

# An Enquiry into Using Supplementary Bioscience Resources in Health

## Abstract

The learning and teaching of bioscience subjects has been recognised to be problematic for well over 20-30 years. Various reasons have been suggested but it is evident that better support for learning at least is required. Various strategies have been tried and effective online support looks promising, especially as an aid to help those students who struggle with science and for whom English is not their first language. This project sought to introduce an online module designed to support student self-efficacy on the basics of science that are fundamental to gaining an understanding of more advanced bioscience processes. The module went 'live' in February 2013 as a voluntary adjunct to curriculum teaching. Though designed with students in mind the subsequent access has been disappointing and raises questions about the willingness of some students to voluntarily access extracurricular material. This might be a focus for further exploration.

## Keywords

undergraduate human biology, self-efficacy in science, on-line learning



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## Background and rationale

The importance of understanding biological sciences (i.e. anatomy, physiology, immunology, and biochemistry) for nursing competence has been acknowledged for decades. Student nurses appreciate that importance but studies over the last 20-30 years have identified that a proportion have major difficulties in learning the topics (cf. Akinsanya, 1987; Chapple *et al.*, 1993; Nicoll and Butler, 1996; Jordan *et al.*, 1999; Clancy *et al.*, 2000; McKee, 2002; Friedel and Treagust, 2005; Davis 2010). Consequently many nurses qualify with an understanding of bioscience that arguably fails to meet all statutory expectations (McVicar and Clancy, 2001; Friedel and Treagust, 2005; Davis, 2010). In a recent study (McVicar *et al.*, 2010), nurses in the Surgical Directorates of two NHS Trusts generally were aware of the significance of key clinical observations but were less able to explain the physiological changes that could relate to altered observations, or of the potential meaning for patient welfare. Accurate observations are a key aspect of patient assessment and that study found no evidence of unsafe practice in these respects but maintaining the status quo is not conducive to expectations of clinical decision-making which requires a higher level of analytical skills and problem-solving.

Possible factors that may contribute to student difficulties with learning bioscience include recruitment strategy, delivery issues, and curriculum time (cf. McVicar and Clancy, 2001; Davis, 2010). It cannot be assumed that the recent introduction of graduate nursing education will resolve the 'bioscience problem' in pre-registration education, despite the higher entry qualification requirements (cf. Friedel and Treagust, 2005; Whyte *et al.*, 2011).

Increased curriculum time is also unlikely to be feasible as the biosciences comprise just one component of the breadth of material covered by a pre-registration curriculum and re-apportionment would therefore have to be at the expense of other topic areas. Better strategies for improved bioscience learning within existing curricula are therefore necessary, possibly involving teaching that focuses more directly on student need by accommodating a range of learning styles and/or the application of more 'active' learning activities (cf. Torrance and Jordan, 1995; Michael, 2006; Meehan-Andrews, 2009). Another issue is how to support students studying scientific subjects in English when this is not their first language (Andrew, 1998).

Interventions that have been introduced in studies published during the last 20 years or so identify innovative classroom teaching formats or online programmes (McVicar and Andrew, 2013). Online programmes have promise as useful vehicles to help students who struggle with scientific principles generally, and to support students for whom English is not their first language (Andrew 1998; Windle *et al.*, 2011). This report describes a project that explored the utilization of freely-available online e-resources (i.e. Reusable Learning Objects (RLO)) that have been developed for bioscience subjects in nursing and healthcare programmes, in order to design a VLE-based module to support the learning of the basic scientific fundamental to learning more complex bioscience processes.

## Aims and objectives

The aim was to identify freely-available online resources and develop a VLE module that would be an adjunct, that is supplementary to classroom teaching and other online subject matter that students are expected to access as part of their courses. The module would relate to key learning points and also to those 'sticking points' which students find particularly challenging, and would be linked into curriculum module deliveries. It would provide alternative resources designed to encourage students to reflect on scientific principles and the role of science in everyday lives, and to improve their self-managed strategies to learning bioscience topics.

## Designing the module

The process comprised of three stages:

### Stage 1. Literature review

An initial search was conducted of the use of web-based learning strategies in nursing and health. We identified just seven studies that met the inclusion criteria (e.g. Windle *et al.*, 2011; Koch *et al.*, 2010; Green *et al.*, 2006; Wharrad *et al.*, 2001) but only one (Windle *et al.*, 2011) that had explored the utilization of free-source material as the main resource for a module. In that study, RLOs were rated as excellent / good by 96% of student respondents and a similar proportion rated them as helpful for their learning, and the authors reported a 'high level' of re-use. However they had introduced the (chemistry) module as a

replacement of a taught module whereas our study aimed to introduce an adjunct module for voluntary access. Nevertheless the review gave indicators of how we might proceed.

