

**LEARNING AND
TEACHING CONFERENCE**
2021

A Virtual Conference - 5 February 2021.

E-BIOLOGY: AN EMERGING VIRTUAL RESOURCE FOR LEARNING BIOLOGY AND CLINICAL BIOCHEMISTRY

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Chester
Medical School



University of
Chester

Outline

- ✓ **Attrition in STEM programmes**
- ✓ **e-Biology[®]: structure, content and associated components/tools**
- ✓ **How to use it and results**
- ✓ **Conclusions**

Student retention and progression in Higher Education

University student retention and progression → major issues in HE.

HEIs → minimise student drop-out rates and maximise student potential.

- ✓ Financial and reputational reasons.
- ✓ Personal/academic development.
- ✓ Financial considerations of students → in debt early in their adult life.
- ✓ Entry in an undergraduate degree programme → academically capable, with adequate support → can attain degree.

BBC News website (2017).

Available at:

<https://www.bbc.co.uk/news/education-40641971>



The screenshot shows the BBC News website interface. At the top, there is a navigation bar with the BBC logo, a 'Sign in' button, and a search bar. Below this is a red banner with the word 'NEWS' in white. Underneath the banner is a secondary navigation bar with links for Home, UK, World, Business, Politics, Tech, Science, Health, Family & Education, Entertainment & Arts, Stories, and More. The 'Family & Education' link is highlighted. Below this, there are sub-links for 'Family & Education', 'Young Reporter', and 'Global Education'. The main headline reads 'Tackling university drop-out rate 'is vital'' with a timestamp of '19 July 2017'. To the right of the headline are social media sharing icons for Facebook, WhatsApp, Twitter, and Email, along with a 'Share' button. On the far right, there is a 'Top Stories' section with a headline 'UK 'could ban' social media over suicide images' and a sub-headline 'It comes after the father of 14-year-old'.

Coronavirus SARS-CoV-2 pandemic impact in Higher Education

HE students → new added fears + anxiety due to the on-going pandemic.

- ✓ Different university experience.
- ✓ Impacted employment market → loss of thousands of part-time jobs.
- ✓ Difficulty to adapt due to close of schools → transition from lockdown to university

Higher education



The Guardian (2020).

Available at:

<https://www.theguardian.com/education/2020/sep/19/uk-universities-predict-record-student-dropout-rate>

Anna Fazackerley
Sat 19 Sep 2020 08.00 BST



UK universities predict record student dropout rate

Fears that young people have 'lost the discipline of learning' add to students' money worries as part-time jobs dry up

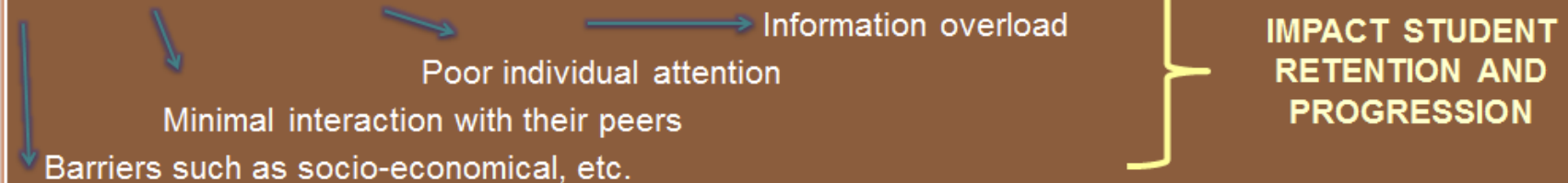


University student drop out: reasons?

University student drop out (UK National Audit Office report, 2007):

- **personal**
- **institutional/course-related issues**
- **financial**

First year University students challenges:



Foy and Keane, 2017.

Available at:

<https://www.tandfonline.com/doi/full/10.1080/0309877X.2017.1311994?scroll=top&needAccess=true>

Articles

Introduction of a peer mentoring scheme within biomedical sciences education – easing the transition to university life

Clare Foy  & Aisling Keane

Pages 733-741 | Received 19 Nov 2015, Accepted 06 Nov 2016, Published online: 31 May 2017

Student retention and progression in BSc Biomedical Science (DMU)

[BSc Biomedical Science \(Hons\)](#) at De Montfort University ([DMU, UK](#)) → failed due to academic circumstances after year 1:

- 17.6% in 2013/14
- 19% in 2014/15



Tackled to improve retention & progression

(Source: DMU reporting software, Tableau).



[COURSES](#) [STUDY](#) [INTERNATIONAL](#) [RESEARCH](#) [BUSINESS](#) [CAMPUS](#) [COMMUNITY](#) [CURRENT STUDENTS](#)



DMU website.

Available at:

<https://www.dmu.ac.uk/about-dmu/quality-management-and-policy/academic-quality/data-management/accessing-the-data.aspx>

About DMU

Department of Academic Quality

Data/management information

Accessing the data

Accessing the data

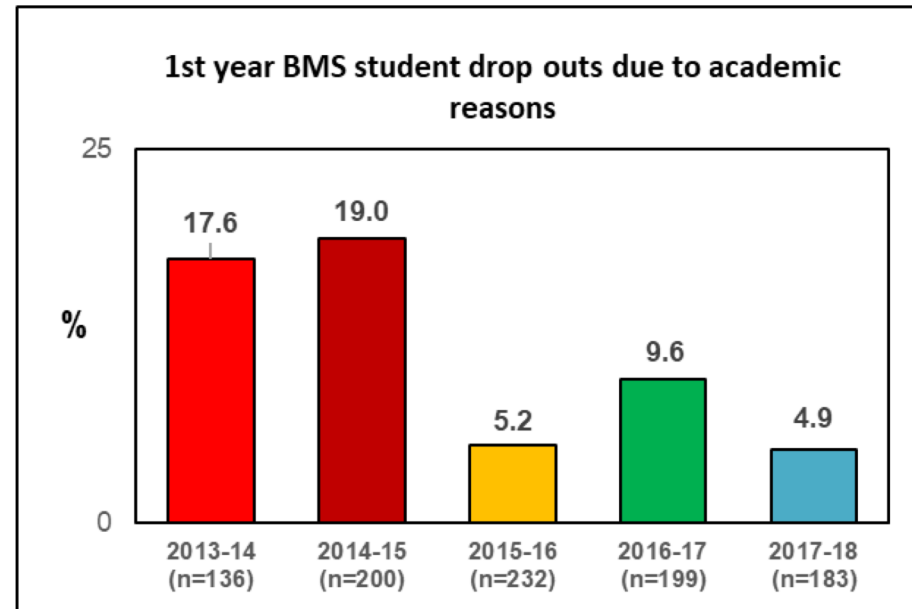
The quantitative data used for quality management purposes is delivered through the reporting software, Tableau. Access for all users is via a secure permission-based account. De Montfort University's (DMU's) collaborative partner institutions (both UK and overseas) are able to view their own performance data remotely. The university's external examiners also have remote access to the data to inform judgements about the appropriateness and comparability of academic standards and



Plan to improve BMS student retention and progression

Strategies to improve retention and progression BMS (DMU, UK) in 2016/17:

- Intensive induction week with social and networking events with academics.
- Increased the number of lectures on foundation in STEM.
- More tutorials and creation of “surgery” hours (weekly drop-in sessions) in each module.



