Using virtual reality to prepare Bioscience students for practical classes

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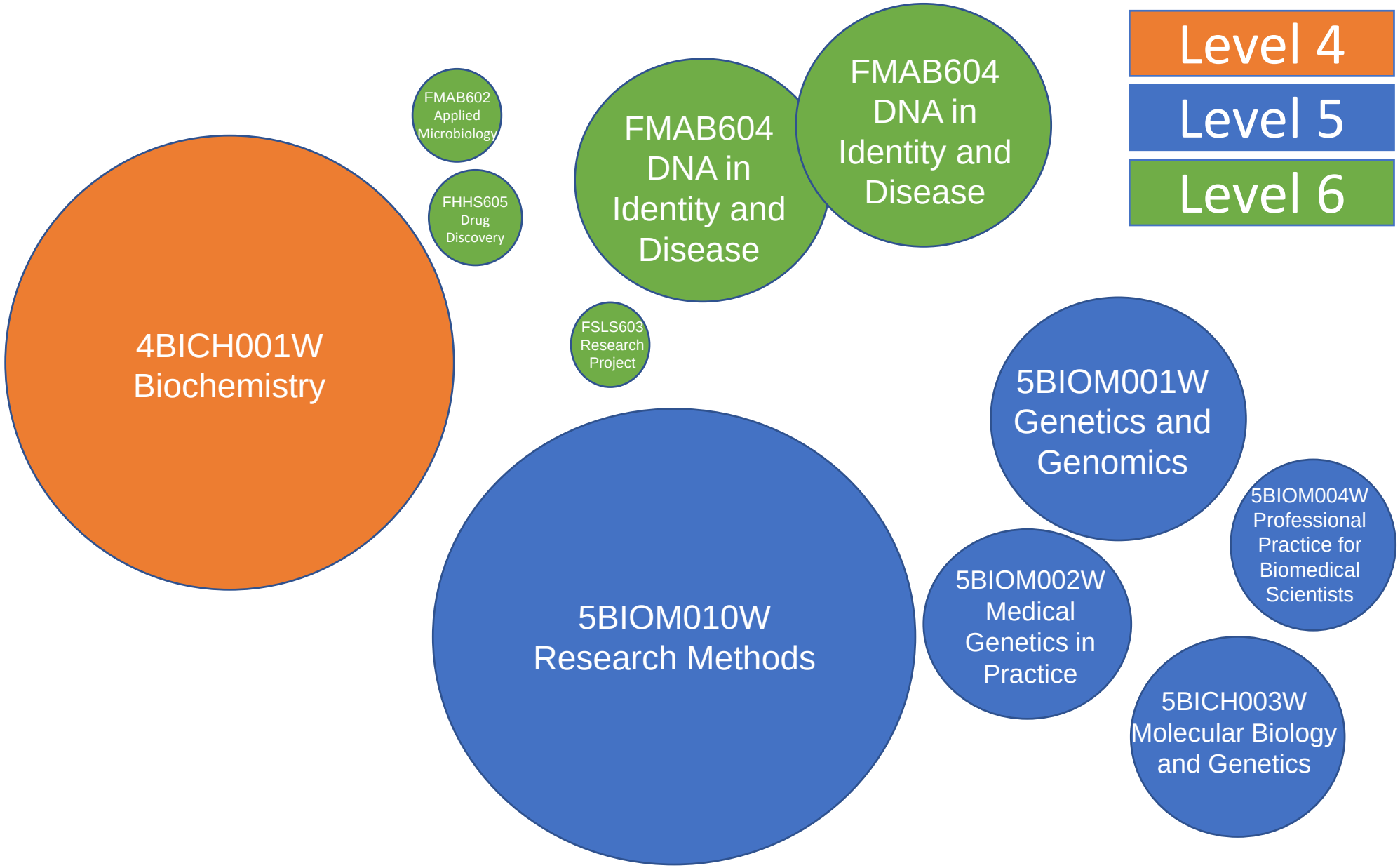

Level 4
Level 5
Level 6
4BICH001W Biochemistry
FMAB602 Applied Microbiology
FHHS605 Drug Discovery
FMAB604 DNA in Identity and Disease
FMAB604 DNA in Identity and Disease
FSLS603 Research Project
5BIOM010W Research Methods
5BIOM001W Genetics and Genomics
5BIOM004W Professional Practice for Biomedical Scientists
5BIOM002W Medical Genetics in Practice
5BICH003W Molecular Biology and Genetics

The Labster Format

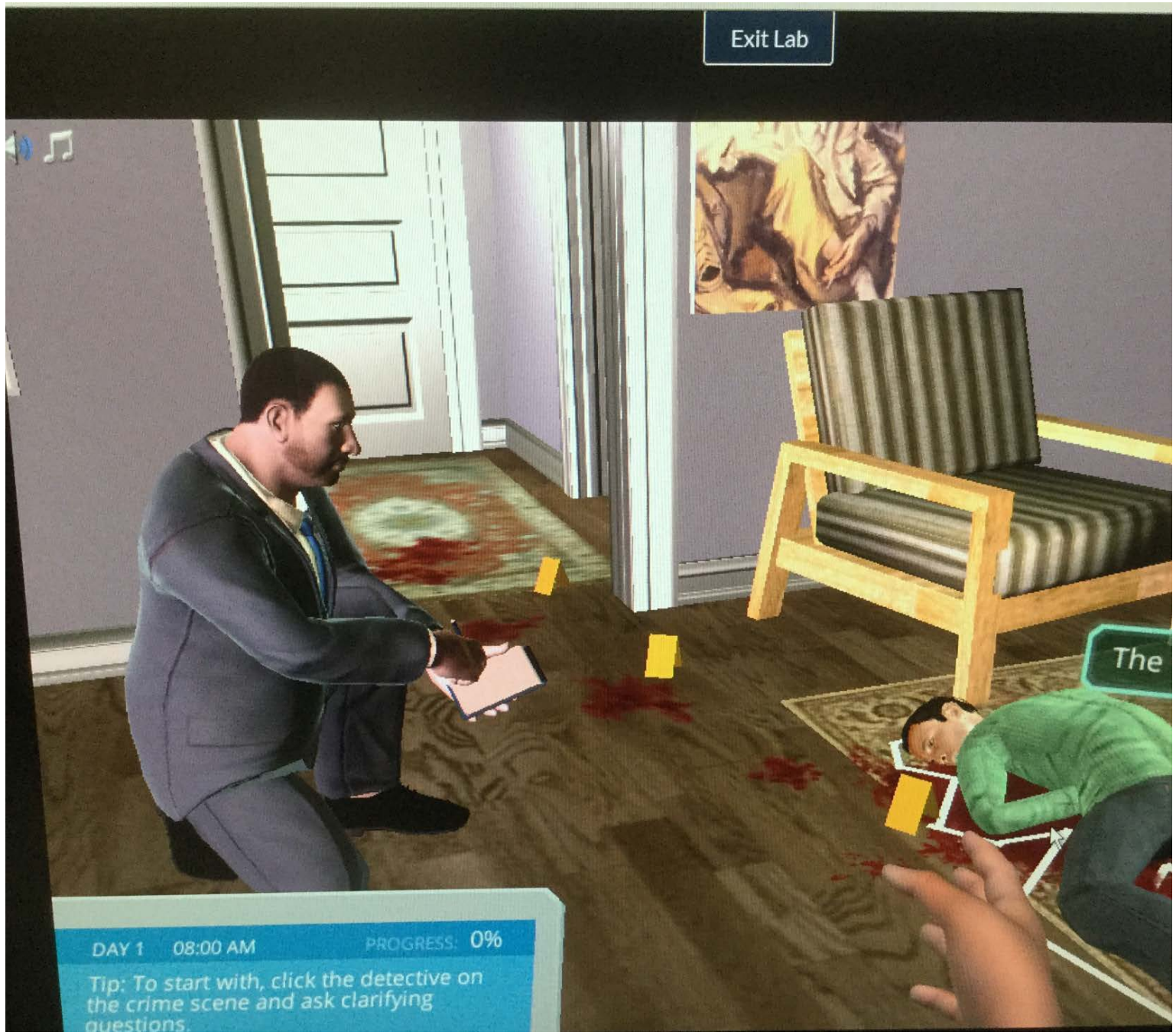
Real world scenario
Then in the lab and the problem to examine
Actions and questions to answer
Theory to read
Media to watch

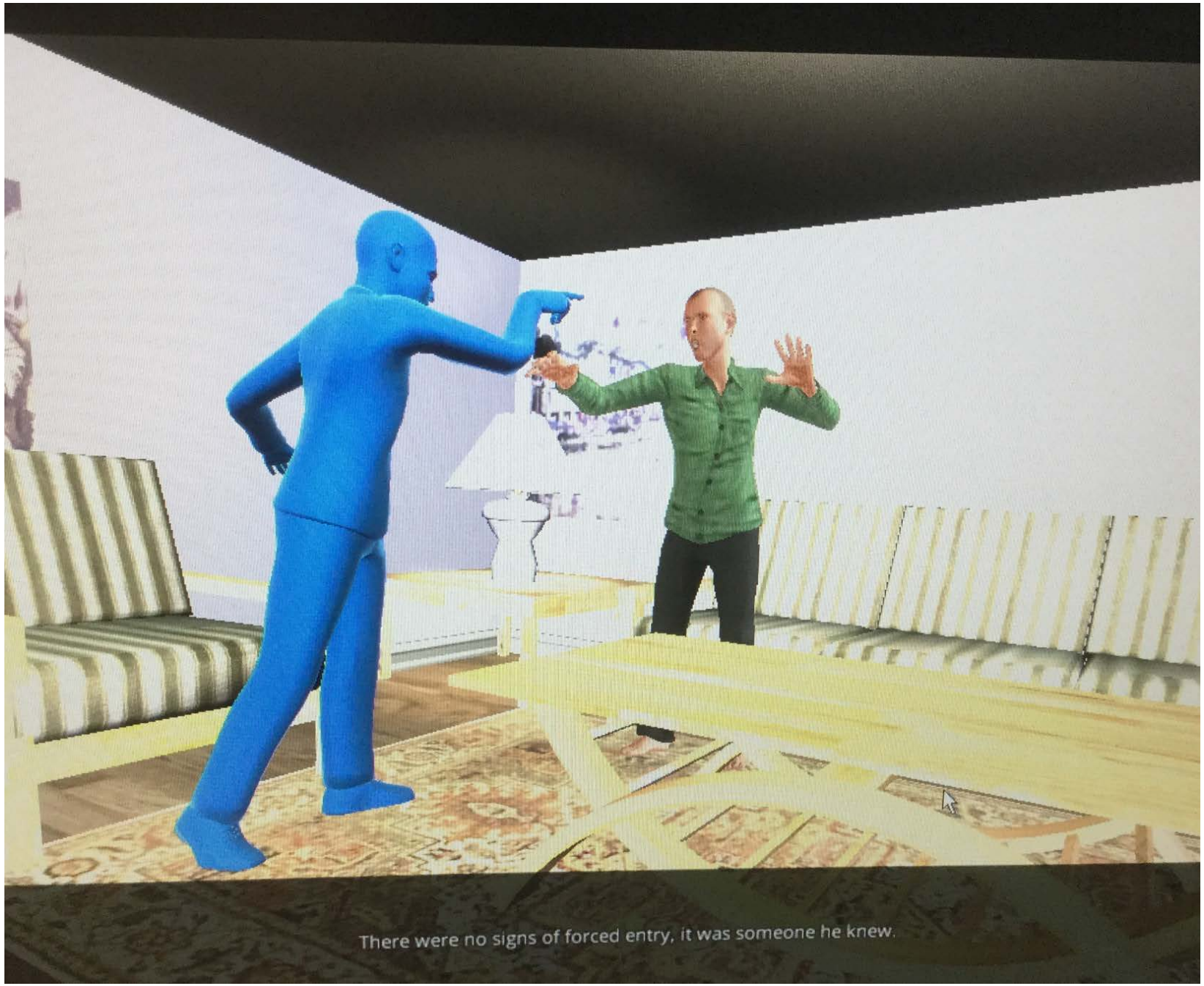
Students advance through by completing actions and answering questions – if answer is wrong they can read theory and have the question re-given.

