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Techniques for Teaching Professionalism to IT Students

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Executive summary

In the 1980s, when our courses were accredited by the Australian Computer Society (ACS), subjects dealing with professional practice and social issues in computing were relegated to Level 2 status: peripheral to a computing qualification. We have continued to offer these subjects, partly because of student demand, and partly because of our conviction that this is an important aspect of education for practice in the IT industry.

Now the ACS' 1996 draft Core Body of Knowledge includes interpersonal communications, ethics and professional practice as *essential* components. We decided that the time for this paper had arrived: interest in discussing the issues raised, and perhaps some practical usefulness of some of our teaching techniques, would be higher than at any other time.

The paper outlines our four main objectives in teaching concerned with professionalism, which are designed to assist students to:

- acquire professional ethical values;
- acquire professional skills (here we distinguish research skills, communication skills, and evaluative skills);
- ease their transition from university to the "real world"; and
- lay the foundations for professional habits (here we distinguish professional association membership, lifelong learning, and "giving something back" to the community).

For each of these objectives the details of what we teach and how we teach it, and how our students (and we) feel about it, is summarised. Our coverage is not balanced: we wanted to emphasise the areas where we felt our contribution to others' practice might be greatest, or which might spark some controversy.

Our recommendation is that the teaching of professionalism should form an integral part of every computing subject in an information technology course. In an ideal world this would allow the concepts to be reinforced over a longer period by many different lecturers. This does not preclude the offering of an elective subject for those students who have a particular interest in learning more about professionalism.

Abstract

This paper describes some of the techniques that have been used over time to teach professionalism in computing courses at La Trobe University, Bendigo. Teaching objectives include acquiring professional ethical values; acquiring professional skills (research, communication and evaluative); easing students' transition from university to the 'real world' (meeting procedure, team work and legal issues); and laying the foundation for professional habits (professional association membership, lifelong learning and 'giving something back'). For each objective, specific techniques are outlined and the text of assignments referred to are available at <http://ironbark.bendigo.latrobe.edu.au/publications>. Our thoughts on the success or otherwise of the techniques are included. Where appropriate student evaluations have been quoted.

1. Introduction

For many years aspects of professionalism have been taught in various subjects in computing courses at La Trobe University, Bendigo. Our goal is to describe some teaching techniques we have used in attempting to equip our students with professional values, skills and habits. Our paper is by tertiary educators, for tertiary educators.

2. Professionalism

We 'have used the term 'profession' much as it is used in everyday life' (Larson 1979 p.607). In our view, the everyday life definition coincides with more formal definitions, such as:

To put it precisely: by 'professionalism' I mean a way of life which provides a livelihood through the practice of a skill valued by society; this requires a 'cognitive base' of expert knowledge which can be acquired only through protracted training in a special field. The term also connotes the discipline necessary to exercise the skill whenever required. Since the skill is valued by society, there is the 'public service' aspect of professionalism. A profession may or may not have an official code of ethics. (Wilshire, 1990, p.48)

This somewhat idealistic view agrees with that implicit in the current draft Australian Computer Society (ACS) Core Body of Knowledge for Information Technology Professionals (Underwood, 1996; a summary is included as Appendix A), which includes interpersonal communications, ethics, and professional practice among the areas of knowledge essential for any IT professional.

Our problems in terms of the literature on professionalism lie in the fact that we are simply accepting this, and discussing how students can acquire a professional attitude, without debating the nature of professionalism. One issue we have not questioned is the *desirability* of a professional attitude (Larson, 1979; Wilke, 1979; Wilshire, 1990). Is professionalism in fact a matter of self-interest and elitism, not beneficial to society as a whole? Another issue we have avoided is that of whether in fact the discipline of information systems can indeed be regarded as a profession (Goode, 1983). This is a practical paper, not a philosophical one.

3. Where Do We Teach This 'Professionalism'?

We have three entry-level courses accredited by the ACS:

- a Bachelor of Business where students can elect to major in Information Technology (BBus(IT));
- a Bachelor of Computing, which includes a requirement for study in a different discipline of the student's choice (commonly accounting, electronics or psychology)(BComp);
- and a Graduate Diploma in Computing, with no non-computing components (GradDipComp).

