AuPS/ASB Meeting - Adelaide 2010

Symposium: Physiology education

Monday 29th November 2010 - The Gallery - 09:00

Chair: Simon Potocnik & Ann Sefton

Rigour or rigor mortis: a challenge for physiology

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The education sector is in ongoing turmoil with debates around the “difficulty” of the proposed national curriculum in maths and science with potential flow-on effects to the tertiary sector. Physiology as an independent discipline is also under ongoing threat, often seen as primarily service teaching for medicine related courses. Together with the massification of the tertiary sector and fiscal pressures, does this lead to dilution and less rigorous teaching in physiology? The mantra of multidisciplinarity is also a potential threat in that it may encourage a shallower-broader educational approach rather than directing disciplinary depth. Is physiology just too hard for the “average” science student? Or do the current methods of physiology delivery simply fail to engage and excite the students to strive for academic excellence through an inherent curiosity about how the body works? In response to the 2003 BIO2010 report on undergraduate biology curriculum, Dee Silverthorn issued a “call to action” to restore physiology to its true place in the science curriculum as “the integrative discipline in biology”. Since then, there has been an increasing recognition within the physiology family of these issues. Our challenge is to capitalize on the forward movement in this area and enact this essential change. We need to build critical mass to reinvigorate the physiology curriculum in a way that recognizes and contextualizes prior knowledge and challenges students to actively participate in the learning around the fundamental concepts that are the foundations of modern physiology. Encouragement, tangible support, teamwork and academic output and recognition are key enablers that will place physiology in the centre of biomedical curriculum of the future.

Committee on Undergraduate Biology Education to Prepare Research Scientists for the 21st Century. BIO 2010:Transforming Undergraduate Education for Future Research Biologists. Washington DC: National Academy Press, 2003.

Silverthorn DU. (2003) Restoring physiology to the undergraduate biology curriculum: a call for action. *Advances in Physiology Education* **27:** 91-6.

Using the Finapres to teach cardiovascular physiology to second year science students

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There are many ways of teaching cardiovascular physiology to university science students, but few of these directly demonstrate or measure cardiac output and total peripheral resistance, concepts which are fundamental to an understanding of cardiovascular physiology. The Physiology Department at Monash University has been trialling the use of a finger pressure cuff, the *Finapres* system, in the cardiovascular practical classes. This abstract reports on the initial findings from a study of 220 second year physiology students undertaking a practical class on exercise and cardiovascular physiology using the *Finapres* system.

During the practical class students worked in groups of 5, with one student performing graded levels of exercise on a cycle ergometer. The exercise workload was increased every 3 minutes by increments of 50 watts, until the subject reached 75% of their maximum HR. The *Finapres* finger cuff, together with *Beatscope* software, were used to continuously measure and record blood pressure (BP). Heart rate (HR) and cardiac output (CO) were triggered from the pulse rate and the pulse waveform, respectively. The students were asked to calculate the stroke volume (SV) and the total peripheral resistance (TPR).

To determine if the *Finapres* practical class had improved student learning and understanding of cardiovascular physiology and exercise, pre- and post-tests were given to the students at the beginning and end of the practical class. The questions tested the students understanding of cardiovascular physiology during rest and exercise. Statistical analysis of student performance for the individual questions indicated that there was a significant improvement for two questions following the practical class. The first question required a calculation of the CO. On the pre-test 75.81% of students answered this correctly. This rose to 84.5% on the post-test. A similar increase (78% to 84%) was seen for a multiple choice question about the sympathetic cardiac response to exercise. However, there was no significant difference in the overall pre- and post-test results, suggesting that the *Finapres* practical had a positive, but narrow, effect on learning.