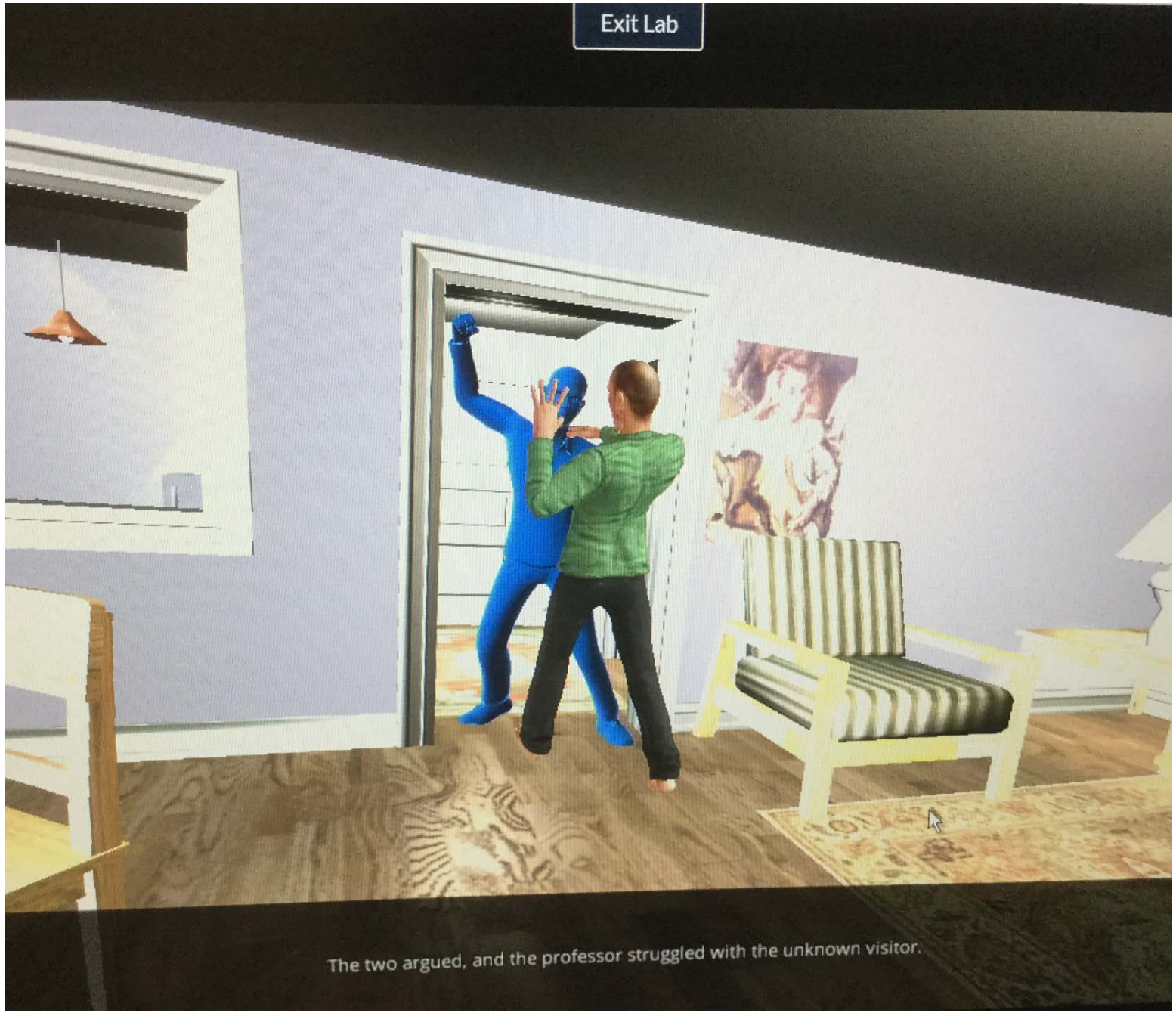
They have a running score and progress bar.

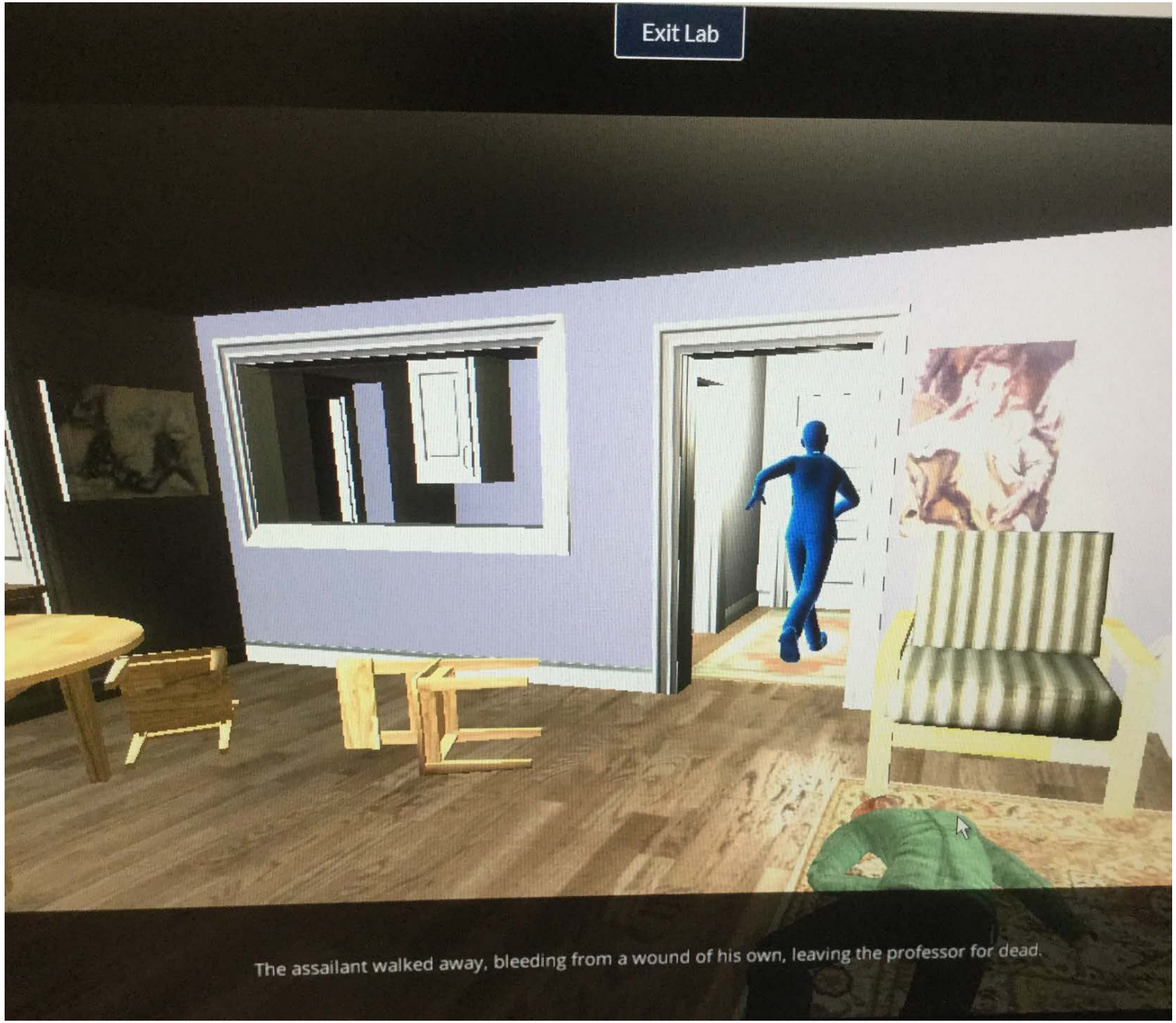
Labster CSI

The scenario



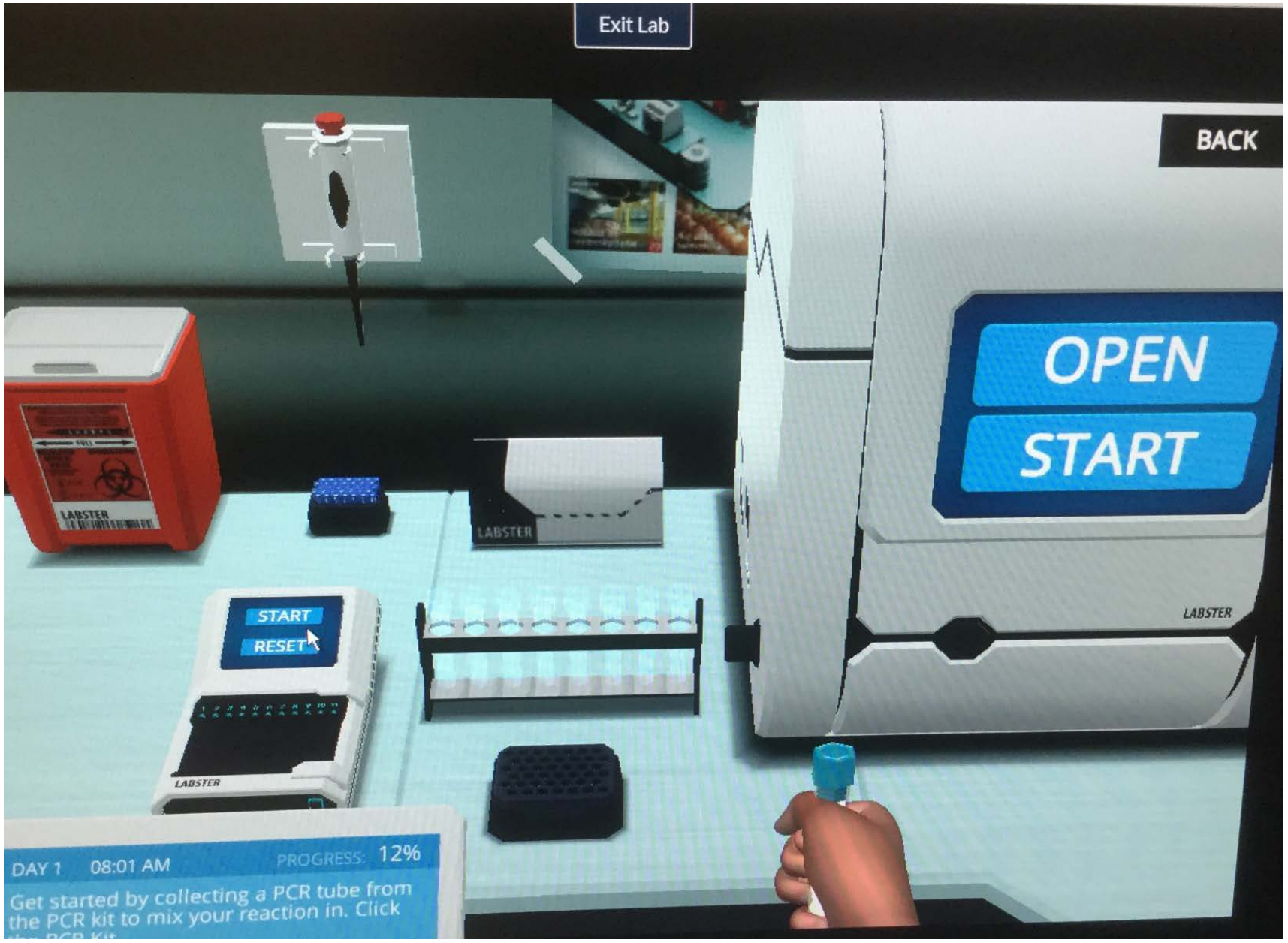

There were no signs of forced entry, it was someone he knew.


