

# Computers as a Tool for Teaching Report Writing

Maurice Allen and Judith G. Mackenzie  
*Chemical and Process Engineering Department,  
University of Canterbury,  
Christchurch, New Zealand.  
M.Allen@cape.canterbury.ac.nz  
J.Mackenzie@cape.canterbury.ac.nz*

## Abstract

The teaching of report writing skills has been incorporated into a compulsory course on engineering computation given to second year engineering students. The course is unusual in the heavy use of computers for teaching, communication, learning and assessment, and in that the course is presented by a team comprised of an engineer and an educator. The evaluation questionnaire at the end of the course has indicated the level of student satisfaction and has provided a basis for required changes in the following year. These questionnaire responses show that engineering students understand the importance of report writing, but it is not until the final year of their degree that they fully appreciate the report writing skills we are trying to develop.

## Keywords

*Computer-aided teaching, report writing, word processing*

## 1. Introduction

Our second year engineering students are subjected to a compulsory engineering computation course that involves word processing, spreadsheeting and computer programming. The course emphasises conventional student computer use with laboratory classes and assignments. The available computer facilities are also used for educational purposes, as part of communication, as part of the lecture environment and as part of the provision of lecture notes and model answers to assignments and exercises.

Initially, the course concentrated on the development of numerical and computing skills, and problem solving ability. This paper reports on the shift of emphasis to the development of report writing skills, based on the teaching of word processing, and its use as a report writing tool. Students have been required to present all assignments, including spreadsheet and programming assignments, as brief formal reports, using the scientific method of report writing (Barrass, 1978). The Microsoft Windows operating system has been chosen for its fully graphical interface, its range of functions, and its integration of the Excel spreadsheet, graphics applications and the Turbo Pascal compiler with the Word wordprocessor.

### *1.1 Writing and Report Writing*

Writing is a complex and creative process that is an essential skill for effective communication; it involves the refining of ideas and their expression, coupled with presentation and editing. Writers move back and forth between these aspects of composing as their document evolves (Hayes and Flower, 1980). Any writing, particularly report writing, can be modelled as a recursive problem solving process.

Engineering students rejoice in a self image of being achievers and facilitators rather than reporters or articulate wordsmiths. This self image is particularly inappropriate with the increasing emphasis on communication in professional engineering, both in personal presentation and in the extensive preparation of individual and group reports.

### *1.2. Process Writing.*

Various models have been proposed to understand the processes writers adopt. Such models are usually based on a number of assumptions: writing involves active and complex problem solving; writing consists of several processes - thinking, planning, generating ideas, evaluation and revision, which are invoked in a recursive manner; differences between novice and expert writers can appear both at the level of the problem addressed and in the interaction of the processes; and lastly, that for effective communication, the strategy of problem solving adopted by the writer is intimately related to the nature and purpose of the writing task (Hildyard, 1994).

Motivation plays a strong role in cognitive performance, but it is not clear what that role might be in relation to writing. Selecting a topic for oneself will facilitate the process, presumably as a result of increased involvement and interest (Englert, Stewart and Hiebert, 1988). Motivation in report writing is coupled directly to the enthusiasm for the task and topic, and engineering students must develop the required discipline, assisted by a well-defined writing process.

Even for experts, written composition remains a complex and difficult task. Studies on expert writers indicate that evaluation and revision are critical components of the writing process, with experienced writers focusing upon global aspects of the text. Inexperienced writers, however, tend to focus on "local" problems, such as grammar, syntax, and word choice (Hildyard, 1994).

Process writing incorporates the top-down view of the writing process, emphasising iterative refinement, and the interplay between content and expression. The limitation in the implementation of this view of the writing process has been the unavoidable dedication and manual effort of writing and rewriting. Wordprocessing removes this limitation with its facilities for assessment and revision.

### *1.3 Wordprocessing*

Does the teaching of wordprocessing facilitate the enhancement of writing skill? Cochrane-Smith (1991), when discussing the research literature on word processing, posed the crucial question *Do students write better with wordprocessing?* and answered *It depends!* The effects of word processing depend on many factors: the writer's preferred writing and revising strategies, keyboard skills, prior computer experience, available computing facilities, additional instruction and the school or university environment. Users of word processors might compose longer documents and engage in more revisions of their documents than comparable users of pen and paper.

Word processing facilitates revision of the written word. A common finding in research of this nature is a correlation between good writing and higher levels of revision. Hartley (1991) describes the level of revision as a major factor that distinguishes expert from novice writers.

Cochrane-Smith (1991) reports that students make more revisions when writing with a wordprocessor. However, wordprocessing alone does not improve the quality of student writing. Writing is a creative process that involves generating ideas, planning, writing and revising. However, a number of studies have shown that the introduction of word processing into instructional programmes is able to affect positively the quality of writing output (Aumack, 1985; Fisher, 1983).

Engineers particularly welcome the support of a spelling checker and a grammatical appraisal.

