Rebecca Donkin & Elizabeth Askew

University of the Sunshine Coast

Evaluating Student Engagement and Learning Outcomes Through E-learning in Biomedical Sciences

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*Rebecca Donkin, Elizabeth Askew

Discipline of Biomedical Sciences, University of the Sunshine Coast, Faculty of Sports, Health, Education and Engineering, Sunshine Coast, Maroochydore DC, Queensland, Australia

*Presenting author contact details: rdonkin@usc.edu.au

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In short…..

1. **Aim:** To evaluate the effectiveness of e-learning formative activities in a biomedical science course.
2. **Embark and Clarify:** The MELT framework was adapted to determine whether the research significantly increased knowledge and engagement.
3. **Analyse and Synthesise**: Significant increase in mean summative assessment score and final grade.
4. **Evaluate and Reflect**: E-learning resources are an option for all educators and promote student engagement.
5. **Communicate and Apply**: R Donkin, E Askew. 'An Evaluation of Formative "In-Class" versus "E-Learning" Activities to Benefit Student Learning Outcomes in Biomedical Sciences' Journal of Biomedical Education (2017). Volume 2017, Article ID 9127978, 7 pages https://doi.org/10.1155/2017/9127978

- The ability to interpret clinical cases in haematopathlogy (blood disorders) is a vital skill for pathology students to learn.
- However, curriculum design has been influenced by the reduction in the number of face-to-face contact and the decrease in teaching staff.
- Utilizing alternative teaching methods provides an opportunity to maintain quality teaching standards and satisfy pedagogical change that is evidence based.



- There has been a growth in blended learning and e-learning.
- New teaching and learning methods can be accessed and experienced in a variety of ways through technology.
- Online tools have superseded paper-based activities.
- The Millennial learner (born 1982-2004) has grown up in a technologically driven environment with a routine involvement with e-learning.

https://technofaq.org/posts/2016/10/top-5-trends-in-virtual-reality-gaming-in-the-nearest-future/

Aims

- (i) Investigate a Model of Engaged Learning and Teaching (MELT) criteria that could be used as a platform for student engagement with e-learning.
- (ii) Determine the effectiveness of formative assessment to assess knowledge and skills in haematopathology with and without immediate online feedback prior to summative assessment.
- (iii) Assess whether a new e-learning approach improves final grades through empirical research.

Traditional paper-based activity

<u>Need was recognised to</u>:

(i) incorporate formative assessment that provided timely and relevant support to assist in improved learning outcomes prior to the summative assessment

(ii) increase the opportunities for repetition and interactivity for the learner.

A model of engaged learning and teaching (CRS) framework was adapted to fit the context to design and apply curriculum structure to engage students and enhance teaching in this area.

CRS Development Framework

Facet of Skill Development	Student Role
Initiative	Establishes a professional role: Scientist.
Use of Technology	Resources & technology to generate information: e-learning modules.
Learning & Evaluating	Evaluates performance, sets goals, establish life-long learning: applies clinical learning and skills, interactive and on-going learning.
Self Management	Reflective practice: sets goals to improve and focus learning, application to work placement.
Problem Solving	Synthesises and analyses clinical contexts: real case based studies.
Communication	Communicates understanding: assessment & team work in a clinical setting.

CRS Development Framework adapted from University of Adelaide by Assoc. Prof. Cathy Snelling and Assoc. Prof. Sophie Karanicolas

