Faculty of Education

Educational Productivity of an Open Learning Environment within the Vocational Education and Training Sector in Western Australia

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To

Bronwyn
Benjamin, James, Emily

and

Percy and Denise

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Abstract

Rapid reform in the vocational education and training sector within Australia has driven the need for a more flexible approach to the delivery of education and training. One facet of such flexibility is Open Learning. Currently there is little research on Open Learning within the training sector on which planning decisions can be based.

A model of educational productivity (Walberg, 1981) has been proposed in the research literature to investigate relationships between key factors such a student antecedents, learning environments and learning outcomes. The Walberg model has been employed in this current study to explore how these factors may be studied in an Open Learning environment and a more Traditional Learning environment within the vocational education and training sector. The research design is a comparative description, utilising techniques from both quantitative and qualitative paradigms.

A major aspect of this current study has been to investigate the constructs proposed by Walberg's Productivity Model and source appropriate instruments to measure these constructs. Where the appropriate instruments were not available, a process of instrument development and validation was conducted.

The research has identified Walberg's model as being a valid frame of reference within the Vocational Education and Training sector. As expected, significant differences between the Open Learning environment and the Traditional Learning environment were apparent for the measures of Classroom Environment. Of interest, however, was that the productivity factor of Quantity, for students studying in both learning environments, was shown to have a negative relationship with achievement. While small differences were apparent for other factors, generally, the relationship between productivity factors and educational achievement was seen to be similar for both the Open Learning and the Traditional Learning environments.

The findings of the study should be of significance to a range of people involved in the Open Learning environment, including decision makers in the areas of educational policy, curriculum design and implementation, administration and teaching.

Contents

List of Tables

List of Figures

Chapter 1: Introduction

Chapter 2: Review of Literature

Chapter 3: Research Design

Chapter 4: Results

Appendices

Appendix A

Appendix B

Appendix C

1. INTRODUCTION

1.1 Background

Australia, in the 1990s, is undergoing unprecedented reform in the vocational training and education sector, driven from the highest political levels and underpinned by national economic reform, national award restructuring and national competency standards. In the last decade, the Federal government has made the quality and flexibility of training, along with access and equity issues, a high priority in its social/economic reforms (Dawkins, 1989). The Federal government has also implanted a policy for dramatically increasing the retention rate of post compulsory students (Finn, 1991). Such a widespread reform agenda, impacting on the areas of training and education, access and equity and high school retention, has driven the need for flexible approaches to the delivery of vocational training and education. Given the rapid introduction of flexible methods of delivering training within the Australian vocational training and education sector, along with the potential for enormous diversity in training environments, it is timely to address the issue of effectiveness of some of these new approaches. It is imperative, however, that educational researchers provide some empirical measure of the overall effectiveness of these flexible approaches. It is proposed, therefore, that this current research study investigate the educational productivity of flexible delivery methods within the vocational training and education environment.

Flexible delivery is a generic term encompassing a range of educational delivery methods. This project researches one facet of flexible delivery, namely *Open Learning*. Open Learning is a student centred approach to the learning, where the student decides what, when, where and how to learn. The teacher becomes a means to facilitate this learning if and when required. Policy makers, curriculum developers, teachers and students, may all state that Open Learning is effective learning, but just how effective is this mode of learning? There has been much research on learning environments and learning outcomes, however, the research on Open Learning environments and their outcomes, or comparisons between different flexible environments, is limited, particularly in the Technical and Further Education sector.

This dissertation extends the limited research on Open Learning and explores relationships between students, environments and learning outcomes in both Open Learning and traditional learning environments.

1.2 Objective of the Study

A major objective of this current research study was to investigate the constructs identified by Walberg's Educational Productivity Model (1981), develop and validate suitable instruments to measure these constructs, develop a framework of comparison based on the model, and investigate the productivity of an Open Learning environment. In the vocational training and education sector, Open Learning is seen by an increasing number of policy makers as the answer to many of the challenges imposed by far reaching national reforms. Governments, both National and State, are facing increased budgetary constraints. Educators are being required to do more with less. Industry requires competent workers from the training systems, who have accompanying life-long learning skills. Social reformists require that the vocational training and education sector be made accessible to all. Educationists are left with the decisions of how to achieve all of these requirements. Currently, however, there is little research evidence on which such decisions can be based.

Trigwell & Prosser (1991) suggest that there has been very little research conducted into the consecutive study of students, environments and outcomes. Whilst these authors acknowledge numerous research projects focussing on the students and the environment, or on the environment and the outcomes, very few projects have examined relationships between all three. In the limited cases where students, environment and outcomes have been included, Trigwell & Prosser (1991) contend that the research has not included both quantitative and qualitative data. The research projects which have focussed on all three aspects, have done so within a limited or narrow framework. It is the intention of this project to broaden the research base and to include the most salient factors affecting the quality or effectiveness of the learning. Walberg (1981) has identified nine factors affecting the productivity of education (see Figure 1.1). These factors will be used as a framework for broadening the research focus of this proposed study.

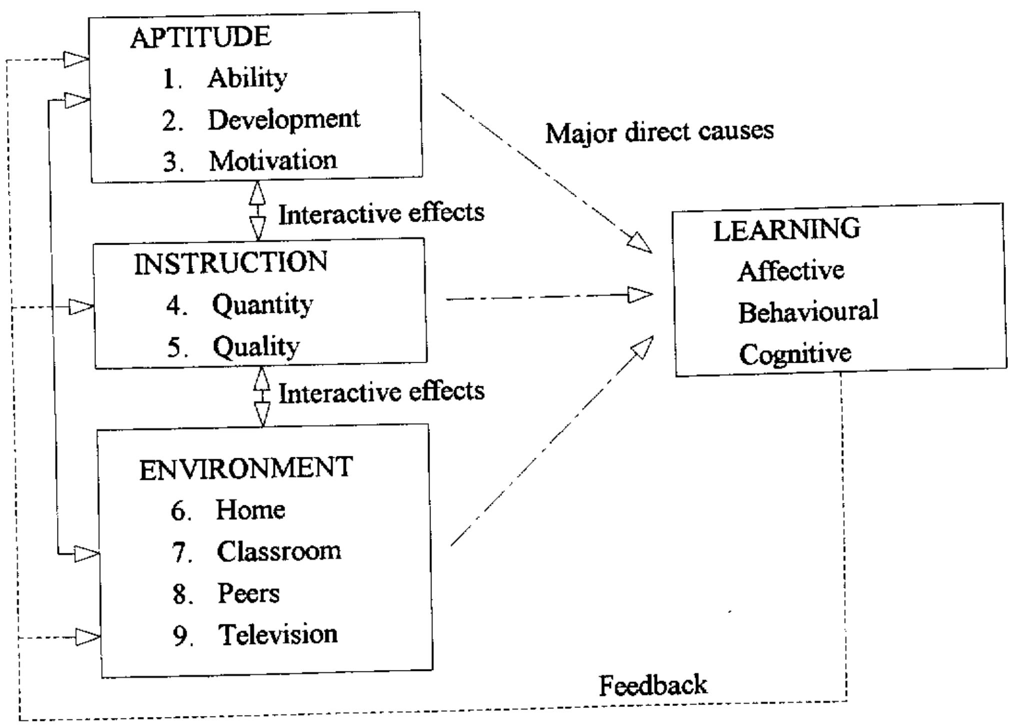


Figure 1.1 Walberg's Educational Productivity Model (1981)

There has been much discussion and research on the outcomes of education within the TAFE sector. This activity has produced a range of performance indicators. The focus of these indicators, however, has concentrated on the effectiveness of the learning. There appears to be a dearth of research which focuses on the quality of learning. Linke, *et al* (1984) have aligned the term 'quality' with the level of goal achievement and the worth or value of that achievement. These authors differentiate effectiveness as simply the levels of goals achieved. Whilst TAFE has historically utilised a range of performance indicators, such indicators have focussed on cost effectiveness, with little attention being paid to quality. A Federal Government group known as the Flexible Delivery Working Party (1992), listed as their second goal the development of performance indicators that include the concept of quality. It is intended for the purposes of this project that the term *effective* shall also include the concept of quality.

The objective of the research, therefore, is to explore the productivity of Open Learning within the TAFE sector of Western Australia.

1.3 Research Questions

The main research question of this study, posed within the conceptual framework of Walberg's Educational Productivity Model, is:

1. *In terms of the factors of Walberg's Educational Productivity Model, what are the characteristics of Open Learning students within the vocational education and training sector?*

Within an Open Learning context, this single broad question can be expanded into the following more specific research questions.

2. *Is Walberg's Model an appropriate means by which to investigate Educational Productivity in the vocational education and training sector?*

In order to answer the first research question, instruments relating to each of the nine productivity factors need to be identified and examined for suitability. Where required suitable instruments need to be developed and validated for use in this study.

2i. *What is the relationship between student aptitude, in the form of ability, cognitive development and motivation, and learning outcomes?*

2ii. *What is the relationship between instruction, in terms of quantity and quality, and learning outcomes?*

2iii. *What is the relationship between student environments, in terms of home, classroom, peer and mass media, and learning outcomes?*

3. *How does the Open Learning environment compare to a Traditional Learning environment in terms of productivity factors and learning outcomes when students are matched on ability?*

1.4 Research Methodology

This research method has followed a descriptive approach that is describing and exploring relationships between variables using correlation methods (Gall, Borg & Gall, 1996). Such a research approach is ideal to measure a number of variables at the same time. The correlational method of research is primarily used for either an exploration of relationships, or for the prediction of scores based on specific variables (Gall, Borg & Gall, 1996; Ary, Jacobs & Razavieh, 1990). This study has focussed on the former purpose of correlational research, exploring relationships between a number of variables.

This research has observed the correlations of a number of specified variables (as described in the research questions) in a given learning environment. Using Walberg's Educational Productivity Model, quantitative data have been used to develop a description of two cohorts of students (namely Open Learning students and Traditional Learning students). Student interviews, providing a qualitative description, have been used to enrich the quantitative data. Given concise descriptions of the two student groups, based on a common foundation in the Productivity Model, comparisons have been made between the two groups.

An investigation of the productivity factors within the Open Learning environment has been conducted. The process of utilising the educational productivity model has allowed an examination of its relevance to the vocational education and training sector. A conceptual framework of the research methodology appears in Figure 1.2 below.

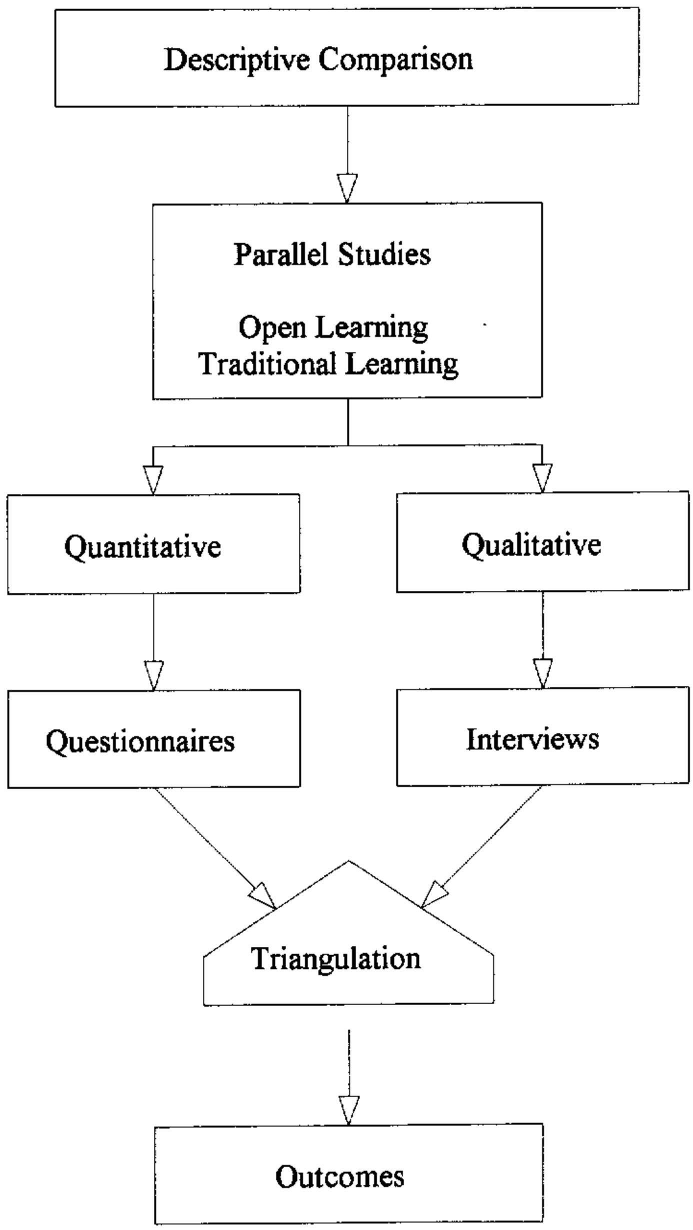


Figure 1.2: Research Design

The research methodology combines aspects of both qualitative and quantitative research paradigms. Howe (1985) has stated that there is no reason why the paradigms should not be mixed. The quantitative approach adopts a survey method of data collection. This data have been analysed using computer based statistical programs. Interpretations of this statistical analysis is enriched by qualitative data emerging from student interviews.

As previously stated, the research has been conducted under the general framework of Walberg's Educational Productivity Model. This model has been constructed by Walberg from a synthesis of many different research projects. A major aspect of this study has been the process to source, adapt or develop a range of survey questionnaires to measure each of the identified productivity factors. The quantitative components of the study have, therefore, utilised a range of survey questionnaires.

To enable comparisons between the Open Learning and traditional environments, a parallel study has been conducted of both environments. With the exception of student ability, data have been collected utilising survey questionnaires and interviews for each of the productivity factors, within each of the learning environments. Student ability was a measure of previous academic achievement. The outcomes, or educational performance, were based on students' current academic achievement. Educational performance has been measured, analysed and compared. Interpretations of the data explores the relationships between educational performance, the learning environments and the factors of Walberg's Educational Productivity Model.

1.5 Significance of the Study

Through an exploration of the salient factors impacting on the productivity of an Open Learning environment, this current research study has significance for a range of people, including policy makers, curriculum developers, training providers, students, evaluators and researchers. Policy makers, given information from the research, will be better informed and therefore better placed to make wise decisions regarding the channelling of scarce educational resources in TAFE. Curriculum developers will be more informed regarding program development and better able to address needs for bridging or remedial courses for students wishing to enter courses. Deliverers of educational programs, such as lecturers, facilitators or program managers will be better placed to develop and deliver programs more effectively. Students will be better placed to make both short and long term decisions regarding learning paths in TAFE. Evaluators and researchers will have a framework from which reasonable comparisons can be made.