Exit Lab
The two argued, and the professor struggled with the unknown visitor.

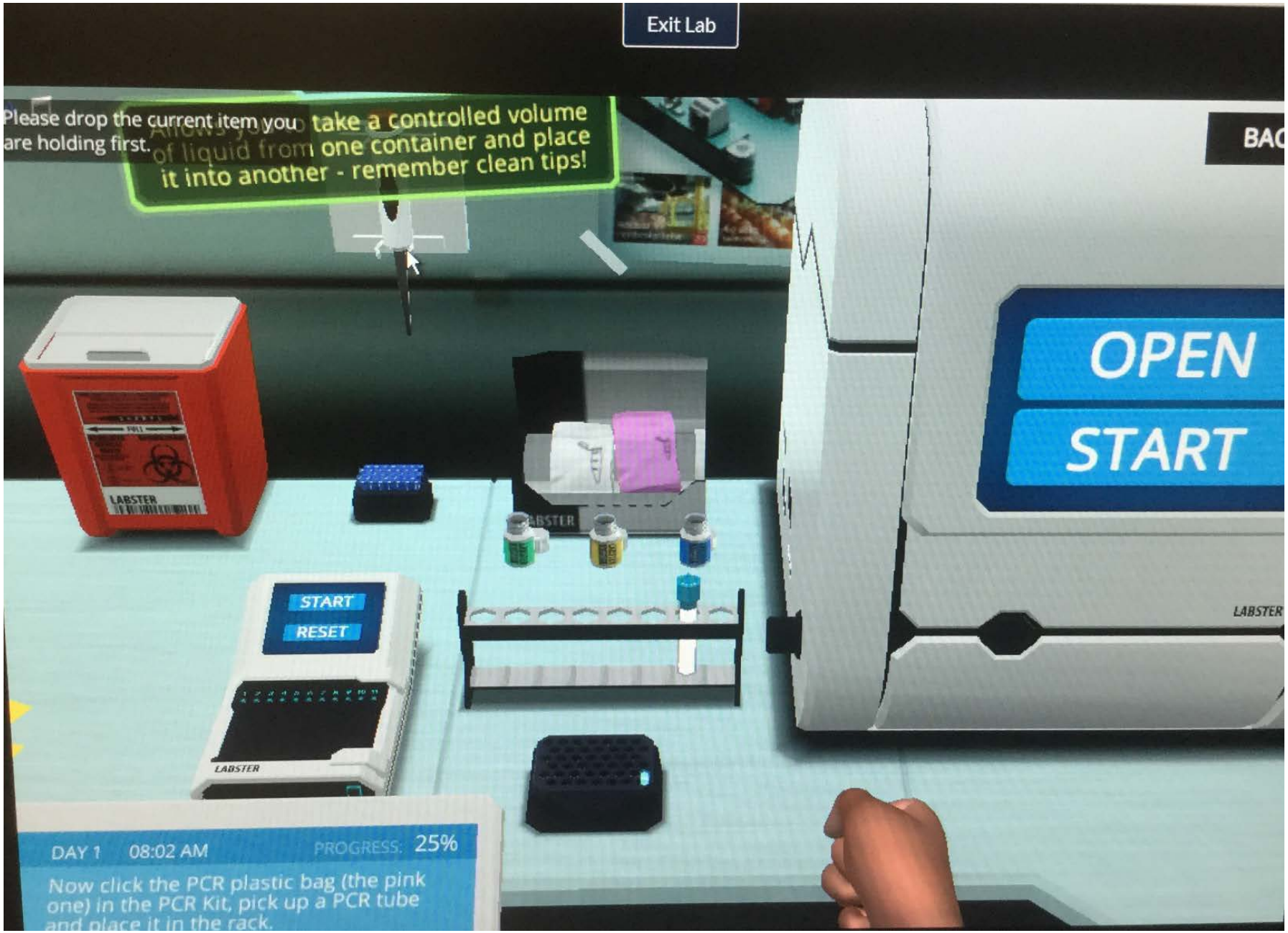

Exit Lab
The assailant walked away, bleeding from a wound of his own, leaving the professor for dead.

In the lab

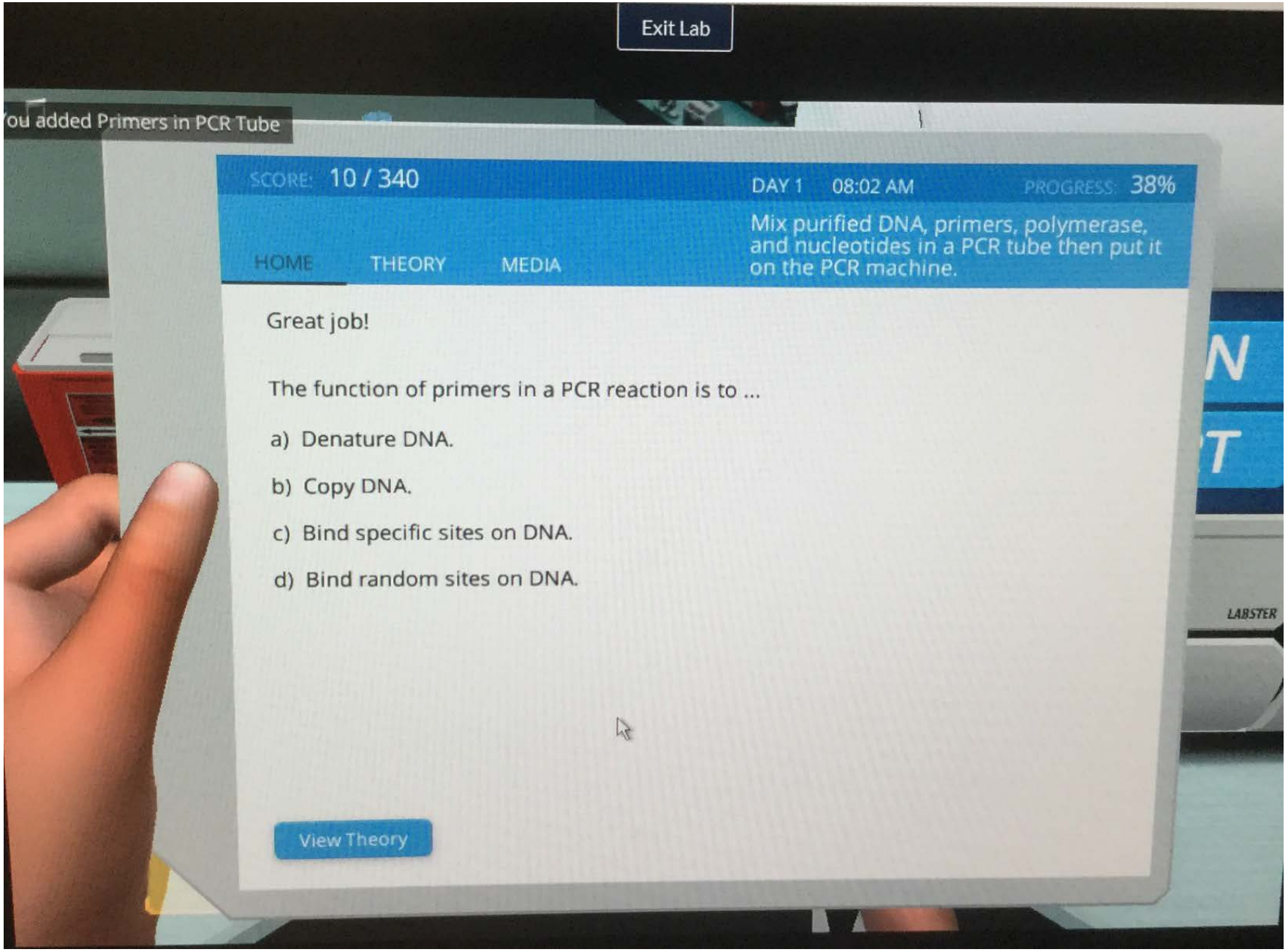

Exit Lab
LABSTER
DYNAMO
Work bench 3
DAY 1
08:01 AM
PROGRESS: 12%
Go to Workbench 1 to prepare your PCR
eaction.