Organise & Manage

Task 1

- Formative 1A
- Summative 1B
- In-class tutorial → Case study assignment

Compulsory laboratories

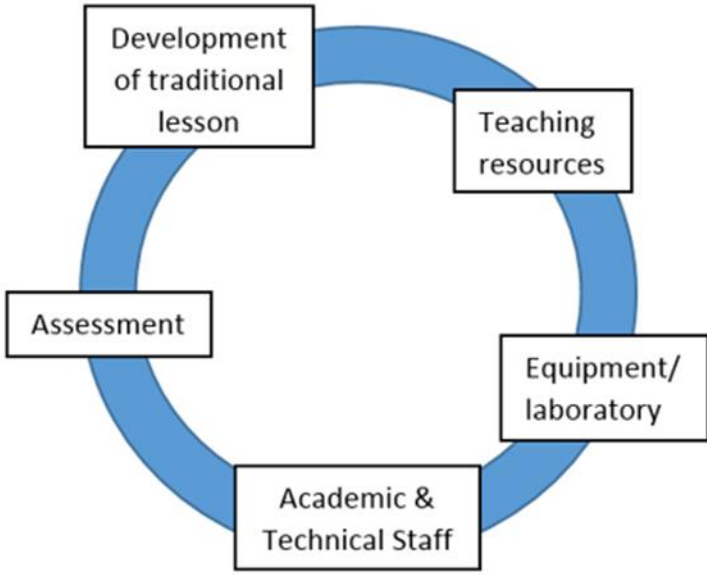
Task 2

- Formative 2A
- Summative 2B
- E-learning module → Case study exam

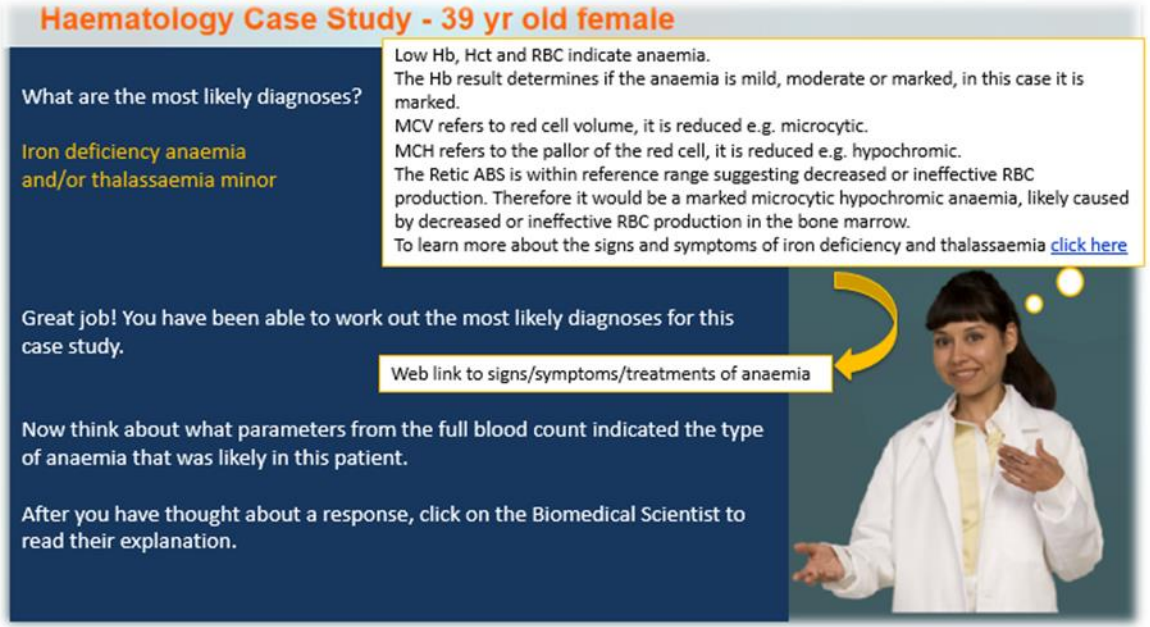
Feedback

Verbal from Tutor	Marking Rubric	Online	Grade (%)
In class only	10 days post submission	Instant feedback	Score only
One attempt/class	One attempt	Multiple attempts	One attempt