1.6 Sample Group

This study has focussed on students currently within the vocational education and training sector. Post-compulsory students studying similar courses in an Open Learning environment at one TAFE campus and a Traditional Learning environment at another campus have been surveyed. Details of specific courses and student numbers for each learning environment are contained in Chapter three, the method section of this study.

1.7 Definitions

The ***Open Learning environment*** refers to a method of delivery recently introduced to the TAFE system in Western Australia. This method of delivery terms the traditional instructor a facilitator. All student learning is conducted on a self-paced, self-directed basis. Facilitators are drawn upon only as and when required by the student. Such a method of delivery is heavily dependant upon self-directed learning materials and adequate resources and facilities. There is a tendency for this delivery method to be centred on computer based instruction, however, print based material is also widely used in the learning environment.

The ***Traditional Learning environment*** relates to the current mainstream method of delivery within TAFE Western Australia. Such delivery methods tend to be teacher centred and lock stepped. For much of the course, students are instructed by the teacher and learning is conducted in a structured classroom environment.

The acronym ***TAFE*** refers to the Technical and Further Education sector within Australia, and encompasses post compulsory vocational education and training. TAFE operates both part time and full time courses, ranging from single short courses, to full trade certificates, through to Advanced Diploma Courses.

The term ***Educational Productivity***, with reference to Walberg's Educational Productivity Model, relates to the achievement of specific, desired, educational goals within a general framework of efficiency of use of available resources.

2. REVIEW OF LITERATURE

2.1 Introduction

An objective of this study was to determine what student characteristics affect learning outcomes within an Open Learning environment. In order to identify any effects on learning, it was first imperative to operationalise the concept of Open Learning. Given a clear understanding of the Open Learning environment, specific student characteristics perceived to be of importance could then be identified. The importance of student characteristics is largely identified by the research literature related to educational learning outcomes. A review of recent literature related to student characteristics and learning outcomes identified Walberg's Educational Productivity Model as being both widely researched and accepted as a theoretical framework to investigate such characteristics. With the general framework of Walberg's (1981) Educational Productivity Model as a basis of measurement, the selection of specific measurement instruments could be undertaken. In order to select instruments for the measurement of those factors identified as impacting on the education, a review of literature related to each factor was undertaken. This review of literature, therefore was threefold. First, Open Learning was operationlised, second, Walberg's concept of productivity was operationlised, and last, specific factors within the Educational Productivity Model, in terms of aptitude, instruction and environment, were also operationalised

2.2 Development of the Concept of Open Learning

Early research into Open Learning has focussed on the open education movement in Great Britain and the United States of America. Walberg and Thomas (1972) suggest that open education appears to have grown out of practical experience, rather than any philosophical or scientific foundation. In operationalising the term Open Education, Walberg identified the differences between what might be considered traditional educational processes and what is perceived as open education. Rather than be aligned with the learning approaches of teacher centred, student centred, program, textbook or materials centred education, open education is a combination of all three processes. The Open Education process is one where the teacher and the student, together, determine the goals of the education, the materials to be used, and the activities to be undertaken. Walberg identifies open education closely with the thinking of

Rousseau of France and Tolstoy of Russia, and to the operations of the early one-room prairie school in America. From a philosophical perspective, Walberg and Thomas (1972, p. 198) state that the open educator's point of view is ".... far more consonant with developmental, humanistic and clinical psychology than with the branches that have been most influential in education, connectionism, behaviourism and psychometrics."

2.2.1 Open Learning in the United States

In 1982, the Centre for Individualised Instruction at Middlesex Community College Massachusetts was established primarily to offer an alternative learning process for students. This institution was established to provide alternative methods of delivery across a range of instructional disciplines. The centre was based on a distinctive conceptual model of individualised instruction. Knowlton (1986) highlights aspects of this model in stating that:

- courses would be identical to those offered in a traditional context, with equal credit and credibility
- courses would utilise different modes of instruction to accommodate different styles of learning
- courses would be managed in such a manner as to free both teachers and students to progress through the teaching and learning process in new ways
- courses would incorporate flexibility whilst maintaining rigour
- courses would offer opportunities for learning to people who had previously been denied.

In describing the conceptual model, Knowlton (1986) implies that courses would evolve through innovative development, utilising modern technologies, and be largely based on mastery learning theory. Knowlton highlights principles of individualised instruction, based on the conceptual model. Teachers would be more creative in the design of learning activities and work more with individual students. Technology would be utilised to provide a range of instructional approaches. Students would be able to learn at different rates and in different ways. Materials would be largely self-instructional. Integrated course design would allow for entry and exit testing along with course refinement based on student performance. Knowlton suggests that the courses offered by the center were best suited to students who wanted to progress more quickly or slowly than they were able to in a normal classroom, to students who enjoyed a self-paced and individualised instructional format, and to those students who enjoyed the flexibility of enrolment and completion of courses. Knowlton also suggested that the courses offered at the centre for individualised Instruction were not suited to students who enjoyed learning in a group context, or enjoyed anonymity, or those who accepted mediocre academic performance.

2.2.2 Open Learning in Britain

Mitchell (1986) lists three major factors which drove the need to develop Open Learning systems in Britain. Firstly, the education system had constantly failed to meet the needs of a significant number of young people and adults. Secondly, the domains of further and adult education had been increasingly subjected to financial hardship. Thirdly, the advent of rapid technological change had driven the need for ongoing training.

2.2.3 Open Learning in Australia

The introduction of Open Learning policy in Australia can be traced to the launch of the open university in Great Britain in 1971. In 1973 a Committee on the Open University was appointed to investigate Open Learning possibilities for Australia. An decline in the general economic performance of the nation can also be traced to the grass root developments of Open Learning. The ACTU/TDU Mission to Western Europe in 1987, resulting in the report Australia Reconstructed, was the catalyst for a national agenda with respect to Open Learning. This mission highlighted weaknesses in Australian work organisation and skill formation, and identified the need for an improved training system focussing on the development of lifetime learning. A plethora of Federal reports, including Skills for Australia; A Changing Workforce (1987), Industry Training in Australia; The Need for Change (1988), Improving Australia's Training System (1989), Australia's Workforce in the year 2001 (1991), the Finn Report (1991), the Meyer Report (1992) and the Carmichael Report (1992), on the training system in Australia set the course for national training reform. Award restructuring within the work place and the ratification of national competency standards established the need for a nationally consistent training system based on achieved competencies. In light of such developments, the report on Alternative Delivery in TAFE: A National Implementation Model (1992) was commissioned. The thrust of this report was in promoting alternative delivery strategies for future training, methods which did not rely on the traditional face to face contact of institutionally based teaching. The term Open Learning was adopted to be an all encompassing term related to the approaches, design, delivery and management of student centred, flexible learning systems.

Nation (1990) asserts that Australian politicians have been largely influenced by the British Open Learning developments. Such an introduction has come largely from Australian educators in the schooling and technical and further education sectors importing ideas from the British systems. This process has tended to align the term Open Learning with the concept of distance education, with very little public debate over the nomenclature of principles of Open Learning. Much confusion has existed over the terminology and concepts of Open Learning.

2.2.4 Defining the Term Open Learning

In defining the term Open Learning, Lewis (1986) suggests the terminology of "open" implies the existence of something that is its opposite, that is "closed". Lewis states that there is a regrettable perception that Open Learning is a definitive term, suggesting that all other education processes, if not open, are therefore closed. The understanding of the term Open Learning has evolved from an understanding of what Open Learning is not, rather than what Open Learning is. Open Learning, essentially, is not what closed learning is. Open Learning is student centred rather than being centred around the institution; Open Learning utilises a wide range of teaching learning strategies, rather than a narrow or limited range; Open Learning removes barriers to learning, rather than imposing barriers to the learning process. In clarifying these perceptions of the term Open Learning, Lewis suggests that Open Learning is all about choice, the who, what, where, how and when regarding the student's learning. It is clear that rather than a dichotomy of open or closed learning, the learning process of any given type lies somewhere on a continuum between the two extremities. The degree to which a course or institution is open or closed might be established by identifying the degree of choice associated with that course or institution. Lewis (1986) acknowledges the Council for Educational Technology in redeveloping a table highlighting extremities of open and closed learning. By determining the who, what, where, how and when in Figure 2.1 below, the degree of openness of a course or institution can be established. Educators operating in a traditional classroom setting may well say "I do that". Lewis acknowledges that many traditional classes have varying degrees of openness to them. The term Open Learning, therefore, begs the question, "how open?", or indeed "how closed?'.

In defining the term Open Learning, Hall (1987) supports Lewis' findings regarding the questions to be answered when identifying courses, as well as Lewis' description of a continuum between open and closed learning. Hall refers to the Manpower Services Commission of the United kingdom for a concise definition of Open Learning, suggesting that Open Learning is a

> "..... term used to describe education and training schemes which are designed to meet the varied requirements of individuals - for example as to what, where when and how they learn. Organisations make these freedoms of time, place and method possible by providing a carefully planned, flexible learning package. This enables the learner to study, for much of the time if necessary, away from the direct supervision of the trainer."
>
> (Hall, 1987, p.3)

Rumble (1989) asserts that there has been much confusion over the conceptual understanding of the term Open Learning. Rumble approaches the concept of learning in terms of proximity, suggesting that all education and training falls somewhere on a continuum between purely contiguous (being close to or in contact with) and purely distant learning. In terms of a method of education, Open Learning is no different to either contiguous or distant learning. Open Learning is more to do with educational policy and philosophy, rather than any method of teaching and learning. Rumble asserts that Open Learning has to do with access, freedom from time and place constraints, structure, dialogue, support systems and the means of education. The means of the education referred to as the choice the learner has between distant or contiguous learning, along with a choice of media. Rumble expresses concern that many systems are described as being Open Learning systems, when in fact they are quite closed when measured against the criteria for Open Learning.

Question	Open	Closed
Who?	• Scheme open to all • Self assessment and diagnostic facilities • Extensive publicity, regularly updated information	• Scheme open to select groups only • Set entry requirements, eg traditional exam success • Scheme not marketed
Why?	• Learner choice • Pre-entry counselling	• Choice made by others, eg tutor, employer • No counselling or guidance
What?	• Learner formulates own objectives and syllabus • Uses wide range of materials drawn from many sources • Content tailored to individual need, learners can take different modules • Guidance on selection of content • Credit given for past experience	• Entire syllabus set out in advance, eg by validating body; no choice possible within it • Limited to materials the tutor has produced • Whole course must be taken • No guidance on selection of content • No recognition for past experience
How?	Choice of learning methods/styles; varied activities • Choice of routes through material • Package uses variety of media	• Only one method/style provided for; little variation in learner activity • One route only through material • Package in one medium only
Where?	• Learner chooses place (eg home, work, while travelling) • Learner can attend or not - as desired • Practical work offered through kits and/or drop in access and/or place of work itself	• One place only (eg work) • Regular fixed attendance required • Practical work requires fixed attendance
When?	• Start any time • Learner decides place of work • End at any time	• Fixed starting date(s) • Learner placed by a fixed timetable • Fixed ending
How is the learner doing?	• Variety of assessment methods; learner choice of assessment methods; learner constructs method of assessment • Criteria/competency based assessment • Frequent, full, ongoing feedback on performance, available as desired • Learner decides when to be assessed • Assessment available for each module	• Externally mixed method of assessment eg formal exam • Normative assessment • No feedback on performance • Assessment dates fixed and non negotiable • Assessment available only for whole of course
Who can help the learner?	• Variety of possible kinds of support (eg advice, guidance, counselling) • Non-professional as well as professional supporters, informal as well as formal support encouraged (eg mentor, family, friends) • Support available in many places • Support available in a variety of modes, eg letter, telephone, face to face	• No support outside course/package • Only professional supporters (eg teachers) encouraged • Support available only in one place, eg training centre • Support available in one mode only, eg face to face
Where does it lead to?	• Various possible destinations	• One destination

Figure 2. 1: Questions of Open Learning (Lewis, 1986)

While Lewis (1990) confirms much of what Rumble says, some of Rumble's assertions are refuted. While agreeing that the earlier understandings of the term Open Learning focussed on the access of learners, Lewis refutes that Open Learning might simply lie somewhere between distant learning and contiguous learning. In citing a definition of Open Learning by Coffey, Lewis (1990, p.4) extends the term Open Learning to include the widest possible choice of teaching strategies, with a particular focus on independent and individualised learning. Lewis suggests that the overall understanding of the term Open Learning has evolved to focus on the positive qualities that this mode of learning can generate, rather than simply focus on the barriers that it removes. The term Open Learning also includes aspects of the delivery of the curriculum, rather than simply who might have access to it. Open Learning is also referred to in terms of mainstream education and training rather than simply referring to the development of new learner groups.

In Australia societal changes are cited as being the driving force behind the need for Open Learning. Increased multiculturalism, increased concerns for equity issues and an increased need for skills are the major components if this societal change. A greater demand for skills acquisition places greater demands on existing educational institutions. Adding to this pressure is the diversity of learner backgrounds in terms of both ethnicity and traditional routes of access. In achieving this objective of a more highly educated population, Johnson (1990) suggests that major changes to education approaches and structures will be required. Hall further suggests that the change of attitude and measures that will achieve these objectives can be grouped under the term Open Learning. Hall describes Open Learning as an approach rather than a technique or system, and is based on the needs of the individual learner rather than the teaching institution. Open Learning gives the learners as much choice as possible over what, when, where and how they learner. Open Learning commonly uses the delivery methods of distance education and the facilities of modern technology. In an Open Learning system, the role of the teacher moves from being a source of knowledge to a position of a facilitator and manager of learning. Hall suggests that the measures inherent in an Open Learning system are justified by issues related to efficiency, cost effectiveness and equity.

In addressing some of the implications of Open Learning, Johnson (1992) further refines the term Open Learning. Through the development of the open universities, both in Britain and

Australia, a general perception of Open Learning had been restricted to the idea of open access and the delivery of courses through the use of modern technology. But "real Open Learning includes more than open entry plus electronics" (Johnson, 1992, p.6). Identifying the hallmarks of real Open Learning, Johnson identifies the following points:

- open entry irrespective of scholastic achievement
- open enrolment, noting the absence of an academic year
- widest possible choice of small modules, able to be combined for specific needs
- choice of delivery method
- a choice of assessment time and methods
- recognition of any prior learning, formal or informal

Johnson acknowledges that throughout Australia these practices are widely used, however, a fully open system would utilise all of them. Perhaps the biggest adjustment any institution must make to adopt an Open Learning system is the role reversal of the student. The institution serves to meet the needs of the student, rather than the student be required to change in order to meet the needs of the institution.

