The Effect of Metacognition on Learning Outcomes for Tertiary Level Computing Students

Susan Hastings
Edith Cowan University

Follow this and additional works at: https://ro.ecu.edu.au/theses_hons

Part of the Educational Methods Commons

Recommended Citation

This Thesis is posted at Research Online. https://ro.ecu.edu.au/theses_hons/281
1995

The Effect of Metacognition on Learning Outcomes for Tertiary Level Computing Students

Susan Hastings

Edith Cowan University

Recommended Citation


This Thesis is posted at Research Online.
https://ro.ecu.edu.au/theses_hons/281
Edith Cowan University

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study.

The University does not authorize you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following:

- Copyright owners are entitled to take legal action against persons who infringe their copyright.

- A reproduction of material that is protected by copyright may be a copyright infringement. Where the reproduction of such material is done without attribution of authorship, with false attribution of authorship or the authorship is treated in a derogatory manner, this may be a breach of the author’s moral rights contained in Part IX of the Copyright Act 1968 (Cth).

- Courts have the power to impose a wide range of civil and criminal sanctions for infringement of copyright, infringement of moral rights and other offences under the Copyright Act 1968 (Cth). Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.
USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.
THE EFFECT OF METACOGNITION ON LEARNING OUTCOMES FOR TERTIARY LEVEL COMPUTING STUDENTS

SUSAN HASTINGS
B.A. (HONS) PSYCH.
1995
THE EFFECT OF METACOGNITION ON LEARNING OUTCOMES FOR TERTIARY LEVEL COMPUTING STUDENTS

by

Susan Hastings

A Thesis Submitted in Partial Fulfilment of the Requirements for the Award of

Bachelor of Arts (Hons) Psychology

at the Faculty of Health and Human Sciences
Department of Psychology, Edith Cowan University

Date of Submission: October 31, 1995
Abstract

The Technical and Further Education system Australia-wide is in a state of change. There is a push to become more cost effective and to have courses that closely relate to the demands of the work place. As part of the change, courses at TAFE are increasingly being based on a competency-based system, with students being responsible for their own learning. This entails the use of course materials by students which allow them to work at their own pace. There is a perception by educators that this method of learning may suit some students, but that the majority require a more structured learning environment, with far more input by teachers (Siekerka, 1994).

The concept of competency-based learning is not new. It is based on the mastery learning model which has been the subject of debate in education for many years. Younger students, especially, are believed to be more in need of guidance and structure in learning.

The present study is part of on-going research being conducted in the TAFE system to help to understand the strengths and weaknesses of the course programming and to make the transition to competency based training as effective as possible. The role of metacognition in the learning process is explored with regard to development of the skills necessary for
students to function as independent learners. A questionnaire, developed and used widely with Australian students (Biggs, 1993), has been taken as a measure of metacognitive awareness in students.

A computing department at a TAFE college was approached and staff and students volunteered to participate in the study. In all, 114 students completed the questionnaire. Scores from the questionnaire, together with academic results, were used to explore the relationship of metacognition to academic outcomes. Four research questions were addressed:

1. Does a capacity for metacognition, as measured by a higher Deep Achieving Approach score, result in good academic outcomes for students?

2. Does metacognition increase with age, thus showing that life experience is a factor in the development of metacognition?

3. Does learning and studying in another language (which is thought to promote metacognition) lead to a more Deep Approach.
4. Does having a higher Deep Achieving Approach score (metacognitive awareness) make it more likely that students will continue studying?

Analysis of the results found that none of these hypotheses was supported, but a significant relationship was found between increasing age and better academic outcomes. This tallies with the perception by educators that maturity is a factor in academic success. However, the nature of the factor was not measured by the questionnaire.

More research is needed to analyse the types of skills that older students use. The possibility then exists of teaching students learning skills to ensure their success, and, also, to allow institutions such as TAFE colleges to plan course delivery to suit different approaches to study by students.
Declaration

I certify that this thesis does not incorporate, without acknowledgment, any material previously submitted for a degree or diploma in any institution of higher education and that, to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where due reference is made in the text.

October 31, 1995
Acknowledgments

To my husband, Stephen, thank you for your help in gaining access to the TAFE college where I conducted my research. Thanks also for your help with the administration and scoring of the questionnaires.

To Dr Kevin Franklin, my supervisor, thanks for stimulating discourse, intensive and valuable critique of the thesis, and unfailing optimism.

To Dr Amanda Blackmore, thank you for your help, encouragement and support with the design and analysis stages of the research.

A special thanks to the staff and students of the Computing Department, TAFE, who participated in this study.

To Dianne McKillop, thanks for organising the seminar on thesis presentation which provided valuable ideas for this thesis.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Declaration</td>
<td>v</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>vi</td>
</tr>
<tr>
<td>List of Tables</td>
<td>x</td>
</tr>
<tr>
<td>List of Figures</td>
<td>x</td>
</tr>
<tr>
<td>Chapter 1</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Chapter 2</td>
<td></td>
</tr>
<tr>
<td>Theoretical Perspectives</td>
<td>5</td>
</tr>
<tr>
<td>Student and Teacher Role Expectations</td>
<td>5</td>
</tr>
<tr>
<td>Metacognition and Learning</td>
<td>8</td>
</tr>
<tr>
<td>Ecological Validity</td>
<td>13</td>
</tr>
<tr>
<td>Chapter 3</td>
<td></td>
</tr>
<tr>
<td>Approaches to Studying</td>
<td>16</td>
</tr>
<tr>
<td>Development of the <em>Study Process Questionnaire</em></td>
<td>16</td>
</tr>
<tr>
<td>Motive-Strategy Congruence Theory</td>
<td>21</td>
</tr>
<tr>
<td>Previous Research using the</td>
<td></td>
</tr>
<tr>
<td><em>Study Process Questionnaire</em></td>
<td>22</td>
</tr>
<tr>
<td>Research Questions</td>
<td>25</td>
</tr>
</tbody>
</table>
List of Tables

Table 1 - Study Process Questionnaire - Internal Consistency - Alpha Coefficients. 32

Table 2 - Mean Scores for Academic, Age & Approaches to Studying. 35

Table 3 - Intercorrelations Between Approach Scores, Age and Academic Results. 36

Table 4 - Mann-Whitney $U$ tests of Differences between English as a Second Language and English as a First Language Students. 37

Table 5 - t-tests of Differences between Students who Continued and Students who Withdrawed. 38

List of Figures

Figure 1 - Study Process Questionnaire Constructs 30
Chapter 1

Introduction

Research into student learning has traditionally been undertaken from the point of view of how students are taught, the cognitive processes involved in learning and the abilities and attitudes which students bring to the learning situation. The present study is part of an emerging trend investigating the individual characteristics of students as they interact with the learning environment, and the effect of this interaction in terms of academic outcomes (Biggs, 1993; Puccio, Talbot & Joniak, 1993).

At present TAFE colleges in Western Australia are in the process of changing the nature of their delivery of teaching in computer studies. Students are now being encouraged to work at their own pace through self-paced learning material. Many subjects within courses are still being taught by traditional classroom methods, with teachers deciding the pace of the learning and with set times for exams. However, it is planned to increase the option of the self-paced learning mode of course delivery over the next year or two.
Research into open learning has found that students appear to have difficulty with learning in this mode. There tends to be a high fall-out rate from courses and students take longer to complete sections of their courses (Kember, Lai, Murphy, Siaw and Yuen, 1992). Siekierka (1994) in a report on student directed learning highlights the relevance of previous research into open learning, and the need for specific research into factors affecting student learning in TAFE during this process of change.

