

A Multi-Modal Approach to Laboratory Skills Development.

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In the pure sciences, laboratory skills development is an integral component in developing a well-rounded young scientist. With the onset of Covid-19 in 2020, contact teaching and learning at universities, including the Cape Peninsula University of Technology came to an abrupt halt and with that, the opportunity for students to obtain laboratory skills. The continuation of various lock-down levels in 2021 necessitated the implementation of innovative teaching and learning strategies. In this context, a multi-model teaching and learning approach was implemented in the practical component of Marine Biology 1. This approach involved using an online simulation to expose students to microscopy skills which were consolidated in a face-to-face practical session. The multi-model approach was aimed at complying with the regulations of Covid-19 and the subsequent restrictions while attempting to reduce the negative impacts online teaching and learning may have on the learning outcomes associated with the subject. The online, freely accessible simulator, the BioNetwork Virtual Microscope, was included in the practical component. The BioNetwork Virtual Microscope is a fully interactive 3D light microscope and was incorporated to teach students the basic skills of microscopy. Students were instructed on how to use the simulator and were then tasked with various activities based on the simulator. The simulation practicals were split over a three-week period, with one practical per week. Each practical had an associated activity which focused on a specific set of microscopy skills and learning outcomes. Some of the main learning outcomes included identifying the parts and functions of the light microscope, listing the steps in focusing a light microscope, describing how to properly handle the light microscope, making accurate identifications and observations of a biological specimen with the use of a light microscope. Students were then given one face-to-face practical session, to practice what was learnt through the simulator. Before the session began, students were asked to indicate their perceived preparedness in focusing a specimen with a light microscope. After the session they had to indicate the mark they obtained for focusing a specimen and whether they felt the simulation assisted in preparing them for the session. Based on student feedback (N = 25), the average score obtained for focusing a specimen was 94.6 %, 92 % of students indicated that the microscopy simulation activities assisted in preparing them for the face-to-face practical session. Furthermore, 100 % of students, suggested that the simulation be incorporated into the subject in future. The main reason given for supporting the incorporation of the simulations was that it provided a more interesting and interactive method of learning about microscopy, rather than just reading a text describing this. It is important to note that simulators of

this nature will never be able to completely substitute a hands-on laboratory skill building. However, they can be incorporated and used in conjunction with traditional practical teaching and learning to reduce the time spent face-to-face as students may be significantly more prepared.