2.2.5 Confusion in the Literature

The confusion over the use of the term Open Learning is further highlighted by Martin (1992), referring to the ins and outs of Open Learning. Apart from the title of this article, there is little reference to the term Open Learning, rather the author adopts the term flexible delivery to describe what essentially appears to be Open Learning courses. While in light of the content of the article, the term flexible delivery might be more appropriate to describe the range of courses reported, the title refers to Open Learning. Such a situation does little to develop an operational understanding of the term Open Learning. Baron, Thiele and Hintz (1995) present a similar situation where a section of their publication is dedicated to clarifying the jargon, presenting a broad definition for the term Open Learning. The remainder of the study refers to the learning process as flexible delivery. Rather than clarify the terminology, this report appears to further confuse the understanding of Open Learning.

Pedagogical issues related to Open Learning appear to have been largely ignored by the literature. Jakupec and Nicoll (1994) contend that Open Learning is politically driven, with little if any pedagogical base. Jakupec suggests that Open Learning has been largely adopted due to political expediency and equity of access issues. As a result there appears to be no connection with underlying educational theory. Jakupec states that various approaches to learning (for example behavioural, critical , interpretive) and models of learning (for example problem based, independent, experiential) each have a distinct understanding of how knowledge is constructed and therefore how learning occurs. The authors contend that Open Learning demonstrates little evidence of any pedagogic value. The authors suggest that Open Learning can only be as open as the approach or model through which the learning is occurring will allow it be. Such an understanding positions Open Learning as some sort of adjunct to the learning process, perhaps more aligned to the administration process rather than the actual learning process. From a pedagogical perspective, the degree of choice in content in Open Learning is also reason for concern. If content is open to choice, there is the distinct possibility of a deterioration of skills where only particular aspects of knowledge are chosen to be studied. Jakupec and Nicoll (1994) further contend that if what 'counts' as knowledge is determined via open content, that is through choice by students, then society ultimately would begin to lose the ability to understand, critique and further develop theories of knowledge. Open Learning might well be a social ideal, but it should not be confused with pedagogy.

Johnson (1994, p.15) suggests that "Teaching staff need to see themselves much less as 'teachers' and more as 'producers' of learning materials and 'managers' of students' learning". Such a situation would appear confirm the concerns of Jakupec and Nicoll (1994) with respect to a dilution of a pedagogical base in Open Learning situations. Johnson also contends that Open Learning is increasing for good educational reasons. In an explanation of the terms Open Learning and flexible delivery, however, the salient aspects of these two terms are largely based on the administration of the learning process, rather than the learning process itself. Where there are stated benefits to the learning process (such as time, place, style of learning and assessment), Jakupec and Nicoll would argue that such benefits could only operate within the confines of the existing approaches or models to the learning. Whilst Open Learning appears to display obvious benefits to the educational process in terms of administration and access, there is some question as to the educational benefits in terms of the learning process.

2.2.6 Open Learning versus Traditional Learning

In a review of educational research studies Walberg, Schiller and Haertal (1979) examined the relationship between Open Learning and traditional learning. Findings suggested that there was no significant difference between the two forms of learning with respect to achievement levels. Walberg found that when Open Learning had a significant effect on achievement, positive results were recorded for creativity, self-concept, school attitudes, curiosity and independence. These findings were seen to reply to the assertions of the Bennett (1976) study, where Open Learning had failed.

In a meta analysis of studies comparing open education with traditional education, Horwitz (1979) concluded that there was not enough evidence to suggest that the open education system was superior to the traditional education system. Giaconia and Hedges (1982, p.583) cite Paterson in suggesting that the traditional classroom is more effective in increasing student achievement. Open Learning, however, is cited as being more effective for non achievement outcomes such as creativity, independence, curiosity, attitudes to school and learning. Similar findings are reported by Hedges, Giaconia and Gage (cited in Giaconia & Hedges, 1982, p.586). The weakest aspect of Open Learning was reported to be in the skills areas of reading, mathematics and language development. Conversely, strengths of Open Learning were reported in the areas of creativity, cooperativeness, independence, teacher attitudes, school attitudes and curiosity.

2.2.7 The Joondalup Model: A Definition

In 1991, a team of people from within the TAFE sector were formed with the express purpose to design and implement an Open Learning system at the Joondalup campus of TAFE. After several months of grappling with the concepts and terminology related to Open Learning, the team defined Open Learning on the Joondalup campus to mean:

- skills formation options that are flexible with respect to course structure, delivery mode, time and place,
- modularised curriculum,

- entrance and exit on demand rather than the traditional twice a year, and
- assessment based on demonstrated competency, not time served.

(Muller & White, 1994, p.140)

Such a definition has been developed based on the principle that 'one size does not fit all'. The Open Learning college was designed to cater for students of all shapes and sizes. As a result, the college has been designed such that each student has a tailored learning programme which is independent of the requirements, time frames and abilities of other students. The charter statement of the institution was to produce skilled graduates who were self-directed lifelong learners. Muller and White state that the impetus for the development of the Open Learning system at Joondalup was politically driven, citing the reports "Skills Recognition in Australia", "Australia Reconstructed" and the Dawkins' White Paper on Education. These reports were identifying the need for more effective, responsive and cost efficient ways of providing education and training.

2.3 Educational Productivity

"A central problem of psychological research in education is to determine how to make learning more effective and productive" (Walberg, 1982, p.115). Walberg describes effective learning as a situation where students achieve the desired goals. Productive learning is a situation where the performance or achievement of goals is maximised while frugally utilising limited resources. Whilst in the education domain it would appear that the means to achieve effective education is readily identifiable, however, not such a clear picture is apparent for productive education.

2.3.1 Production Theory

Production theory stems from research in agriculture and industry. One of the earliest formalised production theories is that of Cobb and Douglas, who presented their productivity theory in the form of a mathematical equation.

Walberg (1982) cites Cobb and Douglas in presenting the Cobb-Douglas equation:

$$O = a\,\mathrm{K}b\,\mathrm{L}c$$

(Walberg, 1982, p.116)

where O relates to output, *a* is a constant, K relates to capital, L relates to labour, *b* and *c* are constant coefficients.

The model might be best explained using a farm as an example. By adding more capital (K, in the form of land or machinery) or more labour (L), there will be a consequent increase in crop yield (O or output). Each factor is necessary, but insufficient alone, for increased production. Increasing each factor can increase production, but at a rate of diminishing returns. That is, an increase of farm machinery will increase production, but without an increase in other factors, a continual increase in machinery will prove to be less and less efficient.

2.3.2 A Productivity Model

Using the Cobb-Douglas agricultural theory of productivity as a basis, Walberg (1982) presented a psychological productivity theory of education. Drawing on extensive educational research, examining the positive relationships between learning and specific factors related to learning, the following model was put forward.

$$\text{Learning} = a(\text{Age})^{b}(\text{Ability})^{c}(\text{Motivation})^{d}(\text{Quantity})^{e}(\text{Quality})^{f}(\text{Classroom})^{g}(\text{Home})^{h}$$

Walberg (1982, p.117)

where *a* is a constant and *b* through to *h* are coefficients.

Walberg hypothesises that:

- increasing any factor increases learning
- increasing any factor whilst holding the other factors constant results in diminishing marginal returns
- when a factor is zero, zero learning will occur, however, given the inability to establish zero points for most of the factors, more correctly, minimal measure of a factor will result in reduced learning occurring.
- factors substitute for each other but in diminishing amounts
- coefficients *b* through to *h* allow student profiles to be developed. Productive students would have high flat profiles, unproductive students would have low uneven profiles.

2.3.3 Confirmation of the Model

Further development and confirmation of Walberg's Educational Productivity Model occurred as a result of a synthesis of theoretical constructs by Haertel, Walberg and Weinstein (1983). Major constructs of eight educational models or theories of learning were identified and compared with Walberg's Educational Productivity Model. The specific theories or learning models were those of Carroll (1963), Bruner (1966), Gagne (1974), Cooley and Leinhardt (1975), Bloom (1976), Glaser (1976), Harnischfeger and Wiley (1976), and Bennett (1978). Four essential constructs have appeared across the eight models inspected with a reasonable degree of consistency. Those four constructs were named Ability, Motivation, Quantity and Quality. Environmental factors were not identified consistently within the eight models. Haertel, Walberg and Weinstein (1983) suggest that further research would be required to determine the worth or place of environmental factors within the Educational Productivity Model.

2.3.4 Parsimony, Replication and Generalisability

The Educational Productivity Model has been developed along the three fundamental scientific routes of parsimony, replication and generalisability Walberg (1984). In terms of parsimony, the model focuses on the least number of factors that most consistently and most powerfully explain learning. Other influences on learning in the form of economic, political and sociological characteristics of school or district are seen to be distant from the immediate factors of the Educational Productivity Model. These other influences are less alterable, less direct and less observable than the factors of the Educational Productivity Model. Walberg suggests it is of more importance to examine the effects that these other influences have on the model factors, rather than examining the other influences individually. In terms of replication, it is suggested that the model can be readily used by different studies and would generally deliver consistent results. In terms of generalisability, it is suggested that the Educational Productivity Model is consistent in findings based on either national or international survey groups.

2.3.5 Effect Sizes

Based on a synthesis of approximately 3000 research studies, Walberg (1984) lists the effect for each of the productivity factors. It can be seen that the measurement of reinforcement has the strongest effect on educational achievement. Media in the form of television viewing is reported as having the least effect on achievement.

Productivity Factor	Measurement	Effect
Ability	IQ	0.71
Development	Piagetian Stage	0.47
Motivation	Motivation	0.34
Quantity	Instructional Time	0.38
Quality	Reinforcement	1.17
Home	Home Environment	0.37
Classroom	Class Morale	0.60
Peers	Peer Group	0.24
Media	Television	-0.05

Table 2 . 1 : Effects of Productivity Factors

Walberg, Fraser and Welch (1986) present the paradox of educational research, suggesting that limited intensive studies, while strong on measurement, technique and verification, are often weak in external validity or generalisability. Conversely, larger surveys may be sampled from large, well defined populations, suggesting external validity and generalisability, but they may be weak in terms of internal validity as factors are usually measured cross sectionally and superficially with limited numbers of research items. Irrespective of which method of research is adopted, if findings are sound, then such findings should be apparent in both methods. Walberg, Fraser and Welch state that almost 70 syntheses of several thousand intensive studies revealed results which were similar to those found through large national surveys. In either research method, the nine factors of the productivity were seen to be consistently powerful influences in the achievement of learning. It was found that gender and race were strong predictors of academic achievement.

2.3.6 Increased Productivity

Fraser, Walberg, Welch and Hattie (1987) suggest that increased productivity may be the answer to improving the declining trends in educational achievement in an era of increased educational expenditure. Increased productivity is presented as a desirable alternative to educators, parents and students simply working longer and harder as suggested by the National Commission on Excellence in Education (cited by Fraser et al, 1987, p.149). Improvements in the nine factors identified in the Educational Productivity Model are seen to be the most effective means of increasing educational productivity. It is also suggested that high correlations between factors will occur because of what is known as "Matthew Effects". Students who appear advantaged on one factor, for example home environment, will probably be advantaged on other factors, perhaps measuring higher ability, motivation and attending schools with better instruction and environments. Increases in several factors will, therefore, be more effective than simply increasing one factor. Whilst there are obviously other factors that impact on educational achievement such as class size, expenditure per student, private as opposed to public schooling, gender or ethnicity (Walberg, Fraser and Welch, 1986; Waldrip, 1994), the factors of the Educational Productivity Model have consistently been reported as being the most powerful or alterable factors influencing learning. In this light, the Educational Productivity Model is presented as a means by which educational policy may be formulated. A pictorial representation of the Educational Productivity Model appears in Figure 2.2 below.

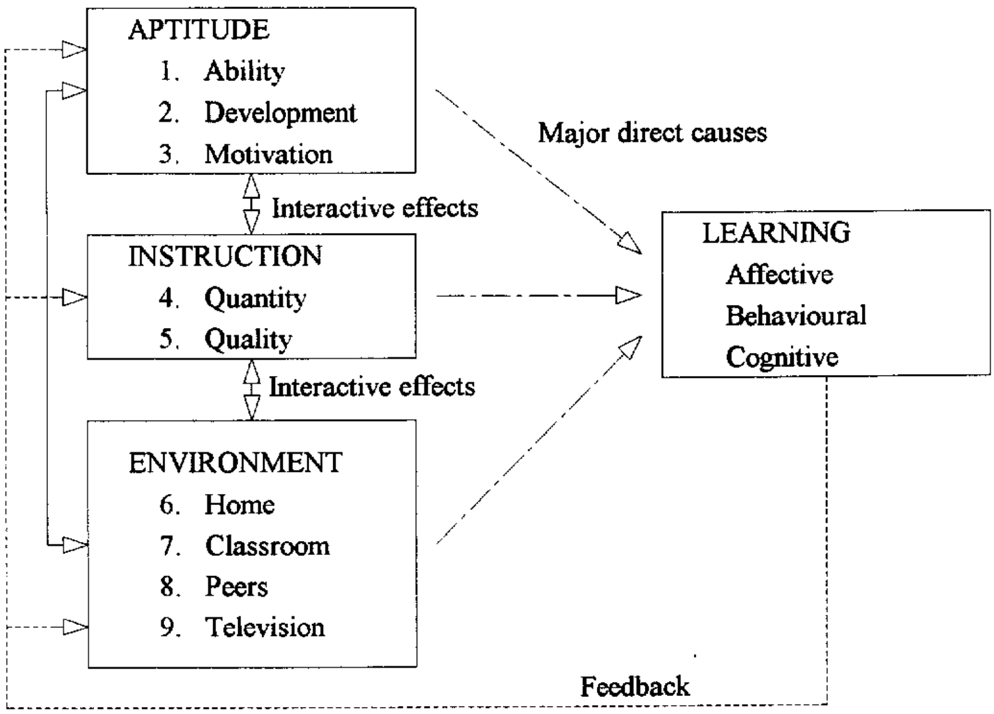


Figure 2. 2: Walberg's Educational Productivity Model (1981).

Walberg (1994) stresses that a simple rise in expenditure is not the means to increased learning. International comparisons showed that the Japanese education system achieved the highest results for the least cost. In comparison, the United States achieved the worst results with the second most expensive system. Walberg and Walberg (1994) show a distinct negative correlation between state educational expenditure and student achievement, and suggest that national policies cut across the local influences, leading to a decline in overall learning.

Research on educational productivity has confirmed the nine productivity factors as being consistent influences of student learning. As a result of such wide use and confirmation of the Educational Productivity Model, it is appropriate that such a model be adopted for use in this thesis.

The Educational productivity as described by Walberg (1981) identifies nine distinct factors that contribute significantly to the educational achievement of students. This model has been cited as being particularly useful in measuring differences between the Open Learning process and the traditional learning process. Walberg and his colleagues have developed this model largely through a procedure of meta analyses, or by utilising data from surveys which have previously been conducted. There are no specific survey tools that accompany the Educational Productivity Model. In order to use the Educational Productivity Model as a basis for comparisons between the Open Learning environment and the traditional learning environment, survey instruments measuring each of the nine factors were required. In order to select or develop worthwhile survey instruments, an integral understanding of the factors being measured was required. The following chapter is a review of the literature related to each of the nine factors, which serves as the basis on which survey instruments were selected or developed.

