Using virtual reality to prepare Bioscience students for practical classes

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The Labster Format

Real world scenario
Then in the lab and the 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 have the question re-given.
They have a running score and progress bar.
Labster CSI

The scenario
There were no signs of forced entry, it was someone he knew.
The two argued, and the professor struggled with the unknown visitor.
The assailant walked away, bleeding from a wound of his own, leaving the professor for dead.
In the lab
Action - Setting up PCR reactions
Please drop the current item you are holding first.

Angyly: take a controlled volume of liquid from one container and place it into another - remember clean tips!

Now click the PCR plastic bag (the pink one) in the PCR Kit, pick up a PCR tube and place it in the rack.
Great job!

The function of primers in a PCR reaction is to ...

a) Denature DNA.
b) Copy DNA.
c) Bind specific sites on DNA.
d) Bind random sites on DNA.
Great job!

What you will now see is an animation of what is happening on the molecular level in the PCR process.

Press "Continue" to start the PCR machine.
Animations and media
At this step in the PCR process, the DNA was ...

a) Separated into two strands.
b) Broken into many pieces.
c) Twisted into a double helix.
d) Kept intact.
Correct!

At this step the DNA denatures and becomes single stranded.
Could virtual laboratories increase student understanding and engagement within modules?
Labster survey

In general I was pleased with the simulation
I gained relevant knowledge by using the simulation
I found the simulation motivating
I feel more confident about my lab skills after the simulation
I feel that I can apply what I have learned in the simulation to real world cases
5BIOM010W Research Methods, Protein synthesis

- Scenario based around EPO (Erythropoietin)
- Students purify EPO
- This is linked to EPO drug screening in cyclists
5BIOM010W Research methods

- Core all level 5 Life Science and Biomedical science students
- 294 students attempted
- 260 survey responses
CSI evaluation, Labster survey

Level 6 FMAB604 DNA in Identity and Disease
N=75, all responded to survey, part of assessment

Level 5 5BIOM010W, Genetics and Genomics
N=68, 35 responded to survey
Gene regulation, Labster survey

Level 6 FMAB604 DNA in Identity and Disease
N=73, all responded to survey, part of assessment

Level 5 5BIOM010W, Genetics and Genomics
N=88, 14 responded to survey
5BICH003W – Molecular Biology and Genetics

• 68 students were given Labster access
• “Gene regulation” – on the test
• “CSI”, “Cell Culture” and “Mendelian Genetics”
• 26 students completed an end of module survey

Gene regulation 18
CSI 17
Mendelian Genetics 16
Cell culture 7
None 4
5BICH003W – Molecular Biology and Genetics

Which aspects of Labster did you like? (% responses)  N=26 (from 68 students)

- Graphics simulating pipetting, centrifuging etc: 70%
- The animations within the Labster: 50%
- Theoretical questions to be answered: 60%
- The 24/7 accessibility: 50%
- The additional reading and theory provided: 40%
- I had problems with accessing the Labster: 10%
- Labster crashed and I didn't complete it: 20%
- I didn’t use it, I didn’t think it was relevant: 10%
4BICH001W Biochemistry – Lab safety
207 students started, 197 completed, 73 completed survey
207 students started, 197 completed, 73 completed survey
4BICH001W Biochemistry – Lab safety

Lab Safety Student 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
New Labster simulations

• Ray Camilleri, Carol D’Souza and Chrystalla Ferrier – HAEMATOLOGY CASE STUDIES (live)

• Nelson Chong – GENE THERAPY AND HEART FAILURE (soon to go live)

• Nina Porakishvili – SIGNAL TRANSDUCTION (soon to go live)
Hematology

In this simulation, you will join a biomedical diagnostics lab and learn about the different blood components. Will you be able to identify different blood disorders based on your blood analysis results?

Purchase Access

About This Simulation

Not only vampires are obsessed with blood. Haematologists love blood as well! In this simulation, you will join a biomedical diagnostics lab and learn about the different blood components. You will be taught how to make peripheral blood smears, how to use an automated blood count analyzer and how to interpret the results from these experiments. Will you be able to identify different blood disorders based on your blood analysis results?

Learning Objectives

- Learning about the organisation of a haematology laboratory, equipment selection and lab safety
- Understanding the principles, application, and limitations of selected haematological tests in relation to clinical problems
- Being able to select an appropriate test and interpret laboratory data in relation to a clinical problem

Screenshots
Lessons Learned from First Year of Use...

• Students generally like them
• Few technical issues arose – peer support
• Not embedded into Blackboard
• Easy to register, but registration is per module
• Instructor can obtain student data and meta-data as Excel spreadsheet
• More participation when compulsory or linked to summative assessment
• All staff on module should go through the virtual practical in advance
Conclusions

- The majority of students have reported that use of virtual practicals has increased understanding within modules.
- We would recommend the continued use of these Labster simulations.
- Student engagement is greatest where students can see a direct relevance of the simulation to the module, rather than as a bolt-on activity.
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Labster

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FHHS605 Drug Discovery and Development  
Cell culture; Transfection; HPLC

Dr Caroline Smith and Dr Pascale Gerbault  
FMAB604 DNA Identity and Disease  
Gene regulation; Crime scene investigation (CSI)

Dr Rumy Begum  
FSLS603 Research Project  
Gene expression; Cell culture; CSI; Lab safety

Dr Godfrey Kyazze  
FMAB602 Applied Microbiology  
Fermentation

Dr Andrew Dalby  
5BIOM010W Research Methods  
Protein synthesis

Chrystalla Ferrier  
5BIOM004W Professional Practice for Biomedical Scientists  
Cell culture; Bacterial isolation; HPLC

Dr Caroline Smith  
5BICH003W Molecular Biology and Genetics  
Gene regulation; Cell culture; CSI

Dr Emanuela Volpi  
5BIOM002W Medical Genetics in Practice  
Clinical cytogenetics; Medical genetics; Next generation sequencing

Dr Lorna Tinworth  
5BIOM001W Genetics and Genomics  
CSI; Gene expression; Medical genetics; Mendelian inheritance; Monogenetic disorders

Dr Sarah K Coleman  
4BICH001W Biochemistry  
Laboratory safety