The present research focuses on the individual characteristics of students as learners which affect academic outcomes. A questionnaire which purports to measure different approaches to learning has been used to assess individual learning styles. Academic results are used to assess the relevance of the different approaches in terms of learning outcomes. In addition, the research addresses the question of whether students for whom English is a second language are more inclined to adopt a deep approach to learning and whether this had an effect on learning outcomes.

There is a perception amongst the computer lecturing staff that students need a certain level of maturity to manage in less structured learning situations, and this research also focused on age as a factor in adopting what is often described as a deep approach to learning. A deep
approach to learning, coupled with a strong motive to achieve, is thought to lead to better academic outcomes for students.

Self-paced learning is based on the tradition of mastery learning, where the syllabus is broken up into units, with each unit having its own diagnostic test. This test must be passed before students move, as individuals, to the next level. Students are helped individually or in small group tutorials. In the TAFE system this idea is enhanced by using computers, both as a part of the practical aspect of learning the subject matter, and to generate tests. Within the Australia wide TAFE system self-paced learning is also known as student-directed learning or open learning. The role of the teacher is moving from a controlling function to facilitating student learning (Siekierka, 1994).

Theories which contribute to an understanding of the reasoning behind a 'student-centred' approach to learning will be discussed first. The developmental aspect of learning developed by Vygotsky will be used as a basis for understanding how humans learn. There is an emerging trend towards research that is relevant in particular contexts, with outcomes that do not necessarily generalise to other populations. In this type of research the theoretical background becomes particularly important in that research is geared towards gradually refining, modifying
or changing theories, which can then be applied to other research into particular contexts. The concept of ‘ecological validity’ will be discussed and explored for its relevance to this particular study.

Metacognition and its relationship to meta-learning and approaches to studying will be explored. Biggs (1993) suggests that there is a relationship between metacognitive processes and particular approaches to learning. This study is aimed at exploring whether there is a relationship between particular approaches or individual characteristics of students and learning outcomes.

Research into the best possible conditions for learning to take place will be reviewed. The perspective of the student as playing an active role in the process is crucial to this project and is an emerging trend in understanding the processes of learning. Implications for the development of institutional policies and programmes to enhance learning will be discussed.
Chapter 2

Theoretical Perspectives

Student & Teacher Role Expectations

Dahaney (1986) has explored a number of metaphors of the student/teacher dyad that reinforce the idea of the student as passive. His view is that these culinary, gardening, scientific and other metaphors typically define students as passive, inferior and subordinate, and that the use of such metalanguage in pedagogy affects policy making at all levels. His metaphors include human/non-human dichotomies, as well as human/human. In the family metaphor, for example, teachers are 'urged to take students by the hand, to lead them along the path...or to treat them in all the other ways reminiscent of how we handle helpless, babbling infants who can do nothing for themselves' (p. 230).

Dahaney notes that an outcome of these ways of viewing the teacher/student dyad places the teachers in the unenviable position of being solely responsible for learning outcomes. He points out that this way of viewing the teaching/learning process leads to unrealistic expectations by teachers of what is required of them and an essentially unsatisfying experience for the student who will have no sense of
ownership or agency in learning. What he suggests as an alternative is a reimagining of the teacher/learner dyad as being a partnership between people who have a mutual goal, namely that of the student acquiring the knowledge and skills required for the subject.

The outcomes of the learning process are thus seen to involve the active participation of the learner. A developmental perspective developed by Vygotsky (1978) on learning in children takes into account the active participation of the learner in the process of acquiring knowledge and skills. Although Vygotsky wrote about learning in children his model may be relevant throughout adult development as well. Day (1983) describes this model as a dialectical process where children learn through their interactions with others, and, as they learn, act upon others to provide something new and unique arising from internal transformation. This process results in individualistic learning experiences and outcomes.

It cannot be assumed, for example, that there is an ideal environment in which everyone will be able to learn. If this were so, it would only be necessary to provide the perfect learning environment in terms of teacher skills, curriculum materials and so on, to ensure particular learning outcomes. The Vygotskian perspective on learning assumes that a creative process is at work involving the interaction of the learner with
the environment. Although Vygotsky saw the ‘environment’ in terms of interaction with other people, one could usefully extend this to interaction with everything in the environment such as the physical reality of the person’s world, ideas and values as conveyed in print and the media and technological change.

Vygotsky’s view of the child as an active participant in his/her development, with a capacity to internalise and transform incoming data and to act upon the environment to change is an enlivening picture of the process of learning. Students are seen as active participants in their own learning. This does not mean that teachers do not have an important role to play. In Vygotskian terms, the teaching role would be that of mediation between the student and the subject. Teaching would involve engaging with the student to provide access to previously unknown knowledge and skills and a preparedness to accept what the student will inevitably add in the process of internalising and acting upon what is learned.

The teacher’s role is to help the student to do what he/she cannot yet do. Vygotsky’s theory of a Zone of Proximinal Development assumes that there will always be a difference between what a child can do and what he/she can do with the help of more capable others. In the teaching/learning process, this writer sees that the skill of the teacher lies
in providing sufficient support for students without actually doing for them what they can already do for themselves. The teacher adjusts the level of interaction to the changing needs of the student.

Intelligence and ability are seen by Vygotsky and his colleagues as being processes which static intelligence tests cannot measure. This suggests that any assessment of ability that does not take into account the individuals' capacity for development is likely to be both false and unjust. Transfer of skills from one situation to another is one of the most important learning potential indicators. Some people transfer spontaneously and thus appear to apply what they have learned in a situation to new situations at will. Other people can be taught to transfer, and sometimes this involves no more than being told that one set of skills can be used in many similar situations. For others, transfer is neither spontaneous, nor easily taught (Vygotsky, 1978). The relationship of the Vygotskian model to present day theories regarding metacognitive processes will become clear in the next section.

**Metacognition and Learning**

Braten (1991) in a series of journal articles has drawn attention to the link between the Vygotskian perspective on the development of cognition as a process and present theories regarding metacognition.
Indeed, the current interest in Vygotskian theory appears to be the result of renewed interest in theories of mind in cognitive psychology.

Interest in what goes on in people’s minds was an important part of psychology at the beginning of this century, but fell out of favour when it was realised that a great deal of what happens is inaccessible to introspection (Metcalf & Shimanura, 1994). Nevertheless, with the renewed interest in cognition in the last 30 years has come a more optimistic approach to studying what we know and its effect on behaviour. Cognition refers to thinking and knowing, whereas metacognition is defined by Metcalf and Shimanura as ‘our knowledge about how we perceive, remember, think and act - that is, what we know about what we know’ (1994, p. Xi).

A great deal of theory and research relevant to metacognition is related to memory, probably because memorising is something that can be measured. There is a perception that a part of metacognition relates to beliefs, which motivate performance. Herzog and Dixon (1994) discuss three categories of memory constructs which could also apply to learning. These are knowing about memory and the usefulness of strategies for memorising, the capacity to be aware of one’s level of skill at remembering and one’s beliefs about one’s capacity to memorise. Beliefs about oneself
and memory are very important. Herzog and Dixon cite the work of Bandura with regard to self-efficacy as important because self-efficacy is believed to affect performance. Beliefs affect the planning of strategies, the amount of effort and perseverance and the level of anxiety in performance situation.