Of the ACS's key areas of knowledge relevant to this paper, 'interpersonal communications' has always been an important feature of all our courses. Group work and presentation skills in particular are established components of many subjects (Horan, 1989; Horan, 1993; Horan, 1996; and Cope and Horan (in press)).

Our history of treatment of the 'ethical and professional' areas of knowledge is perhaps patchier. Each year, as we develop our ideas on what professionalism is and how we can teach it better, it is tempting to regard the topic as inadequately handled in the past. In fact handbooks for the last twenty years give evidence of inclusion of aspects of professionalism in the syllabus of all entry-level courses. Key phrases (from different subjects in different courses) have been:

- social implications of computers;
- designed to make the student familiar with current trends in computing and to teach him [sic] to advance his own knowledge;
- the social responsibilities of computing professionals;
- IS professional, social and ethical responsibilities.

Core subjects in the Information Systems streams of our generic IT courses acquaint students with, for instance, the ACS Code of Ethics. However, in-depth treatment of this type of content is currently in an elective subject called Professional Environment, open only to final year students in all three courses:

The subject provides the opportunity for students to orientate themselves to the professional aspects of practising in the computing field; to learn about ethical and legal responsibilities, to consider social implications of their work, to do independent research and to further develop oral and written communication skills.

4. Our Teaching Objectives

Our teaching objectives regarding professionalism are to assist students to:

- acquire professional ethical values;
- acquire professional skills;
- ease their transition from university to the 'real world'; and
- lay the foundations for professional habits.

Some of the techniques we will describe are used in the subject Professional Environment, and others are used elsewhere. Some are described in some depth, and others are simply mentioned (this reflects, probably, the work we have put into developing them).

Although the techniques are used in various subjects, we chose to write this as a joint paper mainly because we worked together on a predecessor of the Professional Environment subject. For ease of reading we have used the collective pronoun throughout, although the development of each technique to its present stage has in fact been an individual affair.

4.1 Acquiring professional ethical values

Ethics is a difficult topic to teach. An excellent bibliography prepared by Tavami (1995a, 1995b, 1995c) is available which covers computer ethics and computers and society. We have decided to use a combination of methods: theory via a lecture, tutorials using case studies and/or role plays, videos, and an assignment where students need to apply the theory to an ethical dilemma from their personal experience.

- **Ethical theory:**
This introductory lecture is based on a chapter from Deborah Johnson's (1985) book and is followed up by a case study where the students analyse an ethical problem using two different ethical theories.
- **Ethical case studies:**
Johnson (1985) and Parker et al. (1990) provide excellent but sometimes dated cases for discussion. Ethical case assignments (described below) from previous years are a good source of up to date case studies.
- **Ethical case assignment:**
After the formal lecture on ethical theory and class discussion on some ethical case studies the ethical case assignment is given to students. It is based on the work of Kallman (1992). In the assignment the students are asked to come up with an ethical problem from their own experience which involves information technology. The ethical problem may be either an actual or potential one. Invariably the initial student reaction to this assignment is one of bewilderment - they believe they have no experience of ethical problems. When the assignments are handed in we are always surprised and delighted by the standard of work achieved. A small number of students each year come to us for ideas and there has never been a problem helping them to come up with a topic for the assignment. We ask them to think about situations in their part time or full time employment and also in their year long project.

Student comments from the Professional Environment subject evaluations single out this as the most valuable component of the subject:

"Ethics - our responsibility as future computing professionals";

"Ethical issues examined in class".

4.2 Acquiring professional skills

4.2.1 Research skills

It is sobering to realise at the start of any subject involving research that many of our students lack appropriate skills, such as:

- **Locating materials:**
Library staff run tailored classes on demand and those organised for the Professional Environment are the most advanced given to our undergraduate students. Proliferation of electronic sources has ensured that most students have something new to learn each year.
- **Acknowledging sources:**
The Professional Environment is usually our last chance to ensure correct acknowledgment of sources. Time spent revising the standards and heavy penalties for incorrect acknowledgment of sources usually remedy any problems.

4.2.2 Communication skills

Communication skills are emphasised throughout our subjects. The following points relate only to the Professional Environment.