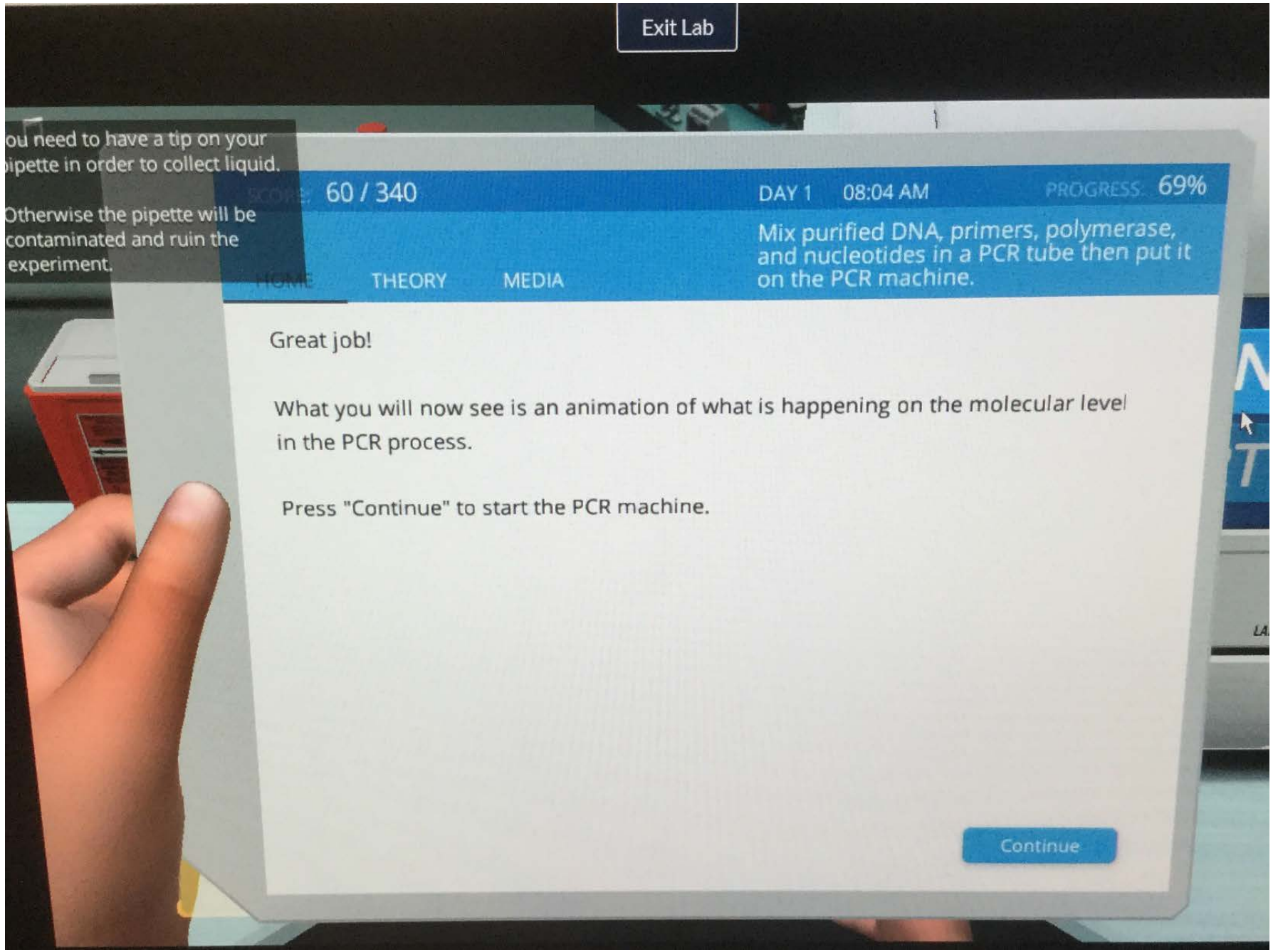


Action - Setting up PCR reactions

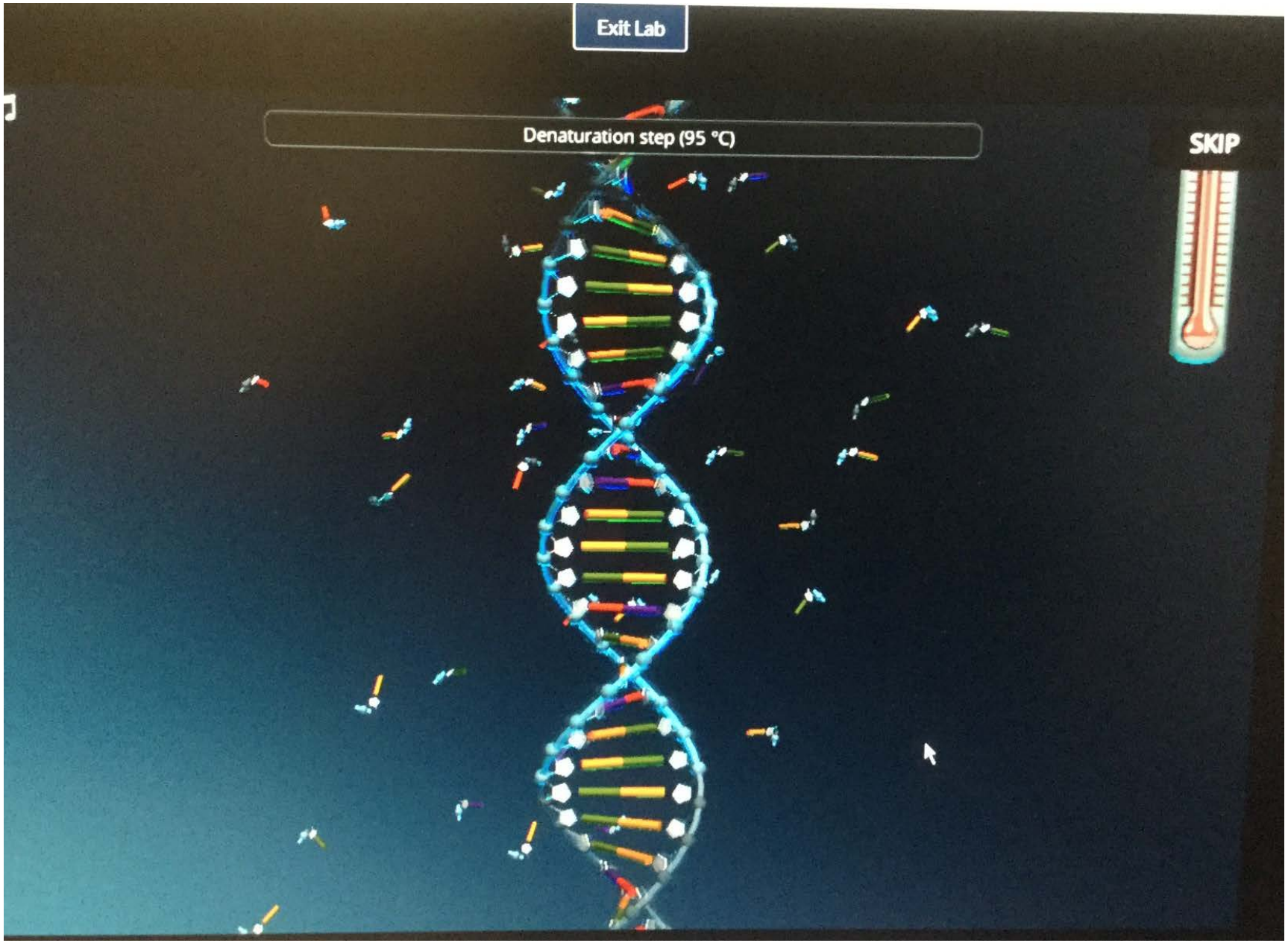

Exit Lab
Please drop the current item you are holding first.
take a controlled volume of liquid from one container and place it into another - remember clean tips!
OPEN
START
START
RESET
LABSTER
DAY 1 08:02 AM
PROGRESS: 25%
Now click the PCR plastic bag (the pink one) in the PCR Kit, pick up a PCR tube and place it in the rack.

Theory and questions

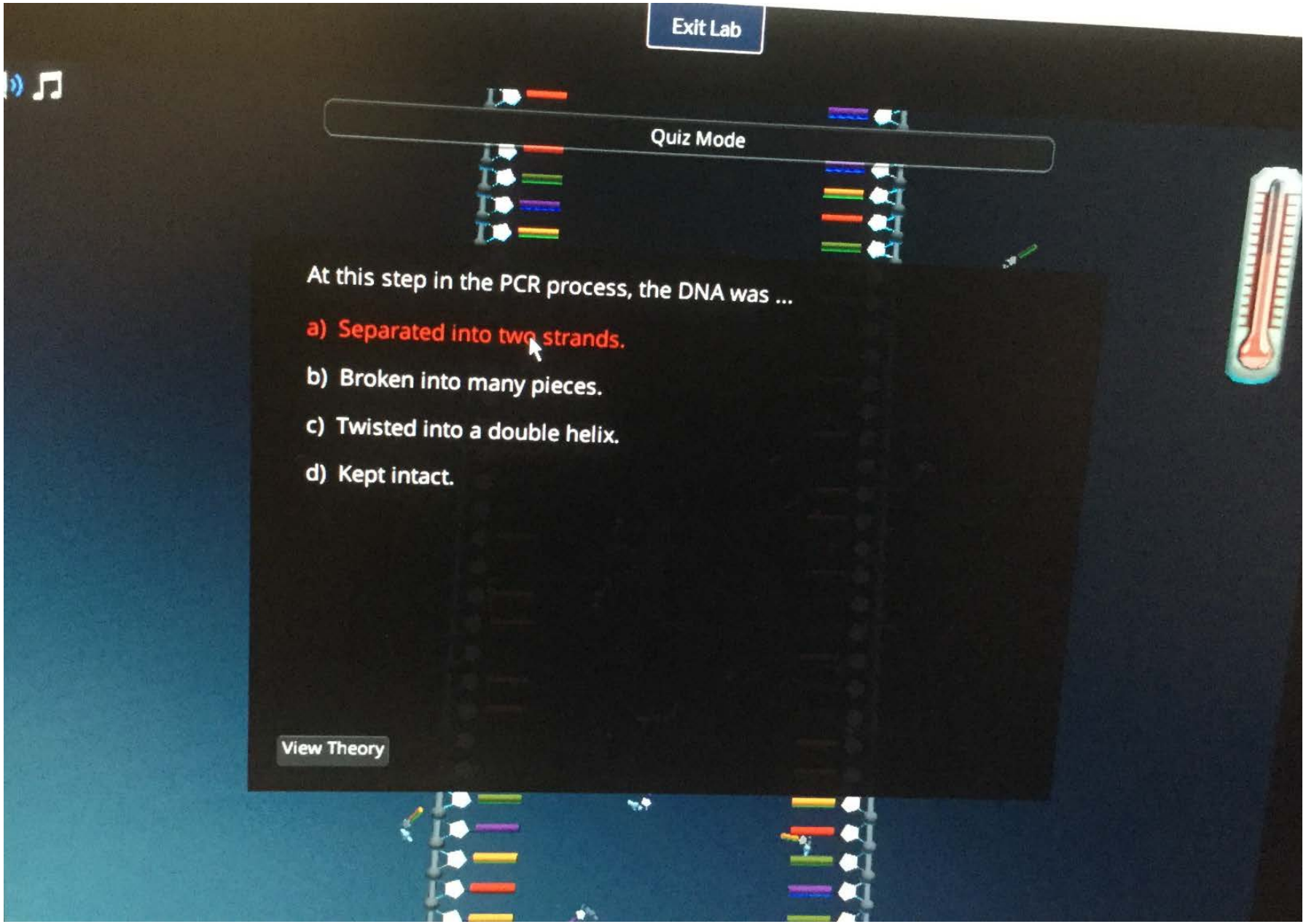


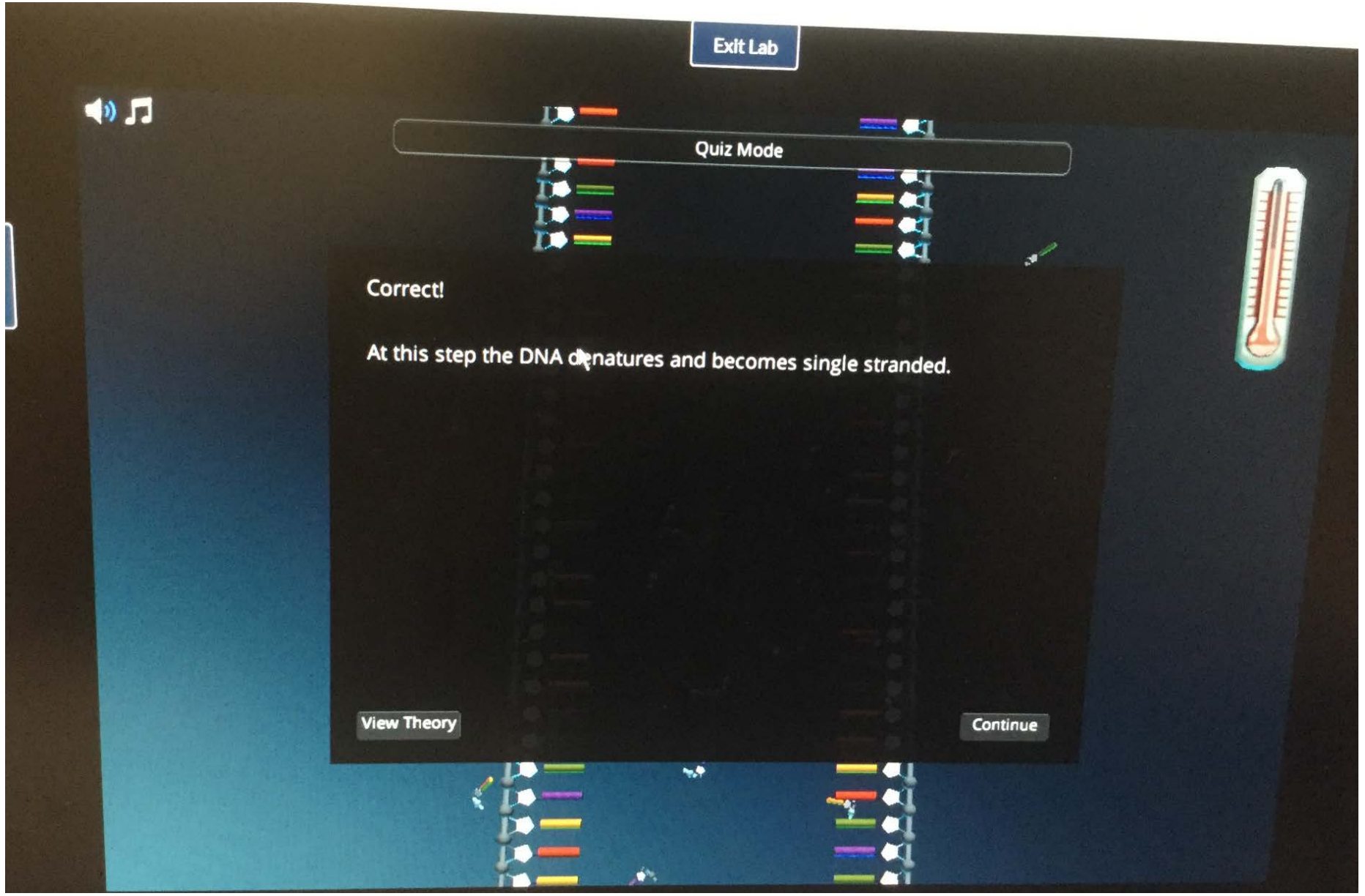

Exit Lab
ou need to have a tip on your
ipette in order to collect liquid.
Otherwise the pipette will be
contaminated and ruin the
experiment.
SCORE: 60 / 340
DAY 1 08:04 AM
PROGRESS: 69%
HOME
THEORY
MEDIA
Mix purified DNA, primers, polymerase, and nucleotides in a PCR tube then put it on the PCR machine.
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.
Continue

