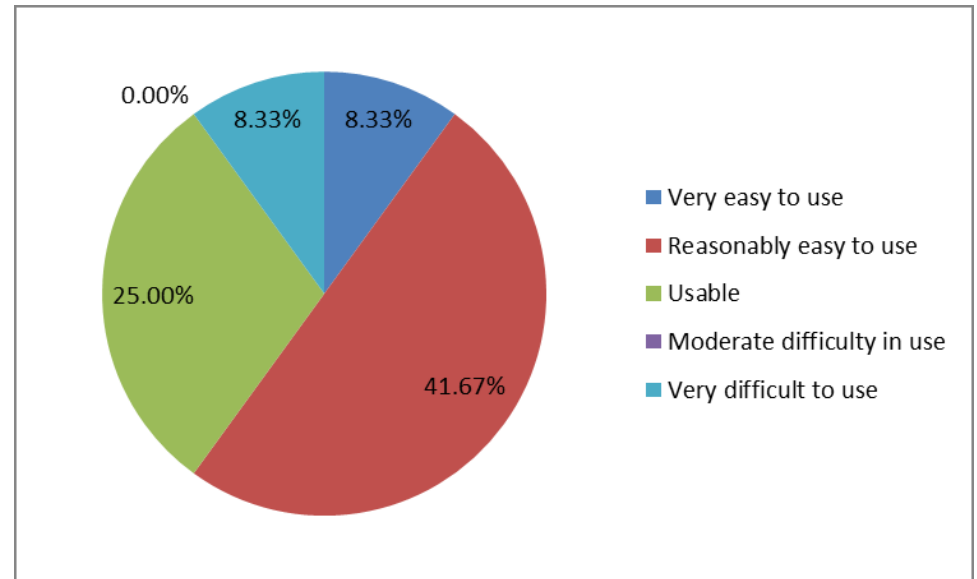
Student Feedback: Student 'B'

Year 1

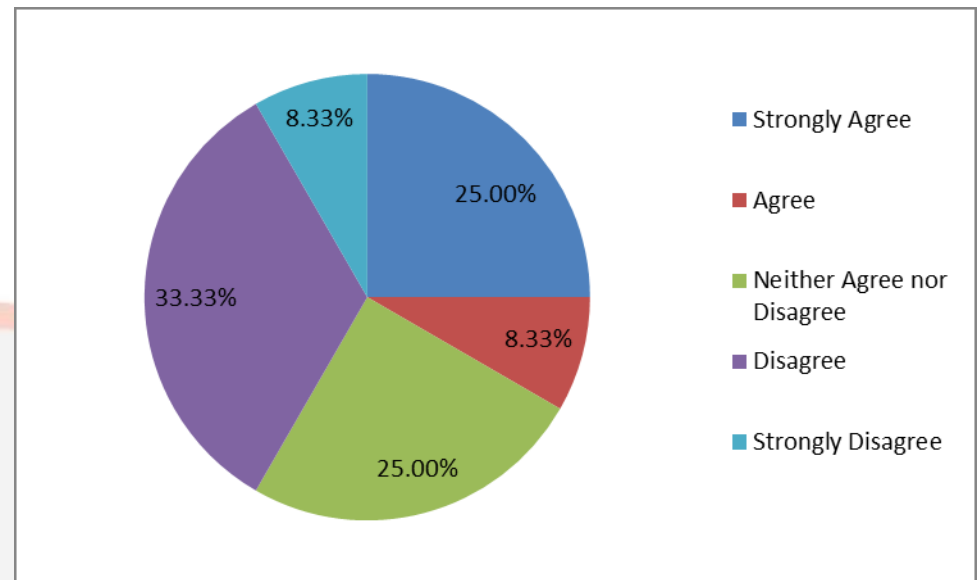
- The programme is relatively easy to navigate. It has very life-like images and movements of the patients to show what a real practical experience is going to be like.
- There are lots of different positions you can put the patient in, as well as setting various exposure factors. This is useful because you can see what adjusting KVP/MAS will do to the image quality. And when focusing on the ALARP principal, having the lowest exposure (with a still diagnostic image) is critical.
- It allows you to make mistakes without actually doing harm to people or yourself.

Survey Feedback

- Was it easy to use?



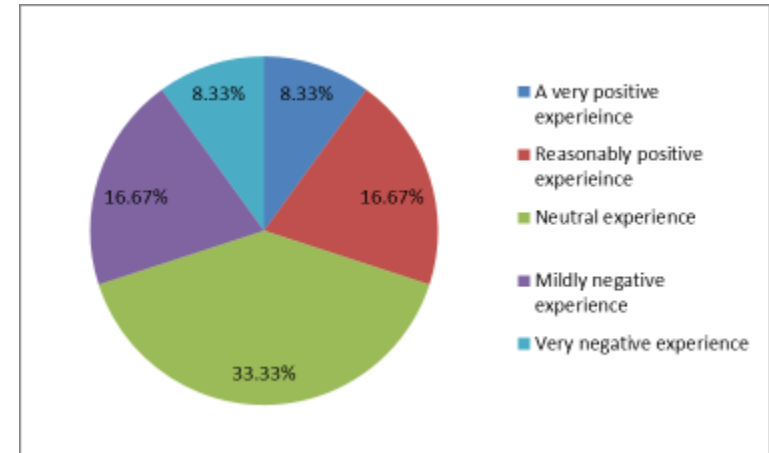
- Did the simulator aid your learning of techniques?