A questionnaire using a five point Likert scale, similar to that used by Rodrigues-Barbero (2008), was used to evaluate the student experience of the *Finapres* system. The findings showed that students: i) appreciated the immediacy of the recording of cardiovascular responses (4.17 ± 0.85, mean ± SD); ii) felt that they gained a better understanding of how to record physiological data (4.06 ± 0.89); iii) enjoyed the practical class (4.17 ± 0.96); and iv) would recommend the *Finapres* to other students (4.12 ± 0.97). Given this positive student feedback, we have subsequently used the *Finapres* system to teach Physiotherapy and third year Physiology (Science) students about circulatory reflex responses to perturbations in the cardiovascular system. The ability of the *Finapres* system to continuously record and calculate BP, HR, CO, SV, and TPR during the experimental protocols provides students with immediate feedback and, we believe, improves their understanding of cardiovascular physiology.

Rodríguez-Barbero, A. & López-Novoa, J.M. (2008) Teaching integrative physiology using the quantitative circulatory physiology model and case discussion method: evaluation of the learning experience. *Advances in Physiology Education*, **32**: 304-311.

The KISS approach: How to develop an effective self directed e-learning application

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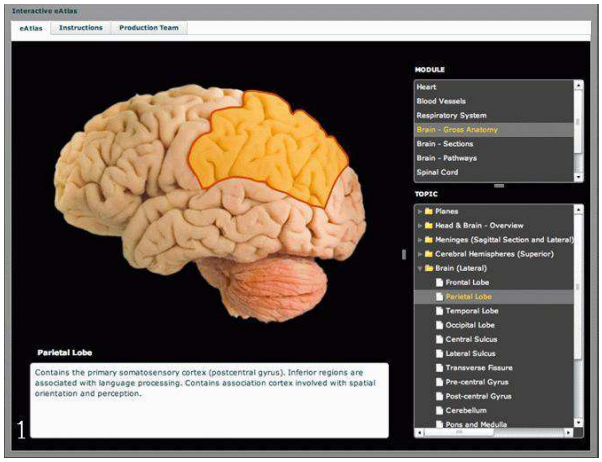
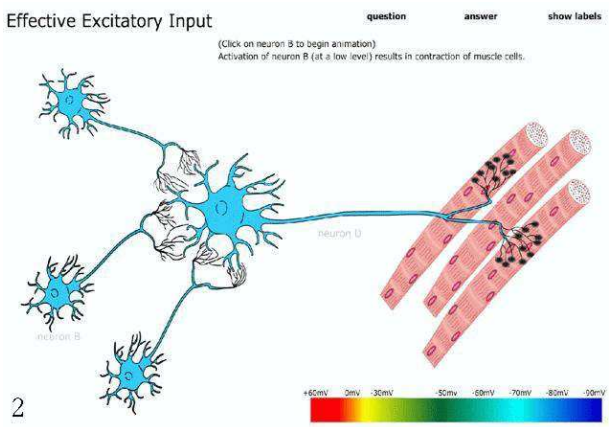
An Interactive e Atlas of functional anatomy (IeA) has been developed to provide support for large class teaching and to encourage engagement in the study area (Figure 1). The IeA provides general support for introductory anatomy & physiology courses and also forms a component of blended learning and distance education.

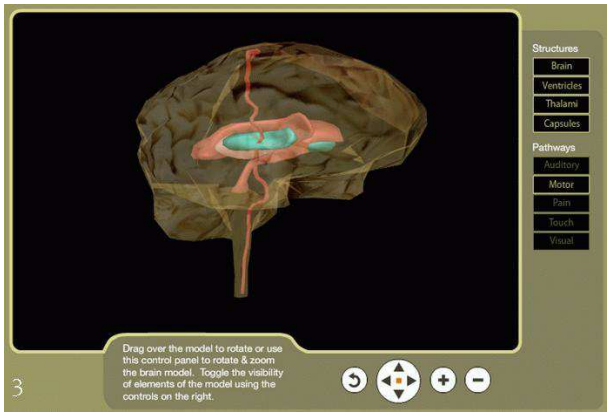
The KISS approach (keep it simple for students) was used during development of atlas content and structure. Best practice principles and cognitive load theory were used to provide effective interactivity, flexibility, options and feedback.

Two other online applications (Neuronal Physiology animation Figure 2; Glass Brain Figure 3) have also been developed using best practice principles.