Animations and media



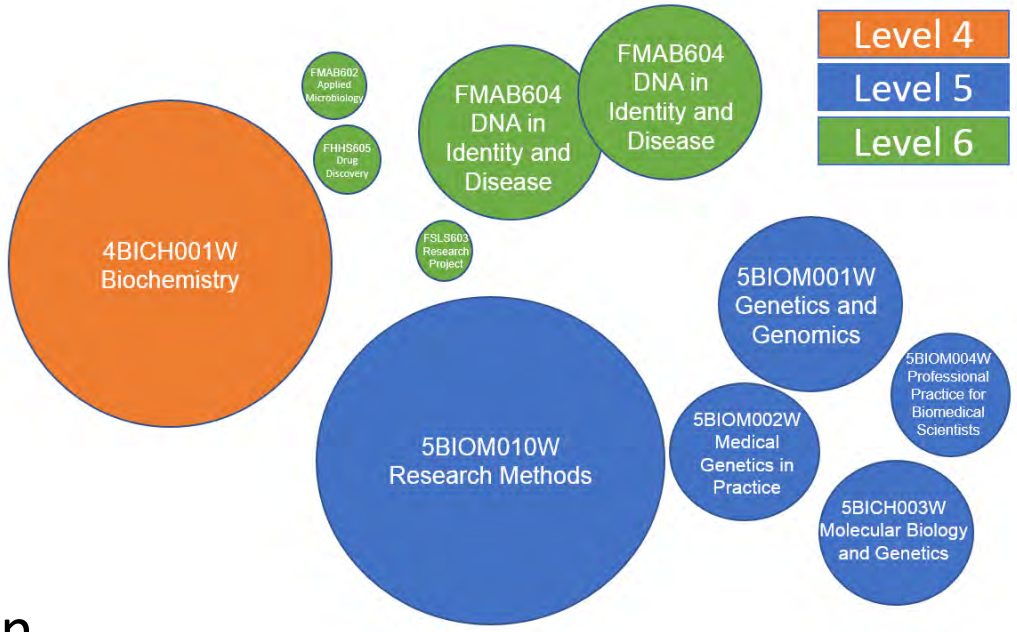
Theory and questions



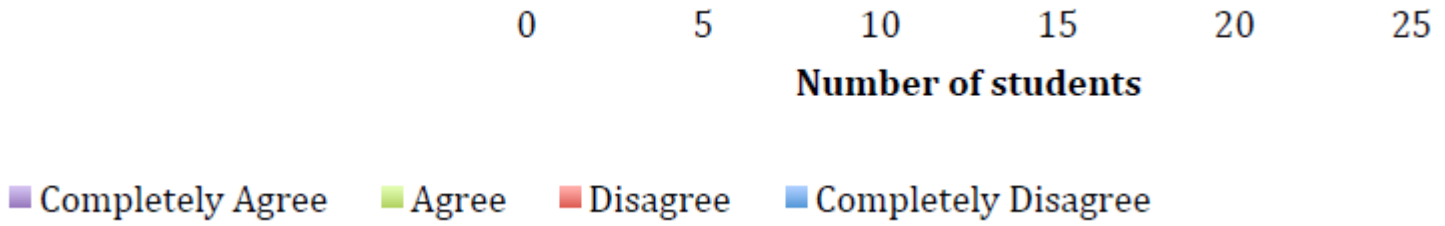

Exit Lab
Quiz Mode
Correct!
At this step the DNA denatures and becomes single stranded.
View Theory
Continue

Could virtual laboratories increase student understanding and engagement within modules?

