A Review of Student Support Computer Packages used in Universities

MATHWISE Pre-Calculus

Interview with Sanowar Khan ▪ School of Engineering ▪ City University, London

Background

At City University, a number of first year engineering students are using the software package Mathwise Pre-Calculus. The degree programmes such as BSc/BEng Electrical and Electronic Engineering, BSc/BEng Computer Systems Engineering and BEng Multimedia and Internet Systems contain students with varying backgrounds, some of whom have low A-level grades in mathematics or with no A-level mathematics.

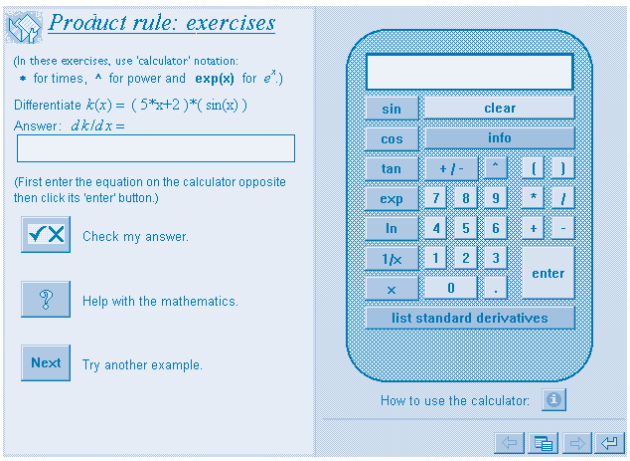
Integrated within the module General Mathematics, the package is intended to provide lecture support, offer an interactive learning option, improve student understanding and enhance self-learning habits.

The Execution

The package is incorporated into a weekly four-hour teaching slot, over a period of 20 weeks. Three hours of this is lectures with a one-hour tutorial that is not compulsory but provides assistance for students. Within the three-hour lecture, one hour is set aside for a tutorial in Mathwise.

During timetabled sessions the students work individually or in pairs. The package is also available for use on home PCs for self-study. This provides the student with the opportunity to work through the material at his or her own pace. At this stage it is not part of the assessment process.

At City University, Computer Assisted Learning (CAL) and Computer Based Learning (CBL) are considered important add-ons to the delivery of lecture material. Funding is available for such tools and lecturers are encouraged to make use of them.



Product rule exercise from Mathwise Calculus Cluster

Staff Perspective

Responses from the academic interviewed were positive. The general approach to teaching and presenting the material was considered appropriate for the subject matter and the students. The hierarchical structure of the package was easy to follow; it offered students the opportunity to engage interactively, investigating different variations and observing the effects. Altogether, it was found to be a powerful conceptual tool, which encouraged the student to learn through interactive elements, animated graphics and self-assessment exercises.

Student Perspective

Integrated within the lecture and tutorial sessions, six students completed a questionnaire based on use of Mathwise Pre-Calculus. It was viewed as a valuable source of mathematical learning. Many utilised the university facilities to access the package; some downloaded the software onto their laptops or PCs for home use.

The package fitted well into the rest of the course, and was easy to use. The students felt that the material was presented in a logical order. Frequent use was made of the on-line help; each used the self-test questions and the marked questions. The students did however request more information regarding their progress and performance when exiting the programme.

Comments were extremely positive; for example one student made the following statement; “We had theoretical knowledge only. Mathwise showed many of the practical applications. It helped us to confirm our doubts. (I mean if we had any doubts, say …about a graph…we were able to confirm the correct shape)…etc. It made the subject interesting and helped us to broaden our knowledge in Mathematics. It was very useful”.

There was however a contrasting viewpoint that possibly highlights the need for packages such as Mathwise, to teach diverse backgrounds.

“For those students who are in the low level it can be very useful, but for me I found it very, very, very easy, then I was bored doing it.”

CALMAT

Interview with Dexter Booth ▪ School of Computing and Engineering ▪ University of Huddersfield

Background

The School of Computing and Mathematics at the University of Huddersfield offers the first year module, Mathematics 1. Delivered over two semesters the course consists of 12 teaching weeks. Each week the course material is demonstrated in two one-hour lectures, which is followed up by a computer mediated one-hour tutorial coupled with more than five hours of directed unsupervised activity. The module aims to provide a solid foundation of skills in using mathematical techniques and an awareness of a range of mathematical techniques for analysis and modelling for engineering.

Approximately 120 MEng and BEng students enrolled in Electrical and Mechanical Engineering courses participate in the module, a comprehensive syllabus in which the software package CALMAT plays an important role. An assessment suite called TASMAT accompanies the software (Tutorial and Assessment in Mathematics).

The Execution

CALMAT was integrated into the module five years ago. The content of each lecture was related to one of the CALMAT modules and the appropriate course notes were duplicated. Each tutorial was taken in a computer laboratory and also related to one of the CALMAT modules.

Certain other modules were designated as 'starred' modules and the student was expected to work through these in their own time. These formed the directed unsupervised activity (DUA). Every three weeks the students sat a TASMAT test during the appropriate tutorial.

The assessment of the module is in two parts; the in-course assessment (40%) and the final examination (60%). The in-course assessment is built up by collecting points. The seven TASMAT tests contribute a maximum of 40 points. The first test will contribute a maximum of 4 points and the remaining six tests will each contribute a maximum of 6 points to the final grade.

To encourage the students to take part in their directed unsupervised activity and so develop their own self-assessment, each completed 'starred' modules gained them an extra point. There are 15 of these self-assessment programmes. These extra points can be added to their test points to accumulate to a maximum of 40 points.

Staff Perspective

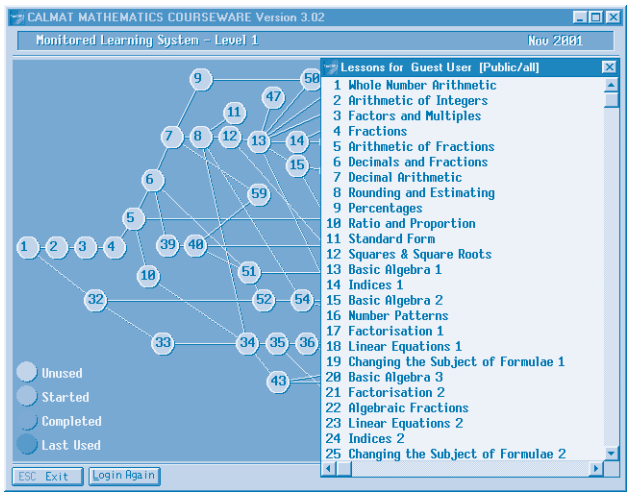
The CALMAT interface was described in the interview with the academic as interactive and straightforward, covering all general topics from foundations of arithmetic, through trigonometry to complex numbers.

It was observed that by embedding CALMAT within the module, the learning culture of the module changed. The software provided an educational tool for the student, which did not exist before. In linking the package with the assessment procedure this seemed to create a willingness for the student to participate. The software became in many cases an enabler for the student to progress in the module (This effect had also been observed in a bridging course, run in the summer for students applying for computing courses).

Student Perspective

Comments from six students presented an element of enthusiasm towards using the package. There was a clear understanding of the practical tools available, e.g. the assessment mode, the on-line help, tutorials and questions. One student stated "it provided practice for exam questions and lots of different questions on the same topic".

The shift from the paper-based tutorial to software embedded within the module had enabled the students to put in a consistent effort throughout the year. Regular effort was made to practise questions and revise, and this contributed to a more structured approach to learning and a genuine understanding of the mathematical topics.



Module map from CALMAT