One vital factor that limits the success of word processing as a writing tool is keyboard unfamiliarity. Dybdahl and Shaw (1989) found that lack of keyboard skills was an impediment to writing with a word processor. Poor keyboard skills may increase the burden of report writing and divert from the

writing process, and the lack of these skills is closely related to an inexperience with computers and the computer culture. Our students enter the School of Engineering with a wide range of computer experience, and the unfamiliar are prone to computer phobia. An optional course in keyboard skills prior to the engineering computation course is essential.

#### *1.4. Computers and Learning*

Questions about the impact of computers on student learning and thinking have not always been clearly answered. According to Salomon (1992), one must distinguish between two different ways computers can affect human learning and intellect.

One way concerns the changes in performance that people display when using computers - for example the quality of the student's accomplishment while using a computer-based graphic tool for solving mathematical problems, or the level of presentation in the writing process when using a word processor. Working with a computer affects what one does and how well one does it. Care must be taken, when teaching word processing, that students do not devote more time learning how to use a word processing program than to improving writing ability (Becker, 1991).

The other computer effect, particularly as a tool for report writing, is the influence on the quality of student thinking and on their learning processes, such as cognitive learning, creative expression, and communication skills. Our experience has been that the presentation and content of student reports significantly and consistently improves with each assignment throughout the engineering computation course.

#### *1.5. Report Writing*

Report writing is introduced to the engineering computation course by a single lecture using a computer-based data projector presentation. The conventions of grammar, spelling and punctuation are emphasised, but the lecture specifically focuses on the Scientific Method of report writing (Barrass, 1978). One lecture on report writing is inadequate for such an important topic; the vital issues of clarity, style and completeness are neglected. However, other classes with a major laboratory component teach report writing separately, generally in agreement.

## **2. Evaluation and Course Assessment**

The processes of action research; planning, acting, observing and reflecting (Kolb, 1984; Zuber-Skerritt, 1993); have been used as a framework to improve the practice of teaching and learning in this course in a systematic way. For each of the last four years a consistent student evaluation questionnaire, as part of the observation phase, has been completed by most of the class. Student-initiated improvements to the course have included a more structured format for the laboratory classes, improvement to the reliability and ease of use of the computer system, the provision of on-line resources and the abolition of a formal examination - assessment is now completely by performance in assignments.

The other clear student requirement was for reference material. *Word Idioms* (Allen and Mackenzie, 1995) is a booklet written to help the students understand MS Word, Version 6.0, and to facilitate learning wordprocessing skills. This document is organised as a mini reference, arranged as a series of answers to *How to* questions, and is designed to be used while students are working at a computer.

#### *2.1 Feedback and Reinforcement*

The most effective assistance for students is an individualised, oral response from a teacher during the writing process (Freedman and McLeod, 1988). Engineering computation students may discuss their assignments or other difficulties with their lecturer or a tutor any time they can find them available, as well as at specific open office hours. Tutors are available in the computer laboratory for about four hours per day throughout the week, and for more restricted hours on the weekend. Further tutor

support would be appreciated, both in laboratory classes and full time in the Computer Laboratory. Limitation of resources constrain teaching effectiveness.

Each assignments is marked by one person to provide uniformity in the marking. Our students get feedback and reinforcement by detailed comments on their marked reports - a time consuming task in a large class of 250 students. Explicit marking is also essential to convince students of the justice of their final grade - an outcome of increased assignment weighting for assessment (Sommers, 1980).

## 2.2 Student Responses

Questionnaire results show that students find computer-based teaching effective. The ability to see the result of actions on a large screen as they are discussed enlivens the lecture process.

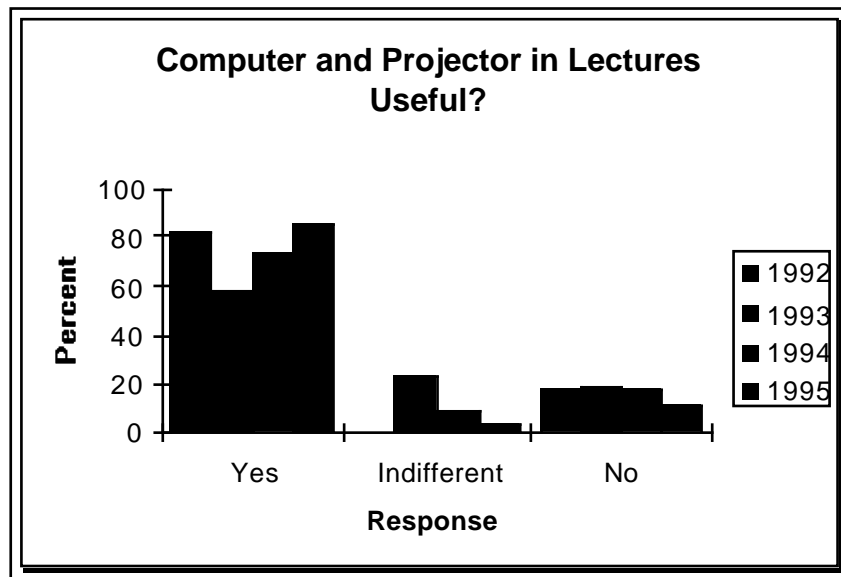


Figure 1. The effectiveness of Computer Displays in Lectures

However, inadequacies in lecturer computing skills are very obvious, and any equipment malfunction may destroy a lecture. Fallback measures, such as a supplementary set of overhead transparencies, are prudent.