2.4 The Factor of Ability.

Ability is the first factor contained in Walberg's Educational Productivity Model (1981). The factor of ability forms a part of what Reynolds and Walberg (1991) terms the aptitudinal attributes of students. The authors make a clear distinction between aptitude and aptitude attributes. Student aptitude relates specifically to the student's cognitive abilities. The student's aptitudinal attributes include the student's cognitive abilities, but is also contributed to by their motivation and cognitive development. For the purposes of this research, and in light of the Educational Productivity Model, the factor of ability is dealt with separately and may be aligned with aptitude. Ability or aptitude is one facet of student aptitudinal attributes.

2.4.1 Educational Models

A broad reference to Walberg's construct of student ability occurs in many well known models of teaching or learning. Carroll (1963) operationalises student ability in terms of student aptitude, where a student with high aptitude would take minimal time to master a specific learning task. Conversely, a student with low aptitude would take a longer period of time to master the same task. Carroll also refers to ability in terms of a student's ability to comprehend specific instruction. Such an understanding relates to a level of general intelligence or verbal intelligence.

Bruner (1966) presents a model that describes a student's disposition to learn impacting on the overall success of the learning process. The disposition to learn is one factor that forms part of an overall learning structure. The overall structure includes the initial disposition to learn, the structure of the material to be learnt, the sequence of the learning and the consequent rewards or punishments. Bruner suggests that this overall structure will vary dependant on the learners characteristics and previous instruction. Glaser's (1976) model approaches the learning process from the perspective of required outcomes. Once required outcomes are established, then the student's characteristics are assessed as to their abilities, prerequisite knowledge and possible strengths and weaknesses in terms of achieving the desired outcomes.

The Cooley and Leinhardt (1975) model is similar to that of Glaser's in terms of ability, where general ability and previous achievement forms part of a major construct within their model. Bennett's (1978) model is also similar to Glaser's with respect to ability. Bennett identifies mediating variables which impact on the student's comprehension of the content covered. Amongst other variables such as difficulty, pace, and clarity of instruction, are the variables of aptitude and prior achievement. Harnischfeger and Wiley (1976) suggest that all student outcomes are largely as a result of the students pursuits. Three parts to the model are designated background characteristics, teaching and learning process and the overall educational outcomes. Pupil pursuits are influenced by the background characteristics and the teaching/learning processes. Pupil background forms a part of these background characteristics, thus student outcomes are influenced by student background characteristics.

2.4.2 Ability Defined

In a synthesis of studies researching cognitive ability and science achievement, Steinkamp and Maehr (1983, p. 371) cite Bloom in stating that cognitive ability is "....defined by phenomena typically measured with mechanical or pictorial devices that present problems to be solved through analysis, synthesis and evaluation." From this same synthesis of research studies, Steinkamp and Maehr (1983) report a mean correlation coefficient of 0.36 for boys and 0.32 for girls with respect to the relationship between cognitive ability and achievement. Close inspection of the instruments used in this study suggest that the factor of cognitive ability would be more closely aligned to Walberg's second aptitudinal attribute of cognitive development. The factor of cognitive development relates closely to the Piagetian stages of cognitive development. As the instruments commonly used in the research by Steinkamp and Maehr (1983) were based on Piagetian tasks, it is suggested that the measure of ability, for the purposes of this research be referred to as cognitive development. Parkerson, Lomax, Schiller and Walberg (1984) clarify the definition of ability in suggesting that the proxy for ability be prior achievement. Studies using national data banks have used prior achievement as the measure of ability. Subject tests conducted each year focus on subject knowledge, uses or applications of subject material and integration or problem solving abilities. For the uses of the Educational Productivity Model, the factor of ability relates directly to prior achievement.

2.4.3 Measures of Ability

Measures of ability have been typically achieved by either self report mechanisms or subject testing. Walberg, Fraser and Welch (1986) used data from the National Assessment in Science when exploring relationships between productivity factors and achievement. The measure of ability in this data was developed from student self reports on their previous school grades. Data from the Longitude Study of American Youth has been widely used in the research of the Educational Productivity Model. Reynolds and Walberg (1993) utilised grade seven results from mathematical students as a measure of ability when inspecting educational achievement for the same students in grade eight. The researchers reported a strong correlation of 0.73 between the prior mathematics achievement of the grade seven students and the consequent mathematical achievement in grade eight of the same students. A similar study by Reynolds and Walberg (1992) using the Longitude Study of American Youth used grade ten mathematical results in establishing prior achievement for grade 11 mathematical students. The researchers reported a standardised effect of 0.72 for achievement based on prior achievement. Similar studies were also conducted in the science field by Reynolds and Walberg. Grade eight science students were surveyed using the Longitude Study of American Youth, where Reynolds and Walberg (1991) reported a total beta weight of 0.81 for the effect of prior achievement on current achievement. The total effect is a combination of the direct effects of prior achievement and the mediating effects of prior achievement through other productivity factors such as motivation. The direct effect of prior achievement was reported to have a beta weight of 0.73, with an indirect effect of 0.08 reported. In a similar study using the same Longitude Study of American Youth, Young, Reynolds and Walberg (1993) conducted research in educational productivity using grade 11 students. In this study prior achievement was reported as having a correlation of 0.65 with current achievement. Marjoribanks (1987) reported correlations between ability and achievement ranging from 0.56 to 0.24, based on family environments. Marjoribanks illustrated that the relationship between ability and achievement was not linear, but curvilinear.

2.4.4 Affective Measures of Prior Achievement

A number of studies measuring the effects of ability on educational achievement have also produced a measure of student attitudes toward their course of study. This measurement has been aligned with the productivity factor of ability. Whilst it has been widely reported that there is a high correlation between prior achievement and current achievement, the same cannot be said for student attitudes.

A range of correlations have been reported between attitudes and achievement, and ability and achievement. Steinkamp and Maehr (1983) reported 0.18 and 0.34, Reynolds and Walberg (1991) reported 0.13 and 0.59, Reynolds and Walberg (1992) reported 0.10 and 0.74 and Young, Reynolds and Walberg (1993) reported 0.24 and 0.65 as correlation coefficients between attitudes and achievement and ability and achievement. It can be seen that there is a relatively weak relationship between attitudes and achievement. There is, however, a relatively strong relationship apparent between ability and achievement.

2.4.5 The Effect of Ability

In terms of the Educational Productivity Model, overall, the factor of ability has by far the greatest effect on educational achievement. Reynolds and Walberg (1991) report ability, in terms of prior achievement has having a direct effect with a beta weight of 0.73, with the next highest effect being that of home environment. Home environment had an effect weight of 0.45, quantity had an effect weight of 0.32 whilst the effect weight of 0.21 was reported for motivation. Young, Reynolds and Walberg (1993) also reported the preponderant effect on educational achievement being that of prior achievement. The authors suggested that prior achievement may well have the greatest effect because of the mediating variables on prior achievement. Whilst years of prior learning has been completed in contributing to a current level of ability, the same is not necessarily true for the other variables. Young, Reynolds and Walberg suggest that because the other productivity measures are only a measure of the current year, a lower correlation is expected. If such factors were improved over years of learning, in a similar manner to prior achievement, correlations for these factors may be considerably higher.

2.5 The Factor of Cognitive Development

Within the Educational Productivity Model, Walberg (1981) identifies three broad areas that influence student achievement. These areas relate to the student's aptitude, the student's instruction and the student's environment. With respect to the student's aptitude, Walberg sub-categorises this area into three distinct factors. The first factor relates to student ability, the second factor relates to student development and the third factor relates to student motivation. In a syntheses of research related to educational productivity, Fraser, Walberg, Welch and Hattie (1987) noted the correlations between educational achievement and these three factors. For the area of student aptitude, Fraser and others reported correlations of 0.71 for ability, 0.47 for development and 0.34 for motivation with respect to student achievement. The reasonably strong correlation between development and achievement makes this factor one worthy of consideration. This situation is especially worthy of consideration when one considers that the correlation between development and achievement was higher than the correlation between motivation and achievement. Student motivation has been the focus of much educational research, but the results put forward by Fraser and others show that perhaps a greater consideration needs to be given to the area of student cognitive development.

2.5.1 Piaget's Stages of Cognitive Development

The concept of student cognitive development as proposed by Walberg, appears to relate most specifically to the Piagetian stages of development. Piaget (1966) proposed that four stages of cognitive development occur in the development off the human mind. The first stage, referred to as the sensori-motor stage, begins at infant birth and lasts through to the point where language starts to appear, usually 1.5-2 years of age. The second stage, referred to as pre-operational thought, is where intuitive and operational thought begin to develop. This stage lasts generally until the child is 7-8 years of age. The third stage, referred to as the concrete operational stage, occurs where the child can perform operations, but only based on concrete examples. This stage lasts through until approximately 11-12 years of age. The last stage of cognitive development, that of formal operations occurs where individuals are able to hypothesise and deduce. Perhaps the most controversial aspect of these stages is the last one, that of formal operations. Whilst 11-12 years of age has been reported as the beginning of formal operations, questions remain as to whether some individuals ever reach the formal operations stage. A study by Dale (1970) found that at 15 years of age only 25% of students had achieved the formal operations stage. An indication of group norms has been presented by Shayer and Adey (1986). By utilising the Piagetian stages of cognitive development, and conducting a substantial number of surveys, a series of group norms for students in England and Wales were developed. The authors noted that as little as 30 percent of 16 year old students have the ability to utilise formal reasoning skills. It was also noted that the ages of children that do achieve formal operations can vary significantly. Shayer and Adey explore the possibility that cognitive growth is not necessarily a continuing growth, but in fact, suggest that many adults may never be achieving formal reasoning skills.

2.5.2 Formal Operations

Lawson (1985) has suggested that a central purpose of the educational process is to enhance the reasoning abilities of students. Given such a premise, the importance of cognitive development to the educational process is self evident. Research into the stages of cognitive development by Piaget has developed a framework on which much educational research has been based. Perhaps most central to the enhancement of reasoning abilities, as postulated by Lawson, is the development of the Piagetian stage of formal operations. In reviewing research related to formal operations, Lawson addresses a number of questions related to Piaget's original theories of cognitive development. These questions are central to any research based on Piaget's developmental theory.

The first question relates to the importance of biological maturation with respect to the development of formal operations. Inhelder and Piaget (1958) suggest that the development of formal structures is linked to biological maturation, however, the organisation of these formal structures may be dependant, to a large extent, on the social environment. Hence, speculation remains as to whether formal operations simply develop biologically, or are in some way influenced by the social environment. It would appear that measures of formal operations may well be enriched by a measure of environmental structures as well.

Research based on Piaget's stages of cognitive development may be seriously flawed if the methods used to determine formal operations are neither valid nor reliable. Lawson (1985) refers to many research projects when reflecting on the wide range of inter-correlations that have been reported. Such a wide range of results appear to both confirm and dispel the developmental stages as proposed by Piaget. Lawson suggests that any instrument used in an attempt to measure the different developmental stages of students must meet three criteria to be considered valid. Firstly students must be of a similar age, secondly, students should be of a wide cross section of developmental stages, resulting in a range of performances on given tasks. Thirdly, students should be of an age where the development of formal operations has only recently reached a peak or is still developing.

Another question explored by Lawson (1985) relates to the unitary structure of the formal operations stage of cognitive development. Are the component tasks all measuring the same factor, or are there a number of factors which the formal operations tasks measure? Whilst Lawson reports again a range of results, there appears to be agreement that essentially the stage of formal operations is a unitary factor of cognitive development. The tasks used to measure the different aspects of formal operations are, in essence, all measuring the same factor.

Research based on the development of formal operations should be well informed as to the educational effects of the development of formal operations. Lawson (1985) highlights evidence to suggest that formal operation tasks form an inter-correlated cluster which is separate to other measures of general intelligence. The performance on formal operations tasks account for "... a substantial amount of achievement variance over and above that accounted for by general intelligence."... (Lawson 1985, p. 583). Thus, measures of formal operations development is a separate measure to that of general intelligence.

Lawson also highlights the ability of formal operation measures to be generalised. He suggests that research shows a measure of formal operations is not content biased, rather a similarity across a range of disciplines is displayed. Similarly, the context in which the formal operation tasks are presented does not bias the result of such measures. Students performance on formal operation tasks will not vary considerably whether the tasks are presented in a familiar context or an unfamiliar context.

With respect to achievement and formal operations, Lawson presented correlations ranging from 0.42 through to 0.88. A high degree of consistency in the results of research studies reviewed by Lawson, led to the stance that ...

> "...Task performance is significantly related to performance in a wide variety of domains including poetry, the interpersonal domain, the ability to make critical judgements in social contexts and achievement in biology, history, literature, English, social studies, mathematics and the language arts."
>
> Lawson (1985, p.590)

From the perspective of educational productivity, it can be seen that the development of formal operations may have considerable influence on achievement. Given that the development of formal operations has a significant effect on the educational achievement of students, means by which such development might be enhanced is of obvious interest to educators. Lawson (1985) suggests that performance on formal operations, or reasoning tasks can be considerably enhanced. The extent of the enhancement, and the longevity of the enhancement relates directly to the methods by which the training is undertaken. Student characteristics also appear to influence the degree to which formal operations may be enhanced. Lawson suggests that field dependant students, impulsive students and those students from restrictive social environments, fail to spontaneously develop formal operations, however, such inadequacies can be overcome with appropriate schooling.

Whilst some question may remain as to the reliability of the measurement of the Piagetian stage of formal operations, the following conclusions appear to be well supported by the literature.

- Formal operations is a single unitary factor with sub components
- Formal operations is separate to general intelligence
- Formal operations correlates with achievement in a wide range of disciplines
- The measurement of formal operations is not biased by the context in which it is presented
- The process of the developmental of formal operations is able to be enhanced

2.5.3 Group Measurement of the Stages of Cognitive Development

Lopez-Ruperez, Palacious and Sanchez (1991) suggest that Piaget's theory of cognitive development has served as an adequate framework for ongoing curriculum development, particularly within the scientific disciplines. One major shortcoming of Piaget's work was the means by which the cognitive stages of development were established. Originally, detailed, individual interviews were conducted, with the presentation of specific tasks utilising elaborate laboratory equipment, to determine the cognitive development of individuals. As interest in the underlying theory developed, a range of measures to determine cognitive development with greater expedience developed. A number of pencil and paper tests were developed for group administration. One of the earliest paper and pencil tests developed was the Longeot test. This test was originally developed in French in the 1960s, and later translated into English in the 1970s. The test included the sub components of the inclusion of class; combinational analysis; logic of propositions; and proportional and propositional logic. The paper and pencil test was reported by Lopez-Ruperez, Palacious and Sanchez (1991) as having a reliability index of 0.68 using the Kuder-Richardson method. Ahlawat and Billeh (1982) suggested that of the many group administered tests, both pencil and paper and presentation types, the Longeot test was perhaps the most effective. Ahlawat and Billeh suggest that the test was developed in the true spirit of Piagetian theory, had been widely used by researchers from different countries and found to be useful, was reasonably reliable and could be administered within a normal teaching period. However, closer analysis of this test highlighted some problems. There is argument as to how reliably this test measures Piaget's stages of cognitive development. Ahlawat and Billeh identified 6 distinct factors when analysing results from the Longeot test. Such a finding is in stark contrast to Piaget's proposition that the trait of formal operations is a unitary factor. Even though the Longeot test may have measured reliably, if what it was measuring had six distinct factors, it is likely that what it was measuring was not what Piaget had earlier identified as formal operations.