Nelson and Narens (1992) have pointed out that although the use of introspection in research yields flawed and distorted data, if this is taken into account the data can be used with that in mind. An example of this would be a study which looks at what is called the "Labour-in-Vain Effect" (Nelson & Jacob Leonesio, 1992). In three experiments it was found that having unlimited study time and information regarding the level of difficulty of items did not result in sufficient study time being allocated to memorising all of the items. They cite findings that have found that in self-paced study students tend to allocate insufficient time to master difficult material, which is what Nelson and Leonesio call the "Labour-in-Vain Effect". They conclude that the metacognitive process of self-paced study, which involves monitoring and control of the process, does not necessarily result in better learning outcomes and that more research is needed into the complexity of the relationship.
The belief-action aspects of metacognition are discussed by Friedman, Sholnick & Cocking (1987) in relation to planning by humans. Their view is that planning is driven by three sets of beliefs: those about the causal structure of physical events; those about control and the role of fate, luck or chance; and beliefs about the self and one’s ability to achieve a desired goal. All of these beliefs affect the individual’s propensity to plan. The authors further contend that these beliefs are social in origin, which links with Vygotsky’s ideas of how children learn. Research into planning focuses on why students might fail to plan and why there might not be transfer of skills to similar situations (Covington, 1987).

In research into metacognition it becomes apparent that it is not enough to know how to perform a skill. Whether one can actually know oneself and one’s abilities sufficiently well to plan the types of activities that will lead to a desired goal is very important. Beliefs about the environment and the self will interact to affect motivation, behaviour and achievement.

Pressley, Levin and Ghatala (1992) found evidence for the necessity of experience in the promotion of metacognitive strategies. In a study with adults and children it was found that both groups needed feedback in
order to have awareness of metacognitive strategies before assuming control of their own learning. Children needed more help than adults, thus validating the view that experience is more likely to lead people to believe they have control and to encourage planning. A study which looked at a reading comprehension task and people’s metacognitive awareness of comprehension found strong support for the idea of an “illusion of knowing”, that is, subjects were unable to determine their own level of comprehension. This relates back to Nelson & Narens (1992) idea that introspective data may be highly distorted.

There appears to be some support for the idea that higher achieving students have more metacognitive awareness and skills (Romainville, 1994). There is also a great deal of interest in training students in aspects of metacognition, with subsequent effect on their metacognitive skills and self efficacy (Lauffer, 1994: Klein & Freitag, 1994; Kobayashi, 1994 and Pirolli & Recker, 1994). However, there does not seem to be any support so far for the notion that enhancing metacognitive skills and awareness leads to gains in achievement. Therefore, the promotion of metacognition as the answer to improvements in learning seems to be largely unsupported by the research so far. Studies which attempt to link metacognitive skills to achievement will be affected by the complexities of
the construct itself, the problems of measurement (especially when moving away from experiments on memory where there is extensive work) and the on assessment of outcomes. Is it enough to promote more reliable critical thinking and feelings of self-efficacy even if this does not lead to higher levels of achievement?

**Ecological Validity**

Nelson & Narens (1994) in an overview of the historical development of research into metacognition attempt to answer the question of why this research is important. Although they discuss this area of psychology specifically with regard to research on memory, it is relevant to my study because of the relationship between memorising and learning. Indeed, the authors’ main criticism of much of the early research is that it has been laboratory-based research that may have little relevance in other settings. This is not to devalue the importance of pure research in uncovering important aspects of memory and learning, however what Nelson & Narens suggest is more of a collaborative process involving applied and pure research.

They suggest that the value of science lies in focussing on factors outside of the laboratory in the first instance and that being able to control variables in the laboratory is valuable at a later stage in the
refining of theories. Research that begins and ends in a laboratory setting may have little relevance and generalisability in environments where knowledge about human processes is most needed. We really need to know about how learning takes place in particular settings and under particular environmental conditions. Theories arising from applied research may then be said to be ecologically valid.

Accordingly, in the area of learning, the main focus for research would be students. An enormous amount of research has been done using college students simply because they were the group most readily available. Researchers hoped that the results of work done with students would be generalisable to other populations. Using students as the target population, the group we really want to know about, leads to further changes.

Firstly, there would be a shift away from students as non-reflective and unchanging subjects to students as participants, bringing all of their own ideas, strategies, personality variables, attitudes and beliefs to the research process. In the real-world situation students are constantly making decisions about what, when and how much to study and memorise. Research needs to encompass both static aspects of encoding and retrieval and the dynamic processes of monitoring and control.
Secondly, Nelson & Narens state that although researchers typically do not take into account the reflective ability of subjects in studying memorising and learning, they do tend to control for it, by asking subjects to employ specific strategies for encoding and retrieval. Researchers also try to set conditions, such as timing of presentation of words, that force subjects into learning at a particular rate. The dynamic participation of subjects is thus seen as something to be eliminated. The authors suggest that what is being controlled for should in fact be part of the overall focus of research into memory and learning. There appears to be a shift from regarding the living focus of psychological research as relatively inert material to be manipulated to regarding it as it really is, the study of human thoughts, feelings, behaviour and physiology. The APS Publications Manual (4th Edn) (1994), with its change of emphasis to describe subjects as participants who play an active role in the process of research reinforces the ideas raised in this article.

This study explores the learning processes of a particular group of students, in a particular setting, at a particular point in time. Being grounded in developmental, metacognitive and learning theories means that the outcomes contribute to knowledge about those theories.
Chapter 3

Approaches to Studying

Development of the Study Process Questionnaire

Research is now moving into the area of examining student perceptions and attitudes in the learning process. Cooper and McIntyre (1993), in a qualitative study of teacher and pupil perceptions of effective classroom teaching, found that both students and teachers felt that the active participation of students in learning strategies such as group problem-solving resulted in much more effective learning. In these contexts the teachers saw their role as being that of ambassadors for their subjects, inviting students to learn and to appreciate the curriculum materials. The students, in particular, were able to be perceptive about the learning strategies involved in this kind of teaching. The student is seen as actively engaging in learning. It appears that it is valuable to ask students about their perceptions and approaches to learning and to treat them as active participants in the teaching/learning process, rather than passive recipients of knowledge.
In order to study the processes of learning as perceived by students various inventories have been developed. The value of studying learning styles and processes lies in being able to both adapt the learning environment to be closer to what individual students need and to provide an indication of what students may need to help them adapt to the environment.

A short form of the *Approaches to Studying Inventory* was evaluated in terms of its underlying factor structure and its predictive value in terms of academic outcomes (Newstead, 1992). The full *Approaches to Studying Inventory* was developed by Entwistle and Ramsden (1983) using extensive interviewing of higher education students. A number of different approaches to learning were identified, the most important of which are the concepts of deep learning (which they termed ‘meaning’) and surface learning (which they termed ‘reproducing’). The deep approach is associated with learning at a level which seeks to understand new material and to integrate it with what is already known. It suggests an intrinsic motivational orientation. Students who aim for a surface approach are more inclined to use rote learning to memorise the facts that are needed to pass a course. Surface learning relates to extrinsic
motivation and an achievement orientation which sees, for example, the
 gaining of a qualification as the aim of studying.

Newstead (1992) found that the reliability of the scale was verified
by research covering a variety of cultural settings. The validity of the
constructs appears to have had more mixed results, but the scale was
found to be useful when used to measure student adaptation to the
teaching/learning environment. The scale was used in this particular study
to test the following hypotheses: was it a psychometrically sound
instrument to measure meaning, reproducing and achieving factors; did
student academic results correlate with Approaches to Studying Inventory
scores and to measure changes in learning styles over three years of a
degree course. It was found that the Approaches to Studying Inventory in
its short form did appear to be useful, with moderate reliability and
validity. The deep (meaning) approach to learning was found to be the
best predictor of academic performance. This particular study, because it
uses an instrument similar to the Study Process Questionnaire, which is
measuring much the same constructs, plays an important role in providing
a rationale for the present research.