Level 4 BMS student drop outs due to academic reasons
(Source: DMU reporting software, Tableau, January 2019).

Preliminary strategies might have translated into a trend in the reduction of drop outs due to academic circumstances after year 1

Virtual teaching resources

Virtual teaching resources could be useful tools to:

- **Address the increasing shortage of health professionals** (WHO, 2015).
- **Tackle the significant increase of scientific knowledge over the past several years** (Aysan, 2015).
- **Provide long-term impact on student learning and engagement with flexible access** ([Coleman & Smith, 2019](#)).

eLearning for undergraduate health professional education

A systematic review informing a radical transformation of health workforce development



Publication details

Editors: Najeeb Al-Shorbaji, Rifat Atun, Josip Car, Azeem Majeed, Erica Wheeler
Publication date: January 2015
Languages: English
ISBN: 978 92 4 150826 1



Available at:

https://www.who.int/hrh/documents/elearning_hwf/en/

Utility of the virtual laboratory resources and simulation

Virtual lab simulation → an effective supplement to traditional teaching activities for education (de Vries and May, 2019).



Combination of virtual and physical laboratories → **Best practice** (de Jong et al., 2013)

PubMed.gov Save Email Send to Display options

> *Biochem Mol Biol Educ.* 2019 May;47(3):257-262. doi: 10.1002/bmb.21221. Epub 2019 Feb 12.

Virtual laboratory simulation in the education of laboratory technicians—motivation and study intensity

Lisbeth Elvira de Vries¹, Michael May²

FULL TEXT LINKS

WILEY Full Text Article

ACTIONS

Cite

Available at: <https://pubmed.ncbi.nlm.nih.gov/30748084/>

Review > *Science.* 2013 Apr 19;340(6130):305-8. doi: 10.1126/science.1230579.

FULL TEXT LINKS

Physical and virtual laboratories in science and engineering education

Ton de Jong¹, Marcia C Linn, Zacharias C Zacharia

Available at: <https://pubmed.ncbi.nlm.nih.gov/23599479/>

Science AAAS

DMU e-Biology: development

DMU e-Biology → development

DMU graphic designers are collaborating with academics and biomedical scientists registered by the HCPC (UK Health and Care Professions Council).

Development started in summer of 2017 → will cover the specifications for AS and A level described by the Assessment and Qualifications Alliance ([AQA, 2019](#)) for human biology.

Methods used → similar to those described to develop DMU e-Parasitology (Peña-Fernández et al., 2017).

Appears in:
ICERI2017 Proceedings
([browse](#))
Pages: 1582-1587
Publication year: 2017
ISBN: 978-84-697-6957-7
ISSN: 2340-1095
doi: 10.21125/iceri.2017.0498

BUILDING A DMU E-BIOLOGY RESOURCE FOR HEALTH SCIENCES' STUDENTS

A. Peña-Fernández¹, T. Sgamma¹, C. Young², M.J. Randles¹, C. Del Águila³, C. Hurtado³, M. Evans¹, N. Potiwat¹, F. Izquierdo³, M.A. Peña⁴, J. Coope⁵, M. Armstrong⁵, A. Bhambra¹

Available at:

<https://library.iated.org/view/PENAFERNANDEZ2017BUI>

DMU e-Biology



BMS students require basic support in STEM subjects → *e.g.* BTEC routes.

Chemistry/biochemistry modules → particularly challenging and often causing stress.

DMU e-Biology

→ developing a complete e-learning package designed to enhance learning and underpin the fundamental concepts of biology and biochemistry

→ Available on the DMU website in 2020 here

(Image courtesy of DMU; Peña-Fernández A, 2020):

<http://parasitology.dmu.ac.uk/ebiology/index.htm>



Overview of the **DMU e-Biology** home page (Image courtesy of DMU; Peña-Fernández et al., 2019).

Available at: <http://parasitology.dmu.ac.uk/ebiology/index.htm>

DMU e-Biology: structure

DMU e-Biology has the following modules [More details have been described in Peña-Fernández et al. (2017)]:

- **A theoretical module** with mini e-learning units that cover the basic Biology/Chemistry and related concepts delivered across our programmes.
- **A virtual laboratory module** with engaging and interactive units about different biomedical techniques.
- **A virtual microscope module** with virtual histology slides.
- **A module with virtual clinical case studies.**

Appears in:
ICERI2017 Proceedings
([browse](#))
Pages: 1582-1587
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Available at:

<https://library.iated.org/view/PENAFERNANDEZ2017BUI>

DMU e-Biology: *theoretical module*

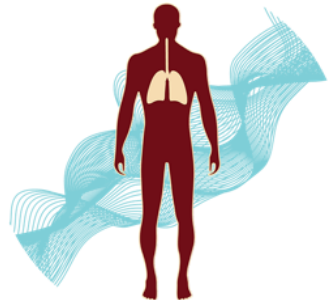
Biology Units



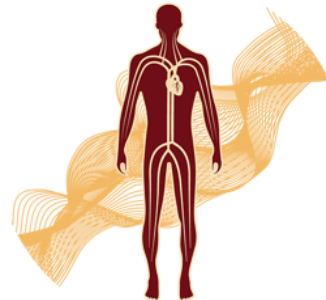
Anatomy & Physiology



The Digestive System



The Respiratory System ✓



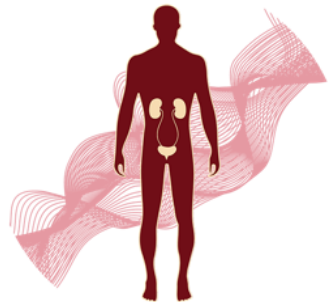
The Circulatory System ✓



The Nervous System ✓



The Sense Organs



The Excretory System ✓



The Endocrine System



The Musculoskeletal System

eBiology

Learning Resources for the Study of Biology

Overview of the **DMU e-Biology's theoretical module** (Image courtesy of DMU; Peña-Fernández et al., 2021).

