ABSTRACT

The computer revolution has affected almost every aspect of life including the scientific disciplines. Higher education in science must take account of this in the preparation of effective scientists. This article is based on an attempt at Griffith University to do this in the School of Science by the introduction of a new concentration area named Electronics and Instrumentation and postulates that the success of the program in enabling students of all scientific disciplines to take this concentration area is due in part to the flexibility available within this interdisciplinary school.

1. Introduction

It is almost trite now to describe the rapid spread of computers and microprocessors into most aspects of life as a revolution. Workers in heavy industries use computing systems to operate plant and maintain inventories, accountants use computer files instead of books, medical practitioners use microprocessor based equipment to monitor critical care patients, children play computer games and housewives use programmable sewing machines and ovens. A list of this type grows daily. It is becoming increasingly common in Australia for primary and secondary students to take courses involving computers e.g., computer programming, computer-aided-instruction and computer awareness. Many students now entering university are seriously disadvantaged by the limited number of courses in computing available and the inadequacy of computing facilities. Furthermore, there is insufficient computer-based equipment in laboratories for the teaching of science. It is incongruous that science departments and schools in universities which are at the forefront of scientific research and which are for this purpose using sophisticated computer-based
technology should be lagging in the provision of computer based teaching and laboratory equipment. Although not all scientific experiments need computers to be conducted effectively it is essential that they should be available where appropriate. Some university departments, e.g., organic chemistry, geology and microbiology, are further restricted by not even having computer based equipment for statistical analyses. These serious deficiencies are due to inadequate funding to provide the necessary equipment and in many cases, a lack of available expertise to teach in this area.

From 1975 until now as computing has become increasingly important, resources available to universities have shrunk dramatically. Despite the substantial fall of computer and microcomputer prices, the inclusion of microprocessor control in instrumentation has given the opportunity to manufacturers of scientific instrumentation to increase their prices. The expertise and background knowledge of many academic staff and support staff, particularly in areas that have traditionally used very little electronic equipment are limited especially in the computing field. Retraining of staff is both a resource and a motivation problem. Even if these problems can be successfully overcome, the retraining programs must be conducted in an appropriate and understandable way.

Current external pressures on universities strongly demand that they become more “relevant” in their courses and prepare more “employable” graduates (Clarke and Birt, 1982). Added to these there are now new pressures for science graduates to have appropriate skills and capabilities in the computing area. Field (1982) drew attention to this using as an example the position of an analytical chemist. His reasoning was as follows. Who is the analyst using automated instrumentation—the chemist who uses the instrument or the computer scientist/electrical engineer who designed it? The importance of analytical chemist is significantly devalued if confined to the role of operator alone. An analytical chemist must be able to develop “fresh approaches to solutions of technical problems and ultimately to develop the skills of the computer scientist”. Field concludes that unless there is a significant change to undergraduate programs we shall “end up training technicians instead of technologists”. His conclusions are equally valid for other scientific fields including microbiology and organic chemistry and are in the process of being realised right now in clinical biochemistry and crystallography because of the lack of training in the computer/microprocessor field.

Postgraduate diplomas in systems analysis and computer programming are available as are short courses in microprocessors offered by electrical engineering departments. These courses are however not oriented towards science graduates and therefore do not cater for the specific needs of scientists. Appropriate training in these areas should be a core ingredient of all undergraduate programmes in science.

It was to meet this need that a new concentration area was developed and