Biggs (1993) has sought to clarify the theoretical constructs behind
inventories of student learning. There are two basic approaches, one
which assumes that learning is taking place within the student and focuses on information processing, and is supported by developments in cognitive psychology, and another one which assumes that learning takes place in a teaching/learning context and seeks to understand learning as taking place within a system. Research using this second approach has found positive correlations between personality factors and academic outcomes. It is as though the student asks him/herself "What am I doing here?" and, depending on how they construe their situation, developing strategies to deal with it.

Biggs (1993) then developed what he terms the motive-strategy congruency theory, on which his *Study Process Questionnaire* is based. Three types of motivation: instrumental, intrinsic and achieving were noted. Their link with the notion of surface and deep processing became apparent, with its similarity to the factors underlying Entwistle and Ramsden's *Approaches to Studying Inventory*. Biggs notes that it is still unclear just exactly what is being measured. Is it motives, strategies, predispositions, processes, approaches or styles? He has also reviewed theories which suggest that affective components of study processes have a profound effect on future learning processes of students. He concludes that deep and surface learning may not be just the result of
individual personality factors, but the result of what is expected in learning contexts. Various levels of the learning context may be seen as the student system, the classroom system, the institutional system and the community system, all of which interact to effect individual student learning.

Research on the person-environment fit suggests that stress results from incongruency between learning orientation and the type of learning style required by the teaching/learning situation. Puccio, Talbot and Joniak (1993) suggest that student perceptions of the requirements of the institution need to be taken in consideration when academic policies are discussed. Stress generated by the demands of the institution may also be a factor affecting academic outcomes.

Biggs (1993) suggests that the difference between non-systems and systems thinking in education may be seen as the difference between additive/deficit and interactive models. The additive/deficit model appears to be the one that is current in TAFE at present (Siekierka, 1994). The learning materials, the teachers or the students are to blame if the outcomes are not what is expected.

An interactive model, taking into account all of the levels of the teaching/learning context, would encourage planning to deal with
problems that arise through the interactions of all of these levels. To date, research in this area appears to support the notion of studying student learning processes in the context of different learning environments as a way of helping to account for academic outcomes. The educational trend is away from seeing the student as a relatively passive, subordinate in the teaching/learning context to engaging with the student as the agent of his/her learning.

**Motive-Strategy Congruence Theory**

In his monograph *Student Approaches to Learning and Studying* Biggs (1987) describes the development of the *Study Process Questionnaire*, research by himself and others using this instrument, and his theories regarding the relationship between his motive-strategy congruence theory and metacognition. The complexities of the relationship between individual approaches to learning, the subjects (English, Maths, Science, etc.) being studied, and the demands of the environment are explored. He concludes that more research will lead to elaboration and refinement of his present ideas. Some of the details from this monograph are described below.

The three approaches to learning assumed to be measured by the *Study Process Questionnaire* are described as follows:
• Surface Approach - leading to accurate recall without much understanding of how different aspects relate to the whole;

• Deep Approach - leading to a greater appreciation for the relationship between different aspects of specific subjects;

• Achieving Approach - leading to the use of whatever strategies a student may see as helping him/her to achieve a particular goal.

A deep approach also implies that the student will adopt a more critical approach to what is taught and be more likely to evaluate what is taught in terms of his/her own ideas and values.

Previous Research using the Study Process Questionnaire

Biggs' research using the Study Process Questionnaire was done as student groups became available, therefore, any norms are not based on a random sample, but on specific populations. He is very specific about the need to check on the validity of the Study Process Questionnaire in various settings. There was also little attempt to link approaches to studying with academic outcomes because the Study Process
Questionnaire was usually administered anonymously, which meant that academic outcomes were not available.

One of the outcomes of this research found an age effect. Increasing age led to a deeper approach to studying. Biggs hypothesised that older students were more motivated and because of their experience of life were more likely to see how subjects related to real-world situations. The motivation effect is because of the greater demands on older students which means that in order to study at all they need to be prepared to take on a great deal of extra work. Younger students seem to have more pragmatic reasons for studying such as to achieve qualifications that will lead to well-paid work.

Biggs used two performance indicators in his research with the \textit{Study Process Questionnaire}. One was the Self Rated Performance (SRP), a 5-point scale which is part of the \textit{Study Process Questionnaire} itself, and the other was Satisfaction with Performance, another 5-point scale. These subjective ratings of performance indicators could very well have different levels of relevance with different students, depending on their ability to evaluate their own performance. This writer suggests that the ability to accurately evaluate one’s own performance may in itself be an indicator of a metacognitive level of functioning in students.
In terms of faculty differences in approaches it was found that Science students scored highest on a Surface Approach, which was correlated most negatively with performance, and that Arts students were more likely to adopt a Deep Approach, which related positively to performance. Performance in this instance related to self-ratings and academic outcomes. Biggs found that in Science students need to have both Deep and Surface Approaches to achieve well.

In exploring ethnic differences, Biggs found that students for whom English was a second language (ESL) were found to have more Deep related scores than students for whom English is a first language (EFL). His way of accounting for this was to hypothesise that the very act of studying in a second language forced students to adopt a deeper approach in simply being able to understand what was happening.

Biggs' motive-strategy congruence theory states that students with a particular motive, surface, deep or achieving, are more likely to choose the appropriate strategy which will help them to achieve their goal. Thus, congruence between motive and strategy, as measured by high approach scores, should produce the desired outcome. This theory relates to metacognition in that students need both awareness of their own goals and the ability to control the way they go about achieving those goals,
that is, in choosing appropriate strategies and being able to take appropriate action. It is this process which may be termed 'metalearning'.

The interaction between the student and the environment must also be taken into account. Individual personality characteristics may not have sufficient weight against factors in the environment, for example, which may affect motivation and control.

Further research by Biggs using locus of control and ability measures found that there might be very small or non-significant results in correlations of approaches with performance because high ability students with an internal locus of control appear to be using whatever combination of approaches that will lead to high performance. He relates this specifically to the concept of metalearning. What he found in using this method of assessment across subjects and with students of varying abilities is that approaches that work for one student may work against another student, depending on ability level and locus of control.

Even with the motive-strategy congruence effect Biggs concluded that although students who rate themselves highly on one aspect of an approach will most likely rate themselves highly on the appropriate strategy, but this does not necessarily mean that the student will achieve
well academically. And students with a Deep Approach will only adopt that approach with subjects they are interested in.

**Research questions**

The present study has taken as its main objective to explore the relationship between a Deep Achieving Approach (combined Deep and Achieving Approaches) and academic outcomes. The main research question is:

1. **Does a capacity for metacognition, as measured by a higher Deep Achieving Approach score, result in good academic outcomes for students?**

The perception amongst computing staff that younger students are less able to manage to achieve well in a self-paced learning environment will be explored in the second hypothesis:

2. **Does metacognition increase with age, thus showing that life experience is a factor in the development of metacognition?**

Taking into account Biggs' finding that English Second Language students had a higher Deep Approach than English First Language students the third hypothesis explores the relationship between English Second Language and metacognition.
3. Does learning and studying in another language (which is thought to promote metacognition) lead to a more Deep Approach.

