FROM VIRTUAL TO PRACTICAL: INTEGRATING AN ONLINE SIMULATION AND FACE-TO-FACE LEARNING TO ENABLE HEMOCYTOMETER PROFICIENCY

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Accurately identifying and counting cells using a hemocytometer are essential skills for cell biology students (Delgado et al., 2021). Learning to use a hemocytometer can be challenging for students, while confirming that the correct technique has been used is challenging for the educator. Students must correctly identify different cell types, disregard cellular debris, and distinguish between viable vs dead cells. These challenges make it difficult for students to attain proficiency in this vital skill.

On completing the online exercise, students should understand how a hemocytometer can quantify cells; how to count different cell populations correctly; evaluate, analyse and interpret experimental data; understand how variations in samples can affect the quality of the cell count; and identify errors in the counting process.

First-year Laboratory Medicine students at the University of South Australia (UniSA) were first taught the principles of a hemocytometer, how it works, how cells are counted, and how cell density and viability are calculated. Students then used an online virtual hemocytometer to count two samples containing enriched lymphocytes and neutrophils. All samples had red blood cell and platelet contamination. Detailed instructions on how to use the virtual hemocytometer, count viable and trypan blue dead cells, and undertake cell density and viability calculations were also included. Student feedback was obtained through a 5-point Likert questionnaire with free text responses.

As part of the online training report, students calculated the cell count, density, and viability for two samples counted using the virtual hemocytometer. Students then completed a 5-point Likert-style questionnaire with free text responses to assess student understanding, benefits to their learning when faced with a F-2-F laboratory setting and perception of strengths/weaknesses of the teaching approach. Likert data were converted to a numeric scale, averaged across all responses, and compared using a Student *t*-test where possible. Written responses were assessed through a thematic analysis.

In most cases, cell density and viability data calculated using the online hemocytometer closely matched the expected computer-generated results. The online simulation faithfully replicated issues typically seen when using a real hemocytometer. This included contaminating cells, cell clumps, and cells falling across two adjacent grids. Students strongly indicated that the virtual hemocytometer training would aid their use of a hemocytometer in an F-2-F setting. Students responded as “strongly enjoying” the approach, finding it engaging and able to replicate a real-world experience. Student confidence increased significantly after using the simulation in all aspects, especially in calculating cell density and viability, two common areas of mistakes.

An online hemocytometer faithfully taught all aspects of hemocytometer use. Students were better able to count cells correctly and perform all required calculations. Moving forward, this approach will continue to be used, but we will improve the graphical representation of the individual cell types.

REFERENCE

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