### **Stage 2. Self-efficacy survey**

Concurrently, student perceptions of their confidence (self-efficacy) and self-regulated learning of biosciences were sought using a survey of first-year students from the Pre-registration Nursing, Pre-registration Midwifery, Operating Department Practitioner (ODP), and Public Health programmes. Ethics approval was obtained from our University to distribute the survey questionnaire. Introducing the survey was slightly delayed by a requirement of the ethics panel for Criminal Record Bureau checks towards distributing the baseline survey (in case some students were under 18 years old). We had originally intended to survey student perceptions in October-November.

The survey focused on the Chelmsford campus only, as for management purposes this was to be the pilot site for the online module. First-year students were targeted as that is the year in which much (though not all) specific teaching of biosciences takes place. The survey was conducted from December 2012 to January 2013. It will be repeated at the start of the next academic year (September 2013). The intention of the survey was not to gauge the performance of students who had accessed the module (though the questionnaires included the student's SID number so that their work could be tracked, with their consent) but to identify the level of need and if that changes during the first year of their studies.

### **Stage 3. Introducing the module**

This stage led to the development and introduction of the supplementary online bioscience module. The team reflected the background and skills required for this: AM and SA have extensive experience of teaching and researching issues of bioscience education, and NH is currently engaged in teaching bioscience modules across various health care-related programmes at Anglia Ruskin, and their input helped to ensure the accuracy of the free source material and its currency to courses. GE is experienced in designing and maintaining VLE sites.

From the outset the intention was to involve students as part of the development team and to this end a call went out to second year students for volunteers from the four courses noted in Stage 2. One representative from each course was invited to join the team in a series of meetings and development activities. Second year students were targeted as they had successfully attended modules in their first year and so could advise on the 'sticking points' for their appropriate peer student group. The students were recruited but for various reasons, primarily their course demands, three eventually dropped-out. One (Lauren Spurling, ODP course) remained as part of the team and made significant contributions to the development including identification of suitable online sites from which material could be drawn.

The 'sticking points' were common to all courses, essentially related to biochemistry including basic chemistry, acid-base regulation, cell transport processes. To provide the necessary breadth of material, the team decided to focus on the fundamentals of chemistry and their relation to bioscience, in particular to the cell. Further decisions were:

1. There would be a maximum of 10 learning 'units' each with a specific focus (e.g. Atoms and Molecules; Macromolecules, Molecules and the Cell Membrane, etc.).
2. Each learning unit would be structured as:
  - (a) Introduction,
  - (b) Learning Outcomes,
  - (c) Resources (i.e. RLOs),
  - (c) Mini-quiz,
  - (d) Did you get it? (i.e. the salient points),
  - (e) What's the point? (i.e. day-to-day life relevance of the material, and importance to the human body), and
  - (f) feedback.
3. Each unit would require just 15-20 minutes or so to complete. A straw poll of a student cohort indicated that this would be most appropriate to encourage use of the site by students.

4. After completion of all units students would be invited to complete a final quiz (questions drawn at random from those used in the Mini-quizzes).
5. The Mini-quizzes would be linked to a bank of questions on QuestionMark. This reduced the assessment input from the team, provided immediate feedback for the student, and ensured variability should students revisit the units.

Sites accessed for reusable learning objects included academic sites (in particular at the University of Nottingham Centre of Excellence in Teaching and Learning (CETL)) and YouTube. Where permissions were not clear then the RLO authors were contacted for this. Over 30 reusable objects were incorporated into the programme as the main learning and teaching component. The team also took the decision not to release units piecemeal but to wait until the whole programme was prepared as it considered that any unforeseen interim delay would risk losing student activity, and so it would be best to ensure that all was ready to go as and when required.

## Outcomes

Responses to the survey were variable between course groups. 350 questionnaires were distributed to students when attending the university. Only 86 (24%) were returned either via the class tutor later in the day or via identified collection points. The greatest shortfall was from the nursing cohort, which was disappointing as the literature more comprehensively identifies nursing students as having difficulties with bioscience. This was also the largest cohort. At the time of writing the team are engaging a postgraduate student via the Anglia Ruskin Employment Bureau in order to complete the data analysis of the self-efficacy / self-management survey.

Difficulties around the Christmas period in identifying times when the whole team could meet was a slight problem in developing the online material but despite this, and the withdrawal of three students from the development meetings, progress was sustained. A podcast introduction to the programme involving an 'interview' between two of the team (AM and NH), and ten units, each one covering a different topic and containing RLOs with supportive text and mini-quiz, were uploaded to a dedicated VLE site constructed and maintained by GE. The programme was released in February 2013 and continues to be available to students. All students on the four courses involved were informed that the site had gone 'live' and were invited to access it. Figures 1 and 2 below show example screen shots of the VLE site.

