

Physical Principles for Bioscience Students: A Problem Based Learning Tool

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Introduction

There are various theoretical concepts and skills that bioscience students need to develop in order to become effective at solving problems. One such issue is being able to apply physical science principles.

With growing pressure on available teaching time it is important that academic staff provide additional resources for students in order to develop important underlying academic skills. It has also been suggested that low achieving students often lack the ability to seek essential information to solve problems (Tsai & Shen, 2009). Integrated e-learning can potentially combine theoretical information with problem-solving tasks to help overcome these issues.

Aims

The main aim of this project was to develop physical science skills for bioscience students by:

- developing a web-based template that allowed interactive problem-based learning materials to be embedded within biosciences courses
- using social networking / communities to engage students in learning and obtain feedback on the materials developed
- assessing the potential of disseminating the interactive template to the wider bioscience community

Methods

An implicit and explicit syllabus was developed to devise appropriate bioscience related physical science problems. These were hosted on a novel interactive web-based template which incorporated key features intended to promote learning (Figure 1). Two online 'Problems' were developed, 'Problem 1' trialled with Undergraduate students, 'Problem 2' with Postgraduate students.

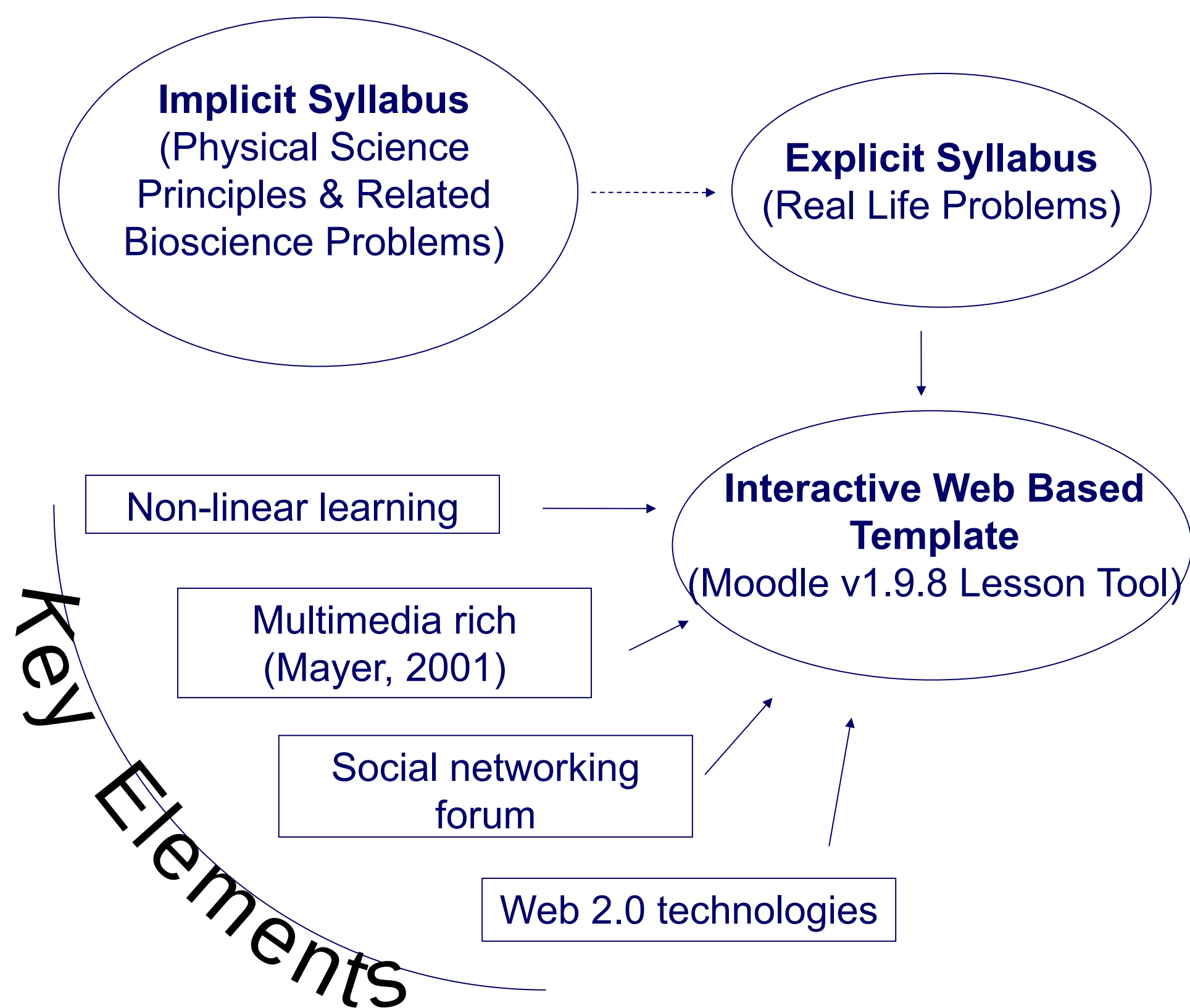


Figure 1: Initial development of online learning tool

The two 'Problems' were evaluated from a student and staff perspective using a questionnaire and semi-structured interviews. Student feedback and usage data were also retrieved electronically. Mean (\pm SD) values were calculated for the Likert scale questions and qualitative data was analysed using hierarchical content analysis. Results of the evaluation fed into future development of the resources.

Results

The resource was used by 58% of Undergraduate and 53% of Postgraduate students who were enrolled on the modules linked to the study. Key findings from the student evaluation revealed that the resource had a positive effect on learning for both groups (Figure 2). The majority of comments indicated that the resource developed an improved understanding of the physical science concepts covered. The lowest scoring items were improvement in problem-solving skills (Undergraduate) and benefit of the social networking forum (Postgraduate). Questions

relating to changes in study habits were generally positive, both groups indicating they would like to use similar resources in the future. The exception was Undergraduate students who scored 2.75 ± 0.97 on the impact of the resource on how they think about solving problems.