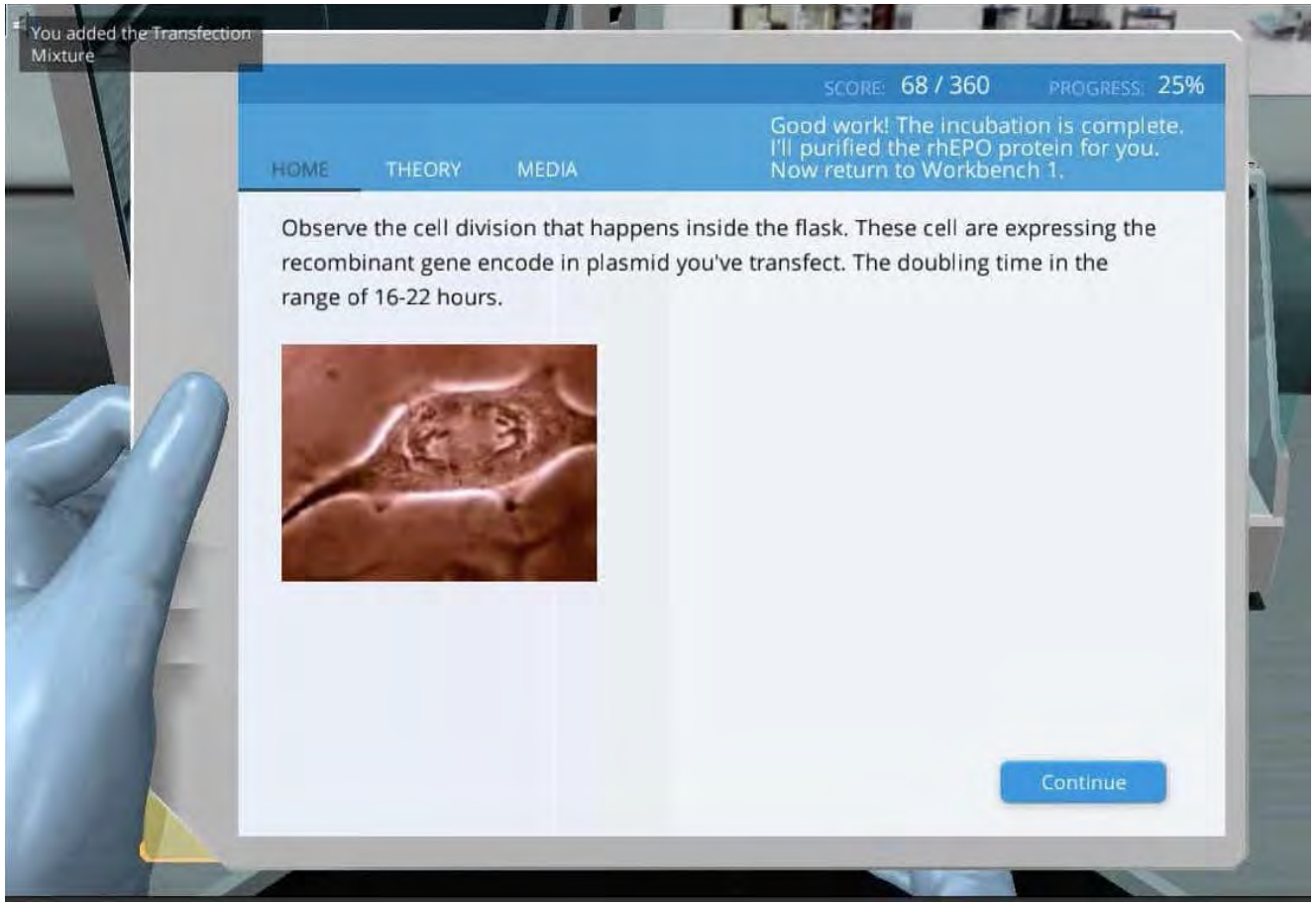
Labster survey



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

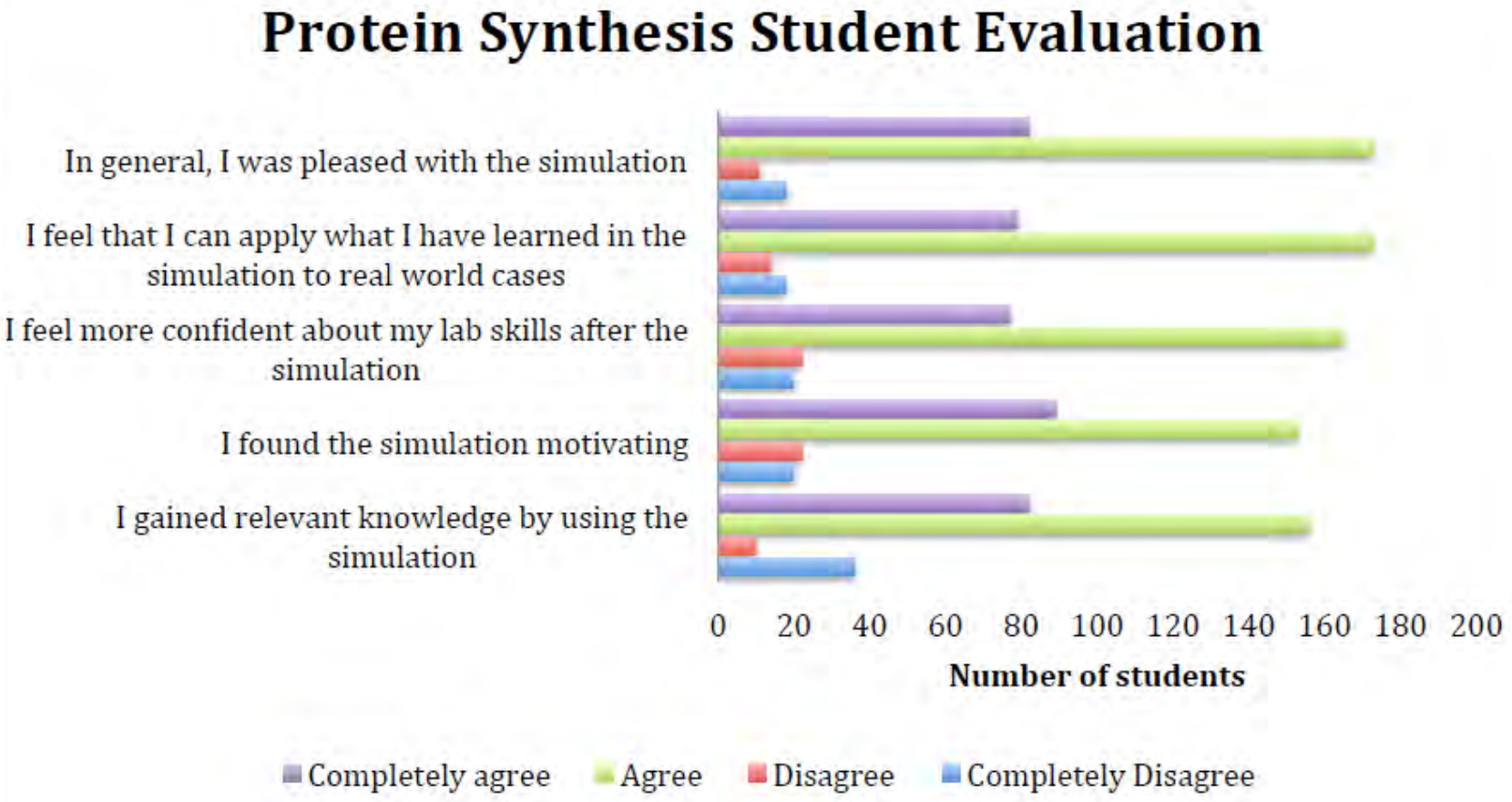


5BIOM010W Research Methods, Protein synthesis



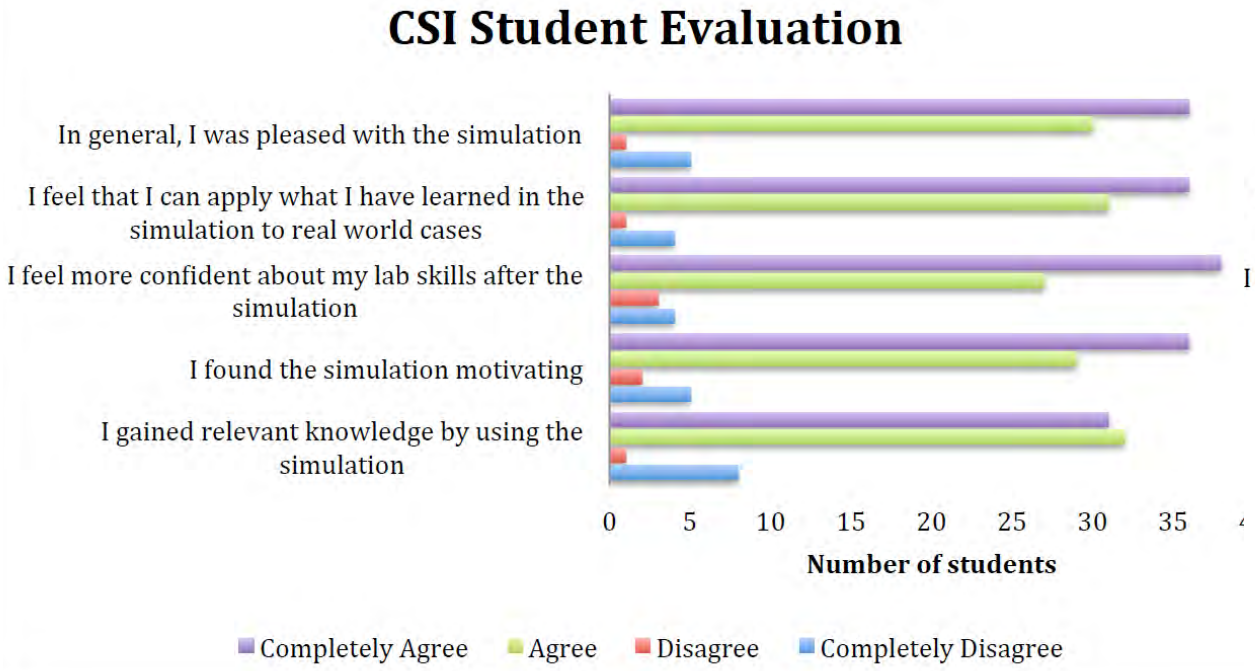
- Scenario based around EPO (Erythropoietin)
- Students purify EPO
- This is linked to EPO drug screening in cyclists

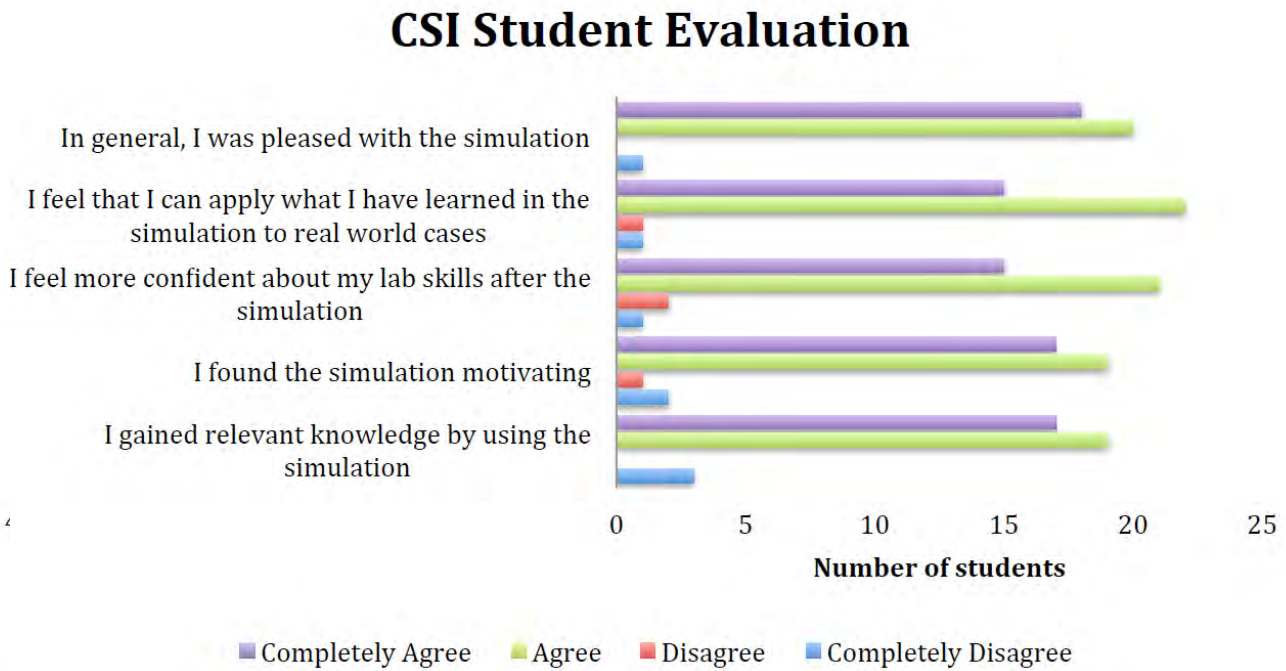
5BIOM010W Research methods



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

CSI evaluation, Labster survey





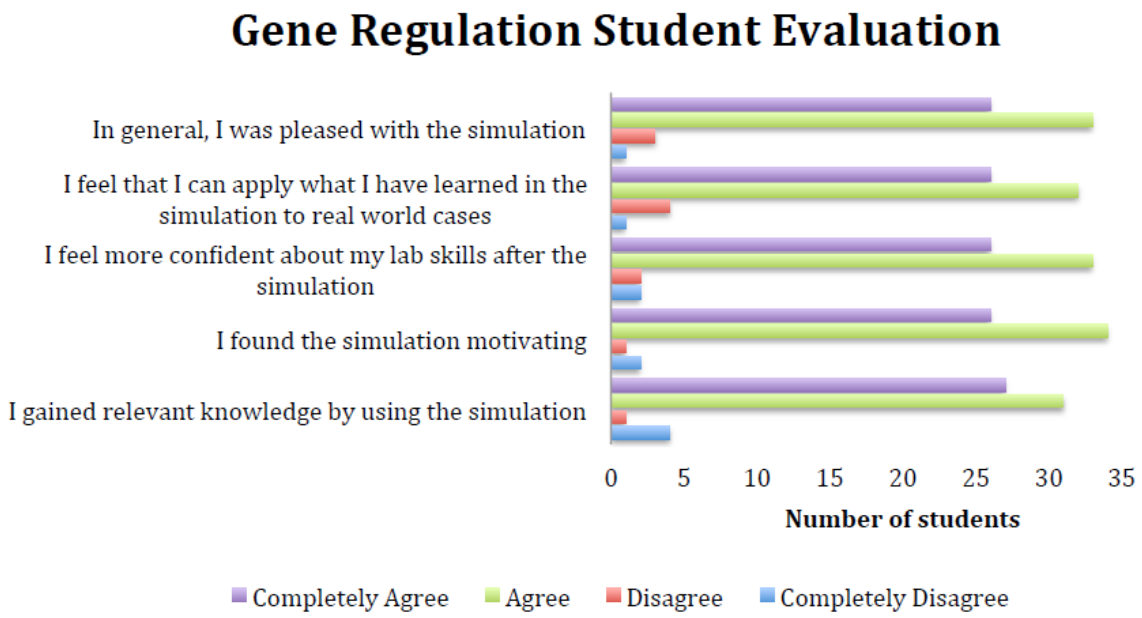
Level 6 FMAB604 DNA in Identity and Disease

