Motivating Learners: Strategies to Engage Students in Deeper Learning in Neuroscience

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SM4123 “System Neurobiology” is an advanced neuroscience module with content that is arbitrarily divided into three domains: neuro-anatomy, neuro-cognition and neuro-diseases. Because of my research interest, I undertook the teaching of neuro-diseases in Semester 1, Academic Year (AY) 2009/2010. Neurodegenerative diseases are interesting and will be increasingly prevalent in Singapore’s rapidly ageing population. As this is a level-4 module, the class size tends to be small and students have to satisfy the module’s prerequisite (i.e. to have completed a level-3 module on basic neuroscience).

Motivation is one major factor in learning. It has been observed that many students in many countries (Stipek, 2011), including Singapore, are motivated by grades. While this is certainly one good way to engage students, other motivators must be in place to complement this factor. This includes ‘humanising’ the information so that students can better appreciate its relevance to everyday life (Tibell & Rundgren, 2010). This would involve linking scientific concepts and principles to students’ personal lives and interests.

In essence, students should learn to confront misinformation, challenge previously held ideas and construct new knowledge. Most effective classrooms foster students’ curiosity by engaging students through the careful planning and design of appropriate instructional strategies for the classroom environment, constantly being mindful that different people learn in different ways, and even the same person may learn a variety of things using different learning strategies (Stipek, 2011; Wood, 2009).

The following sections of the article illustrate how I have redesigned the module with the aim of engaging students at a deeper level.

Teach Less, Learn More

Given the explosion of information in life sciences research (Tang & Yeong, 2009; Tibell & Rundgren, 2010), students tend to rely mostly on rote memorisation to reproduce knowledge during the examinations. To make the situation worse, most exam questions reinforce this learning paradigm. Since the pace of research in this area is rapid, and most of the information undergoes frequent changes within a short period of time, I decided to cut the content and presented only the key concepts to students when I taught the module in AY 2009/2010. Students spent the remaining time in class evaluating recent research papers so that they can keep up with the knowledge through self-learning. This evaluation exercise also helps students promote their critical thinking skills in relation to the subject area.

Systematic Approach to Module Redesign

When preparing my lectures, I use the “backward design” approach (Handelsman et al., 2004). This approach involves three steps: (a) learning goals, (b) learning outcomes and assessment, and (c) activities. Before designing my lecture, I will evaluate the knowledge students are expected to bring in from their prerequisite subjects. I will then design the learning goals which serve as the foundation for my lecture materials. The learning outcomes will define what students should know, apply and understand after the lecture.
Adopting Appropriate Technology to Enhance Students’ Learning

To make the subject more relevant, video clips of the respective diseases will be featured prior to the start of the lecture. Video clips and images are likely to bring the subject closer to the students by making them realise that this is a real disease, show them how the patients suffer and how the family members are affected when their loved ones are afflicted with such diseases. The links to the videos are also included on my teaching webpage (http://medicine.nus.edu.sg/phys/lab/WBS_Lab/Teachings-LSM4213.html) and my lecture notes. These videos are either available on YouTube or provided free on the Internet by charity foundations in US.

In addition, I have also set up a webpage at the NUS blog site (http://blog.nus.edu.sg/bswong/). It contains announcements for all my teaching modules as well as comments on my research and other related topics. One advantage of maintaining the NUS blog site is that future students of the modules I teach can view the comments and discussion of earlier batches of students who had taken these modules.

Learning Beyond the Classroom Environment

In addition, I encourage students to attend relevant seminars by local and overseas researchers. I put up seminar notices either during my lecture or on the Integrated Virtual Learning Environment’s (IVLE) notice board. By attending the seminars, students can keep up with the latest developments and trends in the field, and learn to appreciate the ‘scientific’ process. Given the increasing interest among students in social networking platforms (Gewin, 2012), I have started a Twitter feed (http://twitter.com/bs_wong), where I post interesting research news which are relevant to the topics I teach.

Criteria-based Approach to Designing Examination Questions

Students who understand a concept should be able to (a) explain, (b) interpret and (c) apply the knowledge in a new context. These criteria have guided me in setting the examination questions. Each question will begin with an experimental situation, complete with ‘hypothetical’ or published experimental data. I will begin by testing students’ ability to understand and interpret the given data. The last part of the question will require students to apply their interpretation to current scientific concepts surrounding the topic of interest.

Outcomes and Feedback

The outcome of this teaching approach was evaluated for examination in both AY 2008/2009 and 2009/2010. When analysing the exam answers using the Difficulty Index (DI), I noted that students tend to score better when the experimental data in the exam question is presented as diagrams (DI ~ 0.8) as compared to descriptive observation (DI ~0.4).

Some student feedback for this module in the past three academic years include:

• “[The lecturer] focuses on the analysis and integration of information into knowledge, which is much needed at this level. Sometimes the overemphasis on “thinking” becomes a bit too much.” (AY2009/2010)
• “[The lecturer] promotes thinking and provides available films for further understanding.” (AY2010/2011)
• “He emphasized key concepts for the lectures which is very good as it keeps me focused during my revision.” (AY2011/2012).

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In the rapidly changing teaching and learning landscape, educators have realised that it is more important for students to hone their problem-solving skills and critical analysis than for students to simply being able to answer the typical rote-testing questions. As such, the objective of current science education should be to enhance students’ interest, engagement, and intellectual skills, as well as reducing the potentially debilitating stress which may occur if they encounter challenges along this learning journey.

References

About the Author
Dr. Wong Boon Seng currently teaches Level 3000 and 4000 Life Sciences, and NGS postgraduate modules. He is interested in using new educational technology tools to enhance interactive learning.