

LIVE Teaching Development Team Prize 2019**Development of VR learning materials to prepare undergraduate students for practical and field-based study**

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Aim: to develop virtual reality pre-learning materials for preparation of students for practical and field based study.

Hypothesis: Students will acclimatise faster to new learning environments, and therefore benefit more from these new experiences, if they have previously encountered them virtually prior to the onset of the learning activity.

Introduction: All of our undergraduate programmes require significant elements of practical and field based learning (laboratory, dissection, farm, clinic); potentially challenging environments that many students find daunting when they first encounter them (Teunissen and Westerman, 2011), which may detract from the learning experience. There is an increasing literature demonstrating that encouraging students to prepare for these activities by offering pre-learning materials can enhance practical learning (da Silva and Hunter 2009, Bell et al 2010, Fleagle et al 2018, Loveys and Riggs 2019,). Methods of preparation could include short lectures, directed reading, protocols and handbooks, questionnaires and most recently virtual reality (VR) tours with interactive activities (Kucuk et al 2016, Moro et al 2017, Stepan et al 2017). These activities can be related to formative or summative assessments that relate to knowledge acquisition or to health and safety and technical skill development, and are reported to ensure that the learning time spent in the new environment is more fruitful than when students did not have some form of prior exposure. Three - dimensional or 'immersive' learning resources in particular have been shown to offer advantages over more traditional 2-D alternatives. These include: greater opportunities for experiential learning; increased student motivation/engagement; improved contextualisation of learning and richer/more effective collaborative learning (Dalgarno and Lee, 2010).

We have been collaborating with Darryl Slack (Brunel) on an OIE funded project, to produce a 360° VR tour of a pig production unit. One of the aims of this project was to introduce inexperienced RVC and Jordan University of Science and Technology (JUST) students to pig production and the farm environment. At the RVC the tour has been piloted with Graduate Accelerated BVetMed course and will be introduced in the BVetMed1 program in the 2019/20 academic year. The integration of the tour with group lead learning sessions into traditional didactic teaching enhances understanding of key concepts and helps students to self-identify their own learning outcomes for AHEMS placement. In the UK, due to changes in the pig industry it has become more difficult for veterinary students to secure placements on pig farms and the use of VR technology enables students to gain a better understanding of the specific challenges prior to entering the physical environment.

Proposal: to develop virtual reality pre-learning materials for preparation of students for practical and field based study.

In order to produce suitable videos for various learning environments that students may be less familiar with the purpose of this application is to enable us (1) to purchase our own 360 camera, tripod and associated editing software, suitably powerful hardware, appropriate computer storage space; (2) to purchase sufficient VR headsets to enable students to access the material without having to purchase one themselves; (3) to enable us to recruit current UG students and pay them a suitable

stipend (and expenses for farm visits) to shoot the videos and edit them to a sufficiently high standard. The students will consult with relevant academic staff to produce suitable interactive material to be used in conjunction with the video. Three areas have been identified in which we believe the proposed pre-learning materials will be highly beneficial to students in their first year of study or prior to starting laboratory or farm based research projects.

- 1) Laboratory environments: these will include general teaching laboratory areas; research laboratory – general, tissue culture, microbiology, Category 2 biosafety areas; microscope suite. The focus will be on identification of potential hazards, correct personal protective equipment, correct waste management, correct identification of different instrumentation and equipment. For BSc/MSci Biosciences students completion of these pre-lab activities will form part of the Practical Skills Log that they are required to complete in order to progress onto the 3rd year of the programme.
- 2) Dissection room environment: general area, Integrated Structure and Function (ISF) and anatomy demonstrating lecture theatre, different views of set up for practical ISF examinations. The focus will be on familiarisation with the day to day arrangement of tables, the animals in the demonstrating theatre, and familiarisation with different views of the room lay out when specimens are arranged for ISF oral examinations. Interactive activities will include health and safety assessments, good practice for disposal of blades, biomaterial, links to podcasts of specimens laid out for examination. Students will be encouraged to familiarise themselves with the ISF layout in particular so that they are not overwhelmed when entering the examinations.
- 3) Animal based establishments: these include [poultry, equine, dairy, sheep, kennels/ catteries] general housing areas, specific areas (eg dairy), feed and storage. Interactive activities will include biosecurity, health and safety assessments related to species and stage of production, assessment of the buildings used to house animals including species specific considerations, management of units, husbandry and veterinary procedures, assessment of environment and animal welfare. The tours developed will be integrated within husbandry teaching and serve as preparation for animal handling practical's and AHEMS placements. For AHEMS placements students will be encouraged to set their own learning outcomes based on the VR tours for forthcoming placements and record them on Folium as part of their placement reflections. The tours will be based on the already developed pig farm tour.

Evaluations:

- 1) Laboratory environment: the responses to interactive activities in each of the suggested virtual environments (teaching – safety/waste/equipment, research, specialised environments) will be monitored for marking purposes. Linking the different environments' activities will be linked to specific modules, thus factual learning (PPE, waste, specific equipment etc.) can be assessed with MCQ or SAQ in the module summative examination. Students will be asked to give feedback on the activities and if they find it useful.
- 2) Dissection room: ISF examiners have been asked to provide feedback on student performance (anonymously) on formative ISF exams held March 2019 (**URN SR2019-0083**). These will be collated and compared to similar feedback that will be asked for after March 2020 when students have been encouraged to access the pre-learning materials.

- 3) Animal based establishments: the responses to interactive activities will be monitored and students will be asked to complete short pre and post intervention surveys as well as giving qualitative feedback on the activities (a) at the end of the virtual session and (b) as part of their AHEMS feedback. As above the factual content can be assessed with MCQ or as defined components of the PSQ in summative examinations.

Dissemination of findings: Data will be evaluated and reported at appropriate College Committees. Findings will be written up for publication and presentation as appropriate. It is anticipated that Laboratory data will be reported during the Bioscience Periodic Review and especially RSB Re-accreditation process as evidence of Benchmark #2 “Demonstration of the acquisition of technical skills and familiarity with the practical environment”

Resources requested

InstaPro 360 camera	£3000
Tripod and accessories	£800
3dvista software	£600
Computer hardware	£1500
Storage space	£500/TB
Headsets and devices (for student loan from the LRC)	£1800
Student time 3x students @ £10ph for 180h total (shoot, edit, annotate)	£1800

Timeline

July – December 2019 Shooting of farm, laboratory, ISF footage

September 2019 – February 2020 editing and annotation

(it is hoped there will be beta versions for laboratory safety practicals and for research project inductions for October 2019 for student feedback *see below - but these will not be used in summative assessments for 2019-20)

November 2019- *interim analysis of student feedback to laboratory materials (for inclusion in Royal Society of Biology Re-Accreditation and Biosciences Periodic Review – Autumn 2020)

February 2020 release of farm footage for students about to carry out first AHEMS placements

February 2020 release of ISF footage for students entering their first formative ISF examination

March – July 2020 evaluation of examiner feedback for ISF with vs without pre-examination materials

July – September 2020 Shooting further footage where appropriate

September 2020 - release of Laboratory materials (a) to 1st year students (b) to students about to start research projects

October 2020- *interim analysis of student feedback to laboratory materials (for inclusion in Royal Society of Biology Re-Accreditation and Biosciences Periodic Review – Autumn 2020)

September – December 2020 evaluation of student feedback on farm materials

January – March 2021 full analysis of student summative assessments and feedback on Laboratory materials

March 2021 preparation of results findings for presentation at appropriate forum (RSB, Biochem Soc, Vet Ed etc.)

July 2021 final report due for LIVE

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Approval from CBS Head of Department

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