Patterson and Milakofsky (1980) investigated the use of a little known test developed by Furth (1970). This test was known as the Inventory of Piaget's Developmental Tasks (IPDT). This test had the characteristics of comprehensively covering both concrete and formal operations, requiring minimal language and reading skills, being easily administered and objectively scored.

There were limitations with this test however, as highlighted by Patterson and Milakofsky (1980). The paper lacked qualitative data as to the thinking processes of the recipients. The paper, after analysis, appeared to be directed more at the concrete operations level, and did not adequately measure the formal operations stage. As a consequence, the paper seemed most suited to students below the 14 to 15 year old age bracket, as essentially it was too easy and gave skewed results for students any older

Blake (1980) investigated the use of two instruments for determining the stage of student's cognitive development. These tests were the Understanding in Science Test (Tisher & Dale, 1975) and the Reasoning Test based on the original French Longeot test. The Understanding in Science Test was based directly on the Piagetian stages of cognitive development, and utilised demonstrations by a test administrator along with written responses. The Reasoning Test was purely a pencil and paper test. Results of the analysis by Blake concluded that the Understanding in Science Test was a reasonable predictor of Piagetian stages of development, although it was best suited to year 11 and 12 students. Blake suggested that the Reasoning Test was heavily influenced by the context of presentation. Field dependant students appeared to be at a distinct disadvantage when completing this test. Such a finding concurs with other general findings, as reported by Lawson (1985) where high correlations between field independence and formal operations were observed.

Whilst paper and pencil tests have been shown to be reasonably reliable instruments for measuring formal operations, Herron (1978) noted shortcomings in interpreting the results of such tests. Simple pencil and paper tests give no insight as to how students arrived at particular answers to the formal operations tasks presented. Pencil and paper tests combined with complementary interviews provided valuable insights into the student's reasoning. Herron used the Longeot test as an example, where 88 percent of students who where measured to be operating at a concrete level, in fact gave the correct answer to a formal operations task. When interviewed regarding their procedures for completing such a task, Herron suggests that students were not aware of their reasoning behind solving the problems. Students, therefore, may return scores that indicate they are operating at a formal operations level, when in fact they are only operating at a concrete level. Such a finding highlights the need for a pencil and paper test to be sensitive to the reasoning behind student responses to the specific tasks presented.

Tobin and Capie (1981) confirm such findings, also suggesting that the reasons why students give particular answers to specific tasks is important to the overall measure of cognitive development. As a consequence, the pencil and paper test they developed, the Test of Logical Thinking (TOLT), not only tested a group of students for cognitive development, but also had students justify their answers.

2.6 The Factor of Motivation

In referring to a review of educational research Walberg, Schiller and Haertal (1979, p.182) state that the "...degree of student motivation is consistently reflected in the amount of learning that is taking place." In a quantitative synthesis of 18 research studies, Walberg, Schiller and Haertal (1979) found a correlation between motivation and achievement of 0.34. Uguroglu and Walberg (1979) suggest that this finding shows student motivation accounting for approximately 11 percent of the variance in achievement. Given that such an influence is of obvious interest to researchers, it is pertinent to look more closely at the measurement of motivation in an attempt to gain a better understanding of its impact on the educational process. The development of the motivational construct may be seen from two distinct perspectives, one the mechanistic drive theorist's view, the other the cognitivist's view.

2.6.1 Mechanism

The mechanist's view held that homeostasis, or more correctly, a lack of homeostasis of the body's metabolism was the underlying drive which prompted organisms into action. The resulting theory became known as drive theory. Weiner (1990) cites Hull, Spence and Mowrer as major proponents of the theory. Much of the research within this realm was conducted in laboratory conditions on animals. Basically, the animals were deprived at various levels and for various amounts of time, with the resulting differences in action being conceptualised as degrees of motivation. Drive theory was based on a rewards system, that is, the drive of the animal to obtain the reward which would maintain the metabolic homeostasis. Such a reward system may also be aligned with the behaviourist's perspective of motivation. The behaviourist's perspective suggests that all thoughts, motivation and behaviour are conditioned through either internal or external experiences. In an educational context, learning was thought to only occur when a reinforcement of response and a reduction in drive occurred. That is, response was to be followed by reward which would lead to an increased strength in motivation. Such motivation has been termed extrinsic motivation, and may be described as behaviour that is determined by stimulus-response learning or physiological drive (Csikszentmihalyi & Nakamura, 1989).

2.6.2 Cognitivitism

Similarities between the mechanistic/behaviouristic view and the view of the cognitivist exist in the foundations or beginnings of each paradigm. The cognitivist's view is also has largely based on the biology of the body, where, in the 1930s Freud identified the biological urges of the id. These urges had no concept of control, but were under the direction of the ego and the super ego. Thus from the early thirties, two paradigms developed, the cognitivists suggesting that external processes facilitate development from within, and the mechanists/behaviourists, suggesting that motivation can be determined or controlled by external conditions. Weiner (1990) asserts that, Tolman demonstrated in the early thirties, that learning could occur without a reward structure or a reduction in drive. Such a finding tended to distinctly separate the cognitivists and the behaviourists. Extensions of the biological drive theory began when it was discovered that other drives such as novelty, curiosity and competence existed (Csikszentmihalyi & Nakamura, 1989). Beyond these more complex drives emerged the concept of optimal arousal, the need for the body to be stimulated, and in the absence of stimulation, a drive to find additional stimulation. This concept of the drive of an organism coming from within, with the absence of external stimulants, became known as intrinsic motivation. At this time, an increased awareness of the differing effects of an external reward system was also developing. Deci (1971) suggested that if rewards were seen to be controlling, then they impacted negatively on future effort or motivation. As can be seen two distinct forms of motivation had emerged. firstly, extrinsic motivation which was ostensibly aligned with the mechanists viewpoint, and secondly, intrinsic motivation which was ostensibly aligned with the cognitivists.

In a history of motivational research, Weiner (1990) suggested that in the 60s such research was dominated by four basic theories, namely associanistic theory (Watson), drive theory (Hull), cognitive theory (Kewin & Atkinson) and psychoanalytical theory (Freud). This period of research witnessed a move away from the mechanistic, behaviouristic approaches, with a general shift to the cognitive approaches to motivation. The shift in emphasis was accompanied by a shift in research focus. Humans and classrooms became the focal point of the research, a stark contrast to the laboratory settings and studying of animals with the consequent extrapolation of results to apply to humans. It is important to note, however, that there was still overlapping connections between the two "grand formal theories" on motivation, namely drive and cognition. The concept of cognitive dissonance was obviously embedded in the drive theory of motivation. The fundamental aspect of imbalance, generally associated with drive theory, was also applied to the cognitive dissonance theory, suggesting that a person's belief system must be in balance or in a state of consonance. Also embedded in the drive theory, although more loosely, was the expectancy-values theories, where motivation was driven by the value of the goal and the likelihood of achieving it (Weiner, 1990).

2.6.3 The Individual

In the 1970s a general merging of the sub-categories of psychology emerged. Given such a merging, the person could be seen as a whole, and be "... better understood as a cognitive, conative, affective, biological and social individual." McKeachie (1976, p.6). Ongoing study of the individual in this period and into the 1980s saw the importance of the concept of self begin to emerge. Self efficacy as a concept developed, along with other individual perceptions such as individual control, individual achievement needs, and individual anxiety about failure (Bandura, 1977). As might be expected, the earlier "grand formal theories" of the thirties began to fade with the ongoing development of the cognitive approaches to motivation. The cognitive theories of this period related mostly to attribution theory, achievement motivation, anxiety, curiosity and levels of aspirations. The general focus was on human behaviour, with particular attention given to achievement strivings (Weiner, 1990). The main direction of research focusing on the self was that of achievement motivation. Out of this direction, terms such as self-actualisation, self-concept, self-determination and self-esteem were developed.

Ongoing attention on the individual has witnessed the introduction of the conditioned thought system. This conditioned thought system has been referred to "... as the intellectual system that supports the person as a whole." (McCombs, 1992, p. 6). This period of psychological development addresses the person or body in quite the opposite manner to the early drive theorists. Early psychological theory concentrated on the basic molecular structure and moved in an upward direction from that point. The psychological theory of conditioned thought begins at the highest level of mental processing and moves in a downward direction from this point. This higher level of mental processing, perceives the individual as an agent. Below this level of agency lies the thought system of the individual. McCombs suggests that the thought system of the individual is based on the individual's conditioned belief system or personal frame of reference. This current concept of higher level thinking has also been related to drive theory. The cognitive beliefs of the individual with respect to self, specific tasks and specific others, tend to drive the individual's cognitive and motivational system.

2.6.4 Self Efficacy

The term self efficacy for learning refers to a student's beliefs about his/her abilities to effectively apply the knowledge and skills already possessed to learn new cognitive skills. Bandura (1982) suggests that self-efficacy, or students who are efficacious, choose to engage in tasks more often, persist in the face of difficulties, expend more effort to achieve, and gain a higher level of achievement. Efficacy appraisal (students appraising their own efficacy), does not occur for drill and practice routines, but is more likely to occur in a new learning situation. Other influencing factors on self efficacy are the outcome expectations and values or worth of those outcomes. Thus if a student, through self-efficacy, presumes an inherent ability to apply knowledge and skills is present, then the likelihood of personal behaviours leading to positive or negative outcomes is appraised. If positive outcomes can be perceived, then the value or worth of those outcomes are appraised. If students can perceive that they have the ability to apply appropriate knowledge and skills, that the outcomes are likely to be positive and that the outcomes are of worth or value, then they are far more likely to undertake a given learning situation. Schunk (1989) identifies key theorists in Tolman and Rotter (relating to internal and external control over situations, expectancy-values theories and their specific related constructs to self efficacy as those of locus of control), Atkinson and Vroom (comparing the chance of success to the worth of success, and attribution theories), Heider, Kelly and Michela as well as Weiner (focussing on the causes for particular outcomes). The assertion that high levels of self efficacy means a higher engagement rate in the learning environment must be tempered with the fact that students do not always have a choice of whether they will engage in the learning or not. It must also be noted that the concept of enduring persistence may be more closely related to teacher efforts than to student efforts.

2.6.5 Self Determination

The concept of self determination is embedded in the perception of control. Motivations are self regulated if the student is engaged entirely under their own volition. Where self determination occurs, the regulatory process is one of choice, whereas where control occurs (fundamentally the opposite of self determination) the regulatory process is one of compliance (Deci, Vallerand, Pelletier, & Ryan, 1991). Under the general continuum of self determination, Deci and others identified four forms of extrinsic motivation along with one simple form of intrinsic motivation. External regulation is positioned at one extreme of the continuum, is the least self determined form of self regulation, and relates to tasks being completed simply because of external contingencies. Moving closer to intrinsic motivation on the self determination continuum is introjected regulation. It is the internalisation of rules or demands, but not the acceptance that such rules or demands are one's own. Next on the continuum is identified regulation, a situation where a person values a behaviour and identifies with the regulatory process governing such behaviour. Integrated regulation occurs when behaviour is a reflection of what is of value or important to the individual. Deci and others cite studies by Grolnick, Ryan and Deci (1992) and Pintrich and De Groot (1990) in highlighting the educational benefits of increased self determination.

While behaviours directed by integrated regulation may appear similar to behaviours directed by intrinsic motivation, intrinsically motivated behaviours will be driven by the interest in the activity alone, whereas integrated regulation is characterised by an activity being important for a valued outcome. Csikszentmihalyi and Nakamura (1989) identify the antecedents of intrinsic motivation as a complete involvement in tasks, a deep concentration, self direction, self appraisal, an absence of concern about failing, time passing quickly, a loss of self-consciousness and a loss of an everyday gnawing worry. Intrinsic motivation is the drive behind a student undertaking an activity simply because its own worth. Such an activity, driven entirely by intrinsic motivation is autotelic (Csikszentmihalyi & Nakamura, 1989).

The autotelic state of consciousness is termed flow. When personal capacities meet the actions required of the environment, flow is said to occur, however, this factor is underpinned by the level of challenge. If the challenge is too great the individual will be anxious, if the challenge too small, the individual will be bored. When the skill and challenge are equal, flow is achieved. Gottfried (1985) has associated intrinsic enjoyment with greater creativity and higher school achievement.

Deci and others (1991) have suggested that both intrinsic and autonomously controlled extrinsic motivation were linked to positive academic performance.

2.6.6 Self Regulation

Pintrich and De Groot (1990) help develop an understanding of higher level thinking and motivation by the introduction of the term self regulation. Essentially, self regulation consists of three basic components, namely student metacognitive strategies, student management of effort and cognitive strategies used for learning. Linked to this concept of self regulation is a motivational component. It is not enough that students be self regulated learners, asserts Pintrich and De Groot (1990), students must also be motivated to use such self regulating strategies. This concept of motivation has been described in terms of an expectancy-values model, which is characterised by an expectancy component, a value component and an affective component. The expectancy component relates to students' beliefs about their own abilities to complete a given task. The values component relates to the students' goals and beliefs about the importance of the task. The affective component relates to the students' emotional reactions to a given task.

2.6.7 Motivation and Educational Productivity

Through a general review of motivation, concepts of self efficacy, self determination and self regulation have been identified. Further to these concepts of motivation have been illustrations of extrinsic and intrinsic motivation, an expectancy-values model and examples of higher level thinking. An overall picture of how the general body of educational research perceives the concept of motivation has been developed. It is appropriate to now investigate the way in which educational productivity research has approached the concept of motivation.

In a quantitative synthesis of 18 research studies, Uguroglu and Walberg (1979) identified five basic factors that were used to measure the construct of motivation. These factors were measures of general self concept, academic self concept, Mathematics self concept, locus of control and achievement motivation. As reported earlier, this synthesis of research studies reported correlations between motivation and academic achievement of 0.34, and suggested that 11 percent of the total variance was attributable to motivation.

Parkerson, Lomax, Schiller and Walberg (1984) used seven items to develop a composite score of motivation. An analysis of the questions used indicated that the basic theories of motivation addressed were attribution theory, intrinsic motivation, cognitive strategy use and achievement motivation. The research found motivation to be a significant predictor of educational achievement, however, the authors also stated that motivation did not develop a one way causation effect on educational productivity. Motivation was a factor that both had an impact on other productivity factors, as well as being a factor that was impacted upon by other productivity factors (Parkerson, et al., 1984).

