

USING MULTIPLE-CHOICE QUESTIONS TO ASSESS STUDENT ACQUISITION OF SCIENTIFIC INQUIRY SKILLS AND ENHANCE LABORATORY DESIGN AND OUTCOMES

Peter G. Arthur, Martha Ludwig, Paul V. Attwood

Presenting Author: Peter G. Arthur (peter.arthur@uwa.edu.au)

School of Chemistry and Biochemistry, The University of Western Australia, Crawley, WA 6009

KEYWORDS: Laboratory learning, skills based assessments, Transferable skills

Science laboratory programs are used to develop student inquiry skills. We examined whether multiple-choice questions (MCQs) could provide information on the acquisition of these skills in a one semester, level 2 Biochemistry laboratory program. Each student answered 40 MCQs, comprised of 18 comprehension, 10 quantitative problem solving, and 12 analytical skills questions. We found no significant difference in the percentage mark for comprehension ($78\% \pm 12$, mean \pm standard deviation) and quantitative questions ($78\% \pm 17$). However, the average mark for questions requiring analytical skills ($61\% \pm 13$) was significantly ($p < 0.05$) lower than for comprehension and quantitation questions. To assess whether weaker students caused the decrease in the average mark for the analytical questions, we calculated the average mark for each question category for the quartile of the student cohort with the highest and lowest marks. For the quartile of students with the lowest mark, the average mark for analytical questions ($45\% \pm 6$) was significantly ($p < 0.05$) lower than for comprehension ($60\% \pm 6$), but not for quantitative questions ($52\% \pm 13$). Interestingly, the quartile of students with the highest mark, the average mark for analytical questions ($78\% \pm 5$) was also significantly ($p < 0.05$) lower than comprehension ($91\% \pm 4$) and quantitative questions ($94\% \pm 5$). These data indicate that the entire student cohort found analytical questions challenging. We are now focused on strategies to develop student skills in data analysis, rationalisation and interpretation.

Proceedings of the Australian Conference on Science and Mathematics Education, The University of Queensland, Sept 28th to 30th, 2016, page 17, ISBN Number 978-0-9871834-5-3.