Survey feedback

Tell me about your personal experience of this program was it?

Answer	%
A very positive experience	8.33%
Reasonably positive experience	16.67%
Neutral experience	33.33%
Mildly negative experience	16.67%
Very negative experience	8.33%



Qualitative comments:

1. I would have preferred it to be used for helping us understand exposure factors
2. Potentially have more scheduled session per week rather than just 1?

Student Research: 1. Dose Manipulation

- Used real x-ray experiment for baseline
- Continued the experiments virtually
- Images assessed visually by reporting group.

Investigation into the effect of distance, high, low kVp and air gap technique on image quality and dose of chest radiography using Shaderware virtual technology.

Aa'ishah Shafi 2015

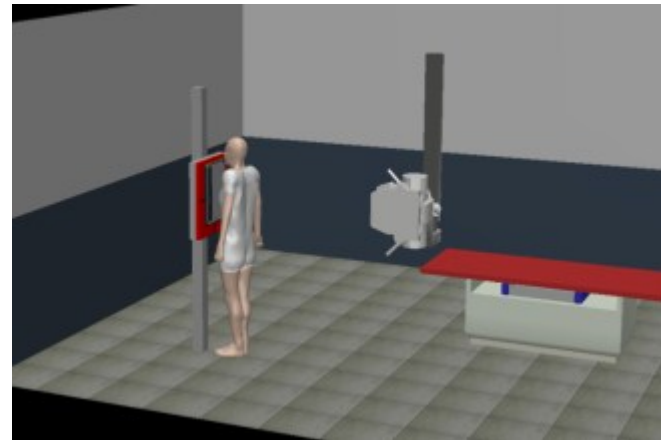
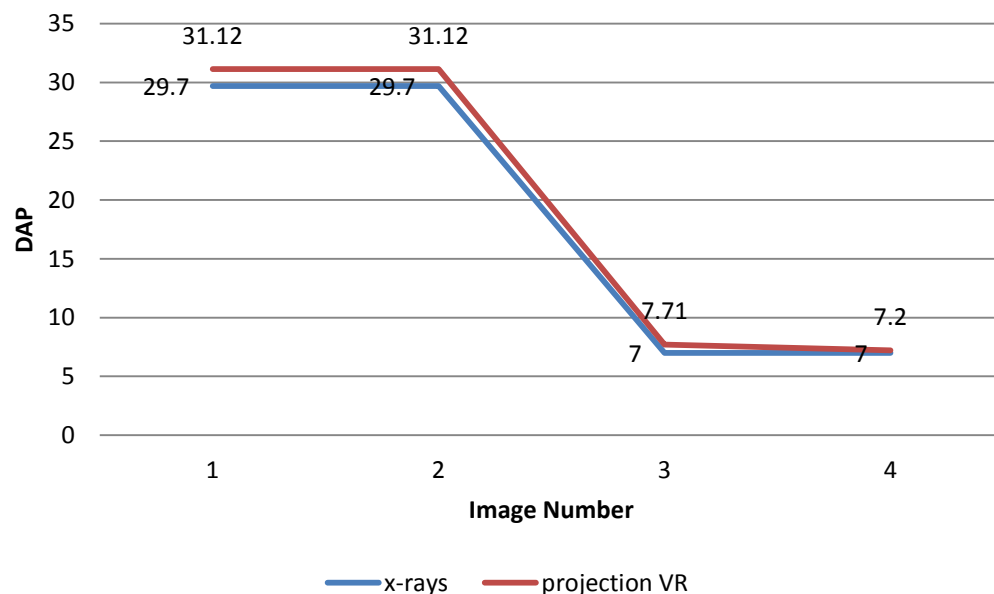


Figure 1. ProjectionVR™ room showing setup at 180cm SID with 10cm air gap (Shaderware, 2014).