Available at: <http://parasitology.dmu.ac.uk/ebiology/index.htm>

DMU e-Biology: *theoretical module*

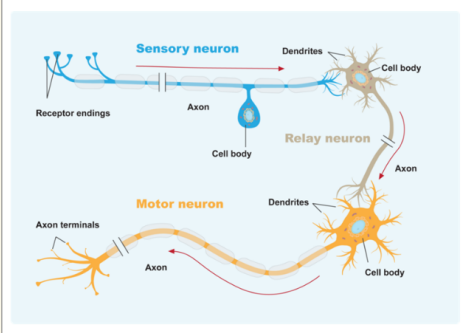
Menu Glossary

- Functions of a Nervous system
- Organisation of a Nervous system
 - 2.1 Basic organisation of nervo...
 - 2.2 Neurons
 - 2.3 Structure of Neurons
 - 2.4 Function of Neurons
 - 2.5 Types of Neurons
 - 2.6 Basic function of nervous sy...
 - 2.7 Basic function of nervous sy...
 - 2.8 Functional divisions of PNS
- Autonomic nervous system
 - 3.1 Division and effects of auto...
 - 3.1 Division and effects of auto...
- Resting Membrane Potential
 - Resting Membrane Potential
 - 4.1 What is resting membrane...
 - 4.2 How resting membrane pot...
- Action Potential
 - Action Potential
 - 5.1 What is action potential
 - 5.1 Key players in action potential
 - 5.1 Different phases of an actio...
- Synapses
 - 6.1 Synaptic transmission

Search...

Functions of a Nervous System

Resources



2.5 Types of Neurons

Sensory neurons carry signals from sense organ to the spinal cord and brain

Relay neurons carry messages from one part of the CNS to another

Motor neurons carry signals from the CNS to effectors

Figure 2.5 Schematic illustration showing the structure of three types of neurons and the connection between them. The green arrows indicate the direction of the flow of the nerve impulses.

The DMU eBiology Project – A European Collaboration.
Funded by De Montfort University (DMU). Copyright 2018 [De Montfort University](#). All rights reserved.

PREV NEXT


Menu Glossary

- Start
- 1. Overview
- 2. Detoxification
- 3. Urine production filtration
- 4. Urine production reabsorption and...
- End of Unit Test
 - Question 1
 - Question 2
 - Question 3

Search...

DMU Biology Series: The excretory system

Resources



The excretory system

End of Unit Test

Question 3

Move the terms and drop below their organ.

Liver **Kidney**

Match these terms to the organ:

- Podocytes
- Glomeruli
- Bile production
- Erythropoietin production
- Hepatocytes
- Renin production
- Angiotensinogen production
- Conversion of ammonia to urea
- Nephrons
- Urine production
- The urea cycle

The excretory system: The DMU eBiology Project – A European Collaboration.
Funded by De Montfort University (DMU). Copyright 2017 [De Montfort University](#).

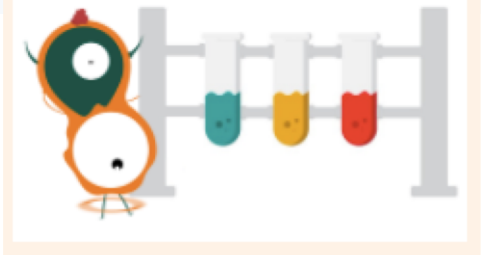
SUBMIT

Overview of two e-learning units in the **DMU e-Biology's Theoretical Module displaying a formative assessment** (Images courtesy of DMU; Peña-Fernández et al., 2019).

Available at: http://parasitology.dmu.ac.uk/ebiology/units/Nervous%20System/story_html5.html and http://parasitology.dmu.ac.uk/ebiology/units/excretory-system/story_html5.html

DMU e-Biology: *virtual laboratory module*

Virtual Laboratory



Units developed so far related to medical histology:

- **Microtome and tissue sample.**
- **Tissue sample staining.**

Overview of the **DMU e-Biology Virtual Laboratory module**

(Image courtesy of DMU; Peña-Fernández et al., 2021).

Available at:

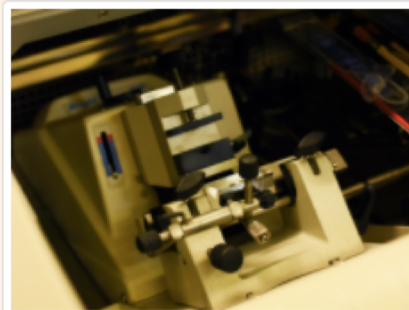
http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm

The Virtual Laboratory

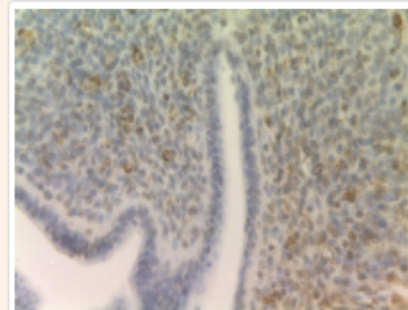
Histology



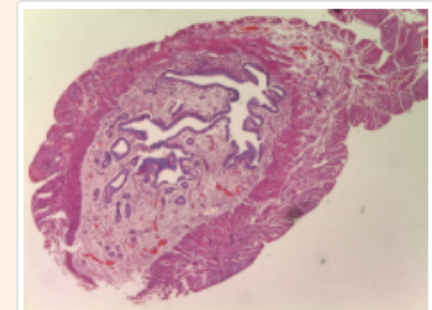
Histology Technique ✓



Staining Methods ✓



PAS Stain ✓



H&E Stain ✓

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Combination of virtual and physical laboratories → **Best practice** (de Jong et al., 2013)

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Science AAAS

Available at:
<https://pubmed.ncbi.nlm.nih.gov/23599479/>

DMU e-Biology laboratory: *microtome and tissue sample*

Menu Glossary

- ▶ Histology Technique
- ▶ Histology
- ▼ Microtomy
 - Microtomy
 - 3.1 Microtomy (a)
 - 3.1 Microtomy (b)**
 - 3.2 Microtomy: Frozen tissue (a)
 - 3.2 Microtomy: Frozen tissue (b)
 - 3.3 Microtomy technique (a)
 - 3.3 Microtomy technique (b)
- ▼ Protocol
 - Protocol
 - Step 1 - Tissue block placed on th...
 - Step 2 - Thin sections of the tissue
 - Step 3 - Sections collected using a...
 - Step 4 - Transported to bath of wa...
 - Step 5 - Glass slide under water le...
 - Step 6 - Sections placed inside an...

