Evaluating the benefits of virtual training for 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
• Students are only allowed in during timetabled classes
Access to highly specialised scientific equipment

• Highly diverse student body
• 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

• Make accessible for all students
Methods used in this ongoing study

- Likert-type surveys
  - Deployed directly after Labster completion
  - Deployed as part of module teaching

- Small group or individual interviews
  - with undergraduate students
  - with life science academic teaching staff
Could virtual laboratories increase student understanding and engagement within modules?
Labster virtual simulations

Real world scenario / story
Enter virtual lab
Tackle the problem
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 all students for laboratory work, including lab safety?
4BICH001W Biochemistry – Lab safety skills

Orientation week
Health and safety talk

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

Labster Health and Safety simulation

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

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

2016-17 cohort

- 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 (n=197)

2017-18 cohort

Number of students (n=151)
Learning objectives were clear
Content was organised and well planed
Progression through VP was appropriate

2016-17 Cohort
n=73

2017-18 Cohort
n=49
4BICH001W Biochemistry – Lab safety

- Time taken to complete virtual practical was appropriate
- Skills/knowledge gained from virtual practical
- Overall usefulness of virtual practical

2016-17 Cohort
n=73

- Poor: 3
- Fair: 4
- Satisfactory: 15
- Very good: 23
- Excellent: 9

2017-18 Cohort
n=49

- Poor: 1
- Fair: 3
- Satisfactory: 16
- Very good: 22
- Excellent: 9
Summary 1

- Students have found the simulations interesting
- They have indicated that the simulations have enhanced their understanding
- Not all students completed the simulation
- Nor did all complete survey
Has the virtual laboratory simulation assisted longer term learning?
Questions to Level 5 students about Health and Safety training one year after the level 4 simulation...  

Did you take 4BICH001W Biochemistry in level 4?  

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

n=106
Evaluating if the Labster virtual simulations had been useful

Student Responses

Level 4 students 2016 n=73
Level 5 students 2017 n=76

Not useful Very useful
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 student responses to their confidence levels.]

- Not confident
- Very confident

Level 5 students, n=106
Click on the bottle with the flammable liquid.

Have a look at the following overview of the different hazard symbols:

- Flammable
- Compressed Gas
- Corrosive
- Oxidizing
- Harmful
- Health Hazard
- Toxic
- Explosive

From: https://www.labster.com/simulations/lab-safety/ 10/1/18 with permission
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?

![Bar chart showing student responses](chart.png)

- Not confident: 0, 1, 2, 3, 4, 5
- Very confident: 0, 1, 2, 3, 4, 5

Level 5 students, n=106
Students Comments

- Liked I could access when and where ever...in free time or at uni, even during holidays
- Used Labster to support other study materials provided in order to reinforce learning
- Useful as a practice before doing a practical. The virtual activities should also be done physically so that the concepts are put into practice
- Better for formative assessment, perhaps not summative due to some technical issues
- Can go back and repeat as many times as you like
- Very time consuming and does not equip you sufficiently for real life lab work
Could this...

or this...

Replace this?
Should virtual labs replace actual laboratory sessions?

- **Yes**: 0 votes
- **No**: 20 votes
- **Maybe**: 5 votes

**Staff**: n=10

**Students**: n=22
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 were rated well to support learning but not replace laboratory classes.
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