N=75, all responded to survey, part of assessment

Level 5 5BIOM010W, Genetics and Genomics

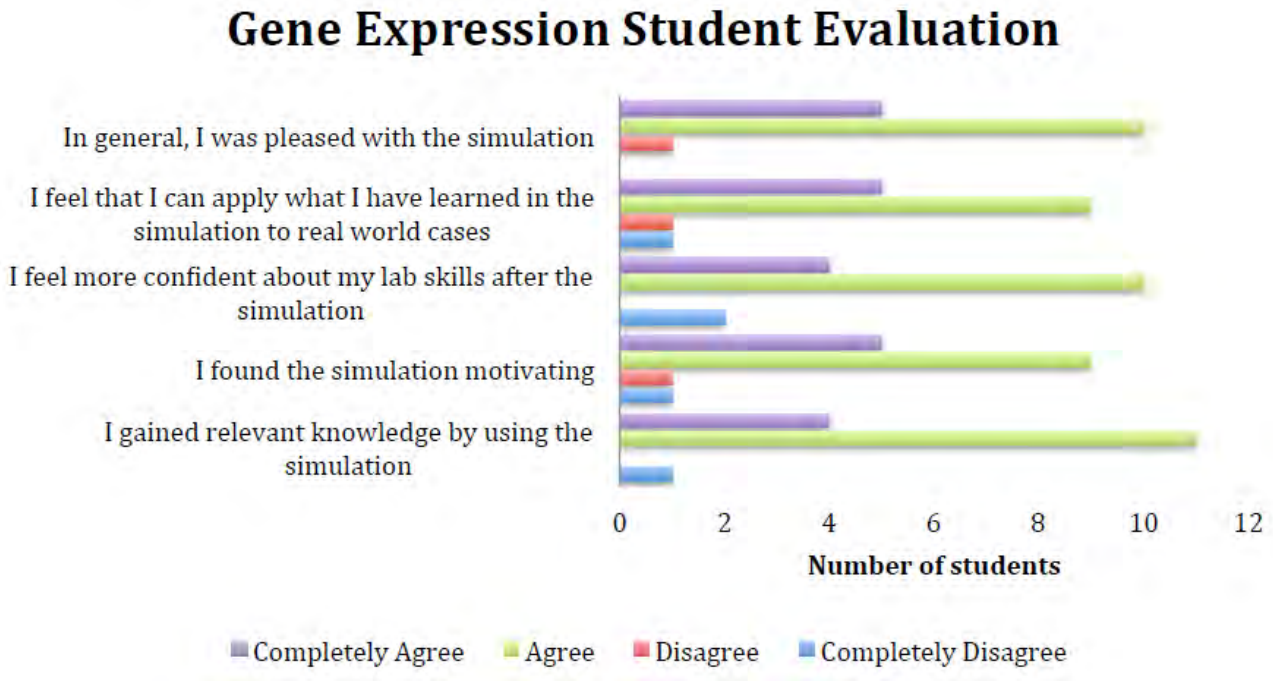
N=68, 35 responded to survey

Gene regulation, Labster survey



Level 6 FMAB604 DNA in Identity and Disease

N=73, all responded to survey, part of assessment

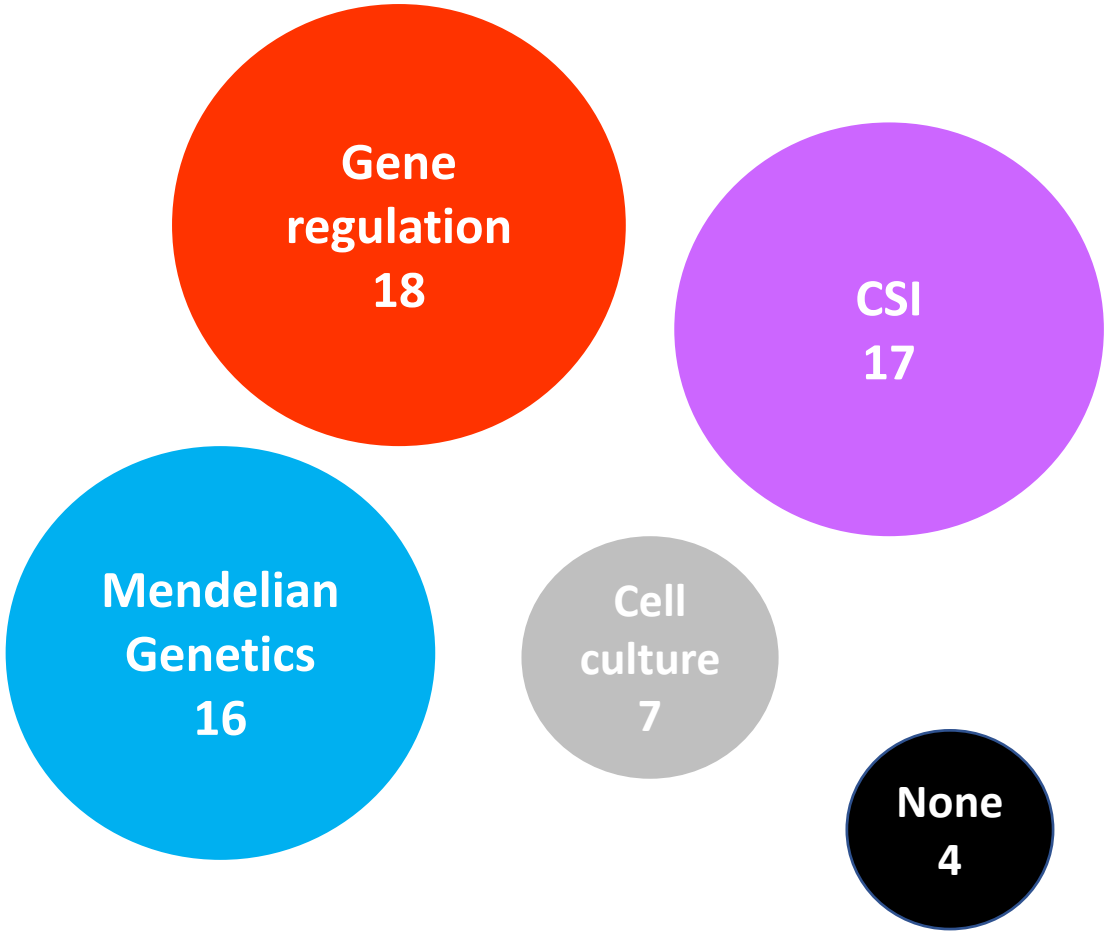


Level 5 5BIOM010W, Genetics and Genomics

N=88, 14 responded to survey

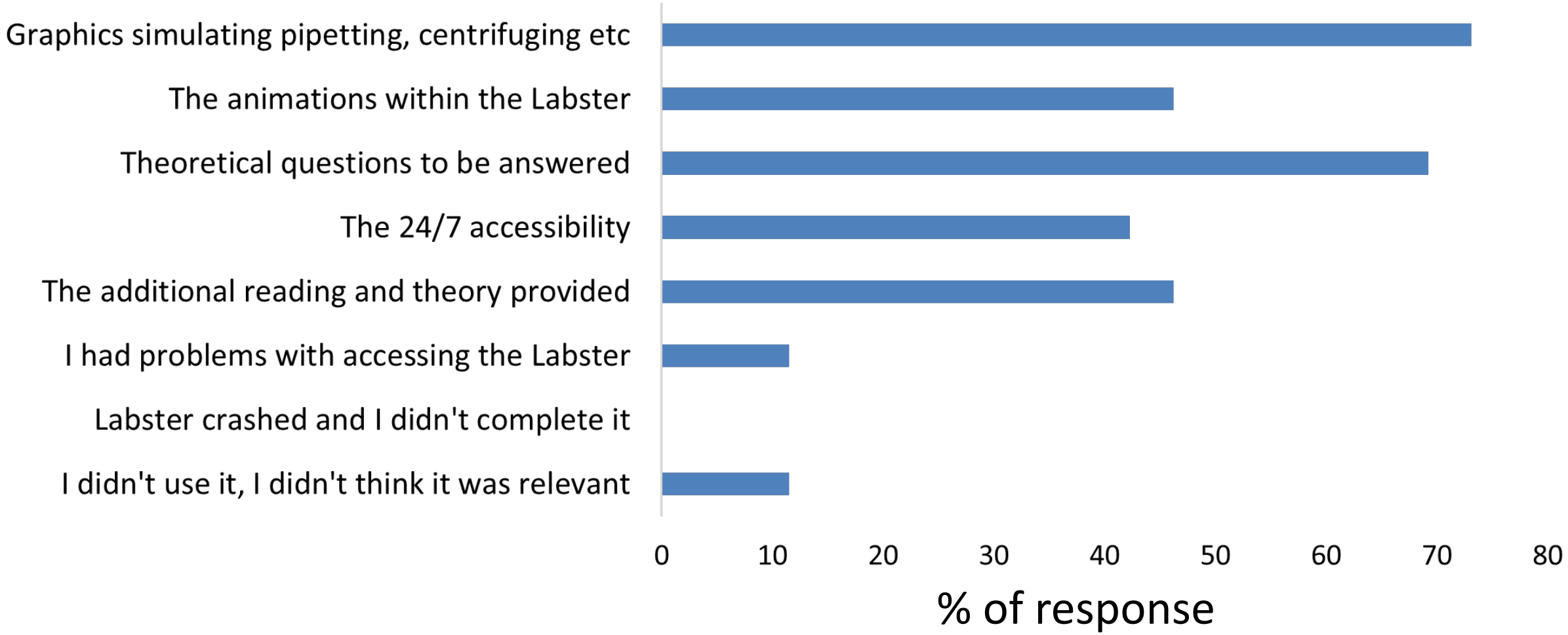
5BICH003W – Molecular Biology and Genetics