- **Verbal presentation skills:**
Feedback from students indicates that they do not in general enjoy public speaking but are grateful for having been forced to do it in this subject. One student said that the best thing about the subject was *"making us have to get up and do all those presentations"*. Another comment was: *"Large emphasis on presentations gave good experience"*. The students are well aware it is a skill that they will need in the work force. Negative comments from students are usually about having to listen to students who are poor speakers (thankfully there aren't too many of these).
- **Logical argument:**
A singles debate is conducted as a major assignment assessed on both the verbal debate and a written argumentative essay which must show that the student is aware of both sides of the argument. In a singles debate each 'team' consists of only one person. Staehr (1993) describes the method used, gives assessment details and provides sample topics. The debate is effective in forcing the students to become aware of both sides of a topic. Surprisingly, this assignment gets mostly positive feedback from students: *"Good way to involve students in the subject. All the debates were good"*. *"Was great fun. Debating against friends gave it that little bit of competitiveness"*.
- **Written skills:**
In this subject these include an essay on a social aspects topic of the student's choice, reports on meetings, the ethical case assignment and the book review.
- **Participation:**
A major problem to be overcome in a subject with no examination is how to encourage students to read ahead, prepare tutorial work that will not be assessed formally, and participate in class discussions. One way is to award marks for participation, and for this subject it has been extremely successful. The students have said that they appreciated the opportunity to discuss issues and found that unlike other subjects it allowed them to get to know each other quite well. They liked: *"Discussion and participation by the whole class instead of just listening to a lecturer and taking notes"*; *"Group participation - the students got to feel out an issue rather than just listen"*; *"Interacting with other students in class"*;

[Being] given the opportunity to have a say. The variety was good with different people speaking all the time. It must have been pretty good as my attention span is quite small and I remained interested throughout the subject".

4.2.3 Evaluative skills

Evaluative and critical skills are developed throughout the courses. A few techniques used in the Professional Environment are:

- **Evaluating written material:**
A book review assignment option began its life with the books for review being restricted to a few 'classics' such as Brooks' *The Mythical Man Month*, plus new information systems texts (to be compared to students' own introductory systems text). In recent years the list of acceptable books to choose from includes a diverse range of material but no technical books or manuals as it does not seem to be a problem to get students to read these, and no systems texts. The 'classics' in computing, and books on management, social issues in computing, and personal development are just some examples of the areas covered. Unfortunately many of our students are not keen readers and it is depressing to be asked which books on the list have the least number of pages.

The debate and the social aspects assignment also require students to read critically, as do activities outside the Professional Environment such as the scrapbook described below.

- **Evaluating events:**
Another assignment option has been to attend a professional meeting or conference approved by the lecturer; to speak to at least one person they did not know beforehand; and to report on it in two pages as follows:

Summarise the content briefly, then comment on the presentation (did you learn anything? was it pitched too high/too low? was it what you expected?). Comment on the speaker (academic or practitioner? Australian or overseas? invited for speaking ability or subject knowledge?). Comment on the meeting atmosphere (well attended and chaired? tea or coffee available? who did you speak to - and did they approach you, or did you have to approach them? would you go again/join that body?).

We have found this level of suggested structure to the comments useful, because the activity was so far outside the students' normal experience that they simply could not think of criteria.

The students' responses were generally favourable:

I loved the professional meeting: good experience and I felt like I was actually a computer professional (self delusion?)".

I would include the professional meeting as compulsory as I feel that there is a lot to be gained by attending them".

Unfortunately from a country campus it is expensive and inconvenient to attend metropolitan meetings. The reasons we haven't made them compulsory were succinctly expressed by one student:

Professional meeting caused inconvenience because missed classes and damned expensive".

Our concession to this last was to allow up to four (a car load) to attend any one meeting.

We have also had students write evaluative summaries of excursions, field visits and even guest lectures.

4.3 Easing transition to the real world

- **Formal meeting procedure:**
The students may choose as one of their assessment tasks to attend an approved committee meeting (within the University or outside as long as formal meeting procedure is followed). Students are encouraged to obtain a copy of the committee structure of the organisation and to interview the committee secretary before the meeting.
- **Team work:**
Team work is encouraged in the courses, though not necessarily as part of the Professional

Environment subject. Its use in the year-long Project and in the teaching of systems analysis and design has already been reported (Horan, 1989; Horan, 1993; Horan, 1996; and Cope and Horan (in press)).