Given that there is normally a high drop-out rate from courses, does having a higher Deep Achieving Approach mean that students are more likely to continue studying? This question relates to the motivation aspect of metacognition.

4. Does having a higher Deep Achieving Approach score make it more likely that students will continue studying?
Subjects

All of the computing students at one TAFE college were invited to participate in this study. This group was chosen as a convenience sample.

One hundred and fourteen students participated in this study. The age range was 16-50 years (M = 27.2, SD = 8.78). The gender ratio was 76 men to 38 women. There were 26 students for whom English was a second language and 88 students for whom English was a first language. Between the time of completing the questionnaire and the end of Semester 1, 41 students had dropped out of their courses.

Design

The design of the study is as follows: the Study Process Questionnaire was administered to students in the first three weeks of Term 1, and academic results were collected for the whole of the first semester (Terms 1 & 2). The independent and dependent variables for the four research questions are:

1. The independent variable is the Deep Achieving Approach score from the questionnaire and the dependent variable is the academic results.
2. The independent variable is the Deep Achieving Approach score from the questionnaire and the dependent variable is age.

3. The independent variable is whether English is a first or second language for students and the dependent variable is the Deep Approach score.

4. The independent variable is whether students continued with their studies or dropped out before completing one or more exams. The dependent variable is the Deep Achieving Approach score.

Materials

Data were gathered using the *Study Process Questionnaire* (See Appendix I) and student exam results for Semester 1, 1995.

The questionnaires were obtained through the Australian Council for Educational Research. There was a manual which described how to administer the questionnaire to students and an overlay (see Appendix 2) for scoring of questionnaires. The questionnaire itself was in two parts - a four page set of questions and a response sheet (see Appendix 3). On the first page of the questionnaire there is a short explanation of the purpose of the *Study Process Questionnaire*, an explanation of how to use the response sheet, and an example question which shows exactly what to do. The responses are on a five point scale as follows:
5 - this item is *always* or *almost always* true of me
4 - this item is *frequently* true of me
3 - this item is true of me about *half the time*
2 - this item is *sometimes* true of me
1 - this item is *never* or *only rarely* true of me.

Students were asked to fill in their name, age, course, gender and whether English was a first or second language on the answer sheet. A consent form designed by the researcher was included as part of the questionnaire (see Appendix 4).

Figure 1 shows the constructs described by Biggs which the *Study Process Questionnaire* purports to measure.

![Figure 1. Study Process Questionnaire Constructs](image)

Each approach, Deep, Surface and Achieving is composed of appropriate motives and strategies (Deep Motive & Deep Strategy, Surface Motive &
Surface Strategy and Achieving Motive & Achieving Strategy). If a student begins with a certain motive, for example Surface, then it is assumed that he/she is likely to choose the study strategies that will be most helpful in achieving the desired goal. If this happens, then the student will have a high Surface Approach score. The composite score is a combination of Deep and Achieving Approach Scores, in turn made up of the motive and strategy scores (see Appendix 5).

The reliability of the questionnaire was examined using Cronbach’s alpha and the results compared with those obtained in previous research as set out in Table 1. Apart from Surface Strategy the alpha levels are at least as high as in previous studies.
Table 1

Study Process Questionnaire - Internal Consistency - Alpha Coefficients

<table>
<thead>
<tr>
<th></th>
<th>CAE (a)</th>
<th>CAE (b)</th>
<th>Uni (c)</th>
<th>Uni (d)</th>
<th>TAFE (e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Motive</td>
<td>.51</td>
<td>.55</td>
<td>.61</td>
<td>.60</td>
<td>.64</td>
</tr>
<tr>
<td>Surface Strategy</td>
<td>.62</td>
<td>.56</td>
<td>.66</td>
<td>.69</td>
<td>.58</td>
</tr>
<tr>
<td>Surface Approach</td>
<td>.68</td>
<td>.64</td>
<td>.73</td>
<td>.75</td>
<td>.72</td>
</tr>
<tr>
<td>Deep Motive</td>
<td>.63</td>
<td>.64</td>
<td>.65</td>
<td>.67</td>
<td>.71</td>
</tr>
<tr>
<td>Deep Strategy</td>
<td>.73</td>
<td>.65</td>
<td>.75</td>
<td>.72</td>
<td>.71</td>
</tr>
<tr>
<td>Deep Approach</td>
<td>.79</td>
<td>.76</td>
<td>.81</td>
<td>.79</td>
<td>.83</td>
</tr>
<tr>
<td>Achieving Motive</td>
<td>.71</td>
<td>.72</td>
<td>.72</td>
<td>.70</td>
<td>.76</td>
</tr>
<tr>
<td>Achieving Strategy</td>
<td>.75</td>
<td>.73</td>
<td>.77</td>
<td>.74</td>
<td>.73</td>
</tr>
<tr>
<td>Achieving Approach</td>
<td>.77</td>
<td>.78</td>
<td>.78</td>
<td>.77</td>
<td>.80</td>
</tr>
<tr>
<td>Deep-Achieving Approach</td>
<td>.85</td>
<td>.85</td>
<td>.85</td>
<td>.85</td>
<td>.89</td>
</tr>
</tbody>
</table>

(a) Biggs (1980) n=1512 (College of Advanced Education)
(b) from O’Neil and Child (1984) (n=245)
(c) Biggs (1980) n=853(University)
(d) from Hatti & Watkins (1981) (n=225)
(e) Present Study (1995) (n=113)
Procedure

Written permission was obtained from the head of computing at the college to conduct the research (see Appendix 6). The questionnaire was completed by students during the first three weeks of Term 1, 1995. The researcher attended orientations for full time and part time students. An opportunity was given at the end of each of these sessions to explain the purpose of the study and ask for volunteers. Students took between ten and thirty minutes to complete the questionnaire. Students asked for clarification of some of the questions, and the researcher answered these in line with the instructions given in the manual.

At the end of the orientations, 97 questionnaires had been completed. Others were obtained by attending classes and speaking with students, or having a senior lecturer of the college, who had been trained to administer the questionnaire according to instructions in the manual, administer the questionnaire to students who had not attended any of the orientations. At the end of three weeks a total of 114 questionnaires had been completed and returned to the researcher.

Exam results for student who had completed the questionnaire were obtained towards the end of Semester 1, and at the beginning of Semester
2. There was some difficulty in obtaining actual percentages because the college had a new policy of awarding student one of two results: a pass if they had passed the exam or a hold if they had failed or had not done the exam at all. Lecturers were approached individually to provide numeric results. Results were obtained for all of the students who had not dropped out of their courses before completing at least one exam.

The response sheets from the questionnaire were manually scored by the researcher and an assistant, using the overlay which came with the questionnaire. Motive and strategy scores were combined to provide approach scores, and Deep and Achieving Approach scores were combined to provide the Deep Achieving Approach score.

The exam results were reduced to one figure for each student by adding the results of two or more exams together and dividing by the number of exams the student had completed. The academic result for each individual student is therefore made up of between one and four exam results.
Chapter 5

Results

The first research question involved exploring whether there was a significant correlation between a Deep Achieving Approach and academic results. Data were screened for normality and outliers using scatterplots and stem and leafs and there were no outliers. Means are shown in Table 2.