Histology Technique Resources

Histology Technique



3.1 Microtomy

Figure 3.1: Microtome (Image courtesy of DMU e-Biology, Peña-Fernandez, 2018).

The DMU eBiology Project – A European Collaboration.
Funded by De Montfort University (DMU). Copyright 2018 De Montfort University. All rights reserved.

Search...


◀ PREV NEXT ▶

Menu

- ▶ Histology Technique
- ▶ Histology
- ▼ Microtomy
 - Microtomy
 - 3.1 Microtomy (a)
 - 3.1 Microtomy (b)
 - 3.2 Microtomy: Frozen tissue (a)
 - 3.2 Microtomy: Frozen tissue (b)
 - 3.3 Microtomy technique (a)
 - 3.3 Microtomy technique (b)**
- ▶ Protocol

Histology Technique Resources

Histology Technique



3.3 Microtomy technique

When rotating the operation handle, the advancing mechanism (behind the specimen holder) moves the tissue block for a predetermined distance (usually measured in µm) until it comes in contact with the blade...

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Search...

◀ PREV NEXT ▶

Overview of the **DMU e-Biology Histology Technique unit and H&E unit** (Images courtesy of DMU; Peña-Fernández et al., 2019).
Available at: http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm

Appears in:
ICERI2018 Proceedings
([browse](#))

Pages: 5218-5222
Publication year: 2018
ISBN: 978-84-09-05948-5
ISSN: 2340-1095
doi: 10.21125/iceri.2018.2202

HISTOLOGY RESOURCES FOR PROMOTING BLENDED LEARNING

A. Peña-Fernández¹, I. Ramos¹, C. Young¹, D. Gray¹, M. Evans¹, M. Randles¹, L. Zhu¹, M.C. Lobo-Bedmar²

¹De Montfort University, Faculty of Health and Life Sciences (UNITED KINGDOM)

²IMIDRA, Departamento de Investigación Agroambiental (SPAIN)

Available at:

<https://library.iated.org/view/PENAFERNANDEZ2018HIS>

DMU e-Biology laboratory: *e-learning units structure*

Menu – index of the unit

- Menu
- Glossary
- Overview
 - Histology
 - Objective
 - Navigation Instructions
- Histology
 - Histology (a)
 - 2.1 Histology (b)
 - 2.2 Histology (c)
 - 2.3 Fixation (a)
 - 2.4 Fixation (b)
 - 2.5 Processing
 - 2.6 Key Stages
 - 2.7 Embedding
 - 2.8 Orientation (a)
 - 2.9 Orientation (b)
- Microtomy
 - Microtomy (a)
 - 2.1 Microtomy (b)
 - 2.2 Microtomy (c)**
 - 2.3 Microtomy: Frozen tissue (b)
 - 2.5 Microtomy: Frozen tissue (b)
 - 2.4a Microtomy technique (a)
 - 2.4b Microtomy technique (b)

Image of equipment (microtome). Red circles display individual components in detail when mouse hovers over item

Navigation buttons

Overview of the **DMU e-Biology Histology Technique unit** (Image courtesy of DMU; Peña-Fernández et al., 2019).
Available at: http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm

DMU e-Biology laboratory: *e-learning units structure*

Menu

- ▶ Overview
- ▼ Kinyoun Stain
 - Kinyoun Stain
 - 2.1 Methanol 5-10min
 - 2.2 Dry Methanol
 - 2.3 Solution Kinyoun
 - 2.4 Wash Kinyoun
 - 2.5 Wash H2SO4
 - 2.6 Malachite Green 5min
 - 2.7 Wash Malachite Green
- ▼ Protocol
 - Protocol
 - Step 1 - Methanol
 - Step 2 - Dry Methanol
 - Step 3 - Solution Kinyoun
 - Step 4 - Wash Kinyoun
 - Step 5 - Wash H2SO4
 - Step 6 - Malachite Green
 - Steps 7-8 - Wash Malachite Green

Kinyoun 1 Resources

DE MONTFORT UNIVERSITY LEICESTER Kinyoun

2.1 Methanol 5-10min

1. Prepare the specimen smear. Smears should be air dried and fixed in methanol for 5 minutes prior to staining.

The DMU [eParasitology](#) Project – A European Collaboration. Funded by De Montfort University (DMU). Copyright 2018 [De Montfort University](#). All rights reserved.

Navigation buttons

Overview of one of the DMU e-Parasitology staining units (**Kinyoun stain**) displaying the structure (Image courtesy of DMU). Available at: http://parasitology.dmu.ac.uk/learn/lab/Kinyoun/story_html5.html

DMU e-Biology: staining methods

Content:

- Videos of technique.
- Protocols and procedures.

Menu Glossary

- ▶ PAS Stain
- ▶ PAS
- ▼ Protocol
- Protocol
- Step 1 - Slides are placed in a c...
- Step 2 - Tissues hydrated after ...
- Step 3 - Remove the slide
- Step 4 - Remove slide from the ...
- Step 5 - Process repeated
- Step 6 - Incubate the tissue in a...
- Step 7 - Place the tissue sampl...
- Step 8 - After one minute remov...
- Step 9 - Place a few drops of 1...
- Step 10 - Drain the excess solu...
- Step 11 - Rinse well with wash ...
- Step 12 - Add a few drops of Sc...
- Step 13 - Purple magenta colou...
- Step 14 - Make up two fresh Sc...
- Step 15 - Drain the excess of S...
- Step 16 - Slide is then removed
- Step 17 - Tissue section needs ...**
- Step 18 - Leave for 5 minutes a...
- Step 19 - Tissue section moved...
- Step 20 - Before placing it in an...
- Step 21 - Section is ready for cl...
- Step 22 - Tissue section ready L...
- Step 23 - Swirl mounting mediu...
- Step 24 - Place mounting medi...


Search...

PAS Stain Resources

DE MONTFORT UNIVERSITY LEICESTER

PAS Stain

Step 17 – Tissue section needs to be rehydrated



Min 7: As we will be using a resinous mountant, t
So the first step is to incubate it in 70% ethanol f

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Funded by De Montfort University (DMU). Copyright 2018 De

Overview of the **DMU e-Biology**
Histology Technique unit and H&E unit
(Images courtesy of DMU; Peña-
Fernández et al., 2019).

Available at:

http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm

Menu

- ▶ H&E Stain
- ▼ H&E
- H&E
- 2.1 H&E
- 2.2 Recap
- 2.3a H&E; How does it work?
- 2.3b H&E; How does it work?
- 2.4 Haematoxylin
- 2.5 Haematein
- 2.6 Mordant
- 2.7 Types of Haematoxylin
- 2.8 Haematoxylin Staining can be:
- 2.8 Haematoxylin Staining can be:
- 2.8 Haematoxylin Staining is: Regr...
- 2.8 Haematoxylin Staining: Progre...
- 2.9 Eosin
- 2.10 Eosin Staining
- 2.11 H&E Staining technique
- 2.11 H&E Staining technique**
- ▶ Protocol


Search...