Pokay and Blumenfeld (1990) operationalised motivation in terms of self concept and a expectancy-values model. This research attempted to differentiate the effects of motivation and the use of learning strategies. It was determined that early in a semester, expectancies and values were the best predictors of achievement, whereas late in a semester, both content and metacognitive learning strategies were seen to be the best predictors of achievement.

Wilhite (1990) researched the predicability of college course achievement in terms of self-efficacy, locus of control, self-assessed memory ability and study activities. This study followed on from the work of Thomas, Iventosch and Rohwer (1987) who studied the relationship between self-efficacy, study processes and academic achievement. Thomas and others (1987) found that self-efficacy was the best single predictor of achievement. In the following study Wilhite (1990) found that self assessment of memory ability was the best predictor of achievement with measures of locus of control as the next best predictor.

In a study of motivation and self regulated learning, Pintrich and De Groot (1990) established strong correlations between intrinsic value and self regulation (0.73) and self regulation and strategy use (0.83). With regard to student achievement, Pintrich and De Groot suggested average correlations with self-efficacy of 0.27 and average correlation of 0.31 with self-regulation.

In a brief review of motivation theory, Uguroglu and Walberg (1986) grouped motivation into four basic categories, namely associative theory, psychoanalytic theory, humanistic theory and cognitive theory. The authors emphasised the wide range of theories relating to motivation in the literature. In citing Shavelson, Hubner and Stanton's review showing 17 different conceptual categories to the one motivational factor of self-concept, Uguroglu and Walberg (1986) highlight the difficulty for researchers in identifying and measuring motivational constructs. It was determined, however, that one concept exists in many theories. The concept of self-perception has been quantified by measures such as self-concept, selfhood, self-actualisation and locus of control. Previous work of Uguroglu and Walberg (1979) suggest that there was no appreciable difference of correlations between educational achievement and the self perceptions of achievement motivation, locus of control, academic self concept or general self concept. Utilising a motivational instrument developed by Uguroglu, Schiller and Walberg (1981), Uguroglu and Walberg (1986), suggested that motivation was a multi-dimensional construct, further suggesting that multi-dimensional measures may have more predictive properties than uni-dimensional measures. Six sub-scales were used in this instrument, namely achievement motivation, locus of control, and the self perceptions of physical, social, emotional and academic self-concepts. Uguroglu and Walberg (1986). also stated that the motivational construct was difficult to isolate from other educationally productive factors, and had close interactions with both home environment and peer influences. As might be expected, prior levels of motivation were the strongest predictors of current motivation

Pintrich and De Groot (1990) developed a motivational instrument, named the Motivated Strategies for Learning Questionnaire, and cite the previous work of Eccles, Harter and Weinstein, Schulte and Palmer as the foundations of the self report questionnaire. The items on the questionnaire were used to investigate both motivational constructs and cognitive constructs. The motivational constructs formed the three distinct sub-scales of self-efficacy, intrinsic value and test anxiety. Reported reliability for these sub-scales were 0.89, 0.87 and 0.75 respectively. The two cognitive scales were labelled cognitive strategy and self-regulation. The reliability of the items measuring these sub-scales were 0.83 and 0.74 respectively.

Vallerand, Pelletier, Blais, Briere, Senecal and Vallieres (1993) developed the Academic Motivation Scale by translating the French version of the instrument (the EMS). This instrument specifically measured motivation in the three basic scales of intrinsic, extrinsic and amotivational. There were three sub-scales of intrinsic motivation, namely the motivation to know, the motivation to do and the motivation to feel. There were also three sub-scales of extrinsic motivation, namely identified, introjected and externally regulated. The scale of amotion was singular with no sub-scales. This instrument was reported to have a reliability coefficient of 0.81 (Vallerand, et al., 1993).

2.6.8 Influences on the Measurement of Motivation

As has been previously mentioned, the construct of motivation is difficult to isolate (Uguroglu & Walberg, 1986). Parental influences have been shown to have significant effects on students' intrinsic motivation (Gottfried, Fleming & Gottfried, 1994). The major underlying perception of self, related to the individual's motivation, has obviously got much of its development from the home and peer environment. Cultural differences may also have marked effects on the differences between various motivational measurements. In a comparative study of Japanese and American education Leestma and Walberg (1992) discovered a number of incongruities. Measures of self concept were consistently scored lower by Japanese students than American students. In terms of achievement, however, the opposite applied, with Japanese students consistently scoring higher than American students. Such a result is not in keeping with the general findings of research on educational achievement and motivation.

Distinct cultural differences exist between the two countries. Japanese culture rewards the concept of humility, and individuals are generally rewarded for fitting into their environment. American culture, however, encourages self esteem and individuals are generally encouraged to change their environment. Such findings highlight the need for researchers to be ever mindful of cultural differences when measuring cognitive constructs.

2.7 The Factor of Quantity

The quantity of instruction has been identified by Walberg (1981) as an influencing factor in the Educational Productivity Model. The basic premise is simply that the more quantity of instruction, the greater will be the level of achievement. The importance of time as a major contributor to academic achievement may be seen in light of cognitive theory. Walberg suggests that the simple cognitive process of recall can require an estimated five to ten seconds, while relating new information to assimilated, existing chunks of information, will require additional seconds. Cognitive processes such as problem solving may take considerably longer.

In conducting early research related to the quantity of education, Carroll (1963) presented a formula for the degree of learning. This formulae showed the degree of learning as a function of time actually spent divided by the amount of time actually needed. Bloom (1976) adapted Carroll's model and considered the outcomes of education in terms of the level of achievement, affective outcomes and the rate of learning. Bloom asserted that these three outcomes of education were a function of the combination of the quality of instruction, the cognitive entry behaviour and the affective entry behaviour. Both Carroll's and Bloom's models can be seen as acceleration models. They tend to hold the achievement of education at a set mastery level, whilst the quantity component of the education is seen as an individual requirement that may vary considerably between students.

Walberg notes that the effects of time are logarithmic rather than linear, and suggests that time should be held as an independent variable with achievement being the dependant variable. Such a stance is based on the theory of diminishing returns. Walberg highlights the close relationship between time and other factors within the Educational Productivity Model. Factors such as quality instruction, positive classroom environments, positive peer environments and positive home environments can increase the amount of time dedicated to education, as well as enhance the efficiency of the learning process.

2.7.1 Diminishing Returns

The achievement of excellence, or even moderately successful achievement, requires time (Walberg, 1988). In referring to exemplary achievement across a range of fields, Walberg notes that time has played a major role in such achievement. Whilst there are exceptions, exemplary achievement in a given field is usually accompanied with a history of early, intense concentration in that given field. Walberg suggests that the cognitive processing ability of the human mind is almost unlimited, and coupled with the ready availability of information suggests that time and concentration are the limiting factors in educational achievement. Whilst a greater amount of time and concentration will usually lead to a greater level of achievement, Walberg notes that this relationship between time and educational achievement is not a linear one. The law of diminishing returns is referred to with respect to quantity of education. The educational process may be likened to that of physical achievement, where a sports person needs to commit increasing amounts of training time to achieve smaller amounts of achievement gains. While exemplary achievement may require many hours work, average achievement may require a relatively small amount of work.

2.7.2 Matthew Effects

With respect to time and educational achievement, Walberg (1988) introduces the term Matthew effects. Matthew effects, based on the Bible text, Matthew 25:29, simply suggests that he who has will gain more, and he who has little will gain less. In other words, the academically rich get richer. In an educational setting, for the equivalent time component, a high achieving student may achieve large educational gains based on prior knowledge, whereas a low achieving student may fall even further behind the other as a result of a lack of prior knowledge. As the educational process continues, if equivalent time components are allotted, the disparity between the two students may be further and continually exacerbated. Such an understanding of learning time questions, to some extent, the value of observed engaged time measurements, if observers have no way of determining whether the time engaged is actually productive time.

Studies by Stevenson, Lee and Stigler (1986) show how the Matthew effects can advantage or disadvantage students. In comparing American and Asian students Stevenson and others measured equal ability students at the beginning of their schooling. After one year of schooling, Asian students were seen to be achieving marginally higher than American students. A small achievement advantage at the end of the first year grew to be a major achievement advantage by the end of the fifth year. At the fifth year of schooling the lowest achieving Asian class from the measured sample exceeded the highest achieving American class.

2.7.3 Effect of Time on Educational Achievement

In measuring the affects of schooling, Hattie (1992) utilised meta-analysis methodology to examine a number of factors affecting educational achievement. Through this process he determined an effect size of 0.84 for the quantity of education. From this finding, Hattie suggests that a student undergoing an enhanced treatment of quantity of education will score 0.84 standard deviations higher on an achievement test than a student not undergoing the enhancement treatment. If an achievement test had a mean score of 50, with a standard deviation of 10, a student undergoing an enhanced quantity program having an effect size of 0.84, would score 58.4 on the same test. Compared with the score of 50 without any treatment, 58.4 is a considerable improvement, confirming the importance of time related to educational achievement.

The impact of time on educational achievement has been shown to be substantial by Uguroglu and Walberg (1986). The quantity of education was shown to account for 20 percent of the variance in educational achievement. It is acknowledged, however, that this variance is overlapping with other educational factors contained in Walberg's Educational Productivity Model.

A review of 25 educational research investigations conducted by Walberg, Schiller and Haertal (1979) showed a general positive relationship between time and educational achievement. Of the 25 studies reviewed, 24 showed positive effects of time with respect to educational achievement. From the studies reviewed, it is suggested that increasing the amount of time students engage in the learning process may lead to large increases in learning gains. Inspection of the distribution of the time component revealed alarming figures. Studies revealed that in lower achieving schools, as little as 25% of the school time may be spent actually learning, whilst in a given mathematics course, it was reported that as little as 30 hours of effective instruction occurred over a full year of schooling.

2.7.4 Components of the Quantity of Education

Bloom (1980) suggests that the number of school years, days and hours spent on school learning is relatively fixed. He further suggests that it is very difficult for institutions to significantly change these times. With respect to individual learning the concept of time allocated is of little relative importance as it is essentially the same for each student. Bloom suggests of far greater importance is the concept of time on task. Time on task refers to the time that a student is actively involved in the learning process.

In contrast to the concept of allocated time, where the time allocated is essentially the same for each student, vast individual differences can occur between students and the time they spend on task.

> "If two students are in the same classroom and one is actively engaged in learning for 90% of the classroom hour while the other is actively engaged for only 30% of that hour, there will be quantitative as well as qualitative differences in their learning in that hour."
>
> Bloom, (1980, p. 382)

Two methods of appraising time on task relate to whether the student is overtly engaged in the learning or, alternatively, covertly engaged in the learning. Overt engagement may be measured by simple observation and the use of low inference coding mechanisms. Covert engagement requires the use of stimulated recall or interviews to determine what the student was thinking about at a particular time. Bloom suggests that most studies give time on task as an index of overt engagement, covert engagement or an average of the two. Time on task is largely related to the quality of instruction and the students ability or prerequisite skills. It is difficult for a student to engage in the learning if the instruction is poor, or if the student cannot comprehend the material being taught. With respect to outcomes, Bloom goes beyond the simple suggestion that achievement will be different with different engagement rates. He suggests that two groups of similar ability students subjected to high or low quality instruction will, over time, have major differences in the time on task measurements of classroom activities. Students of high quality instruction will experience high degrees of time on task, whereas the opposite will be the case for students experiencing poor instructional quality. Learning differences will be reflected not only in achievement, but also in motivation to pursue further learning as well as the self confidence in learning ability. Such an understanding of the quantity of education highlights the degree to which the factors identified in Walberg's Educational Productivity Model overlap and influence each other. What makes time on task such an important influencing factor on the educational process is that it is an alterable variable. To some degree, teachers have control over the amount of time on task students spend and hence the amount of learning that actually occurs.

Fitz-Gibbon and Clark (1982) have operationalised the concept of quantity of education through the use of four distinct factors. Firstly, the term *scheduled time* relates to the amount of time set aside or allocated for the learning to take place. It is a measure of the maximum amount of learning time available to the student. The other three factors take into account other forces or influences that detract from this scheduled time. The second factor is the *time used for instruction*, which is the time remaining after non-instructional activities such as changing rooms or preparing for different subjects are taken into account. The factor of time used does not take into account student attendances, which when considered leads to the third factor of *time received*. As the name suggests, time received is the actual amount of instructional time that the student receives within the learning environment. Though the student may be receiving instructional time Fitz-Gibbon and Clark make the point that this time is not necessarily used by students for instructional purposes. Students who are using the received time for the instructional tasks intended are said to be on task, and this amount of time is said to be *time on task*. This is the fourth factor identified by Fitz-Gibbon and Clark and describes the actual time that the student is working on the educational task in hand. The authors reported average findings of mathematics classes as follows.

Time Scheduled	100%
Time Used	86%
Time Received	69%
Time on Task	52%

This observation method incorporated both whole of class measures (a quick scan of the entire class to determine numbers of students on task) and individual student measures (where target students were observed uninterrupted for a ten second period). The authors reported that stability of readings for whole of class measures could be obtained to a level of 0.8 with as little as a 20 minute observation. This whole of class observation would reveal an average class characteristic, with a reasonable degree of reliability. Measures for individual students yielded an average reliability of 0.72 when taken over approximately 150 minutes. In order to increase the stability of observation to a level of 0.8, Fitz-Gibbon and Clark assert that eight separate 30 minute observations are required. The authors, from their study, reported a weak correlation coefficient of 0.34 for eight classrooms, between the quantity of instructional time and the achievement of students. In explaining such a weak correlation, Fitz-Gibbon and Clark assert that additional time students spent on task is not measured by the instrument. Other factors such as time engaged in homework is not measured in the overall time factor, but may have a substantial effect on the overall amount of time that the student is actively engaged in learning the material.

Lindelow (1983) cites the Beginning Teacher Evaluation Study in referring to time on task. In this study, three aspects of instructional time were measured. Allocated time was determined from teacher logs and represented the actual time available for instruction. Engaged time was referred to as the time in which the students were actually paying attention. Engaged time may be likened to what Fitz-Gibbon and Clark (1982) refer to as time on task. The rate of success that the student experienced, or the number of tasks successfully completed, was also measured. Success was seen to be important, as a student who is actively engaged (or experiencing a high level of time on task) but who is experiencing very little success will, most likely, be achieving very little real learning. This third measurement was referred to as Academic Learning Time. Data from this research showed positive relations between the three time measurements of allocated time, engaged time and academic learning time, and the outcome of student learning. Lindelow noted that the engaged time was highest when students were interacting with teachers. With respect to individual seat work, it was also noted that engaged time was greatest when teachers were circulating and checking student progress. Lindelow presents the proposition that time should not be the measured variable, but rather it should be the criterion variable. Lindelow refers to the work of Bloom (1976) and Carroll (1963) in the proposition, further suggesting that if mastery were the criterion variable of education, research would then study the norms of time required to achieve the set criterion, rather than the present method of comparing norms of criterion achieved for standard allocated amounts of time.