Find, Generate & Reflect

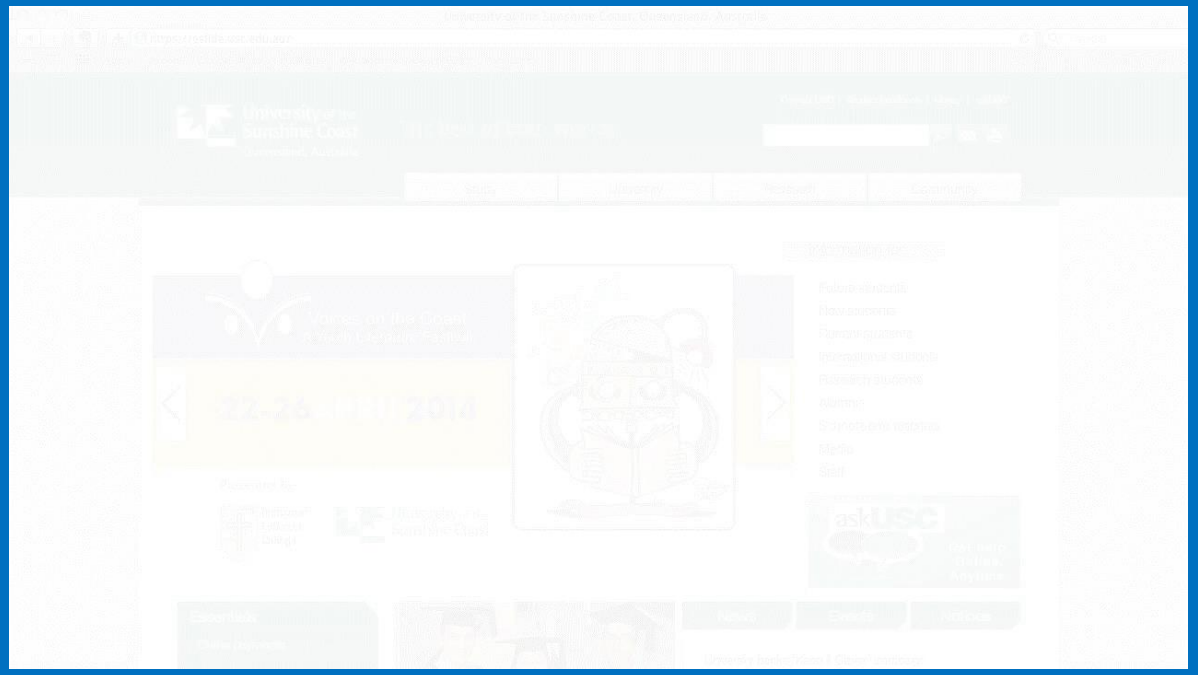


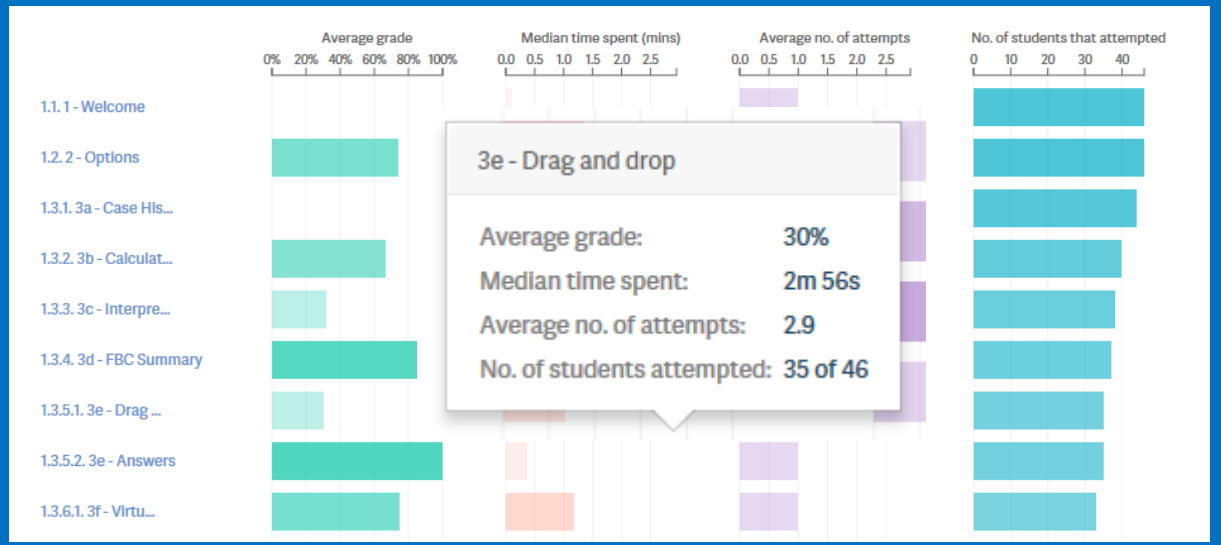
E-Learning Tutor

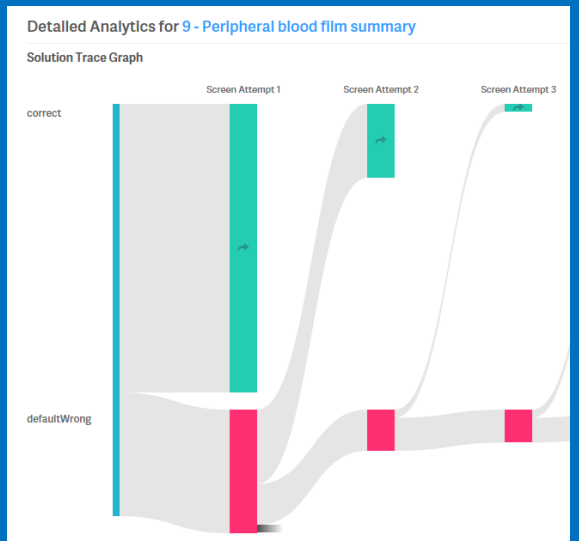


What did students actually do?

- Online haematology modules
- Developed in Smart Sparrow: Immediate feedback & analytics