H&E Stain Resources

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H&E Stain

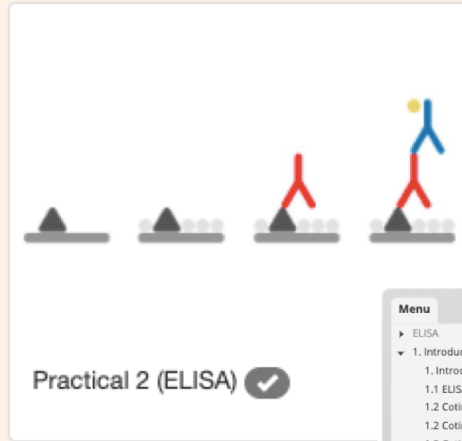
2.11b H&E Staining technique



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DMU e-Biology laboratory: *clinical biochemistry practicals*

Clinical Biochemistry



Menu


- ▶ ELISA
 - 1. Introduction & Background
 - 1.1 Introduction & Background
 - 1.1 ELISA
 - 1.2 Cotinine
 - 1.2 Cotinine
 - 1.2 Cotinine
 - 1.2 Cotinine
 - 1.2 Cotinine
 - 1.3 ELISA - Small Molecules
 - 1.3 ELISA - Small Molecules
 - ▶ 2. Cotinine ELISA
 - ▼ 3. Cotinine ELISA Practical Work
 - 3. Cotinine ELISA Practical Work
 - 3.1 Standards
 - 3.2 Blocking Buffer
 - 3.3 Plate Layout/Washing
 - 3.4 Sample Loading Wells
 - 3.5 Primary Antibody
 - 3.6 Secondary Antibody
 - 3.7 Substrate Addition
 - 3.8 Reading the Plate
 - ▼ 4. Cotinine ELISA Results
 - 4. Cotinine ELISA Results
 - 4.1 Results
 - 4.2 Interpreting the Results
 - 4.2 Interpreting the Results

ELISA

DE MONTFORT UNIVERSITY
LEICESTER

3. Cotinine ELISA Practical Work

3.5 Primary Antibody



00:08 / 00:38

ELISA : The DMU eBiology Project- A European Collaboration.
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◀ PREV NEXT ▶

Overview of the [DMU e-Biology Clinical Biochemistry practicals](http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm) (Images courtesy of DMU; Peña-Fernández et al., 2021).

Available at: http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm

DMU e-Biology laboratory: *clinical biochemistry practicals*

*Populated with quizzes,
formative questions and
exercises:*

→ facilitate audience
engagement and active
learning

The screenshot displays the DMU e-Biology laboratory interface. On the left is a 'Menu' sidebar with a tree structure. The main content area is titled 'ELISA' and shows the '2.2 ELISA Plate Setup' section. A 12x12 grid represents an ELISA plate. A blue box on the right contains text: 'Negative control = serum sample with no cotinine' and 'Blank = PBS only'. Below this is a question: '4. What is the purpose of these?'. The interface includes a De Montfort University Leicester logo, a footer with project information, and navigation controls at the bottom.

Menu

- ELISA
 - 1. Introduction & Background
 - 1.1 ELISA
 - 1.2 Cotinine
 - 1.2 Cotinine
 - 1.2 Cotinine
 - 1.3 ELISA - Small Molecules
 - 1.3 ELISA - Small Molecules
 - 2. Cotinine ELISA
 - 2.1 Cotinine ELISA - Assay Prin...
Quiz
 - Question 1
 - Question 2
 - Question 3
 - Question 4
 - 2.2 ELISA Plate Setup**
 - 2.2 ELISA Plate Setup
 - 2.4 Cotinine Standard Curve
 - 2.4 Cotinine Standard Curve
 - 2.3 Cotinine Samples
 - 3. Cotinine ELISA Practical Work
 - 3. Cotinine ELISA Practical Work
 - 3.1 Standards
 - 3.2 Blocking Buffer
 - 3.3 Plate Layout/Washing
 - 3.4 Sample Loading Wells
 - 3.5 Primary Antibody
 - 3.6 Secondary Antibody

ELISA

ELISA
2. Cotinine ELISA

2.2 ELISA Plate Setup

- The plate should contain the 4 samples (A to D), the standards and the controls (negative control and blank), in duplicate.

Negative control = serum sample with no cotinine
Blank = PBS only

4. What is the purpose of these?

ELISA : The DMU eBiology Project– A European Collaboration.
Funded by De Montfort University (DMU). Copyright 2020 [De Montfort University](http://www.dmu.ac.uk). All rights reserved.

◀ PREV NEXT ▶

Overview of the [DMU e-Biology Clinical Biochemistry ELISA practical](http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm) (Image courtesy of DMU; Peña-Fernández et al., 2021).
Available at: http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm

DMU e-Biology: *virtual microscope module*

Virtual microscope module → with a real slide collection of tissue sample slides.

Virtual microscope benefits (Peña-Fernández et al., 2018):

- remote access to slides of high clinical quality for all users.
- could facilitate the acquisition of problem-solving skills .



Overview of a digitised histology slide in the **DMU e-Biology** (Image courtesy of DMU; Peña-Fernández et al., 2019).
Available at: http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm

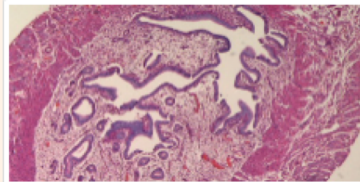
DMU e-Biology: *virtual microscope module*

The Virtual Microscope

Tissue



Uterus (Immunohistochemistry)



Uterus (H&E)



