



Blended learning for teaching human cell culture

Journal:	<i>Medical Education</i>
Manuscript ID	Draft
Manuscript Type:	Really Good Stuff
Keywords:	Clinical Education, Computers, Simulation, new technology, Qualities/Skills/Values/Attitudes

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Manuscripts

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2 3 **What problem was addressed?**

4 The acquisition of laboratory skills critical for medical disciplines which are of
5 increasing global importance need to be urgently addressed in situations where
6 teaching status is being eroded due to curriculum and time restraints. One such
7 example is the multi-disciplinary science of parasitology, with parasite infections of
8 global public health concern due to increasing globalisation and climate change. Cell
9 culture is fundamental in parasitology to support areas such as culture of obligate
10 intracellular parasites or testing drugs that target these pathogens. Thus, a strategy
11 to successfully impart theoretical and practical knowledge of this potentially
12 challenging technique was developed using a blended learning approach (Stockwell
13 et al., 2015).

14 **What was tried?**

15 The Human Cell Culture e-learning unit (HCCU) from the *DMU e-Parasitology*
16 package's virtual biomedical laboratory module was used in a blended learning
17 approach to teach human cell culture. *DMU e-Parasitology* is a novel virtual learning
18 package developed through collaboration between De Montfort University, Leicester
19 (DMU) and the Spanish Universities of San Pablo CEU, Alcalá and Miguel
20 Hernandez, in conjunction with UK National Health Service's biomedical scientists
21 and technicians from cell and parasite culture laboratories. The HCCU provides a
22 detailed description of: a) how to work in a cell culture laboratory; b)
23 consumables/equipment needed; and c) videos of an academic performing all the
24 different steps and procedures in human cell culture; and is equipped with formative
25 assessments and mini-quizzes.

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3 1 The HCCU was tested with a focus group consisting of 25 second year BSc
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5 2 Biomedical Science students at DMU, which were engaged in a voluntary cell culture
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7 3 training in 2018. Prior to attending the laboratory session participants were asked to
8
9 4 view and complete the HCCU. At the end of the practical session, students were
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11 5 provided with a validated feedback-questionnaire with Likert scale and open-
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13 6 questions to collect their impressions/opinions. Ethical approval was provided by the
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15 7 Research Ethics Committee at DMU (Ref. 1851).

8 **What lessons were learned?**

9 The majority of participants completing the questionnaire (n=16), 81.3% (56.3%
10 agreed, 25% strongly agreed), indicated that the overall design of the HCCU was
11 appropriate and interactive. Participants reported high levels of enjoyment (87.5%)
12 and satisfaction (87.5%) with the unit. No negative responses were received.
13 Additionally, overall satisfaction with the HCCU was reflected by the fact that 81.3%
14 of the participants recommended the development of similar resources for other
15 subjects. Students reported that the diagrams and videos embedded in the HCCU
16 describing the different steps of working with cells facilitated their learning. Analysis
17 of the participants' performance in the practical activity in the laboratory after
18 completing the e-learning unit and their feedback (37.5% agreed, 43.8% strongly
19 agreed) indicated that the HCCU facilitated the acquisition of basic cell culture skills.
20 The results indicated the application of blended learning to be a potentially effective
21 pedagogic strategy for learning cell culture and other biomedical laboratory
22 techniques addressed in *DMU e-Parasitology*. Though promising, our results should
23 be considered carefully due to the small number of students involved and the short
24 duration of this pedagogic intervention.

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1 **Reference**

2 Stockwell BR., Stockwell MS., Cennamo M., Jiang E. Blended learning improves
3 science education. Cell 2015; 162(5):933e936.

For Review

1 **Blended learning for teaching human cell culture**

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