Table 2

Mean Scores for Academic, Age & Approaches to Studying

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M(SD)</th>
<th>Act. Range</th>
<th>Poss. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic</td>
<td>74</td>
<td>65.13 (23.77)</td>
<td>14-99.5</td>
<td>0-100</td>
</tr>
<tr>
<td>Age</td>
<td>111</td>
<td>27.21 (8.78)</td>
<td>16-50</td>
<td></td>
</tr>
<tr>
<td>Achieving Approach</td>
<td>114</td>
<td>47.48 (8.95)</td>
<td>23-67</td>
<td>14-70</td>
</tr>
<tr>
<td>Deep Approach</td>
<td>114</td>
<td>46.96 (9.21)</td>
<td>26-68</td>
<td>14-70</td>
</tr>
<tr>
<td>Surface Approach</td>
<td>114</td>
<td>47.30 (8.15)</td>
<td>27-66</td>
<td>14-70</td>
</tr>
<tr>
<td>Deep Achieving Approach</td>
<td>114</td>
<td>94.56 (16.07)</td>
<td>56-130</td>
<td>28-140</td>
</tr>
</tbody>
</table>

There was no significant correlation between a DAA and academic results, \( r(72) = .02, \ p > .05 \).
The second research question explored whether a Deep Achieving Approach increased with age. Examination of scatterplots and stem and leafs found that the distribution of scores was normal and there were no outliers. There was no significant correlation between a Deep Achieving Approach and age, \( r(112) = .09, p > .05 \).

From the Table 3 it can be seen that there was a significant correlation between age and academic results.

Table 3

<table>
<thead>
<tr>
<th></th>
<th>AGE</th>
<th>AA</th>
<th>DA</th>
<th>SA</th>
<th>DAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACADEMIC</td>
<td>.4464**</td>
<td>.0400</td>
<td>.0232</td>
<td>.1248</td>
<td>.0192</td>
</tr>
<tr>
<td>AGE</td>
<td>.2090*</td>
<td>.0091</td>
<td>.2285**</td>
<td>.0936</td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td></td>
<td>.6568**</td>
<td>.5355**</td>
<td>.8995**</td>
<td></td>
</tr>
<tr>
<td>DA</td>
<td></td>
<td></td>
<td>.3964**</td>
<td>.8998**</td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td></td>
<td></td>
<td></td>
<td>.4805**</td>
<td></td>
</tr>
</tbody>
</table>

* < .05  ** < .01 (1-tailed)

Stem and leaf plots were examined for research questions three and four and assumptions regarding normality were met. There were no outliers. Research question three examined the differences between students for whom English is a second language and those for whom
English as a first language with regard to a Deep Approach to studying. As there was such a discrepancy between the size of the two groups (26 & 88) it was decided to use a Mann-Whitney U test examine whether there was a significant difference between English as a Second Language and English as a First Language students and Deep Approach scores. As differences were being explored with regard to other approaches as well alpha was set at .01 to allow for family-wise error. It was found that there was no significant difference between these two groups on Deep Approach. Results are set out in Table 4.

Table 4

Mann-Whitney U tests of Differences between English as a Second Language and English as a First Language Students

<table>
<thead>
<tr>
<th></th>
<th>M(SD) ESL</th>
<th>M(SD) EFL</th>
<th>Z(114)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Achieving</td>
<td>100(12.74)</td>
<td>93.5(16.71)</td>
<td>1.61</td>
</tr>
<tr>
<td>Approach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achieving Approach</td>
<td>49.54(8.08)</td>
<td>46.87(9.14)</td>
<td>1.27</td>
</tr>
<tr>
<td>Surface Approach</td>
<td>50.23(6.9)</td>
<td>46.44(8.32)</td>
<td>2.05</td>
</tr>
<tr>
<td>Deep Approach</td>
<td>49.83(6.25)</td>
<td>46.37(9.85)</td>
<td>1.53</td>
</tr>
</tbody>
</table>

** <.01
Research question four explored whether there was a difference in terms of a Deep Achieving Approach to studying between students who continued with the courses and those who dropped. A t-test of significance between students who continued with their studies and those who dropped out of their courses found that there was no significant difference in terms of a Deep Achieving Approach. The results of the t-tests are presented in Table 5.

**Table 5**

T-tests of Differences between Students who Continued and Students who Withdrew

<table>
<thead>
<tr>
<th></th>
<th>M(SD) ESL</th>
<th>M(SD) EFL</th>
<th>t(112)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Achieving</td>
<td>93.21(17.34)</td>
<td>95.31(15.39)</td>
<td>.67</td>
</tr>
<tr>
<td>Approach</td>
<td>47(10.69)</td>
<td>46.94(8.75)</td>
<td>.03</td>
</tr>
<tr>
<td>Deep Approach</td>
<td>45.97(9.4)</td>
<td>48.33(8.6)</td>
<td>1.35</td>
</tr>
<tr>
<td>Achieving Approach</td>
<td>46.34(8.06)</td>
<td>47.85(8.2)</td>
<td>.95</td>
</tr>
<tr>
<td>Surface Approach</td>
<td>47.84(8.06)</td>
<td>48.33(8.2)</td>
<td>.95</td>
</tr>
</tbody>
</table>

**<01

The decision to use univariate statistics to analyse the data in this study was made on the basis that the research questions were univariate
in nature. Multivariate tests are justified if there might be some meaningful construct underlying two or more outcome variables (Huberty & Morris, 1989). In this case, a Deep Achieving Approach is a known underlying construct of Deep Achieving and Achieving Approaches.
Chapter 6

Discussion

Introduction

The main focus of this study was to investigate whether adopting a Deep Achieving Approach, which the literature suggests is related to metacognition, would have a positive bearing on academic outcomes. With this group of students there was no significant correlation between a DAA and academic results. Therefore, it could not be said that it is possible to predict that students with a strong Deep Achieving Approach would do well at computing in this setting. Similarly there was no correlation between a Deep Achieving Approach and age. The hypothesis that metacognition, as measured by a Deep Achieving Approach, increases with age was not supported in this study.

Biggs had suggested that students learning and studying in language other than their own would tend to adopt a Deep Approach to study. The group of English as a Second Language students at this college did not adopt a significantly higher Deep Approach than English as a First Language students.
With regard to a Deep Achieving Approach and motivation to complete studies, there was no significant difference in Deep Achieving Approach for those students who continued as opposed to those who dropped out. A Deep Achieving Approach, in itself, therefore does not seem to have a bearing in this regard.

Some questions that arise here are whether this outcome is a reflection of the validity of the instrument, or whether it is possible to predict academic outcomes on the basis of one kind of measure? Students' ability and aptitude for this type of study were not taken into account. The demands of the institution, which was in a state of flux at this time, may have influenced strategies adopted by students.

These issues, together with some of the other findings from the data analysis, will be discussed further. Limitations of the present study, such as the difficulty in obtaining academic results, will be explored, and suggestions as to future research in this area will be outlined.

**Metacognition and the Study Process Questionnaire**

A significant correlation was found between Deep Approach and Achieving Approach in this study, which gives some validity to the notion of combining these approaches. This may mean it measures metacognition as literature in this area suggests it does. There was also a
significant correlation between a Surface Approach and Achieving Approach, which suggests that a surface approach to learning does relate to extrinsic rewards, as suggested by Biggs (1993).

A significant correlation between Deep Achieving Approach and Surface Approach is the most important finding in terms of questioning the validity of the instrument to discriminate between different approaches to learning. Apparently many students who completed the questionnaire found that they used all three approaches in their learning. This may reflect that many students are flexible in their approaches to studying and learning, depending on the subject. Students are actually being asked to answer each question in terms of their general approach if the question does not seem to apply to the subject they are currently studying.

