Reviewer's report

Title: Enhancing Student Learning of Research and Diagnostic Skills in Western Blotting and Muscular Dystrophy using an Adaptive Virtual Laboratory Environment

Version: 1 Date: 13 June 2014

Reviewer: Arianne Dantas

Reviewer's report:

Major Compulsory Revisions

1. The title of the article does not accurately reflect its content as the authors did not investigate whether the vLAB actually enhanced student learning of research and diagnostic skills.

2. In the abstract, under the methods sub-section, the first sentence states that the vLAB “was implemented and evaluated to assess its impact on understanding technical research skills and diagnostic skills”. The student evaluation conducted did not actually investigate the impact on understanding.

3. In the discussion, 3rd paragraph, 1st sentence, authors stated that “Students rated the vLAB as being most helpful as a way of learning about Western Blotting and interpreting diagnostic outcomes, when compared to the real lab in 2011”. However, the data shown in figure 5 shows no significant differences in “improved understanding” between the vLAB and the real lab and thus does not support this statement in regards to the learning.

4. In the discussion. 4th paragraph, last sentence, the authors state that the vLAB had an impact on learning but this was not assessed in this study.

Minor Compulsory Revisions

5. Methods section, Evaluation Questionnaires: Since they used a cross-over design for the students to complete the vLAB and real lab, can the authors please clarify exactly when the evaluation questionnaires were given to the students. The authors currently state that “These questionnaires were provided to all students upon completion of the vLAB and used Likert scale questions to allow students to draw comparisons of their understanding, confidence and learning of technical and diagnostic skills in the vLAB versus the real lab environments.” How did the students that completed the vLAB first make such comparisons before even completing the real lab? Did the students complete a questionnaire after the vLAB and then another one after the real lab?

6. In the discussion, both paragraphs discuss the diagnostics outcomes for 2011. This is repetitive and should be combined.

7. In the discussion, the authors should discuss possibilities why the student's
view of the diagnostic skills only improved in 2011. Interestingly, it seems that the percentage of students that agreed for the vLAB was consistent throughout the 3 years but it was the percentage for the real experiment that increased. Were there any changes in the way that the real experiment was conducted and taught in the last 2 years?

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests.