Developing a digital environment for teaching and learning parasitology

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Outline

✓ Relevance of teaching and learning parasitology
✓ Introduction to DMU e-Parasitology
✓ Development, structure and modules
✓ Focus group: testing model unit
✓ Conclusions
Relevance of Parasitology

Parasitic infections → was one of the most important public health issues in Europe → recent outstanding progress has led to:

- Reduction of the numbers of teaching hours
- Reduction of parasitologists

How parasitology is taught in medical faculties in Europe? Parasitology, lost?

Fabrizio Bruschi

Peña-Fernández et al. DMU e-Parasitology. HEA STEEM Conference 2018
Recent serious outbreaks in England and EU → highlight the necessity of parasitology skilled health professionals to protect public health.

Available at: https://www.ncbi.nlm.nih.gov/pubmed/28162113


A large outbreak of gastrointestinal illness at an open-water swimming event in the River Thames, London.

Hall V¹, Taye A², Walsh B², Maguire H³, Dave J⁴, Wright A⁵, Anderson C⁶, Crook P⁷.

Available at: https://www.ncbi.nlm.nih.gov/pubmed/26536814


Cyclospora infection linked to travel to Mexico, June to September 2015.


Available at: https://www.ncbi.nlm.nih.gov/pubmed/27197551


Outbreak of urogenital schistosomiasis in Corsica (France): an epidemiological case study.

Boissier J¹, Grech-Angelini S², Webster RJ³, Allienne JE⁴, Huysse T⁵, Mas-Corna S⁶, Toulza E⁷, Barré-Cardi H⁸, Rollinson D⁹, Kincaid-Smith J¹⁰, Olaga A¹, Gallinier R¹, Feata J¹, Rognon A¹, Berry A², Mouahid G¹, Hennequin R¹¹, Moné H¹, Noel H¹², Mitra G¹.
Current status of teaching Parasitology in undergraduate programmes in England

Current time dedicated to the teaching of parasitology in different health sciences degrees is minimal or non-existent depending on the degree programme.

De Montfort University (DMU, Leicester) → negligible

- **BSc Biomedical Science (Hons)** → Basic Microbiology (1st year) and Medical Microbiology (3rd year).
- **Mpharm Pharmacy (Hons)** → Fundamental Cell Biology and Physiology (1st year); Inflammation, Cancer and Infection (3rd year) and Travel Medicine (Elective Module; 4th year).
- **BSc Pharmaceutical and Cosmetics Science (Hons)** → Basic Microbiology (1st year) and Applied Microbiology (Elective Module; 3rd year).
Developing a digital learning environment on parasitology that emphasises self-learning and will facilitate the acquisition of basic clinical and parasitology skills.

Overview of participating universities in the DMU e-Parasitology.

Available at: http://parasitology.dmu.ac.uk/index.htm
Development started in 2016 → different degrees of difficulty considered → package for undergraduate and postgraduate students.

Two DMU developers and different artists are collaborating with academics, parasitologists and biomedical scientists registered by the HCPC (UK Health and Care Professions Council).

Image of the introductory video developed for the DMU e-Parasitology (Image courtesy of DMU; Peña-Fernández A).
DMU e-Parasitology is freely available on the DMU website here (Image courtesy of DMU; Peña-Fernández A): [http://parasitology.dmu.ac.uk/index.htm](http://parasitology.dmu.ac.uk/index.htm)

Home

This website is currently under development.

- **e-Learning Units and Virtual Microscope**
  On this site you will get the opportunity to learn about a number of parasites. You can do this through working through a self study e-learning units or by directly accessing our virtual microscope to look at parasites in great detail.

- **High Magnification Images and Laboratory Tools/Skills**
  You will have the opportunity to look at highly magnified images. Also you will learn about the technical tools and skills that you will need when working in a laboratory.

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The eParasitology Units  |  The Virtual Laboratory  |  The Virtual Microscope  |  Case Study
DMU e-Parasitology: structure

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

- A theoretical module with mini e-learning units to study major human parasites such as free-living amoebas.
- A virtual laboratory module with engaging and interactive units about different techniques which are relevant for the study of parasitic human diseases.
- A virtual microscope with a real slide collection of clinical samples of human parasites.

Available at: https://library.iat.ed.org/view/PENAFERNANDEZ2017CRE
Theoretical module → will cover the three main classes of parasites that can affect humans, *i.e.* protozoa, helminths and ectoparasites.

To facilitate their study → helminths divided into the three common taxa (trematodes, cestodes and nematodes).

Fungal parasites will be also considered, *e.g.* microsporidia.

DMU e-Parasitology units (Image courtesy of DMU; Peña-Fernández A): [http://parasitology.dmu.ac.uk/learn/learning.htm](http://parasitology.dmu.ac.uk/learn/learning.htm)
DMU e-Parasitology: units

Overview of the DMU e-Parasitology Units
(Image courtesy of DMU; Peña-Fernández A). Available at: http://parasitology.dmu.ac.uk/learn/learning.htm
DMU e-Parasitology: development of units

Academics, parasitologists and biomedical scientists → complete proforma with the most current information for each disease for:

- infectious agent, life-cycle and transmission,
- risk factors and epidemiology,
- clinical and pathologic features,
- diagnosis,
- treatment and prevention.