Previous research (Biggs, 1993) found that metacognition benefits students in the middle range of ability. High achieving students use whatever combination of strategies are necessary to achieve well. In this study a significant correlation was found between age and academic results. Since this was not related to a Deep Achieving Approach by these students perhaps it was more that these students had the ability to use whatever strategies were needed in the situation to achieve well. The effects of experience and the kind of motivation likely to affect mature age
students was not measured by the *Study Process Questionnaire*, but may have been demonstrated because there was a significant negative correlation between a Surface Approach and Age, which suggests that older students may have believed that a Surface Approach would not be beneficial. This finding suggests that either a Deep Achieving Approach may not be measuring metacognition, or that metacognition is not a factor in achievement. Biggs (1993) suggested that in fact metacognition in the case of student learning was the capacity to self-reflect and choose learning strategies congruent with the overall aims.

Students who rated themselves highly on a Deep Achieving Approach may have chosen the congruent strategies because there was a logical connection, as suggested by Biggs (1993), without regard to their actual behaviour in study situations. Students may have also rated themselves highly on Deep Achieving Approach because they felt that this was the most desirable way to be. Therefore their responses would not have reflected their actual learning behaviour.

The researcher decided to investigate further with one student who had a particularly high Deep Achieving Approach score. The student’s main lecturer was approached and asked about the learning style and academic attainment of this student. The student attended lectures
regularly, but spent much of his time talking to the lecturer about his personal problems. He did very little work and this was reflected in his overall level of achievement. Although this is only one student, the possible unreliability of self-report measures in gaining information related to participants’ actual behaviour has long been recognised (Anastasi, 1988).

Limitations of the Study

A major limitation of this study was the difficulty in obtaining academic results. The researcher had planned on combining five or six exam scores to be used as data, in the end the composite score was the result of one to four exam scores for each student. Some students may have done very difficult or very easy exams and if there had been six scores altogether it could have been argued that there would have been a likelihood of each student completing a range of exams, from easy to difficult. The correlation between a Deep Achieving Approach and academic success is likely to have been skewed, and if the result had been significant it would have been necessary to be extremely cautious in claiming that the main hypothesis was supported.

Another point is that the research relied on one measure of assessing students, the Study Process Questionnaire. If, for example, a
locus of control or self-efficacy measure had also been used, together with student self-ratings of ability, and/or some objective measure of ability, then there would have been far more information on which to base discussion of the results. The findings of the study would still have been tentative, but questions about the validity of the instrument in this setting would have been easier to address.

The questionnaire items are sometimes quite complex, for example, "While I realise that truth is forever changing as knowledge is increasing, I feel compelled to discover what appears to me to be the truth at this time". It was possible to answer questions from students during the administration of the questionnaire, but some students find it difficult to seek help for fear of appearing naive. Students for whom English is a second language may have had particular difficulty, but there was no way of assessing reading ability levels for any of the students. Questions 36 and 38 (see Appendix I) would seem irrelevant to students who were answering the questionnaire from the point of view of studying computing. The questions are more suitable for students completing a wider range of subjects.

This study did not take into account the climate of the institution, as well as the many personal reasons why students withdraw from
courses. The Computing Department at the TAFE college was dissolved at the end of the first semester, with all students moving to another campus. It is reasonable to assume that both staff and students would have found this move disruptive. The changes in the TAFE system at the Federal level were affecting the mode of course delivery, which, again, would have been disturbing to staff and students. Whether the changes are positive is not within the scope of this study, but individual approaches to studying and learning in an environment of change might not reflect normal functioning of students.

Conclusion

It is clear from the results obtained in this study that the constructs that the Study Process Questionnaire purports to measure were not useful as predictors of academic success in this setting. The significant relationship between increasing age and better academic outcomes suggests that there is an increasing competency in approaches to studying that comes with maturity. Future research is needed, both to explore this issue, and to facilitate the provision of effective course delivery within the Technical and Further Education system. Vygotsky (1978) has theorised that what is needed in the study of development are ways of measuring ability as a process, rather than a static entity. In the
field of education to understand the process of how students learn, and what will facilitate their learning, remains a crucial area of research.
References


Appendix 1

Questionnaire
What the SPQ is About

On the following pages are a number of questions about your attitudes towards your studies and your usual ways of studying.

There is no right way of studying. It all depends on what suits your own style and the courses you are studying. The following questions have been carefully selected to cover the more important aspects of studying. It is accordingly important that you answer each question as honestly as you can. If you think that your answer to a question would depend on the subject being studied, give the answer that would apply to the subject(s) most important to you.

How to Answer

For each item there is a row of boxes for a five-point scale on the Answer Sheet:

This underlines the desired number.

The numbers stand for the following responses:
5 — this item is always or almost always true of me
4 — this item is frequently true of me
3 — this item is true of me about half the time
2 — this item is sometimes true of me
1 — this item is never or only rarely true of me.

Example

I study best with the radio on.

If this was almost always true of you, you would underline 5 thus:

5 4 3 2 1

If you only sometimes studied well with the radio on, you would underline 2, thus:

5 4 3 2 1

Underline the number on the Answer Sheet that best fits your immediate reaction. Do not spend a long time on each item: your first reaction is probably the best one. Please answer each item.

Do not worry about projecting a good image. Your answers are CONFIDENTIAL.

Thank you for your co-operation.
Study Process Questionnaire

Underline one number for each item.

1 I chose my present courses largely with a view to the job situation when I graduate rather than out of their intrinsic interest to me.

2 I find that at times studying gives me a feeling of deep personal satisfaction.

3 I want top grades in most or all of my courses so that I will be able to select from among the best positions available when I graduate.

4 I think browsing around is a waste of time, so I only study seriously what's given out in class or in the course outlines.

5 While I am studying, I often think of real life situations to which the material that I am learning would be useful.

6 I summarize suggested readings and include these as part of my notes on a topic.

7 I am discouraged by a poor mark on a test and worry about how I will do on the next test.

8 While I realize that truth is forever changing as knowledge is increasing, I feel compelled to discover what appears to me to be the truth at this time.

9 I have a strong desire to excel in all my studies.

10 I learn some things by rote, going over and over them until I know them by heart.

11 In reading new material I often find that I'm continually reminded of material I already know and see the latter in a new light.

12 I try to work consistently throughout the term and review regularly when the exams are close.

13 Whether I like it or not, I can see that further education is for me a good way to get a well-paid or secure job.

14 I feel that virtually any topic can be highly interesting once I get into it.

15 I would see myself basically as an ambitious person and want to get to the top, whatever I do.

16 I tend to choose subjects with a lot of factual content rather than theoretical kinds of subjects.
17 I find that I have to do enough work on a topic so that I can form my own point of view before I am satisfied.

18 I try to do all of my assignments as soon as possible after they are given out.

19 Even when I have studied hard for a test, I worry that I may not be able to do well in it.

20 I find that studying academic topics can at times be as exciting as a good novel or movie.

21 If it came to the point, I would be prepared to sacrifice immediate popularity with my fellow students for success in my studies and subsequent career.

22 I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.

23 I try to relate what I have learned in one subject to that in another.

24 After a lecture or lab I reread my notes to make sure they are legible and that I understand them.

25 Lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.

26 I usually become increasingly absorbed in my work the more I do.

27 One of the most important considerations in choosing a course is whether or not I will be able to get top marks in it.

28 I learn best from lecturers who work from carefully prepared notes and outline major points neatly on the blackboard.

29 I find most new topics interesting and often spend extra time trying to obtain more information about them.

30 I test myself on important topics until I understand them completely.

31 I almost resent having to spend a further three or four years studying after leaving school, but feel that the end results will make it all worthwhile.