- 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

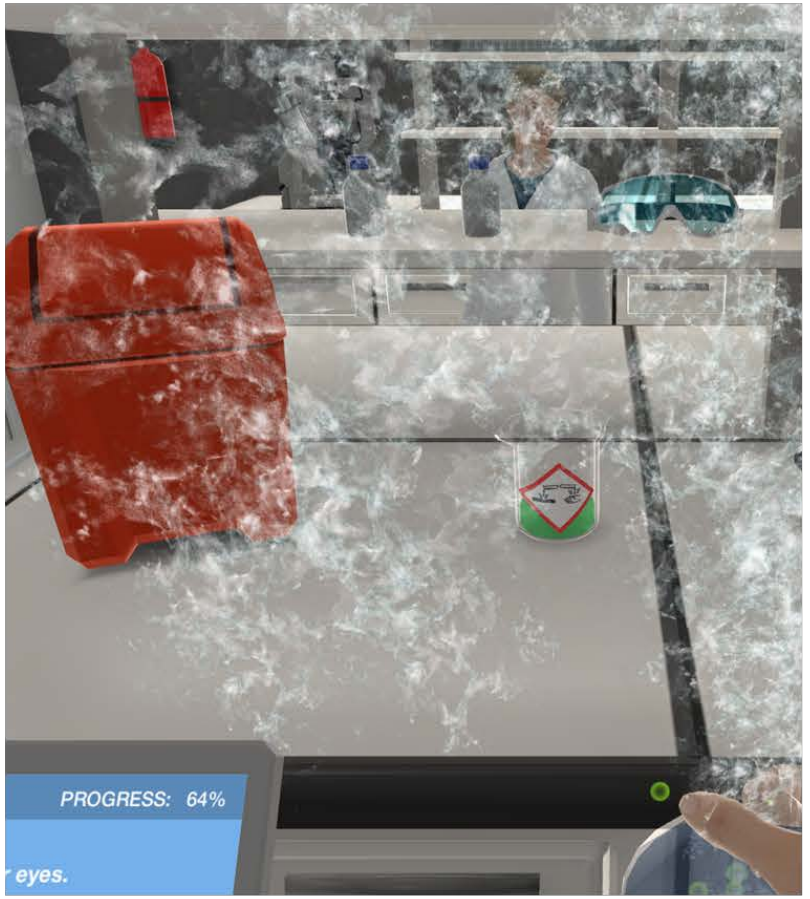


5BICH003W – Molecular Biology and Genetics

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

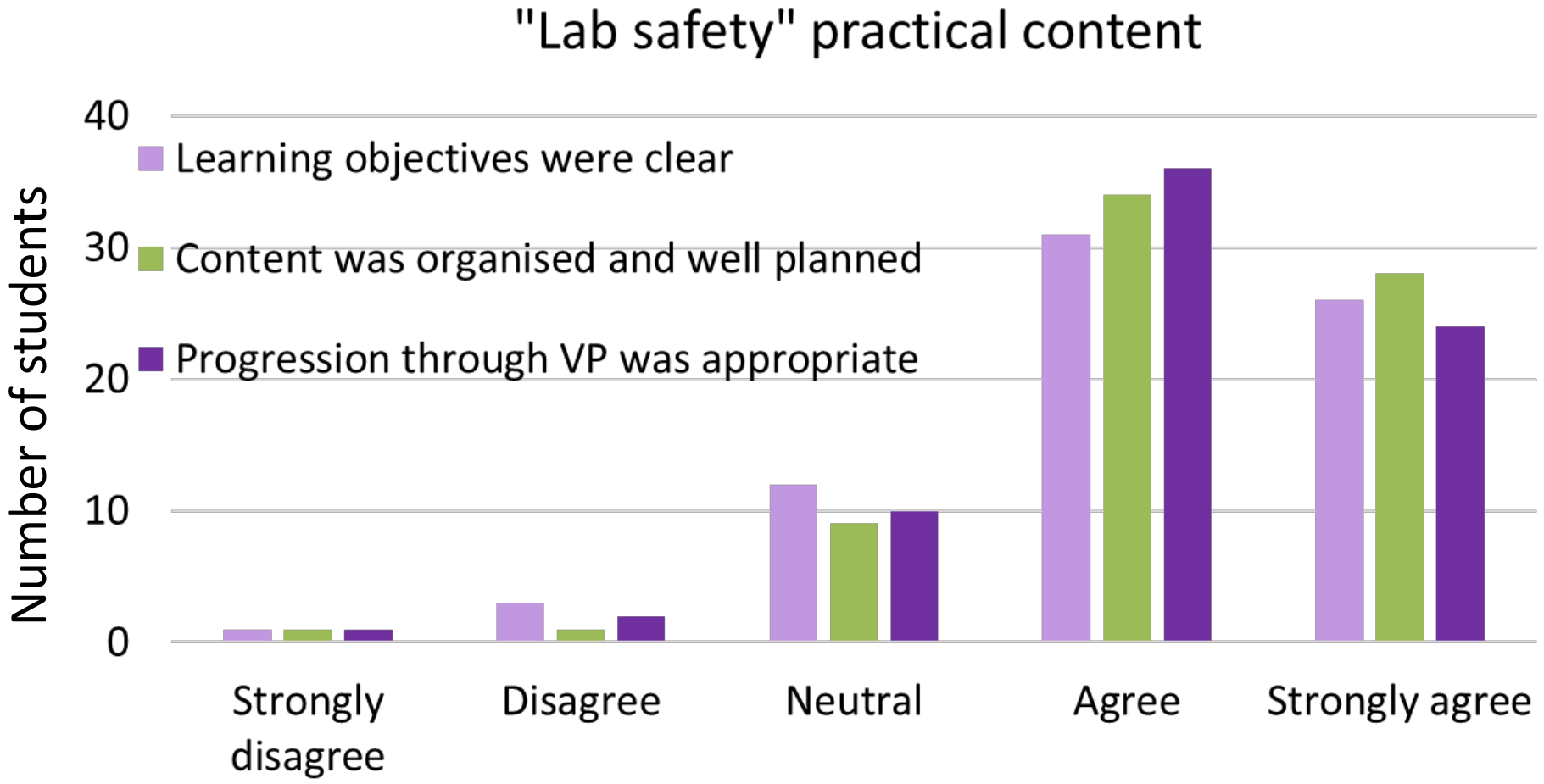


4BICH001W Biochemistry – Lab safety



4BICH001W Biochemistry – Lab safety

- 207 students started, 197 completed, 73 completed survey



4BICH001W Biochemistry – Lab safety

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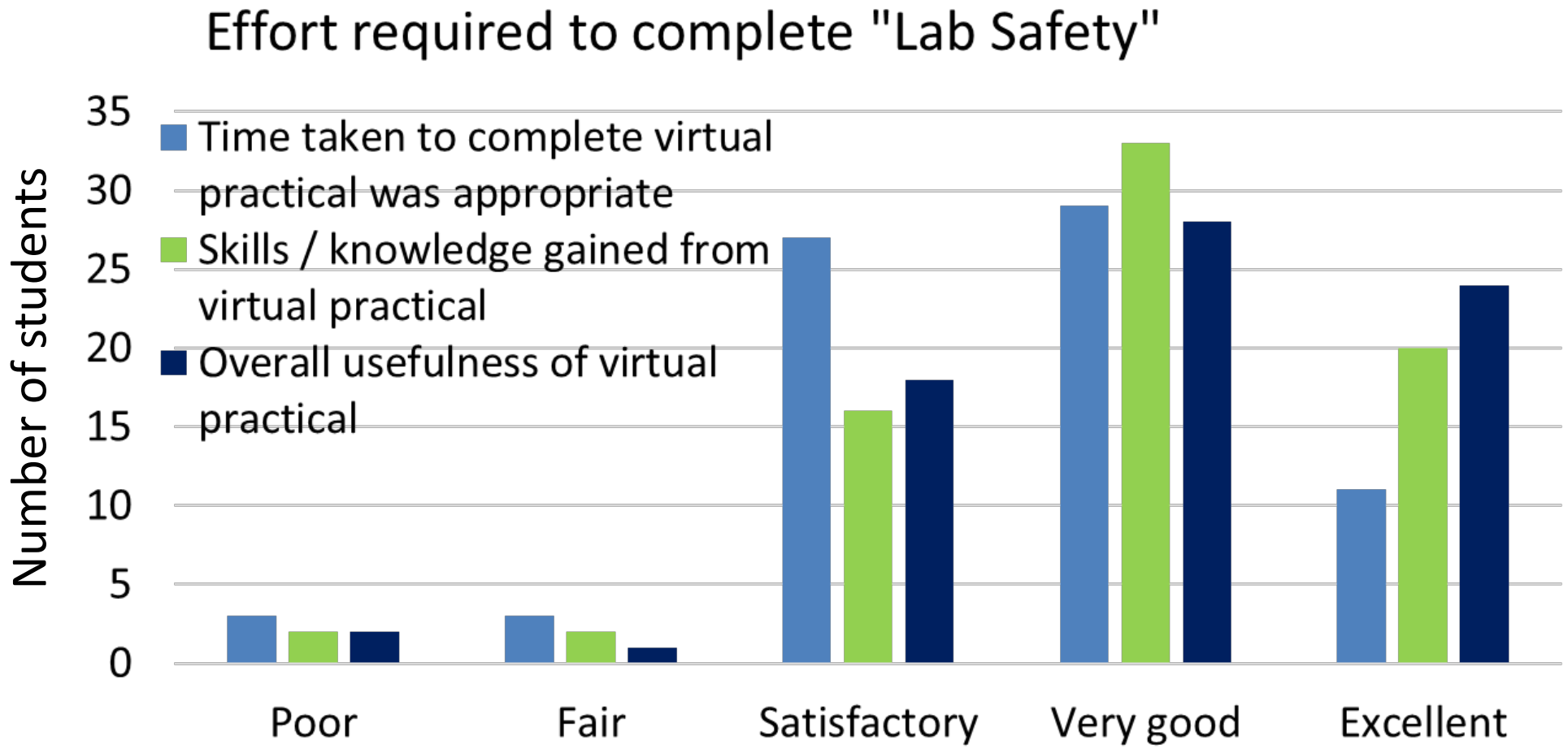
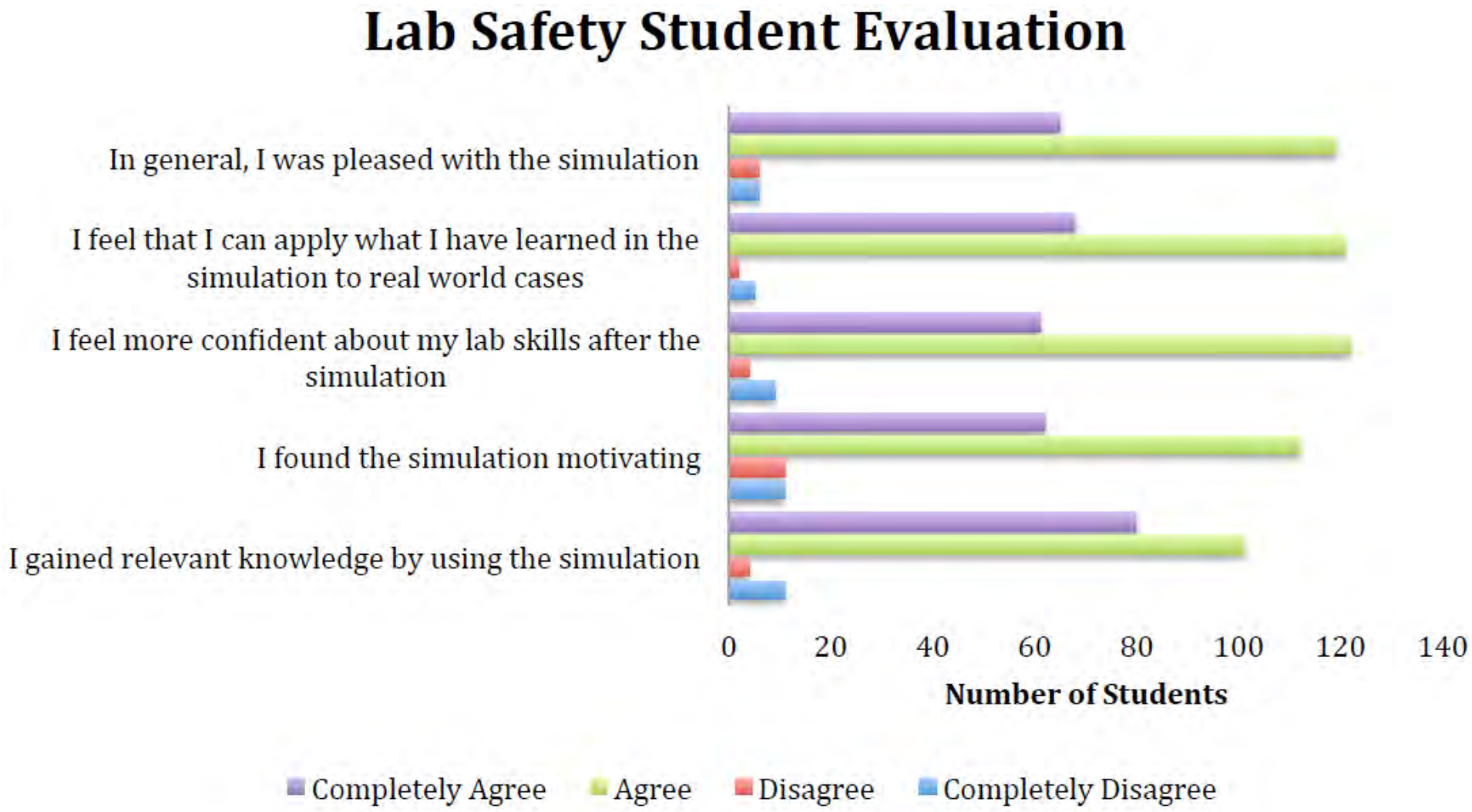


4BICH001W Biochemistry – Lab safety



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)

LABSTER Alexander Skyum Mortensen, Sarah Stauffer, Samuel Butcher

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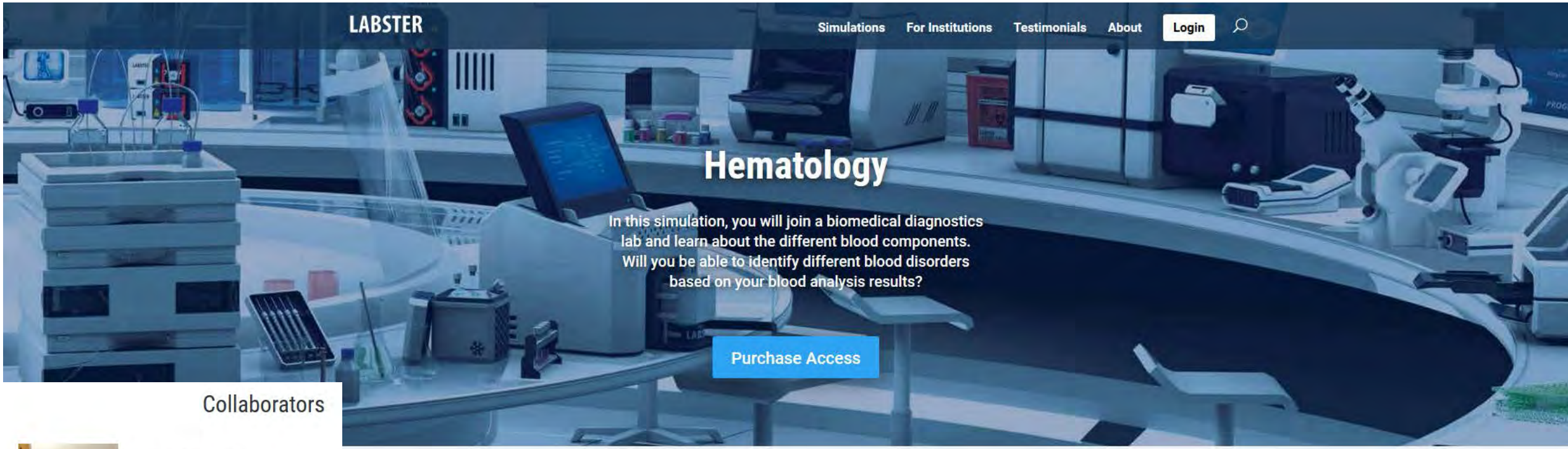

Collaborators

Dr Carol D'Souza
Department of Life Sciences
University of Westminster

Dr Ray Camilleri
Department of Biomedical Sciences
University of Westminster

Dr Chrystalla Ferrier
Department of Life Sciences
University of Westminster

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?

Screenshots

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

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.

Acknowledgments

QUINTIN HOGG TRUST

LABSTER Alexander Skyum Mortensen, Sarah Stauffer, Samuel Butcher

Dr Stephen Getting	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