Beyond the concept of time on task, Walberg (1988) introduces the concept of productive time. That is the time that students are engaged in learning which is suited to individual differences in learning rates and background knowledge. Walberg acknowledges the current concepts of allocated time and engaged time or time on task, but suggests a further aspect of time in the form of productive time. Beyond simply being attentive, as time on task or engaged time would intimate, productive time relates to the time that the student is actually learning from the material. Students would be working at a level and a rate that was most suited to them, not wasting time on material already understood or attempting to understand material for which they do not possess foundation knowledge.

2.7.5 Observational Methods

Halasz and Desy (1984) used a 'whole-of-class' instrument to measure learning time. Three categories of learning time were operationalised. Firstly, *curriculum related tasks* were a measure of the activities strictly related to the curriculum and had six further sub-categories. Secondly, the category of *other tasks* related to such management tasks as setting up, cleaning up or managerial tasks. Lastly, the category *off task* related to any activity not contained in the two previous measures, and had three sub-categories. The observation method utilised observed the class for a two minute period and noted the number of students on each of the three activities. Halasz and Desy suggest that classes should be observed for entire learning periods, which may be up to four hours long. The authors also suggest that at least three observations should be made on different days in the same week.

Marked differences were seen when Halasz and Desy illustrated sample data taken on Mondays, Wednesdays and Fridays. To gain an accurate representation of student activities, observations would need to be spread over the week days.

In a study evaluating the implementation of innovative teaching programs, Kerr, Kent and Lam (1985) used an individual observation method. Five individual students were observed in the one observation period. Observations were conducted for a complete teaching period of approximately 60 minutes. This method involved observing the selected individuals for a period of 10 seconds and recording their classroom activities. The following 20 seconds was used to observe and record the teachers activities, whilst the final 30 seconds of the minute was used to make anecdotal notes on the activities within the classroom. Such a routine was conducted each minute for the entire observation period. Kerr and others categorised the student activities into five groups. The categories used were engaged alone; engaged with a peer; attending passively; off task; off task and disruptive. Whilst this form of observation was utilised in evaluating curriculum implementation, inherent in the process is a measure of student time on task. The methods used have illustrated procedures that readily measure a number of students simultaneously, and through inference have also illustrated the need for extended observation times.

When considering the observational methods employed to ascertain engaged time, it is important to reflect on the assumptions of Good and Brophy (1987) where they suggest that students appearing off task may well be engaged in the learning, and conversely, students appearing to be engaged may in fact be completely off task.

2.7.6 Self Report Mechanisms

Keith, Reimers, Fehrmann, Pottebaum and Aubey (1986) address the issue of educational achievement and quantity of education in terms of homework. The authors used student self report methods in gathering data. Students were asked to report on the average amount of homework they completed each week. Results of Keith and others study revealed correlations of 0.3 between homework and educational achievement. Whilst the authors questioned the reliability of the self report methods utilised, their results were consistent with previous research findings in this area. Given the consistent findings with previous research, the authors concluded that the self report mechanism was acceptably reliable.

The Uguroglu and Walberg (1986) method used to measure the quantity of time in the educational process was based on student self reports. A five point Likert scale was used on a total of ten items. The self reporting method attempted to ascertain student perceptions of classroom activities or teacher activities. Items used in this research related to wasted time, gaining of attention, interruptions, organisation, student effort and homework.

In exploring the relationship between academic achievement and quantity of learning, Smith (1990) examined homework. Student self reporting techniques were used to determine the amount of homework students completed in an average week. In this study no significant relationship was found between achievement and time. Students surveyed by Smith were ninth grade high school students. In light of the generally positive findings of wider research, Smith suggests that the effects of homework may not be as great in the lower high school years as it might be for the upper high school years.

2.7.7 Available Time

Karweit (1976) operationalises quantity of education in terms of the product of average daily attendance, hours in school day and number of school days in school year. The quantity of schooling may, therefore, be understood in terms of the amount of time a student is actually attending the learning centre or school. Karweit asserts that the effects of quantity of education are non linear with respect to educational achievement. Studies by Husen are cited by Karweit (p. 244) to show that Norwegian students receiving almost half the quantity of learning time achieved only slightly below other Norwegian students receiving the total amount of learning time.

In exploring the concept of learning as a function of time, Frederick and Walberg (1980) reviewed previous studies of time or quantity of learning in four different ways. Time was considered in years of schooling, days of schooling, hours of schooling and minutes of schooling. With respect to years of schooling, correlations of 0.26 - 0.71 were reported between knowledge level and years of schooling. Whilst it would appear obvious that additional years of schooling enhances knowledge, it is less clear whether the additional time enhances the high achievement, or whether those wanting to achieve highly simply devote more time to such a pursuit. Of nine studies examining the relationship between days of instruction and educational achievement, four found little or no relationship, whilst five returned values of 0.32 - 0.69 for correlations between the two entities. Frederick and Walberg also point out that the studies show that the correlation between days of instruction and educational achievement are related more closely to gains in achievement, rather than simple educational achievement. The effects of quantity of education in terms of the hours of schooling were shown to have correlations with educational achievement ranging from 0.13 to 0.59, with variance ranging from 3 percent to 22 percent. It was also found that either school hours per day or homework hours may have equal predictive powers of educational achievement. When addressing the research variable of minutes of schooling, Frederick and Walberg found overall correlations of 0.15 - 0.53 between quantity and achievement. The actual amount of time students were engaged may, however, be related to the students' ability to engage in the learning (in terms of intelligent behaviour), or it may be possible that such engagement rates are influenced by the instructional level of the material or instruction. It was also shown that included in the concept of time was student homework. Overall, time is seen as a moderate predictor of educational achievement. For new material, time appears to be a strong predictor, however, when material is familiar time is a weak predictor. If additional time is used to make up for ineffective instruction or student inability, it may return a negative correlation with achievement.

2.7.8 The Number of Courses Undertaken

Horn and Walberg (1984) utilised the relatively course measure of number of relevant courses completed in a specific subject, to measure the quantity of education. A correlation of 0.63 was reported to exist between the number of courses completed and educational achievement. Quantity was conceptualised, therefore, as the total amount of instruction over a given period of time (in this case one school year).

Walberg (1991) also asserts that the amount of time spent on learning can be crudely determined by the number of courses a student undertakes in a given subject. Walberg also adds to this measurement the number of content items that are covered throughout a year.

Such an understanding of time spent learning relates to the degree to which the student is exposed to the content of the course or subject.

This concept has been termed *content exposure*. It has been measured in terms of the number of courses completed, hours of lessons throughout a year, and number of test items covered throughout normal teaching. Within America, correlations of 0.6 have been reported by the National Assessment of Educational Progress (NAEP). A correlation of 0.63 was reported between achievement tests and the rated rigour of the highest course taken. A correlation of 0.62 was reported between achievement tests and the number of courses completed.

2.8 The Factor of Quality

Quality of education is one of four major constructs identified by Educational Productivity Model. In an attempt to more concisely identify the construct of quality of education, Haertel, Walberg and Weinstein (1983) analysed eight specific models of instruction. The models analysed were those of Carroll (1963), Bruner (1966), Gagne (1974), Cooley and Leinhardt (1975), Bloom (1976), Glaser (1976), Harnischfeger and Wiley (1976) and Bennett (1978). Haertel and others (1983) contend, that these models illustrate the immediate conditions required for individual learning. Another model of education reviewed was Slavin's (1986) model. This model was of interest as it also identified the four major components of Walberg's Educational Productivity Model. Whilst these models contain a range of identifiable aspects of educational productivity, it is those aspects which can be most closely aligned to educational quality that are focussed upon here. In Carroll's model, clarity of instruction and matching tasks to student characteristics are of importance. Bruner's model suggests an implanting of a predisposition toward learning, the structuring of knowledge, the sequence of materials and the specifying of rewards and punishments as being central to quality. In Gagne's model, the major components related to educational quality are the activation of motivation, the informing of learner objectives, the stimulation of recall, the provision of learning guidance, the enhancement of retention, the promotion of transfer of learning and the elicitation of performance along with the provision of feedback. Cooley and Leinhardt identify external motivators, structure and instructional events as aspects of quality. There are two main thrusts to Glaser's model, firstly, the provision of materials, procedures and techniques that foster competence, and secondly, the assessment of the effects of instruction. Bloom's educational model espoused the use of cues, reinforcement, feedback and correctives. Harnischfeger and Wiley see the teacher activities as being central to quality, while Bennett's model focused on the clarity of instruction along with task difficulty and pacing. Slavin identified quality of instruction as procedures which make the instruction comprehensible to students. Such procedures include the organisation of material, clear objectives, transitions, reviewing and feedback.

2.8.1 General Characteristics of Quality

Based on the above range of instructional models, a list of general characteristics of quality of education can be constructed. These specific factors have been generalised with respect to feedback, information processing, and teaching activities and behaviours.

Feedback
- the specifying of rewards and punishments
- provision of feedback
- external motivators,
- reinforcement
- feedback and correctives

Information Processing;
- implanting of a predisposition toward learning,
- activation of motivation,
- informing learner of objectives
- stimulation of recall
- provision of learning guidance
- enhancement of retention
- promotion of transfer of learning
- elicitation of performance
- procedures and techniques that foster competence

Teaching Activities and Behaviours
- clarity of instruction
- matching tasks to student characteristics
- the structuring of knowledge,
- the sequence of materials
- structure
- instructional events
- cues
- provision of materials
- assessment of the effects of instruction
- teacher activities
- task difficulty and pacing

2.8.2 Feedback

One aspect of the quality of education that is widely discussed is that of feedback. Hattie (1993) grouped reinforcement, remediation, feedback and mastery learning into the one overall concept of feedback. He reported effect sizes of feedback to range between 0.5 and 1.13.

Hattie (1993) noted that whilst individualised programs had a relatively low effect size of 0.14, this effect size could be dramatically improved by the use of feedback. Fraser, Walberg, Welch and Hattie (1987) also reported considerable effect sizes resulting from the use of feedback. A major synthesis of previous educational productivity research conducted by Fraser and others (1987) concluded an effect size of 1.17 for the use of reinforcement, and an effect size of 0.97 for the use of feedback and cues.

Lysakowski and Walberg (1981) conducted a meta-analysis into the effects of instructional reinforcement, and suggested an overall effect size of 1.17 standard deviations. Lysakowski and Walberg (1981) further suggest that this effect size is similar across the schooling years. To be most effective, however, Lysakowski and Walberg (1981) suggest that the reinforcement needs to be matched to the learners. Whilst the concept of educational reinforcement is by no means a recent one, dating as far back as Plato and Aristotle, it is only in recent decades that clearly articulated operational definitions of the concept have been formed. Lysakowski and Walberg (1981) describes a series of seven categories of reinforcement developed by Forness (1973) based on human psychological development. The categories ranged from the lowest level of edible tokens, to the highest level of individual competence (or learning for learning's sake). Between these two extremes lay categories of tangible reinforcement (non edible toys or trinkets), token reinforcement (representative values that could be accumulated and exchanged for edibles or tangibles), contingent activity (alternative desirable activities as reward), social approval (visible praise ranging from a glance through to effusive praise) and feedback (the results of tests instilling a sense of competition). These seven categories were able to be used to help determine the most effective form of reinforcement based on the individual differences of the learner or learners. Forness (1973) suggests individual differences such as age, physical or intellectual development, race or socio-economic status may all impact on the most suitable type of reinforcement. Hattie (1993) states that feedback is the most powerful moderator enhancing student achievement.

Mory (1992, p.6) cites Skinner's behaviourism as the earliest mode by which feedback was conceptualised. Essentially, tasks were small enough to ensure success, with respondents given feedback upon achieving such success. Conversely Mory notes that advocates of the information processing paradigm held that the focus of feedback should be on the correction and analysis of tasks. Mory (1992, p. 7) cites two models of feedback based on the information processing paradigm, those of Kulhavy and Stock (1989) and Bangert-Drowns, Kulick, Kulick and Morgan (1991a). Kulhavy and Stock (1989) suggest a three cycle model of feedback. Cycle one consists of the presentation of the task, the consequent information gained from completing task, with a response to the task being developed. Cycle two consists of the presentation of feedback, which is processed by the student and corrective responses developed. Cycle three consists of the task being completed again, with appropriate responses gained from cycles one and two. Bangert-Drowns, Kulick, Kulick and Morgan (1991b) organise the feedback process into five stages. Firstly, the initial state, second, the search and retrieval strategies of the learner, third, the learner's response, fourth, the learner's evaluation of the response and fifth, the adjustment that the learner makes. The key to Bangert-Drowns and others (1991b) model is mindfulness. Feedback can promote learning if received mindfully, conversely, feedback can inhibit learning if promoting mindlessness.

There has long been an accepted relationship between the amount of time spent completing tasks and the number of tasks consequently completed. In light of this relationship, Maggs and Morgan (1986) further noted that the use of feedback increased the amount of time that students were on task. Three forms of feedback were investigated to determine the effect of each. The forms of feedback identified were right-wrong, right-blank and wrong-blank. Right-wrong feedback occurred where the feedback followed both correct and incorrect responses. Right-blank feedback occurred where feedback followed only correct responses, with no feedback for incorrect responses. Wrong-blank feedback occurred where feedback followed only incorrect responses. The most effective form of feedback was identified as wrong-blank. Maggs and Morgan (1986) suggested that the other two forms of feedback could in fact reduce the amount of tie a student was on task, where as the wrong-blank form of feedback only interrupted the student when they were off task.

2.8.3 Information Processing

In 1986, Barak Rosenshine (1986) conducted a synthesis of research into explicit teaching. In detailing a set number of steps towards effective teaching, he refers to information processing research. Rosenshine (1986) contends that the limitations of the human body drive the need for explicit teaching. The body has a limit to how much information can be attended to at any one time. Tobias (1982) asserts that only seven items can be processed or attended to at any one time. More than seven items dealt with at once will be either omitted or skimmed over and not dealt with properly. Further than simply attending to information, in order for the information to be retained, it must be transferred to long term memory. This process occurs through elaboration, review, rehearsal and summarising the information. Through the use of effective teaching, Rosenshine (1986) suggests that this information transfer can be achieved by practice. In order that information required be recalled effortlessly, extensive practice and regular review is required. If such a process occurs, students will more readily cope with higher level thinking. Teachers need to accommodate student learning in the three areas of information processing, that is the amount of information presented, the transfer of information to long term memory and the recall of that information when required. Rosenshine (1986) names such accommodation of student learning instructional support. Within the general framework of instructional support, Rosenshine (1986) lists six activities that lead to effective teaching and the overall quality of education. In order to be an effective teacher, the processes of reviewing, concise presentation, guided practice, correction and feedback, independent practice along with weekly and monthly reviews.