Student Research

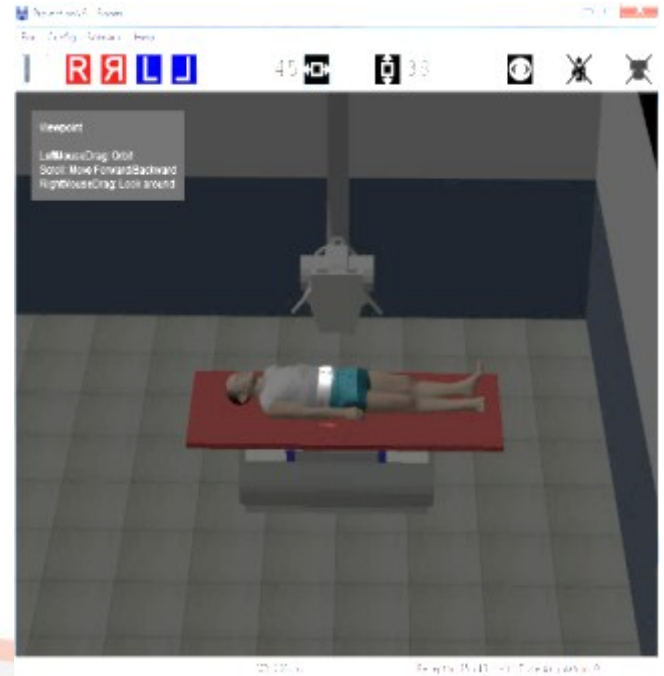
A Graph to show the Difference in DAP Values of the Four images taken with the x-ray room compared to ProjectionVR™



Graph 1. A Graph to show the Difference in DAP Values of the four images taken with the x-ray room compared to ProjectionVR™.

This investigation has demonstrated the uses and benefits to undergraduate learning that can be achieved through the use of Shaderware Projection Virtual Radiography™. ProjectionVR™ allowed for the complete control of many variables and was less time consuming whilst simultaneously providing more information than an actual experiment would have.

- Used anthropomorphic phantom and virtual simulation



Carly-Anne Rudkin 2015

Student Research

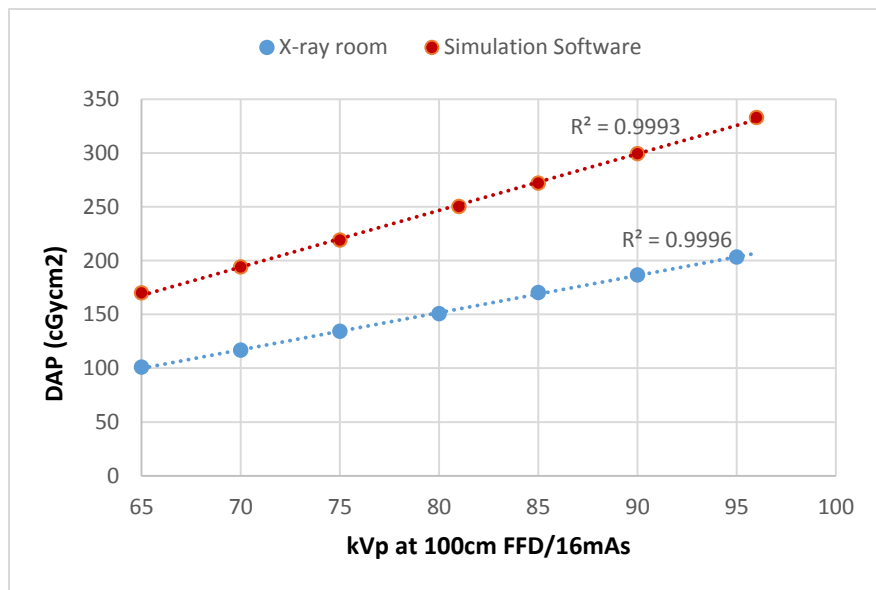


Figure 7 illustrates a similar linear relationship between the DAP and kVp as to the ESD and kVp (figure 6) for both training methods. The DAP is a measurement of the radiation dose to air multiplied by the area of x-ray field (collimation). As collimation can effect dose, the DAP was used as a tool for validating collimation consistency in both experiments (Papp, 2014).

The results of this study have shown that simulation software replicates the same scientific principles as a standard university x-ray training room when experimenting with exposure factors. The kVp, ESD and mAs, ESD demonstrated an expected linear relationship. There was an increase in ESD when only increasing either the kVp or mAs when using both training methods. These findings support Cosson and Willis² (2012) proposal that Simulation Software offers a safe and effective method for teaching radiography students the effects of manipulating exposure factors on patient dose.

Student radiographer perspectives on using a screen based computer simulator in diagnostic radiography
Cosson, P., and Willis, R.N.

Published November 2012 © Shaderware Limited

Student Survey Feedback

5. Use of exposure control settings

	Answer	%
1	Very Useful	43%
2	Useful	0%
3	Neutral	43%
4	Useless	0%
5	Very Useless	14%

- A split range supporting the idea that much more can be accomplished in this area.

So what has been achieved?

- Increased learning potential for students
- Integrated simulation into the current program
- Freedom to fail; integrated into learning
- Learn at the students convenience added
- Multiple feedback and discussion opportunities
- New insight gained for tutors on delivery

Future Research?

- Ideal for cohort studies
- Alternate projection development
- Radiation experiments
- ???

Questions