- Legal issues in the computing industry:
We touch on this with an introductory lecture which is followed up by tutorials where case studies (Knight and Fitzsimons, 1990) are discussed. Some topics covered are:
 - how the law works;
 - problems with computers and the law (e.g. it is not possible to make the law fit a new problem, evidence in cases involving computers);
 - duties and responsibilities of an employee;
 - distinction(s) between working as a contractor and as an employee.

Students are always surprised by the restrictions of working for an employer. We are always very careful to impress upon them that it is not our area of expertise. There are always many questions that we cannot answer and student evaluations indicate that at least some of these topics should be taught by a lawyer as they seem to bring up just as many questions as answers. Students who have chosen law as an elective in their course generally appreciate this section more than those without some background and confidence in the area.

4.4 Laying foundations for professional habits

4.4.1 Professional association membership

Membership of the ACS is required as part of the Professional Environment subject. It is justified as in place of buying a textbook. Some students, usually not many, are already members. The students receive the ACS publications, attendance at free seminars often with speakers who are world renowned IT professionals and attendance at the ACS Student Conference. It ties in well with the professional meeting assignment described above, although those meetings are not restricted to being ACS ones.

4.4.2 Lifelong learning

The IT field moves so quickly that our students need to be in the habit of reading to keep up to date. We developed a scrapbook assignment to encourage a habit of reading, and also to develop students' critical skills.

Each entry in the scrapbook was to consist of a copy of an article and a critical annotation on it. The ideal volume of work was two entries per week. The entries had to be organised under headings corresponding to the topics to be covered in that subject through the whole semester: this had the advantage of making the students maintain an overview perspective.

This assignment has been used with second year, third year and graduate diploma students. Student evaluations have mostly been positive. The following quotes are taken from evaluations by a graduate diploma systems analysis and design class;

A few (were they really telling the truth??) said things like:

"I have continued to maintain the practice and have found that it allows me to feel more confident and have a better understanding of the current trends in the industry and developing technology".

On a more basic level, feedback has indicated:

- an encouragement of autonomous learning:
"It was obvious from our many class discussions that people had obtained many differing perspectives on the same topic";
It also trained us to be independent - read and learn yourself. That is what professional people should be capable of;
"The more you find out, the more you find you don't know, [so you] want more knowledge".
- increased awareness of the relevance of the subject to industry practice:
"A further benefit was the relation of the 'real world' view to our course material".
- an encouragement of generally keeping up to date:

"Even if articles directly related to your specific interest are rare, it is worth while keeping up in other areas as well".

- increased confidence and skill:
*"Above all, I think (I might be deluding myself) that most of the things which had seemed obscure can be cleared up by acquiring some simple knowledge of them - I thought it was understanding I lacked (of course, I can find things to genuinely not understand)";
"Critically analysing articles ... came easier with practice. Finding quality articles also got easier with time as I understood some of the topics".*
- increased interest:
"I found I read many many more articles than actually collected because once started even computer articles not associated with the course were very interesting And as a spin off I find my children have started to read the computer articles".

There is particular charm in those evaluations which indicate surprise in what they found, such as: *"Some articles I found contradicted other articles (e.g. on CASE) depending on the viewpoint of the writer, and surprisingly depending on which viewpoint was taken both were correct and I could see both viewpoints".*

Negative comments related to the fact that not everything found was "interesting", that the assignment required browsing rather than a formal search, so there *"were many subject areas in which it was very hard to find information"* (the assignment did not require balance here, but this patchiness in sources located by browsing was naturally frustrating for the students); and arranging to spend enough time in the library (a problem for part-time students).

For the lecturer, this assignment creates a heavy marking load, with three assessment sessions - and it's a physically heavy one, too, by the end of semester. But there are also advantages for the lecturer when compared with other assignments: marking is enjoyable; it provides an excuse/reason to read around the topic; successive scrapbooks are quicker and quicker to assess, because the papers become familiar, and one has then only to read the student comments.