32 I believe strongly that my main aim in life is to discover my own philosophy and belief system and to act strictly in accordance with it.

33 I see getting high grades as a kind of competitive game, and I play it to win.

34 I find it best to accept the statements and ideas of my lecturers and question them only under special circumstances.

35 I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.
36 I make a point of looking at most of the suggested readings that go with the lectures.

37 I am at college/university mainly because I feel that I will be able to obtain a better job if I have a tertiary qualification.

38 My studies have changed my views about such things as politics, my religion, and my philosophy of life.

39 I believe that society is based on competition and schools and universities should reflect this.

40 I am very aware that lecturers know a lot more than I do and so I concentrate on what they say is important rather than rely on my own judgment.

41 I try to relate new material, as I am reading it, to what I already know on that topic.

42 I keep neat, well-organized notes for most subjects.
Appendix 2

Coding Sheet
**STUDY PROCESS QUESTIONNAIRE**

**ANSWER SHEET**

PLACE TO ALLOW WRITING OF SCORES ON

CUT OUT RECTANGLE SHOWN WITH A SHARP

--

**SPQ PANEL 1**

Total numbers in each panel

SM

DM

AM

**SPQ PANEL 2**

Total numbers in each panel

AS

DS

SS

Max 35

Min 7

Max 35

Min 7

Max 35

Min 7

SM

DM

AM
Appendix 3

Answer Sheet
**STUDY PROCESS QUESTIONNAIRE**

Print name in boxes here, then mark box to underline appropriate letter in each column. Example:

```
E A D E
A A A A
B B B B
C C C C
```

- **Date of Birth:**
  - **Day:** 1 2 3 4
  - **Month:** 1 2 3
  - **Year:** 1 2 3

- **Sex:** M F

- **Item numbers go across in groups of three.**

- **INSTRUCTIONS**
  - Do not go over edges of boxes.
  - Use only HB or B pencils.
  - Erase mistakes fully.

Compared with most of the students in your year, how good at most of your subjects are you?

- **Excellent:**
- **Above average:**
- **Average:**
- **Below average:**
- **Quirky:**

---

© ACER 1985
by The Australian Council for Educational Research

**DO NOT FOLD OR DEFACE THIS SHEET IN ANY WAY**

ACER
Appendix 4

Student Consent Form
This study is being undertaken to help to understand individual personality factors which may affect academic progress. You will be asked to complete a Study Process Questionnaire at the beginning of Term 1, and the results of this will be used, together with your academic results, to gain an overview of the progress of students as a group. You will be assigned a subject number, which will be used by the researcher to assure confidentiality of individual results. The results will be reported for the whole group of students and no one will be given access to information on individuals.

The questionnaire will take approximately 20 minutes to complete. You are asked to take time with the questions and answer them honestly.

Any questions concerning the project can be directed to Susan Hastings of Edith Cowan University on [redacted].

I .................................................... have read the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this activity, realising that I may withdraw at any time.

I agree that the research data gathered for this study may be published provided my name is not used.

Signature.................................................................Date.............................................

Investigator............................................................Date.............................................

Note:
If you would like to receive a one page summary of the outcomes of this study please complete the slip below and return to Susan Hastings, c/- Computing Department, Mt Lawley College of TAFE.

Name.............................................................................................................

Address...........................................................................................................

Postcode ..............

Student Study Processes as Predictors of Academic Outcomes in Traditional and Student Directed Learning
Appendix 5

Questions with Sub-scale Markers
Study Process Questionaire

1. I chose my present courses largely with a view to the job situation when I graduate rather than out of their intrinsic interest to me.SM

2. I find that at times studying gives me a deep personal satisfaction.DM

3. I want top grades in most or all of my courses so that I will be able to select from among the best positions available when I graduate.AM

4. I think browsing around is a waste of time, so I only study seriously what's given out in class or in the course outlines.SS

5. While I am studying, I often think of real life situations to which the material that I am learning would be useful.DS

6. I summarise suggested readings and include these as part of my notes on a topic.AS

7. I am discouraged by a poor mark on a test and worry about how I will do on the next test.SM

8. While I realise that truth is forever changing as knowledge is increasing, I feel compelled to discover what appears to me to be the truth at this time.DM

9. I have a strong desire to excel in all my studies.AM

10. I learn some things by rote, going over and over them until I know them by heart.SS

11. In reading new material I often find that I'm continually reminded of material I already know and see the latter in a new light.DS

12. I try to work consistently throughout the term and review regularly when the exams are close.AS

13. Whether I like it or not, I can see that further education is for me a good way to get a well-paid or secure job.SM

14. I feel that virtually any topic can be highly interesting once I get into it.DM

15. I would see myself basically as an ambitious person and want to get to the top, whatever I do.AM

16. I tend to choose subjects with a lot of factual content rather than theoretical kinds of subjects.SS

17. I find that I have to do enough work on a topic so that I can form my own point of view before I am satisfied.DS

18. I try to do all of my assignments as soon as possible after they are given out.AS

19. Even when I have studied hard for a test, I worry that I may not be able to do well in it.SM

20. I find that studying academic topics can at times be as exciting as a good novel or movie.DM
21. If it came to the point, I would be prepared to sacrifice immediate popularity with my fellow students for success in my studies and subsequent career. AM

22. I generally restrict my study to that is specifically set as I think it is unnecessary to do anything extra. SS

23. I try to relate what I have learned in one subject to that in another. DS

24. After a lecture or lab I reread my notes to make sure they are legible and that I understand them. AS

25. Lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined. SM

26. I usually become increasingly absorbed in my work the more I do. DM

27. One of the most important considerations in choosing a course is whether or not I will be able to get top marks in it. AM

28. I learn best from lecturers who work from carefully prepared notes and outline major points neatly on the blackboard. SS

29. I find most new topics interesting and often spend extra time trying to obtain more information about them. DS

30. I test myself on important topics until I understand them completely. AS

31. I almost resent having to spend a further three or four years studying after leaving school, but feel that the end results will make it all worthwhile. SM

32. I believe strongly that my main aim in life is to discover my own philosophy and belief system and to act strictly in accordance with it. DM

33. I see getting high grades as a kind of competitive game, and I play it to win. AM

34. I find it best to accept the statements and ideas of my lecturers and question them only under special circumstances. SS

35. I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes. DS

36. I make a point of looking at most of the suggested readings that go with the lectures. AS

37. I am at college/university mainly because I feel that I will be able to obtain a better job if I have a tertiary qualification. SM

38. My studies have changed my views about such things as politics, my religion, and my philosophy of life. DM

39. I believe that society is based on competition and schools and universities should reflect this. AM
40. I am very aware that lecturers know a lot more than I do and so I concentrate on what they say is important rather than rely on my own judgement.

41. I try to relate new material, as I am reading it, to what I already know on the topic.

42. I keep neat, well-organised notes for most subjects.
Appendix 6

Letter Giving Permission to Conduct Research
2 February 1995

Ms S Hastings

Dear Ms Hastings

Thank you for your letter seeking permission to conduct a research project with our new intake of computing students.

The College is pleased to grant your permission to conduct your research subject to the following conditions:

* participation by lecturers is voluntary
* student participation is also voluntary
* no published material will in any way identify the College, lecturers and/or students
* the College will be provided with a copy of the research

If you agree to the above conditions could you contact Senior Lecturer who will assist you to arrange the details of your project.

Best wishes for a successful outcome to your research.

Yours sincerely

ASSOCIATE DIRECTOR