They found the program provided a very exciting and informative way of learning organic chemistry. They liked the immediate feedback on their own answers, and the general comments.

ChemMark-WWW is produced by Hampden Data Services, UK, in conjunction with the School of Chemistry at The University of Sydney.

Flexible Learning and Assessment Package for Teaching Data Analysis and Chemometrics in Analytical Chemistry

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Instrumentation for analytical chemistry has become enormously productive and convenient to use in recent times. However, despite successes in automation and computer software, the person driving the instrument is still of prime importance. In the wrong hands, even the very best computer controlled instrumentation will only produce more meaningless data faster. In analytical chemistry it is the quality of the data produced that is of the utmost importance. A related issue is the spread of chemometrics into the workplace for solving routine analytical chemistry problems in areas, which include everything from the petroleum industry to the environment to foodstuffs to forensic science.

Students do learn about quality and data analysis principles in a statistics unit that they undertake but usually they are unable to make the connection between what they learn in statistics and what they learn in analytical chemistry. In any case, generalist statistics units don't go far enough to prepare students for using chemometrics software packages in professional life.

In order to cater for student needs in these areas a package of flexible learning modules has been developed and used with 2nd and 3rd level students in analytical chemistry. These modules are web-based and include the following features:

- students can use them in an on-line mode using an Internet connection;
- students can obtain an installer program on a floppy disk which installs the system onto a home or work computer for off-line use;
- in off-line mode students can do everything except submit answers for on-line checking and connect to the discussion forum;
- the package is integrated with discussion forum software which allows students to keep in close contact with staff and to cooperate more effectively with each other;
- each module contains a set of "real life" analytical data for the students to analyze and interpret;
- students can use a variety of software tools for data analysis and visualization, including *Microsoft Excel*, *Statlets* and *Matlab*;
- once the students have finished the analysis they are required to answer a series of questions, some of these questions are multiple choice or tick the box and these are automatically computer checked for rapid feedback;
- for convenience of teaching staff the web software writes student results directly to an *Excel* spreadsheet; and
- other questions require students to display deeper reasoning skills and are marked manually.

These modules are set in the early part of the semester before laboratory classes start. Where possible the laboratory program has been designed to link in with the data analysis modules. The skills developed with *Microsoft Excel* (and other software) greatly assist students with general laboratory report writing in the later part of the semester.