

# **Development and implementation of an interactive online resource linking foundation knowledge to anatomy, physiology and microbiology units for first year students**

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The School of Human Life Sciences (HLS) at the University of Tasmania (UTas) is committed to engaging students in the first year experience. Consequently, first year teaching staff in HLS have developed a number of resources to complement teaching and learning in first year units. One project involves the development of an online game enabling first year students to link content between successive HLS units. In their first semester, all first year HLS students study a foundation unit in cell biology, which is a prerequisite for the second semester units, Anatomy and Physiology, and Microbiology and Health. The developed online game will incorporate content from the units in a tiered game system to engage students in the unit material and recognise cross unit content. It is anticipated that this resource will enable students to revise and apply foundation material from prerequisite units, while engaging in a fun and stimulating learning environment. This Nuts and Bolts session will discuss the value and role of games in first year learning at university, and discuss strategies which may be used to successfully develop and implement games into course content to engage student learning in first year units.

## *Background of Project*

Increasingly, students at first year (and even second and third year), fail to acknowledge the benefit and need to retain content from prerequisite units as they progress through their degree program. Foundation knowledge-based units are taught in first year (particularly in first semester). Student retention of this material and its contextual application is critical, as the material, is then built on each semester throughout the degree program. Increasingly, academics in the School of HLS and other schools and faculties within the University of Tasmania (UTas), are forced to re-incorporate foundation knowledge into their second and third year units as students fail to make the assumed academic connections. This limits the capacity of this foundation knowledge to be recognised, extended and applied in final year units.

Currently, UTas offers no teaching and learning support to enable students to make academic connections between subsequent units. As the unit coordinators of first year HLS units, we are well aware of the lack of ability of many students to link content. This results in academic frustration and limited time to include new content into consecutive units. In addition, students fail subsequent units due to their inability to incorporate foundation knowledge into the learning and application of new material.

Consequently, we are developing an online resource in the form of a captivating game to enable students to make these unambiguous connections between knowledge in first year units. Humans are instinctively competitive<sup>1</sup>. Therefore, the incorporation of a game system will increase user

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<sup>1</sup> Chang, Yang and Chan, (2003)

motivation and fulfil the current expectation from learners that learning processes should be fun<sup>2</sup>. The resource will complement the current didactic teaching in first year HLS units yet provide students with a self-directed method of assessing their learning.

Students are typically characterised by diverse academic backgrounds and learning styles, varied generic skills and widely diverse interests in the study of biology<sup>3</sup>. It is envisaged that a game-based resource will encompass the broad spectrum of students, while providing a fun, challenging and engaging learning opportunity. Students are generally fascinated with games and embrace interactive learning which incorporates auditory, visual and kinaesthetic stimulation<sup>4</sup>

### *The Learning Resource*

The project involves the development of an online game resource which will combine various learning styles and content from a cell biology unit, an anatomy and physiology unit, and a microbiology unit. This will involve developing and incorporating into a game platform, a series of multiple choice questions which students will answer to achieve points in a game system. Students will be required to answer questions from cell biology in the first level of the game to accumulate their initial credits. Once they have achieved this level, they will then move to the next level which will correlate with anatomy and physiology or microbiology content. Students will be rewarded with extra credits as they correctly answer questions and will be returned to the lower level when they demonstrate a lack of prerequisite knowledge in their answer submissions. Challenges will also be incorporated into the game to enhance student engagement, motivation and fun. This will include students competing with other players in a content-related engagement.

It is hoped that this project will address the commonly perceived problem that students compartmentalise units, particularly those that are service taught by other schools or faculties, and will enable students to scaffold their learning rather than studying individual units as separate, unrelated entities. In addition, the application-based questions within existing levels will challenge higher achieving students and probe and develop deep learning. The development of this pathway is the initial step toward the development of future resources that will incorporate content from a number of units linked by the commonality of prerequisite knowledge.

### *Innovativeness of the Project*

This project is innovative as there currently exists no scholarly research related to a game-based learning educational mechanism which enables students to formally link the content between units in a degree program. Once developed, this game will provide a framework which could be utilised by other schools and faculties at UTas for their specific course programs. The use of a game is proposed as educational games are known to stimulate student learning and enable educators to inspire students to have an excitement and love of learning<sup>5</sup>.

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<sup>2</sup> Okan, (2003)

<sup>3</sup> Franklin and Peat, (2001)

<sup>4</sup> Peschette and Thornburg (2006)

<sup>5</sup> Lujan an DiCarlo (2006a)

The innovativeness of the resource is also apparent in its ability to develop the learning skills of students, as well as building on their knowledge base. The design of the resource is critical to its success, as it is essential that the students are keen to voluntarily engage in the learning resource outside of formally structured sessions, as well as using it in face-to-face teaching sessions in computer laboratories. Students will be able to self-test their foundation knowledge, and then challenge and increase their knowledge in the areas of anatomy, physiology and microbiology. By challenging students, we hope to develop their critical thinking skills<sup>6</sup> and, by providing a fun learning experience, we hope to increase student engagement and interest<sup>7</sup>.

### *Challenge of the Project*

Academic staff are continually frustrated by the inability of students to link content between units of study in their degree. As mentioned earlier, repetitive information is, therefore, often included in second and third year units to make up for this deficiency. Consequently, this challenges staff to devise a means by which students can engage in content-directed learning, revisit the information, and then make connections between their academic units of study.

The game will be developed to include modules which will allow students to test knowledge as well as increase their ongoing learning. The first module will cover cell biology, with students progressing to subsequent modules in anatomy and physiology, and microbiology, relevant to their course of studies. The game design will also cater for first year HLS students from a range of degrees including biomedical science, health science, exercise science, environmental health and medical imaging. Therefore, the online game needs to be focussed on human biology, with an emphasis on relevant examples pertaining to each HLS degree program.

### *Nuts and Bolts Discussion: Development and Implementation*

The proposed Nuts and Bolts session will foster discussion on the use of educational games in first year learning. It is proposed that the game will provide students with immediate feedback on their learning<sup>8</sup> and engage them in epistemic tasks that involve critical thinking and problem-solving<sup>9</sup>. Specifically, the Nuts and Bolts session will discuss:

- a) The validity of using educational games in first year learning
- b) How can students be encouraged to participate in educational games? Is it educational to include games which involve “combat”?
- c) What game format(s) would be most suitable to fulfil the pedagogical role in cementing foundation knowledge?
- d) How can educational games be successfully implemented into the first year curriculum?
- e) What mechanisms can be utilised to successfully evaluate the success of game-based first year learning?

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<sup>6</sup> Elliott (1996)

<sup>7</sup> Handfield-Jones, Nasmith, Steinert and Lawn , (1993)

<sup>8</sup> Lujan and DiCarlo (2006b)

<sup>9</sup> Hativa and Goodyear (2002)

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