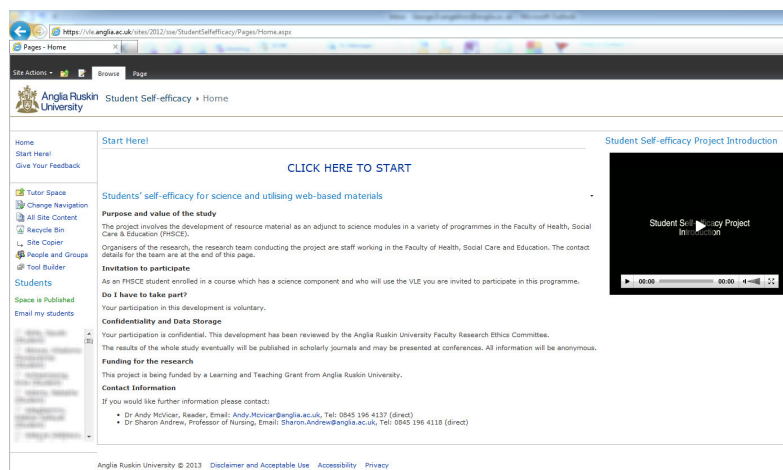


Figure 1: VLE site Home page

Published studies have consistently identified the popularity of online forums for bioscience learning (cf. Gresty and Cotton, 2003; Raynor and Iggulden, 2008; Koch *et al.*, 2010). The poor access of the site by students therefore was surprising, though access is very much dependent on the capacity of individuals to use Information Technology as a learning medium. A reminder email was sent to students in May 2013 and we are aware that some students have accessed the site (by July 2013). However no feedback has been posted so at this time it is difficult to know how the programme has been received. The team publicised the project at a recent Faculty Away Day (June 2013), and at the Anglia Learning and Teaching annual conference (June 2013) and there is interest amongst colleagues in the faculty in

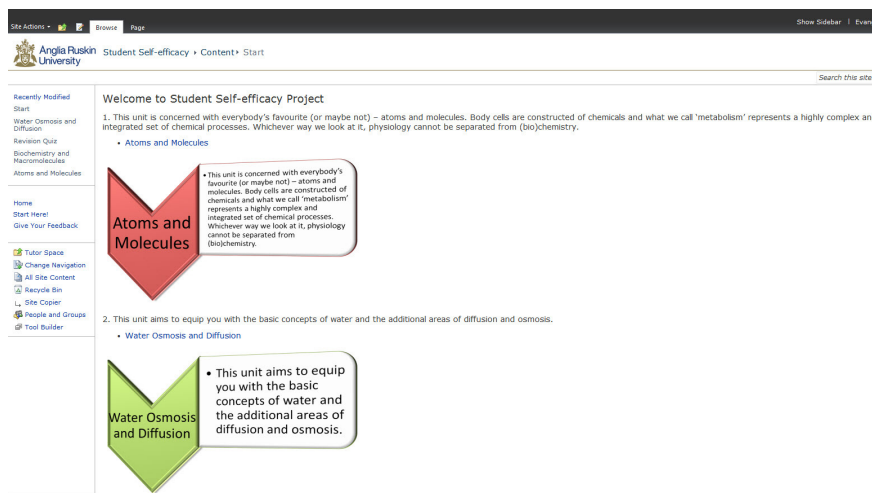


Figure 2: VLE site Welcome page

encouraging students on their modules across all locales of the faculty to use the site during 2013-2014. There is also

interest from other colleagues in the wider University who are working on related initiatives. The site will therefore continue to be available in 2013-2014.

The process has proved fruitful. We were able to deliver the programme as planned though slightly behind schedule for reasons noted. A longer-term aim of the project was to look towards making it available to other programmes of study where human bioscience learning has proved problematic for students. The module is fully-transferable and with further evaluation and development could be made available both internally and externally.

Disappointments are two-fold. Firstly, the inability to retain the full student input into the development which we had hoped to achieve. Apart from better validation of the programme, a stronger student input might possibly have triggered greater access to the site. Secondly, there appears to be an issue in students engaging voluntarily with this support programme. The reasons are unclear but discussions with colleagues from other universities suggest that this is a common problem. VLE programmes can work well when they are compulsory elements of the curriculum but students appear reluctant to spend further study time on extracurricular support. One possible contributory factor is how students divide their time. It seems logical that compulsory material would be viewed as more directly of value to students in passing module assessments particularly when study time is compressed, whereas voluntary material may be viewed perhaps as distractive and superfluous. This might be worth exploring further, and could be a consideration for future developments including for this project.

## Dissemination

The project was reported at the Anglia Learning and Teaching Annual Conference, Chelmsford, June 2013 and the Biosciences in Nursing Forum, BMA, London, June 2013. It will also be reported at the 5th International Nurse Education Conference, Noordwijkerhout, Netherlands in June 2014.

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