

*Resource Review***Biomathtutor Evaluation – a tutor’s perspective**by V. Tariq *et al.*www.ebst.co.uk/biomaths/ (freely accessible)

Biomathtutor is a video-led multimedia e-learning resource designed to provide support for the maintenance and development of mathematical skills in biosciences undergraduates. It was produced by Vicki Tariq with academic colleagues, the EBS Trust and funding support from HEFCE as an adaptation of the **mathtutor** model¹. **Biomathtutor** aims to introduce mathematical concepts contextually by illustrating biological applications through case study films and then developing the mathematical examples and numerical analysis. It therefore aims to break with the pattern of first learning the maths and then applying the maths to the biological situation, which is the format of many maths support materials.

The impact of **Biomathtutor** has been assessed through a national evaluation project funded by an e-learning research grant awarded to Vicki Tariq by the Higher Education Academy. This review is a reflection on my participation in the evaluation of **Biomathtutor**, the response of students to the resource and how it might be further exploited and integrated into the undergraduate teaching of bioscience.

The **Biomathtutor** case study is centred on a visit to the GP by an A level student with symptoms of tiredness and breathlessness. The mathematical applications are based on the processing and analysis of the samples sent for microbiological and haematological testing. Videos are used to illustrate the experimental techniques required for the particular tests e.g. preparing blood films, blood counts, use of haemocytometers and microtitre plates. The mathematical content includes using standard form and prefixes, calculating areas, volumes, dilutions, percentages, magnifications and interpreting the results, both visual and numerical. The video clips help to contextualise the numerical manipulations that have to be performed in order to carry out the tests and produce the results. They also help to reinforce the message that even relatively simple routine tests have numerical aspects and therefore maths cannot be avoided or ignored. Question sets, and some additional questions, lead on from the videos but may also be accessed directly. Answers can be easily submitted and incorrect answers are followed up with an explanation of the correct method of working together with links to relevant **mathtutor** tutorials for further explanation of the underpinning concepts. Navigation around the resource is straightforward and all sections can be accessed from all other sections. Colour coding of the sections adds to the ease of use of this resource.

Biomathtutor was evaluated by Foundation Year and Stage 1 students in the Department of Biosciences at Kent which was one of many departments participating in the national evaluation project. The aim was to have sufficient numbers of participants to allow the e-learning and contextual aspects to be evaluated. Not unexpectedly the significance of the word ‘voluntary’ in the context of maths tests was rapidly appreciated by the students and the numbers willing to participate in the project fell. It is perhaps an indication of the aversion to maths felt by many students that access to this additional resource was not seen as an opportunity but as a threat, with the results of tests having the potential to confirm what they already felt about their maths skills. However, it should also be appreciated that many of our students have direct evidence that a lack of numerical fluency does not preclude a reasonable grade in a science-based A-level and that a strategy of not engaging deeply with maths does not stop progression into higher education.

Many students have also had little opportunity to apply and practise their mathematical skills between GCSE and Stage 1, leading to a lack of proficiency and confidence in applying skills they were previously able to use. This was borne out by the results of diagnostic testing carried out in this department some years ago. Results for a diagnostic test based on GCSE intermediate level maths indicated that at GCSE

an A* grade was the only indicator of a good score on the diagnostic test. At all other grades (A-C) a range of test scores from fail to good was obtained. In contrast a poor, or even unclassified mark, at AS or A2 level was a better indicator of a good score. This indicates that many of the problems we see in applying numerical skills may result from a lack of confidence and practise. The use of **Biomathtutor** following diagnostic testing could have provided a novel way of refreshing students' skills within the biological context and would have allowed the links to their degree programmes to be clearly made. This would also have avoided the supporting maths workshops being perceived as remedial by the students as they repeated material covered at school.

The patterns of use of **Biomathtutor** could be tracked during the evaluation project and also once the formal evaluation period had finished when the resource was made available to the whole year group. Students typically accessed **Biomathtutor** through several relatively short visits with relatively few students spending long periods of time working logically through large sections of the resource. This pattern of use was also seen for my own maths resource which is essentially a collection of worked examples and practise questions. The pattern of use of these contrasting resources supports the observation that students are using such resources as a 'quick reference' to confirm they are approaching a calculation correctly or alternatively in the expectation that there will be a quick and easy answer to a particular question. Whilst there was no clear correlation between use of the resources and performance, it was of concern that many students, including several who seemed to be struggling with their mathematical skills, did not use either resource.

The constraints of the evaluation project meant that **Biomathtutor** was essentially presented as a self-study resource for students to work through. Following the completion of the project and without these constraints my further use of **Biomathtutor** will build on the observations of how students typically accessed the resource i.e. using it as a quick reference guide rather than as a learning package to be worked through. I had initially perceived that the lack of correlation between the content of **Biomathtutor** and our most numerically based module as a potential problem. However, on further reflection, it may provide an opportunity for reinforcing the need for good maths skills in our students. Distribution of the skills throughout several modules avoids the problem of there being one 'maths' module which can allow students, who are willing to accept a poor mark on this particular module, to continue with their previous strategy of not engaging with maths. The mathematical skills supported by **Biomathtutor** are distributed over several of our Stage 1 modules and bioscience students should most certainly have fluency in these techniques. Using **Biomathtutor** across several modules would serve to reinforce the importance of maths as a component of the biosciences that cannot be ignored. Mapping the material to different modules would also serve to present the maths support in much smaller packages which would be consistent with our student's preferred way of working as they enter Stage 1.

The **Biomathtutor** pilot contains valuable resources for supporting the development and maintenance of some of the basic mathematical skills needed by bioscience students at the beginning of their degree programme and can be freely accessed via the EBST website².

Reviewed by Kay Foster
 Department of Biosciences
 University of Kent at Canterbury
 Canterbury Kent CT2 7NJ
 Email: K.E.Foster@kent.ac.uk

References

- (1) V. Tariq (2005) Adapting **mathtutor** for the life sciences *HELM Conference 2005*
http://www.bioscience.heacademy.ac.uk/ftp/SIG/vtariq_HELM.pdf
- (2) www.ebst.co.uk/biomaths/