One improvement we would make the next time we use this is to follow Hovis' (1988) example more closely (this work inspired our own in the first place). He divided the sources his students were to use into three categories (trade newspapers (e.g. *Computerworld*), trade magazines (e.g. *Dataamation*) and professional journals (e.g. *IEEE Computer*)). We will probably add an Internet category. The reason we have not specified sources in the past was because we wanted to encourage any reading. The reason we would now change is twofold:

- The volume of material on the Internet, and students' predilection for it, has increased the need for them to be aware of the significance of the provenance of information, and of the existence of the refereeing/moderation process.
- Comments like *"some of the more 'academic' research oriented articles left me none the wiser"* have made us appreciate the need to include instruction on how to read this type of material.

In fact, each time we use this scrapbook assignment we feel that teaching the 'process' skills needed is worth more sacrifice of 'content' teaching time. We have noted with pleasure that the ACS now makes allowance for a self-directed, reading-based structured program of study for PCP status (ACS, 1996). We feel that the citations and comments as given in these scrapbooks would form a suitable substantiation of such a program. This ability to keep up-to-date independently of formal courses or conferences is particularly relevant for our students, who can be expected to be more likely than metropolitan students to work in non-metropolitan areas.

4.4.3 'Giving something back'

There is an opportunity in the Professional Environment subject for students who are already engaged in some sort of community work involving information technology to negotiate and obtain credit for the work as part of their assessment. Some examples of work that past students have done are:

- volunteer work teaching disabled people to use computers;
- designing and implementing a small network at the student residences;
- providing a session for Open Day;
- giving a presentation or participating in a discussion for secondary school students as part of a careers seminar; and
- presentation of reports on vacation employment experiences to first year students.

5. Evaluation

Specific evaluation of the teaching of topics in professionalism within compulsory subjects has not been attempted. However the elective subject Professional Environment has been evaluated each time it has been offered. It was evaluated using the La Trobe University Quality Assurance Questionnaire in 1994 and 1995. In our opinion the two most relevant statements to report on were:

1. All things considered, I was satisfied with this subject.
2. Assessment was fair and related to the aims and content of this subject.

Figures 1 and 2 compare the responses of the students to the two statements in the two years surveyed. In both years there were small class sizes—14 students in 1994 and 13 in 1995. The 1995 group of students show a higher level of satisfaction with the subject and its assessment methods than the 1994 group. In both years the lecturer was the same, and the structure and assessment of the subject was the same.

There is a possible explanation for the difference in responses for the two years surveyed. The 1994 student group consisted of single degree undergraduates plus two graduate diploma students. Many of the undergraduates may have chosen this subject as a 'soft option'. In 1995 timetabling changes allowed the double degree students (who are usually better students) to choose this subject as an elective. The 1995 student group had a core of seven double degree students who were openly enthusiastic about the subject.