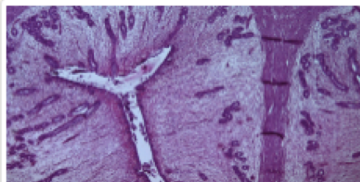
Slide 3



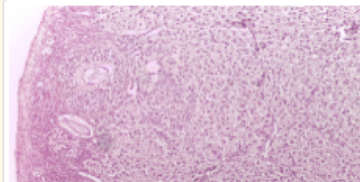
Slide 4

Anatomy & Physiology

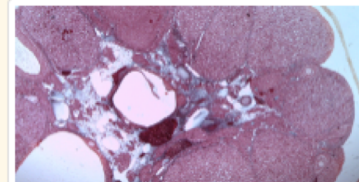
The Reproductive System



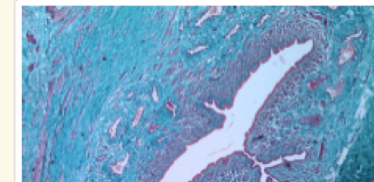
Cervix, mammal (H&E), x40



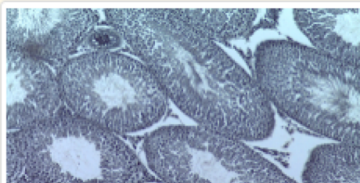
Ovary, mammal (H&E), x100



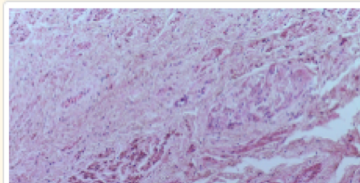
Ovary, pregnant (T.S)



Penis massons trichrome, x40



Testis spermatogenesis, x100



Vagina, human (H&E), x100

Overview of a digitised histology slide in the **DMU e-Biology** (Image courtesy of DMU; Peña-Fernández et al., 2019).

Available at:

http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm

DMU e-Biology: *virtual microscope module*

Uterus, (immunohistochemistry)



Zoom Out Zoom In Pan Left Pan Up Pan Down Pan Right Reset Full View Help

x40 stained using immunohistochemistry for smooth muscle alpha actin (Mouse Uterus). This staining methods distinguishes the muscular myometrium (brown) from the endometrium (haematoxylin/blue).

(Credit: DMU eBiology Group, De Montfort University)

Overview of a digitised histology slide in the **DMU e-Biology** (Image courtesy of DMU; Peña-Fernández et al., 2019).

Available at: http://parasitology.dmu.ac.uk/ebiology/biologyLaboratory_units.htm

DMU e-Biology: *virtual case studies module*

Virtual case studies → interactive,
with different degrees of difficulty
→ facilitates the acquisition of
clinical and parasitology skills
including key transversal
competences (*e.g.* critical
thinking, problem-solving skills).

Students can use the virtual
microscope to resolve the case
studies.



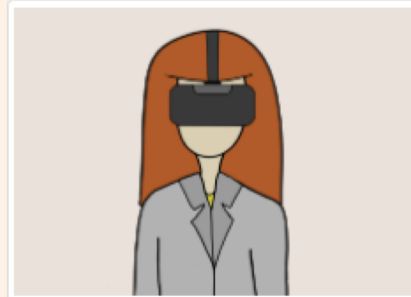
Overview of the **DMU e-Biology Virtual Case Studies module** (Images courtesy of DMU; Peña-Fernández et al., 2021).
Available at: http://parasitology.dmu.ac.uk/ebiology/units/case-study01/story_html5.html

Virtual Case Studies

Mini Case Studies



Mini Case study 1: Kidney ✓



Mini Case study 2: Liver ✓

Case Studies



Case study 1 ✓



Case study 2 ✓



Case study 3 ✓

Overview of the **DMU e-Biology Virtual Case Studies** module (Images courtesy of DMU; Peña-Fernández et al., 2021). Available at: http://parasitology.dmu.ac.uk/ebiology/units/case-study01/story_html5.html

DMU e-Biology: *other resources*



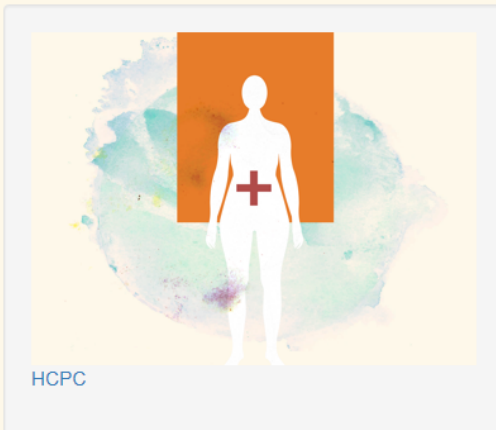
eBiology

Learning Resources for the Study of Biology

Home Modules ▾ About HCPC The Team Publications Contact

HCPC

Brief Overview



Overview of the **DMU e-Biology HCPC section**
(Images courtesy of DMU; Peña-Fernández et al., 2019).

Available at:

http://parasitology.dmu.ac.uk/ebiology/ebiology_HCPC.htm

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2021

A Virtual Conference - 5 February 2021.

E-BIOLOGY: THE RESULTS

Peña-Fernández A.¹, Young C.¹, Randles MJ.², Breda C.¹,
Potiwat N.¹, Ramos I.¹, Sgamma T.¹, Evans MD.¹

¹*Leicester School of Allied Health Sciences, De Montfort University (UK)*

²*Chester Medical School, University of Chester, UK.*



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Medical School



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Chester

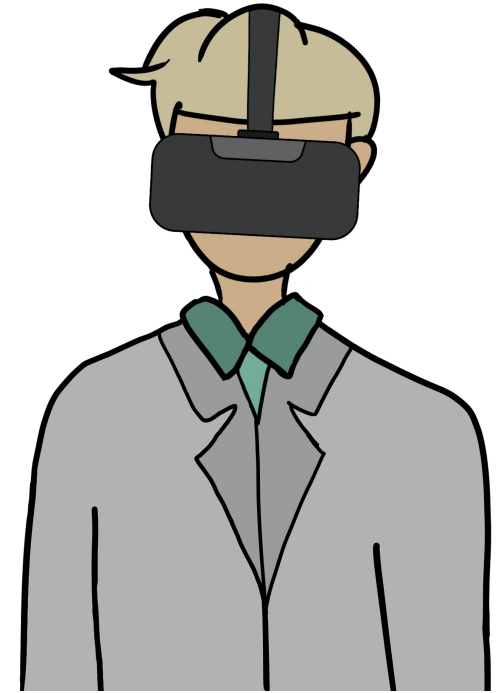
e-Biology: the results

Impact (data not published yet):

- **Clinical training programmes across the UK have abandoned or significantly reduced face-to-face laboratory teaching during 2020/21 to meet the social distancing regulations.**
- **e-Biology® is being used at three universities: Nottingham, Chester & DMU.**

Future application:

- **Academics can enrich their strategies for teaching and make their sessions more appetising and stimulating.**
- **CPD/ course development for future technicians, etc.**



(e-Biology character, courtesy of DMU, Peña-Fernández A.).