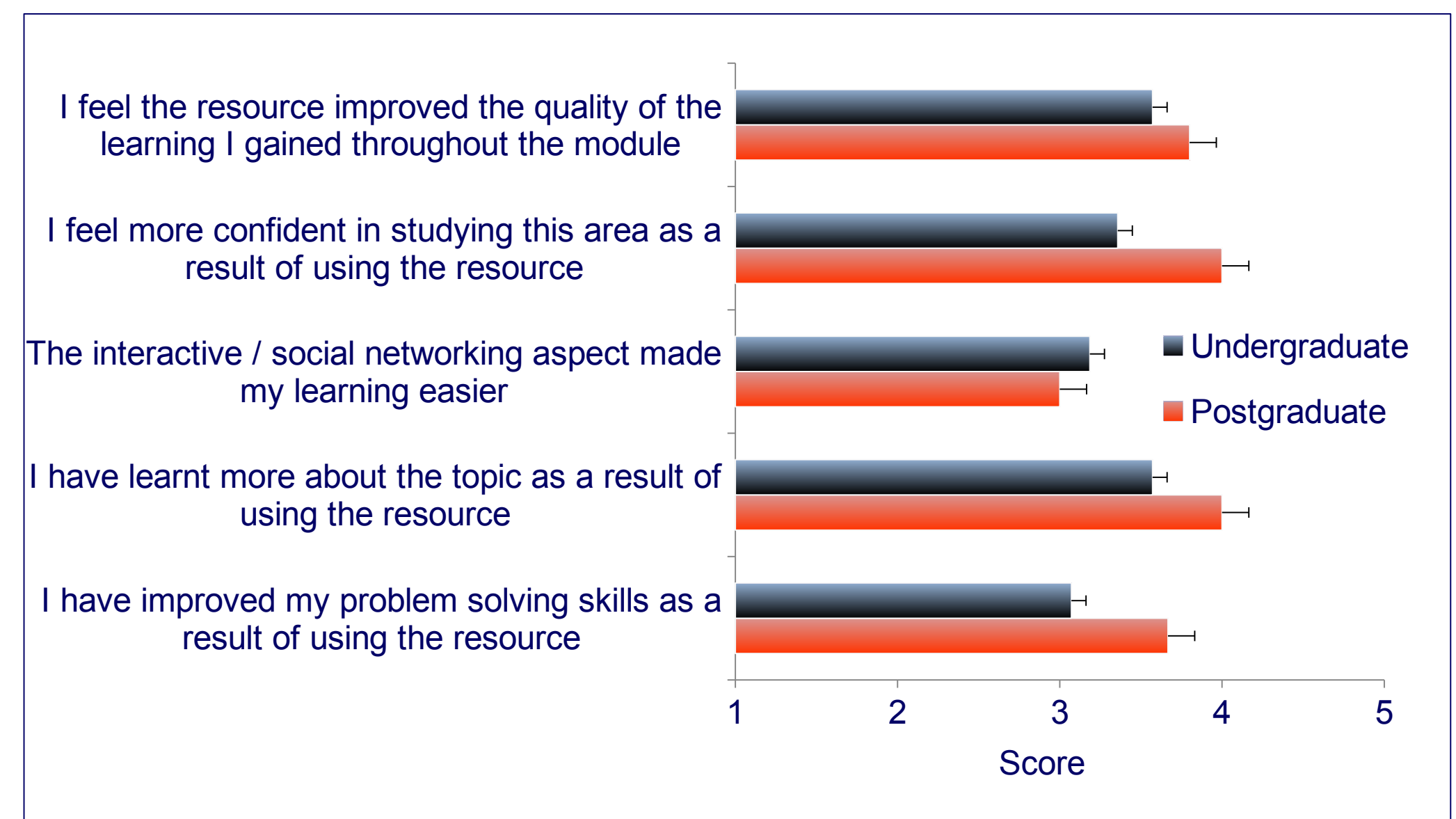


Figure 2: Mean scores from student questionnaires on items relating to effect on learning. Resource content and usability scored highly. Favourable features including immediacy of feedback and information presented in a variety of mediums. Comments from students and staff identified the need for audio files and more interactive material, including information on laboratory procedures that related to resource content at Postgraduate level. Also the length of Problem 1 appeared to be too vast for some Undergraduate students. The social networking element received a mixed reaction with staff and some students feeling a greater level of engagement across resource users was necessary to make it more effective.

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Discussion & Conclusion

Despite the positive reactions to the resource salient features were identified that had the potential to further improve it. As well as develop physical science principles the resource aimed to teach these concepts within a problem based framework. Therefore, when the evaluation revealed Undergraduate students did not perceive any benefits to their problem solving skills the resources were revised. To facilitate this Borromeo Ferri's (2006) theory of the modelling process was applied to questions and content allowing a clearer, more meaningful path through each problem. Analysis of student comments also allowed salient features of each Problem that generated some form of dissatisfaction to be identified and amended. This resulted in the inclusion of audio files, interactive mathematical tools and a laboratory skills lesson. In addition to splitting Problem 1 into two, more manageable parts, and reducing text on facing pages by providing optional links to more detail information. The Postgraduate students scored lowest on the social networking aspect but commented that they communicated through existing social networking channels. Strategies to improve forum usage will be required with future cohorts. Due to the success of this project there are plans to make the resources developed available via the University of Roehampton website.

References

- Borromeo Ferri, R. (2006) *Zentralblatt fur Didaktik der Mathematik*, 38, (2), pp 86-95.
- Mayer, R.E. (2001) *Multi-media Learning*. New York, USA: Cambridge University Press.
- Tsai, C. & Shen, P. (2009) *Computers in Human Behavior*, 25, pp.1189-1194.

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