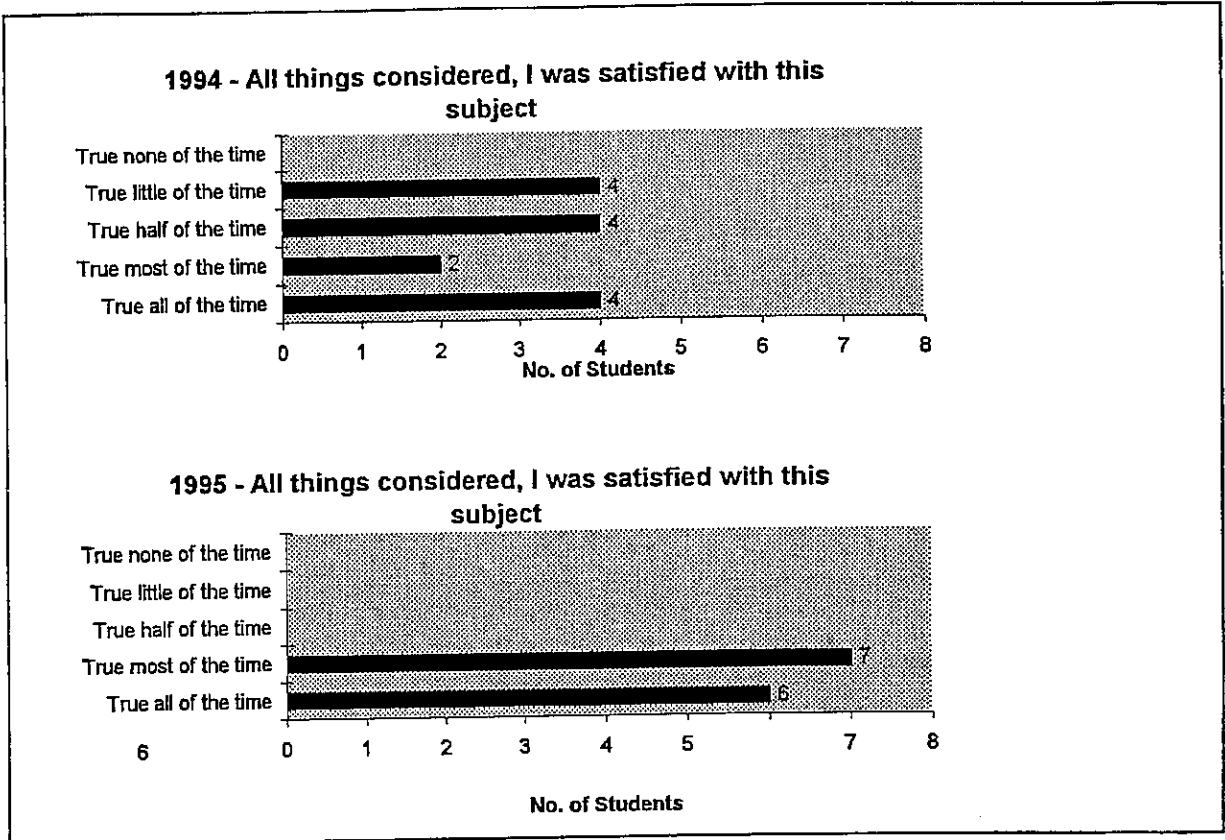


Figure 1

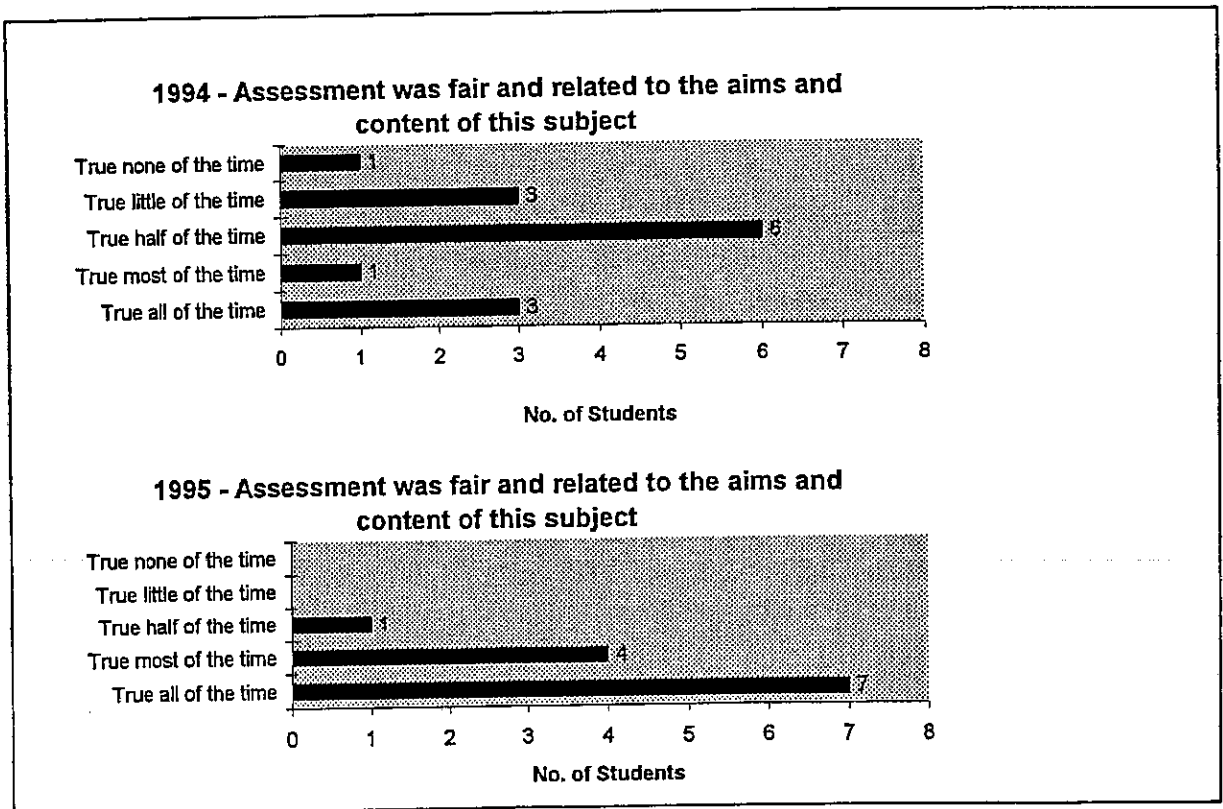


Figure 2

NB. One student in 1995 did not respond to this statement.

In 1996 an independent evaluation of the subject was requested. The Educational Services Unit recommended an informal chat with students as the best method of evaluation since the student numbers were small (12 students). Hence there is no quantitative data for 1996.

6. Conclusion

In the light of the recent release of the draft ACS Core Body of Knowledge (Appendix A; Underwood, 1996) it is timely to have documented the techniques we have used over the years to teach communication skills, ethics and professional practice. Hopefully our work will be a useful resource to educators who want to re-examine courses and include these topics.

If we wish to continue to have level one accreditation of our courses by the ACS then the status of the Professional Environment subject will probably have to change from elective to compulsory. Allowing for the fact that students choose to do this subject (and therefore it is likely that positive feedback will be received), the following comments indicate the attitude of students to it as an elective subject:

"It was something a bit different, informative, and I believe should be compulsory"
"[The Professional Environment] was very relevant and current".

We still have, however, some evaluation sheets of the Professional Environment's compulsory predecessor. Most students appreciated it, but comments like:

"... social stuff is something the individual should find out when they need to, but right now we have enough work";

bring back depressing memories of how a few resistant students can affect a class' ambience.

We suggest that critical though we believe this aspect of our students' education to be, it should not be accumulated into an identifiable core subject for all IT students. It should be woven into courses so that student knowledge builds gradually. In our opinion any course in IT will have a proportion of students who will resist education on this type of topic, and the larger the "chunk" within the syllabus the more overt this resistance will be. An elective subject which allows depth of study for those who choose to do it, as described here, is more satisfying for all concerned than a compulsory subject for a less committed group.

APPENDIX A: THE ACS CORE BODY OF KNOWLEDGE FOR INFORMATION TECHNOLOGY PROFESSIONALS: Draft version for review and comment, 18/7/96:

Some extracts:

This report specifies a minimum set of subject matter that should be included in all IT programmes. A guide is presented to identify the depth of treatment of any specific area of knowledge required by either Information Systems or Computing Science courses. In this way it is expected that tertiary computing courses will exhibit both the recommended core material as well as diversity in the overall course content."

Three levels of treatment of an area of knowledge are identified (they form a continuum):

- Understand: the shallowest, "theory" level. Theory is typically found in mathematics, as well as in the study of algorithms (complexity theory), and programming languages (formal grammars)"
- Apply: the level of use or abstraction. "...abstraction is grounded in the experimental sciences and applies theory through practice or laboratory experiments".
- Design: (implement). The third process of design comes from engineering and is used in the development of a system or product to solve a given problem".

Fifteen areas of knowledge are identified, in four groups:

Group 1:

Interpersonal Communications
Ethics/Social Implications/Professional Practice
Software Quality Principles
Project Management

Group 2:

Data Structures and Algorithms
Program Design and Implementation
Software Engineering and Methodologies
Information Security

Group 3:

Conceptual Modelling
Systems Analysis and Design
Database Management

Group 4:

Computer Organisation and Architecture
Systems Software
Data Communications and Networks
Discrete Mathematics

To comply with the requirements for ACS accreditation an IT related course will have to demonstrate that it meets the Use (Apply) levels of understanding for Group 1 and that it also provides a level of understanding at the Design level for either Groups 2, 3 or 4."

A section on curricula proposals (dated 19th September 1996) is included in the Draft Version. For each area, a preamble and a list of topics is identified together with the context within which the area of knowledge fits the core body of knowledge. It is emphasised that these details are included [...] for descriptive purposes only. It is expected that the various Australian IT tertiary courses would implement and emphasise different aspects of the material in accord with their academic and equipment strengths."

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