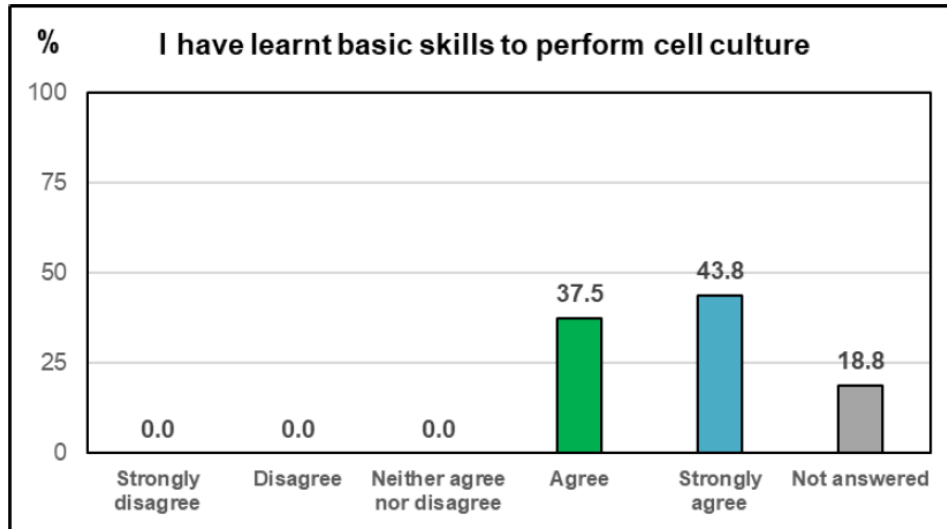
e-Biology: the results

Impact about the *clinical biochemistry practicals* (Peña-Fernández et al., 2021; data not published yet):

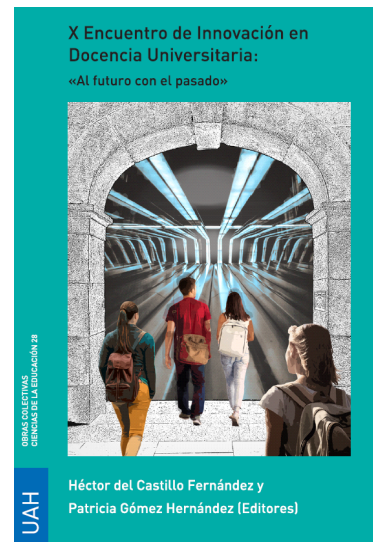
→ **BIOM3001 virtual practicals** (n=41 out of 169; 2020/21) at BSc Biomedical Science (DMU).

The formative assessments and mini-games available in these two practical units enhanced my learning

Previous approaches: blended learning



Peña-Fernández et al., 2019. Book chapter available in the ebook: <https://www.unebook.es/es/ebook/x-encuentro-de-innovacion-en-docencia-universitaria-al-futuro-con-el-pasado> E0002663649



BLENDED LEARNING FOR TEACHING CELL CULTURE AS PART OF *DMU E-PARASITOLOGY*

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ABSTRACT

Emerging and re-emerging human parasites have become a global health threat due to different factors including globalisation, climate and vector ecology changes that have

¹ School of Allied Health Sciences, Faculty of Health and Life Sciences, De Montfort University, Leicester, LE1 9BH, UK

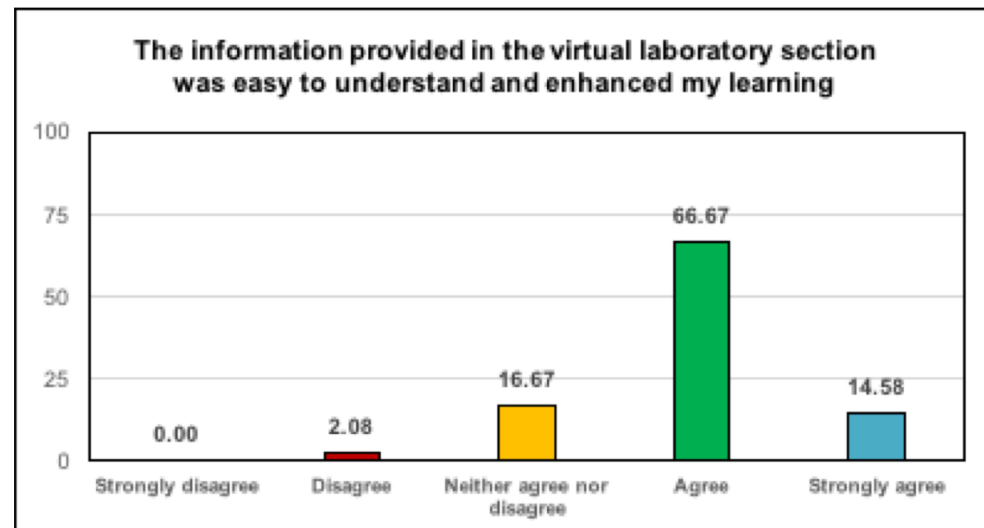
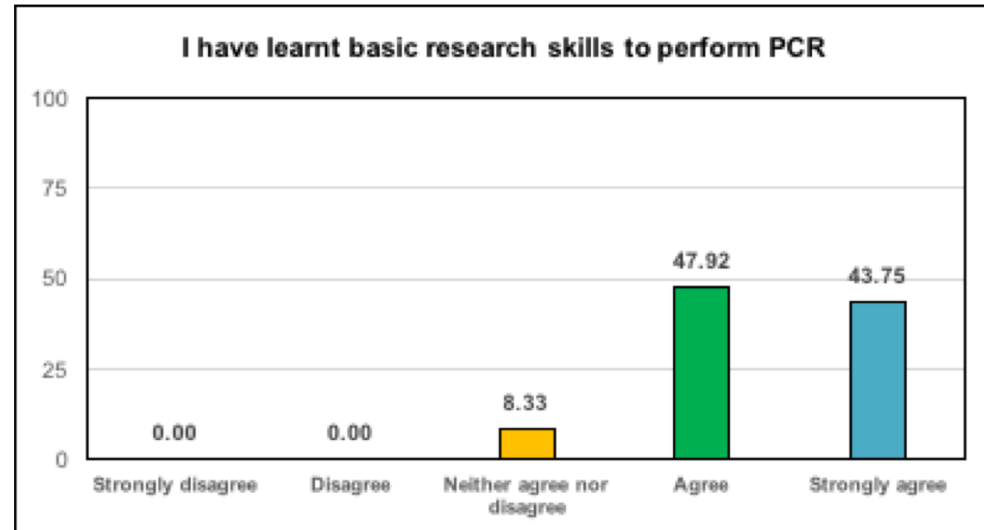
² Facultad de Farmacia, Universidad San Pablo-CEU. Madrid.

³ Área de Parasitología, Dpto Agroquímica y Medio Ambiente. Universidad Miguel Hernández de Elche.