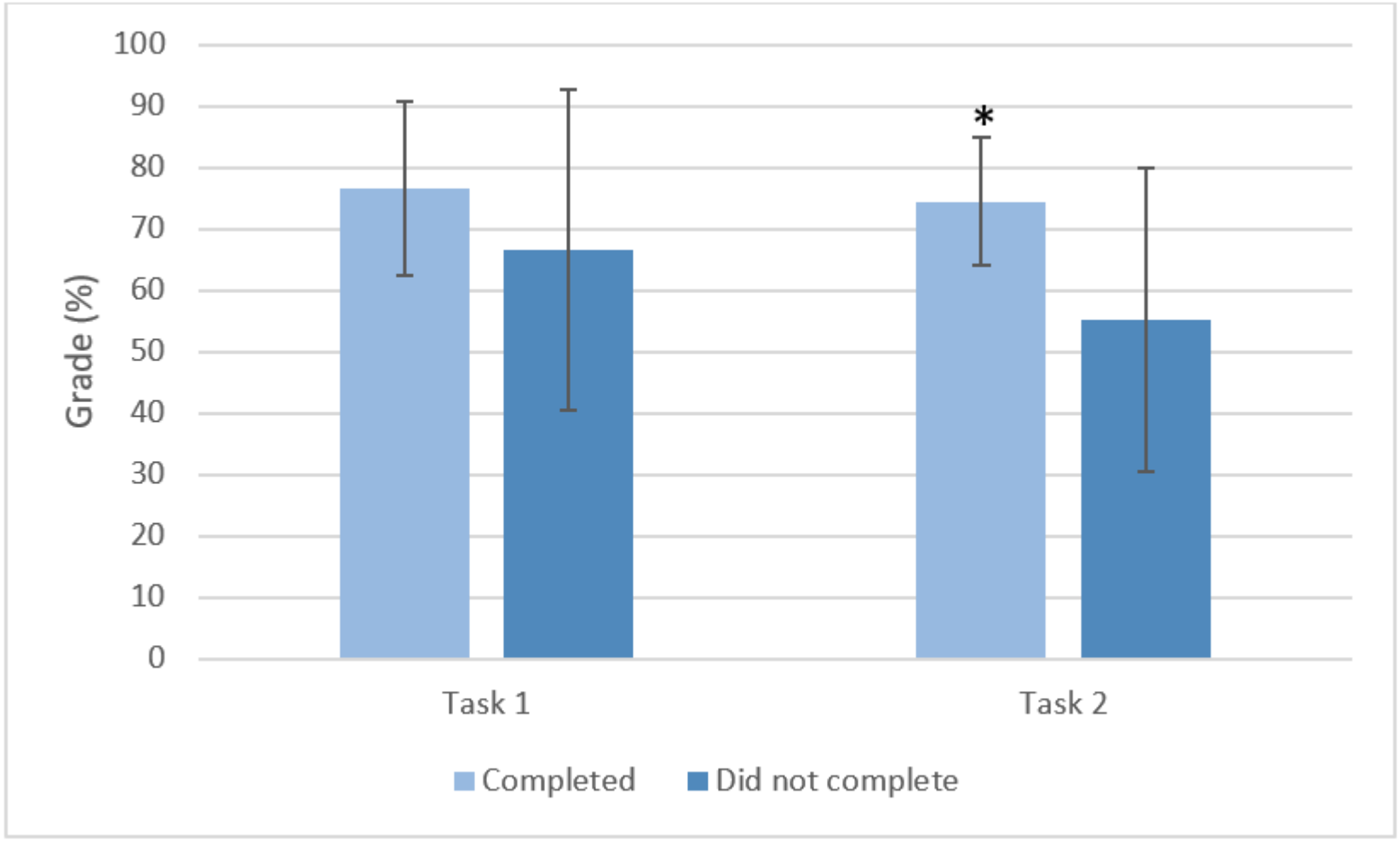




Analyse & Synthesise

Paper-based

e-learning



Evaluate & Reflect

Rebecca has a knack fo *Engaging* her students. She uses positive language to build confidence in her students. Her ethical and *inclusive* manner has helped me feel equal and *supported* on my *Learning journey*

During the game, information about the topic is given, and *Student inquiry* guides learning. By having access to advanced technology teaching spaces and *Group* touch screen participation exercises, students discuss questions amongst themselves before sharing their answers in real-time, on the huge touch screen, for the *whole class* to *evaluate* and *discuss*

Throughout the semester our *group* would have various tasks, such as annotating digital blood films and answering timed quizzes, that