How do the engineering students react to having to write a report for their assignments? Figure 2 shows that most students understand the importance of good report writing.

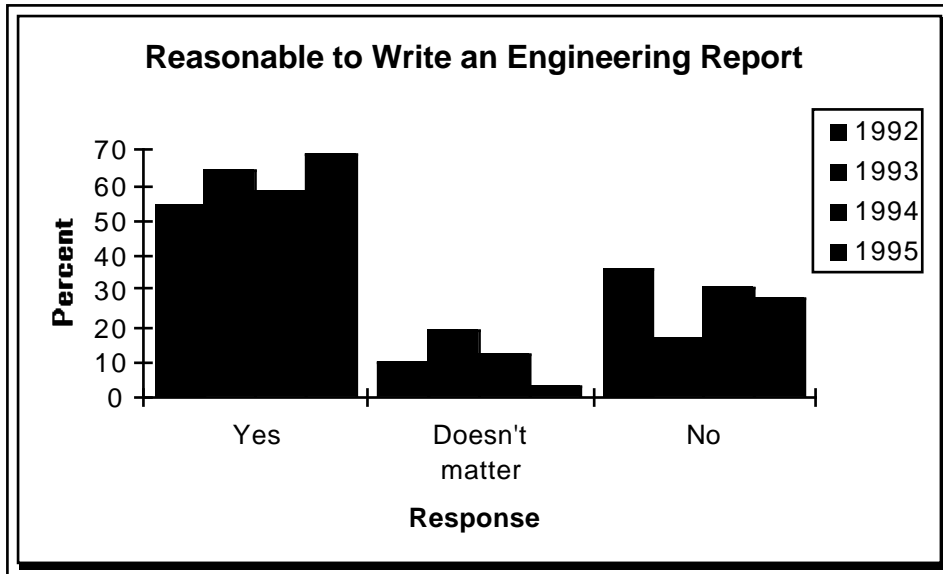


Figure 2. Report Writing as part of the Engineering Process

Some students still argue that only technical content is important - that report writing is separate, a distraction, a dilution of their creative effort taking time from more important technical considerations. However, our informal contact with final year students nearing the end of an engineering degree indicates that their appreciation for the need for good communication in engineering is better understood, and are grateful for help to improve the quality of their writing. Further, some understand that writing can be a useful tool to help with problem solving and understanding the mathematical content of engineering or other subject areas.

Most students enjoy working with computers. The wordprocessor makes the process of writing much less arduous than with pen and paper. Wordprocessing facilitates the process view of writing, enabling the composing text to go through a series of stages in planning, production, revision and editing.

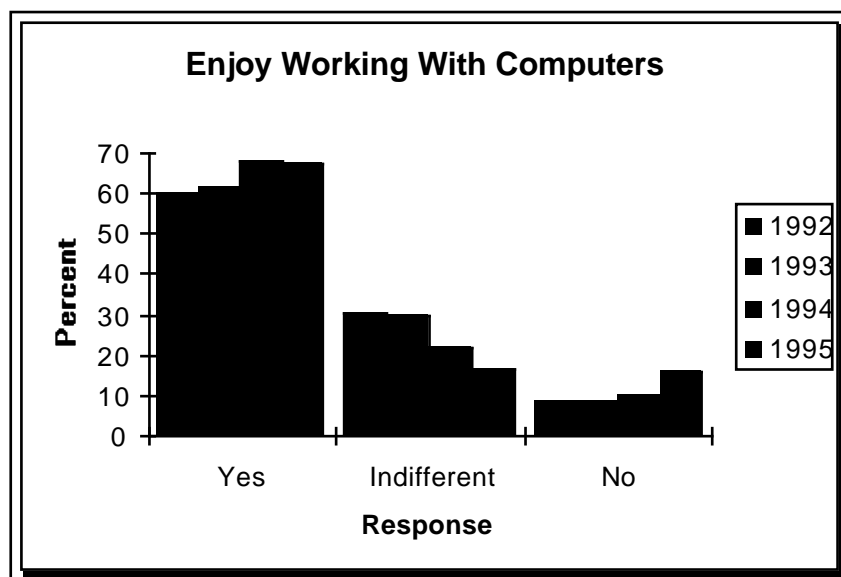


Figure 3. Student Enjoyment of Working with a Computer.

### 3. Conclusion

Writing is a complex process that is an essential skill for effective communication. Wordprocessing is compatible with a process view of writing as it allows the students to revise and rewrite their written work easily. Computers as a tool for report writing can influence the quality of student thinking and learning processes. Our endeavours to improve the content and presentation of engineering students' reports have had impact over the last five years. Our next objective is to improve writing style.

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