⁴ Unidad de Farmacia y Tecnología Farmacéutica, Departamento de Ciencias Biomédicas Universidad de Alcalá.

Previous approaches: blended learning

- ✓ BMS academics have used blended learning to teach molecular techniques (n=48, BIOM2001, 2018/19).
- 91.7% reported to have learnt to perform a very specific biomedical technique (PCR).
- 75% (only 2.1% disagreed) indicated blended learning experience enhanced their satisfaction of studying at DMU.



e-Biology: significant highlights

The knowledge learnt in Clinical Biochemistry will help me in my future career

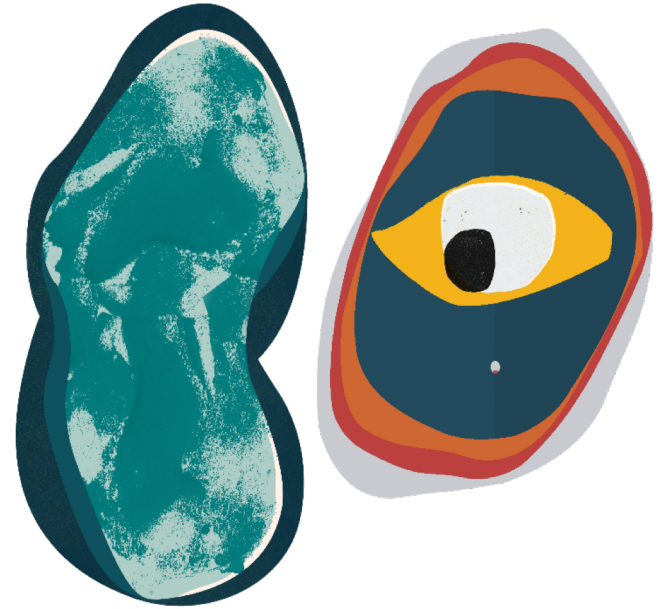
DMU e-Biology[®]:

→ Could aid enhancing motivation, which is a critical component of students' academic success in terms of retention, learning and subsequent performance.

Conclusions

Preliminary outcomes I:

- 1) **Virtual laboratory** → could facilitate the acquisition of clinical biochemistry skills.
- 2) **Virtual case studies** → encourage self-learning and autonomous work (*e.g.* alcohol abuse and biomarkers of disease in clinical samples).
- 3) These two modules combined with the virtual tissue slides → can facilitate a team-based learning approach, which involves (self-work followed by teamwork using different platforms, *e.g.* Blackboard Collaborate Ultra).



Human cells. Artworks created for the DMU e-Biology (Images courtesy of DMU; Peña-Fernández A., 2019).

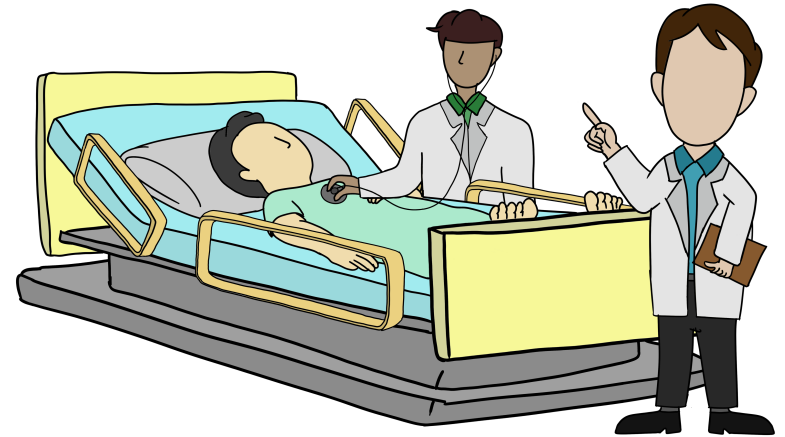
Conclusions

Preliminary outcomes II:

- 4) The availability of this resource prior to students starting their course may enable earlier engagement and improve student retention.
- 5) e-Biology could enhance motivation and engagement, developing students' competencies within problem-solving, critical thinking and the ability to employ multiple perspectives



Help tackling attrition in STEM programmes

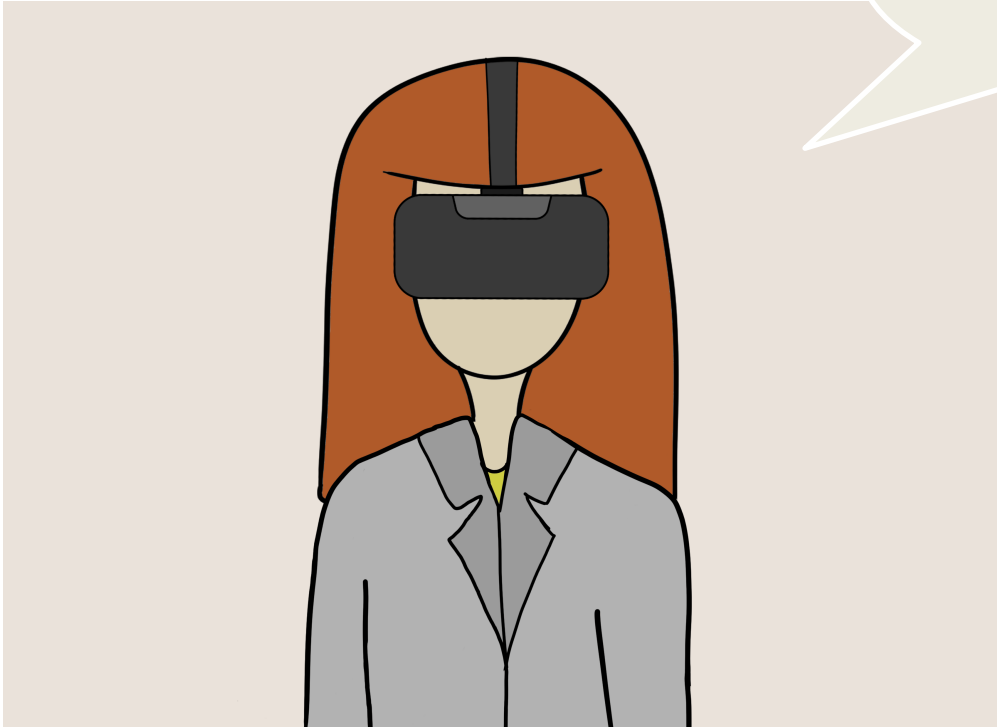


Artwork created for the DMU e-Biology
(Images courtesy of DMU; Peña-Fernández A., 2021).

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Thanks for your attention!



(e-Biology character, courtesy of DMU, Peña-Fernández A.).

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