Overview of the main page of the unit *Toxocara* in the DMU e-Parasitology (Image courtesy of DMU; Peña-Fernández et al., 2017). Available at: [http://parasitology.dmu.ac.uk/learn/modules/toxocara/story.html](http://parasitology.dmu.ac.uk/learn/modules/toxocara/story.html)
DMU e-Parasitology: development of units

All units include formative assessments so the user of the package will be able to assess their learning progress throughout the unit.

Overview of two formative assessments of the unit Toxocara in the DMU e-Parasitology (Image courtesy of DMU; Peña-Fernández et al., 2017). Available at:
http://parasitology.dmu.ac.uk/learn/modules/toxocara/story.html
**Virtual laboratory module** → techniques which are relevant for the study of parasitic diseases.

Key units → related with cell and parasite culture; routine techniques for identifying these organisms (*e.g.* staining techniques) in any clinical samples; molecular techniques to determine species including PCR.

Overview of the main page of **virtual laboratory** in the DMU e-Parasitology (Image courtesy of DMU; Peña-Fernández et al., 2017). Available at: [http://parasitology.dmu.ac.uk/learn/laboratory.htm](http://parasitology.dmu.ac.uk/learn/laboratory.htm)
Overview of the unit Human Cell Culture in the virtual laboratory in the DMU e-Parasitology (Images courtesy of DMU; Peña-Fernández et al., 2017). Available at: http://parasitology.dmu.ac.uk/learn/laboratory.htm
DMU e-Parasitology: virtual microscope

Virtual microscope module → with a real slide collection of clinical samples of human parasites.

Overview of the main page of virtual laboratory in the DMU e-Parasitology (Image courtesy of DMU; Peña-Fernández et al., 2017). Available at: http://parasitology.dmu.ac.uk/learn/laboratory.htm
DMU e-Parasitology: virtual microscope

Students will be able to identify morphologically the parasite in different clinical samples.

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.

Image of *Dientamoeba fragilis* in the virtual laboratory in the DMU e-Parasitology (Image courtesy of DMU; Peña-Fernández et al., 2017). Available at: [http://parasitology.dmu.ac.uk/learn/microscope/slides/01_dientamobe/01_dientamobe0.htm](http://parasitology.dmu.ac.uk/learn/microscope/slides/01_dientamobe/01_dientamobe0.htm)

Abstract available at the IATED library

*Development of a virtual library of clinical samples for medical parasitology diagnosis*

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

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

Overview of the first virtual case study created in the DMU e-Parasitology (Image courtesy of DMU; Peña-Fernández et al., 2017). Available at: [http://parasitology.dmu.ac.uk/learn/case_studies/cs1/story_html5.html](http://parasitology.dmu.ac.uk/learn/case_studies/cs1/story_html5.html)
Focus group study → The focus group was recruited from undergraduate students from the bilingual Pharmacy and Biotechnology degree at USP-CEU that studied parasitology* during the first term of 2016/17 [6 ECTS; 3rd year module; 27 students were enrolled in this module].

*Syllabus Parasitology module. Available at the USP-CEU website: [http://www.uspceu.com/_docs/oferta-academica/fac_far/farmacia/guias-docentes/GD5-a301-Parasitology.pdf](http://www.uspceu.com/_docs/oferta-academica/fac_far/farmacia/guias-docentes/GD5-a301-Parasitology.pdf) [accessed 16/01/2018]

Dr Fenoy and Dr Magnet, lecturers in Parasitology at USP-CEU, undertaken the focus group. More information and contact details available at: [http://parasitology.dmu.ac.uk/team.htm](http://parasitology.dmu.ac.uk/team.htm)
Students highlighted in the survey: (Peña-Fernández et al., 2017)

- a high degree of satisfaction with the *Toxocara* unit (100% agreed).
- enjoyed DMU e-Parasitology (66.7% agreed; 33.3% strongly agreed).

Unit → highly interactive, easy to understand and with exercises relevant to the study of the *Toxocara* parasite.

Life cycle of *Toxocara* in the DMU e-Parasitology (Image courtesy of DMU; Peña-Fernández et al., 2017). Available at: [http://parasitology.dmu.ac.uk/learn/modules/toxocara/story.html](http://parasitology.dmu.ac.uk/learn/modules/toxocara/story.html)
Improvements (Peña-Fernández et al., 2017):

- technical part of the package, such as improving the navigation during the exercises or reducing the information on some slides to facilitate assimilation and understanding.

Overview of some of the changes performed in the *Toxocara* in the DMU e-Parasitology (Images courtesy of DMU; Peña-Fernández et al., 2017). Available at: [http://parasitology.dmu.ac.uk/learn/modules/toxocara/story.html](http://parasitology.dmu.ac.uk/learn/modules/toxocara/story.html)
DMU e-Parasitology

✓ Facilitate the introduction of parasitology in any human health science degree by overcoming barriers of time, space, equipment and resources.

✓ Could actively engage students’ interest in parasitology by promoting active and self-learning.

Image of the introductory video developed for the DMU e-Parasitology (Image courtesy of DMU; Peña-Fernández A).