Preliminary evaluations indicate a good student response to the applications. The KISS approach may be useful in facilitating student engagement in e-learning environments.







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Lecture attendance, learning style and assessment outcome in physiology students

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It seems self-evident that students attendance at lectures should predict their performance in exams and other assessments. This has been shown in some studies, for example in dental students (El Tantawi, 2009) but the correlation is often weak. Some authors have suggested that provision of alternative learning materials, such as online lectures, may be detrimental to student performance because it reduces attendance at "conventional" lectures (Fernandes, Male & Cruickshank, 2008). Students have varied learning styles, or combinations of styles, assessed by VARK (visual, auditory, reading/writing and kinaesthetic), and this has been shown in some cases to predict academic outcomes (Dobson, 2009). However, the interaction between lecture effectiveness and student learning styles is poorly understood. Here, we have investigated the correlation between lecture attendance and student performance in different assessment tasks, and the influence of the students' learning style on this. We hypothesised that the degree of correlation of lecture attendance with academic performance will be different for students with different VARK profiles.

Second year students for the combined Biomedical, Health and Science 2009 cohort (n=120) completed a questionnaire in which they self-reported their lecture attendance and the time they spent using alternative resources to supplement their learning. Self-reported lecture attendance in the first semester of 2009 was 73 ± 2%. Correlations between lecture attendance and grade outcome are shown the Table.

Grade Component	Combined Male/Female n=120	Male Only n=49	Female Only n=71
Practical	r=0.29, p<0.002	r=0.32, p<0.03	r=0.20, p<0.10, ns
Tutorials	r=0.35, p<0.0005	r=0.29, p<0.05	r=0.33, p<0.005
Exam	r=0.21, p<0.02	r=0.29, p<0.04	r=0.10, ns
Combined Grade	r=0.31, p<0.001	r=0.35, p<0.01	r=0.20, p<0.10, ns

95 students completed the VARK assessment. For these students, a greater percentage score of "R" (i.e. use read/writing as a method of learning by VARK analysis) predicted: Exam Mark (r=0.22, p<0.03), Tutorial mark (r=0.20, p<0.05), Practical Mark (r=0.19, p<0.07), Overall Mark (r=0.26, p<0.02). Females had a higher proportion of "R" compared to males (Females =0.29 ± 0.01, n=63: Males =0.25 ± 0.01, n=32; P<0.03).

We conclude that lecture attendance and learning styles interact in predicting overall mark, but the details, and the causal relationships, require more investigation.

El Tantawi MMA, (2009) *Journal of Dental Education* **73(5):** 614-623.

Fernandes L, Maley M, Cruickshank C (2008) *Journal of the International Association of Medical Science Educators (JIAMSE)* **18(2):** 62-70.

Dobson JL (2009) *Advances in Physiology Educudation* **33:** 308-314,

The Human Physiology Writing Centre: Task-based building of student capacity

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Students studying second year Human Physiology write a literature review in the first semester and a critical evaluation in the following semester. Generally, students are asked to complete such writing tasks, without any established teaching procedures. Therefore, these assessments can be difficult, particularly for 'English as an Additional Language' (EAL) students. As an aid, we provide a detailed assessment criteria sheet, however the interpretation of this information can in itself be a challenge. To remedy this situation, we established the Human Physiology Writing Centre, providing tutoring to the students for the specific writing task. The students were provided with two individual 30-minute sessions (one week apart) with a writing tutor (trained Psychology PhD students). The tutors provided guidance with the purpose of the task and an explanation of the assessment criteria. Working with the students and their drafts, they helped with logical flow and structure; as well as grammar and style. The tutors were not familiar with the underlying content (Physiology), which maintained a focus on writing. Qualitatively, the students have reported overwhelming support for this program (*via* student evaluations).

This 'task-specific' approach introduces the students to other 'writing' resources available within the University (the Writing Centre). This mentorship encourages student engagement with improving their writing *via* both intrinsic (context) and extrinsic (assessment) motivators. Importantly, we are providing the resources required to meet the student learning objectives of improved scientific writing.