were then displayed on the big screen alongside each other *group* This provided an *Engagement* competitive means of learning – with your work at the scrutiny of your *peers* you were driven to be the best performing *group*

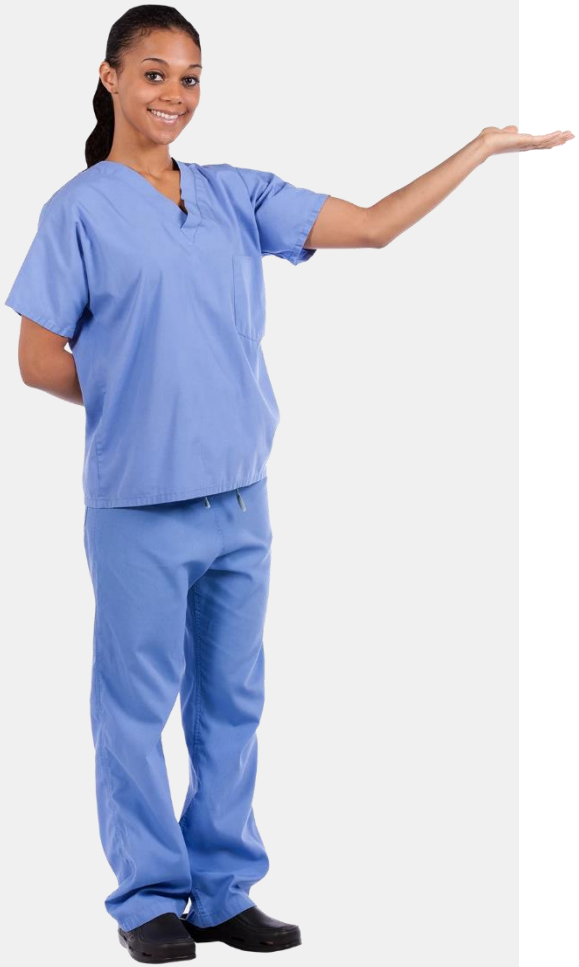
participation influenced class participation by allowing students to work as a *team* to handle case studies in the tutorial. These case studies were online, and as a *team*, we worked through them together in class as well as by ourselves at home, which then would have *personalised* marking. This was an important way of learning and allowing us to better our responses and *knowledge* each time we partook in a case study.

Communicate & Apply

https://2012books.lardbucket.org/books/a-primer-on-communication-studies/s11-informative-and-persuasive-spe.html

