Evaluating the benefits of virtual training for bioscience students

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Laboratory classes for Bioscience students

• Requirement professional bodies and employers
• Range of laboratory competencies of new students
• Work in groups and may not all fully engage
• Health and safety and risk assessment underpins bioscience training
• Restricted access to laboratories and students are only allowed in during timetabled classes
Access to highly specialised scientific equipment

• Cost of consumables and scientific equipment...
• Restricted access and specialist training required
• Space in smaller laboratories
• Risk assessment, health and safety
• Challenge for distance learning students
• Access for all students
Could virtual laboratories increase student understanding and engagement within modules?
Labster virtual simulations

Real world scenario / story
In the lab – and problem to examine
Actions and questions to answer
Theory to read
Media to watch

Students advance through by completing actions and answering questions – if answer is wrong they can read theory and reattempt the question. They have a running score and progress bar.
Can the virtual simulations help to train students for laboratory work, including lab safety?
4BICH001W Biochemistry – Lab safety skills

Orientation week
Health and safety talk

Labster Health and Safety simulation

Lab safety briefing Practical class 1 (week 4, semester 1)

Lab safety briefing Practical class 2
Lab safety briefing Practical class 3
Lab safety briefing Practical class 4
Lab safety briefing Practical class 5

Lab skills practical exam end of semester 2
Click your way around the lab to identify the safety hazards.
Turn off the Bunsen Burner.
Using the virtual simulation to create a lab accident....
Click on the safety equipment that you would use if you had a cut.
4BICH001W Biochemistry – Lab safety immediate evaluation

- In general, I was pleased with the simulation
- I feel that I can apply what I have learned in the simulation to real world cases
- I feel more confident about my lab skills after the simulation
- I found the simulation motivating
- I gained relevant knowledge by using the simulation

Number of Students

- Completely Agree
- Agree
- Disagree
- Completely Disagree
4BIC001W Biochemistry – Lab safety

• 204 students started, 197 completed, 73 completed survey
4BICH001W Biochemistry – Lab safety

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Summary 1

• Students have found the simulations interesting
• They have indicated that the simulations have enhanced their understanding
• Not all students completed the simulation
Is there evidence the student have incorporated lab safety into their lab practice?

Part 1 of practical exam safety awareness
97% students got 100% for this element (n=329)
Other virtual laboratory simulations

• Level 4 Cell Biology
• McGrawHill Education; LabSmart
• Dr Linda Percy
Has the virtual laboratory simulation assisted longer term learning?
Questions to students about Health and Safety training one year after the level 4 simulation...

Did you take 4BICH001W Biochemistry in level 4?

- Yes: 93.4%  
- No: 6.6%  

n=76

In 4BICH001W Biochemistry you were asked to complete the Labster Health and safety simulation. Did you do this?

- Yes: 90.8%  
- No: 2.6%  
- I can't remember: 6.6%  

n=76
Evaluating if the Labster virtual simulations had been useful

Response in Level 4 – October 2016

Overall usefulness of virtual practical
"Lab Safety"

Response in Level 5 – October 2017

How useful did you find the Labster simulations?
76 responses

Not useful  Very useful

0 5 10 15 20 25 30
Poor Fair Satisfactory Very good Excellent
How much information from the simulation can the students recall after 1 year?

At the start of level 5, how confident are you about knowing what to do if a chemical splashed in your eye in the laboratory?

[Bar chart showing responses]

76 responses

Not confident  Very confident
Click on the bottle with the flammable liquid.

Have a look at the following overview of the different hazard symbols.
Which of these hazard symbols is for an oxidising reagent?
Has confidence in Health and Safety increased following the virtual laboratory simulations?
How confident are you about Health and Safety?

76 responses

<table>
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<tr>
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<td>30.3%</td>
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</table>
Which of the following resources have you used to date to learn about Health and Safety?

Level 5, n=76

- Health and safety briefing
- Textbooks
- Internet resources
- Lectures
- Lecture notes
- Laboratory sessions
- Laboratory simulations
Please rank which of the resources would be useful for you to learn about Health and Safety in this module?

- Health and safety briefing
- Textbooks
- Internet resources
- Lectures
- Lecture notes
- Laboratory sessions
- Laboratory simulations

Level 5, n=76
Student comments

“Useful for practice but I still believe we should actually go into the lab and use a hands on approach.”

“Good way to understand lab experiments virtually”

“It is useful when preparing for laboratory practicals”

“Very time consuming and does not equip you sufficiently for real life lab work”

“Useful as a practice before doing a practical. The virtual activities should also be done physically so that the concepts are put into practice.”

“It is an amazing tool to provide laboratory simulation to the students”

“I honestly don't understand why people don't like it”
Conclusions

• Most students reported that the use of virtual simulations increased understanding.
• There is evidence that the impact of the simulations is long lasting and that students have assimilated this knowledge.
• Virtual simulations for Health and Safety were rated well to support but not replace laboratory classes.
Acknowledgments

Sarah K Coleman  Jane Lewis
Carol D’Souza  Linda Percy
Andrew Dalby
Chrystalla Ferrier

Alexander Skyum Mortensen,
Sarah Stauffer, Emma Durand,
Samuel Butcher