http://bejlt.brookes.ac.uk/articles/student-engagement/

Engagement



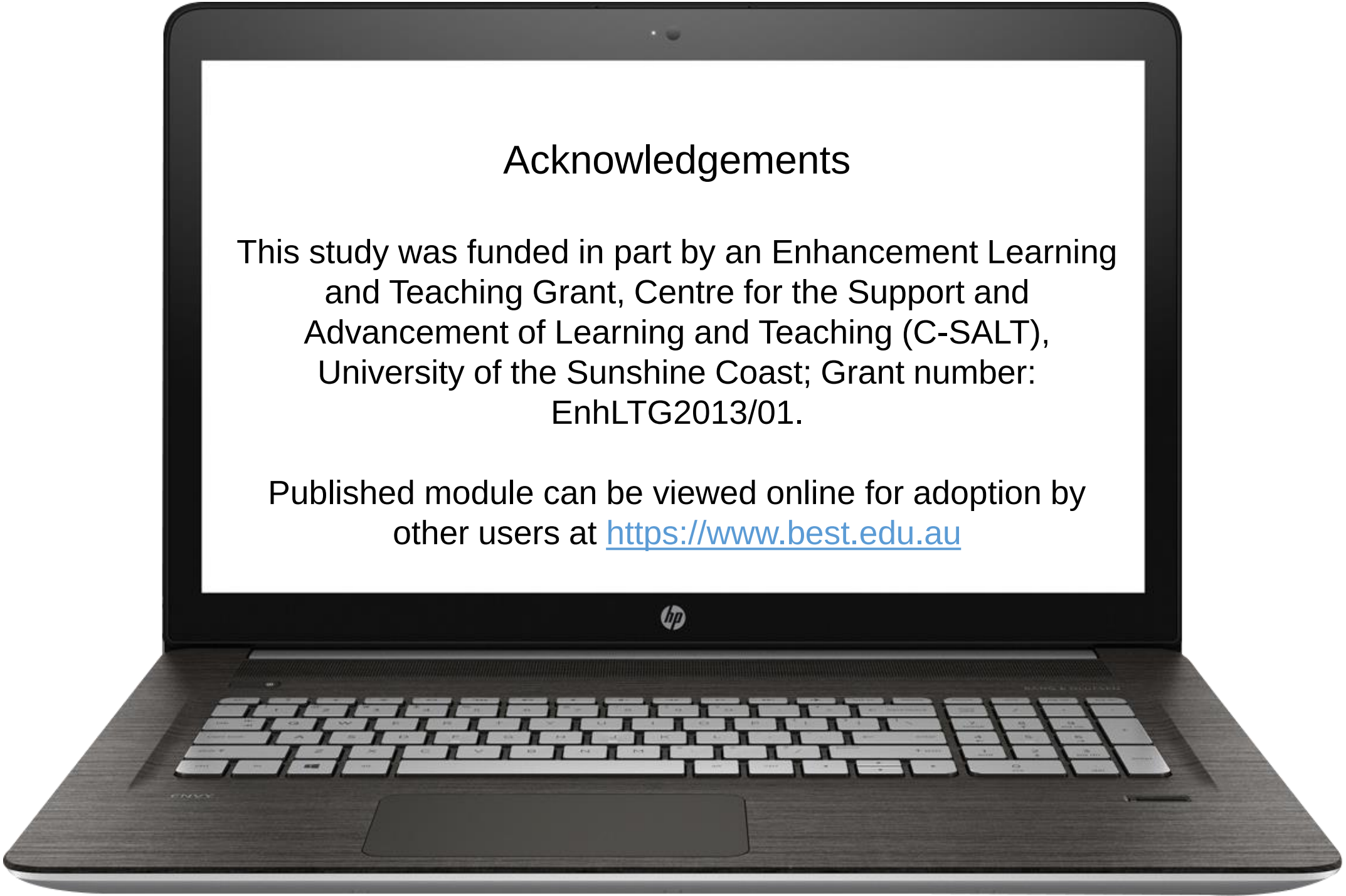
The design of an interactive and adaptive e-learning module should:

- Provide comprehensive learning objectives
- Stimulate attention, engagement and motivation to continue the module
- Contain knowledge that reduces cognitive load
- Be an efficient use of time
- Give the ability to complete and repeat the module anywhere/anytime
- Offer a positive interactive experience
- Demonstrate good aesthetics of the interface and user-friendly design
- Provide instant feedback and evaluation
- Have adaptable self-led learning with a choice of learning pathway
- Provide immediate analytics for improved usability and learning modification
- Have an application of the module to ‘real world’ scenarios.

Conclusion

- Formative assessment has a positive impact on student learning.
- Evidence suggests students want more e-learning lessons which corresponds with letting the students tell us how to teach [1].
- Further research is needed into the development of e-learning modules to assist learning using adopted MELT frameworks.

[1]Davis CR, Bates AS, Ellis H, Roberts AM. 2014. Human Anatomy: Let the students tell us how to teach. Anat Sci Educ 7:262–272.



Acknowledgements

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Published module can be viewed online for adoption by other users at https://www.best.edu.au