In research related to cooperative learning, van Oudenhoven, van Berkum and Swen-Koopmans (1987) also espouse the information processing paradigm as fundamental to favourable achievement. In the cooperative learning environment, information exchange takes place between students. Through such informational exchanges students develop increased personal reasoning, and as a result increased cognitive processing takes place.

2.8.4 Teaching Methods

Ornstein (1987) suggests that much research which focuses on student outcomes, addresses both the quantity and the quality of learning. With respect to the quality of the learning Ornstein suggests two main foci, namely those of direct instruction and mastery learning. Direct instruction is structured in small steps, the teacher is dominant, goals are clear, with extensive practice and immediate feedback. Positive results in this form of instruction correlate to a strong academic focus by the teacher, the wide use of textbooks accompanied by regular homework. Mastery learning is largely based on Bloom's assumption that 90 percent of students can learn the same educational material at practically the same level of mastery. Bloom's assumption is underpinned by the amount of time students are allotted to complete tasks, suggesting that weaker students will require more time to achieve mastery. Some of the key components to mastery learning are clear instructional objectives, the provision of immediate feedback, matching the level of instruction to the students ability, and the division of the learning material into small self contained modules.

Helmke and Schrader (1987) suggest that adaptation is very important to effective teaching and consequently the quality of the learning process. Adaptation relates to altering the instruction to more closely suit the individual characteristics of the learner. Such adaptation includes appropriate levels of difficulty, suitable types of questioning, and well suited timing of instructional events. Adaptation is central to many school programs focused on the individual, including that of mastery learning. Helmke and Schrader (1987) further suggests that the effectiveness of an adaptive teaching/learning process is largely dependant on the accuracy of teacher judgements. Quality of instruction not only relates, therefore, to effective teaching activities, but also to the sensitivity of teachers to determine the optimum timing or location of such activities. In theory, a higher level of teacher sensitivity to individual differences would lead to a closer matching of learning task and student ability.

2.8.5 Teaching Behaviours

Alberta Education, in Canada, has dealt with quality of education in a broader sense. McEwen (1993) focussed on four areas within the broader sense of quality, and highlighted profiles of the quality of education occurring in districts and schools. These four categories were; student achievement, school climate, funding and the quality of instruction. Within the last area, that is the concept of quality of instruction, Rymhs, Allston and Schulz (1993) suggests that the teacher is the key, or more precisely, the teacher's behaviour is the key to quality of instruction. Research into the teacher's behaviour has historically focussed on direct instruction, using set criteria to identify effective teaching behaviour. Rymhs and others (1993) note that research is also addressing the more inductive teaching methods, at the other end of the direct teaching continuum. Rymhs and others (1993) state that the criteria used to judge teaching effectiveness may not be suitable for both ends of this teaching continuum. The criteria used to determine effective teaching will invariably be either a presage, process or product variable. Rymhs and others (1993) assert that process variables are the most widely used criteria for effective teaching. Research methods are able to reliably observe process variables, and strong correlations have been shown to occur between process variables and student outcomes. With respect to educational quality, Rymhs and others (1993) contend that presage variables have received mixed reactions from the wider research body. Product variables have had little use, probably because the teacher behaviours are only one of the many variables that effect the product of education. In focussing on the process variables of the teaching/learning process, Rymhs and others (1993) identified 26 indicators of effective teaching. The indicators fell into the four broad categories of a sequentially developed planning and preparation procedure, the use of key instructional strategies, good communication skills and effective teacher/student relationships. The 26 indicators are incorporated in the matrix in Table 3.3 contained in the method chapter.

Giuli, Troy and Calkins (1987) note a word of warning regarding a simple focus on process-product indicators of effective teaching. Giuli and others (1987) contend that much of the research in this area is de-contextualised. This de-contextualised nature tends to miss the 'big picture' of the teaching learning process. Giuli and others (1987) suggest that the teaching behaviours need to be viewed in light of the whole teaching/learning process. Unless teaching behaviours are viewed from a wide perspective, Slavin (1986) suggests that individual variables may be seen as ineffective, while in fact a combination of these variables might well be effective teaching behaviours. As a result of such criticisms, Giuli and others (1987) suggest that a combination of low and high inference variables be observed, and that that these variables be observed at both the micro and the macro level of the teaching/learning process.

2.8.6 Student Perceptions

Helmke, Schneider and Weinert (1986) identified student perceptions of the quality of instruction as a major variable in the research of instructional quality. Student perceptions were seen to be important for two reasons. Firstly, they reflected the students' perception of the classroom, and secondly they gave an added dimension to any classroom observations by researchers. With respect to the student perceptions of classroom activities, teaching activities such as teacher cues may be observed by researchers as quality teaching. The value of these cues, however, depends largely on the student attending to the cues. If a student perceives a cue to be of little value, there is a consequent lack of attention by the student, resulting in the cue being largely ineffective. Conversely, if the student perceives the cue to be appropriate or of value, then the student attention will be heightened. A heightened student interest will result in the cue being far more effective. From an observational perspective, Helmke and others (1986) contend that observations of classrooms by researchers can only be a 'snapshot' of the teaching /learning process. Such a snapshot observation can be substantially complimented by soliciting the student perceptions of the teaching/learning process. Student perceptions were used in a National Assessment in Science survey in order that researchers gain insights into teaching quality (Walberg, Fraser and Welch, 1986; Fraser, et al., 1987). From a relatively large sample of 1900 respondents, the authors reported alpha reliability of 0.72 of the student perceptions. Students were solicited about their perceptions of the teacher's characteristics.

2.8.7 Open Education

Giaconia and Hedges (1982) suggest that the effects of open education are difficult to substantiate as there is a myriad of different open education programs. Although all under the common umbrella of Open Learning resultant programs may differ greatly. Giaconia and Hedges (1982) examined different open education programs from a perspective of educational quality. In the attempt to identify salient features of effective education, Giaconia and Hedges (1982) built on the earlier work of Traub, Weiss, Fisher and Musella (1972) and Walberg and Thomas (1972) to identify specific features of open education. Seven specific features were identified by Giaconia and Hedges (1982). The first feature related to the central role of the student, where students determine and guide their own learning, and teachers are seen more as resource people. Diagnostic evaluation of student progress is essential to guide future student learning. Also essential to open education is a range of diverse materials to be manipulated by the students. Instruction is individualised, at all times centred on the needs and abilities of the individual student. Open education systems do not group students based on age. Open education systems rely to a large extent on the flexible use of space and furnishings. Team teaching was also identified as a major component of an effective open education program. It must be noted that the open education systems dealt with in these research studies relate largely to the compulsory school years. Whilst the Open Learning environment studied in the post compulsory sector differs to some extent, the underlying philosophies are basically the same and many of the features of effective open education identified relate directly to the post compulsory sector as well. Giaconia and Hedges (1982) contend that if an Open Learning environment is to be considered effective, it must be identified by most if not all of the seven features described.

2.9 The Factor of Home Environment

The sixth factor contained within Walberg's Educational Productivity Model is that of Home Environment. In order to understand the underlying features contained within this factor, a review of research studies related to home environment is reviewed. Given a clear understanding of the current literature on the construct of Home Environment, a sound basis for survey questionnaire selection or development is formed.

2.9.1 Perpetuating the Home Environment

Kohn (1959) asserted that people generally perpetuated their own social class. Children from higher socio-economic status groups (described as white collar workers) would generally proceed to occupy a similar socio-economic status (SES) in their adult life. A similar situation occurred with children from lower socio-economic families (described as blue collar workers). Kohn posited that this perpetuation of one's own social class was due to two distinctly different attitudes. White collar workers generally possessed an attitude of self direction, understanding the world around them and coming to grips with their effects on that world. Conversely, blue collar workers generally possessed an attitude of conformity, holding high the values of obedience, neatness and cleanliness. Lareau (1987, 1989) suggested a distinct difference between the parent-school relationships of working class parents and middle class parents. It is suggested that working class parents experience a degree of separation from the school. Such a situation is based on the premise that schooling is the task of the school, whereas parental involvement should focus more on non-academic matters. Conversely, middle class parents see their role as a shared responsibility between themselves and the school.

2.9.2 Family Orientation

Kahl (1961) determined that the impact of home environments was significant and divided household into two basic categories, namely, *getting by* and *getting ahead*. As the name might suggest, *getting by* families encouraged educational pursuits only to the extent of securing employment. There was little thought of an extended college education, and personal enjoyment of the early years of schooling was considered important. In contrast, *getting ahead* families began to exert pressure on children at an early age, encouraging high achievement as this was necessary for occupational success. Parents suggested to children a range of possible occupations that they may pursue.

Marjoribanks (1987) revisited Kahl's concept of *getting by* and *getting ahead* family environments in studying achievement correlations of different family groups. The *getting by* and *getting ahead* measures were compared with socio-economic status. Socio-economic status was measured by parental education and occupation.

2.9.3 Paternal Education

Studies by Blau and Duncan (1967) showed a father's educational level as being a major influencing factor on the educational achievements of children.

Coleman (1987, 1988, 1990) developed the concept of social capital. This concept was divided into two components, namely human capital and social capital. Human capital related to the potential for cognitive achievement and could be estimated from the parents' level of education. Social capital related to the strength of the parent-child relationships.

2.9.4 Maternal Influence

Bernstein (1961) suggested that the language of the social class predicted, to a large extent, what socio economic status children leaving their families would achieve. Hess and Shipman (1965) suggested that the language patterns used by mothers were of great significance to the eventual socio economic status of their children. The learning and teaching styles of mothers also had great impact on the socio-economic destination of the children (Hess & Shipman, 1965). The socio economic status that students eventually achieve, therefore, is largely influenced by the social class, language patterns and learning styles of the mother.

2.9.5 Chicago School: Behavioural Processes

The work of Bloom, Dave and Wolfe became known as the Chicago Studies or the Chicago School. These studies examined the influence of the home environment in childrens' early years, especially related to their cognitive development. The studies measured social psychological dimensions of the home environment and focussed on those behavioural processes within the home thought to be conducive to learning.

2.9.6 Wisconsin Model: Social Psychological

Sewell, Haller and Portes (1969) developed a home environment model which became known as the Wisconsin Model. This model was social psychological in nature and was developed from the earlier work based on levels of aspirations and significant others.

2.9.7 British School: Experiences and aspirations

The British School of Home Environment Studies began to emerge in the 1960s and 1970s. The measures used by the British organisation focussed mainly on parental experiences and personal aspirations, the material conditions in the home, and a range of other status variables. In contrast to the stationary measures of the British School, the Chicago School (described previously) focused more on the behavioural processes within the home environment. Studies associated with the British School include Fraser (1959), Peaker (1967), Wiseman (1967), Plowden (1967), Clasey and Deboerk (1976), Marjoribanks (1976) and Schafer and Clark (1977).

2.9.8 Structure, Attitude and Process

An Australian study by Keeves (1972) operationalised the concept of family environments by three dimensions, namely, structure, attitude and process. The structural dimension of the family environment included the family structure (in terms of the number and age of family members), the socio economic status of the family (in terms of parents' education and income), and the ethnicity of the family (determined by their linguistic background). The attitudinal dimension of the family environment included the parents' attitude toward the child's existing education along with the parents' hopes for the child's future education and eventual occupation. The process dimension of the family environment was assessed by ascertaining educational practices employed in the home such as the use of books, help with school work and the provision of resources or space for the completion of school work.

2.9.9 Family Environment Scale

Moos and Trickett (1974) developed the Family Environment Scale which consisted of ten sub-scales. These sub-scales were Cohesion, Expressiveness, Conflict, Independence, Achievement Orientation, Intellectual-Cultural Orientation, Active Recreational Orientation, Moral-Religious Emphasis, Organisation and Control. As can be seen from the naming of the sub-scales, the Family Environment scale was social psychological in nature.

2.9.10 Process Variables

In a review of alterable variables in the learning process, Benjamin Bloom (1980) suggested that a measurement of socio economic status is of little use to schools. Correlations between academic achievement and socio economic status are typically quite low (0.3 - 0.5). Whilst this measure offers some predictive powers in academic achievement, the low correlations suggest that predictive powers are limited. Bloom also suggests that whilst there may be a degree of predictive power related to socio economic status, such information offers little guidance to the school as to how to improve a given situation. Conversely, Bloom holds up the concept of process variables as being of far greater use to the schooling system. Two reasons for such a stance are given. Firstly, the process variables were alterable to some extent by the school system, and secondly, they had a much higher correlation with academic achievement (0.7 - 0.8). Bloom listed the home's contribution to the development of language, the encouragement of children to learn well, parental aspirations for children, the provision of parental help when needed, and the organisation for time and facilities in the home to complete school work as being most significant to measuring home environments.

2.9.11 Socio-Economic Status

Mueller and Parcel (1981), in a review of socio-economic status measures, concluded from the literature that the occupational hierarchy was the significant dimension of social stratification. Current issues relate to the criteria referenced to rate occupations, along with the identification of specific data required to classify the occupation. Methods to classify occupations have historically utilised the father's occupation (Svensson, 1971) although more recently combined scores of both father's and mother's incomes are used. The education required to reach the given occupation, along with the salaries offered for such occupations have been used as the basis for occupational classifications. Mueller and Parcel (1981) suggest that two scales have been widely used for allocating scores to occupation, namely the Siegal (1971) Prestige Scale and the Duncan (1961) Socio-economic Index. The following variables have been identified as determinants of the household SES: educational levels and occupations of spouses, race and ethnicity of the couple, number and age of children, family migration history, single versus multiple adults present in the household and spouse's father's social status (Mueller & Parcel, 1981).

In studies examining the relationship between socio economic status and academic achievement, White (1982) concluded that there was only a weak correlation between the two measures. White acknowledges that there has been a wide range of correlations reported (0.1 through to 0.8), but suggests that the majority of studies reported low correlations. White further suggests that many of those studies reporting low correlations go unpublished, giving rise to a false view of the impact of SES on academic achievement. Traditionally, socio economic status has been measured with the individual as the unit of analysis, and the parents' income, educational level and occupation as the dimensions of SES. Under such conditions

White (1982) suggests that socio economic status accounts for only five percent of the variance in academic achievement. White makes the point that there exists a degree of confusion over the definition of socio economic status and the way in which various dimensions are measured. He suggests that the results of research would greatly benefit from a clearer definition of both the variable and the dimensions of the variable.

2.9.12 Home Environments

Results from a synthesis of studies on home environment and school learning by Iverson and Walberg (1982) state that a measure of SES should be included in home environmental studies. They suggest that SES should be specified and included on home environmental measures related to academic achievement. The synthesis, which spanned 19 years and covered 18 different studies concluded that home environments, relevant to academic achievement, have been approached in four different ways. The first approach, sociological surveys, concentrate on socio-economic measures related to the parents including income, education and occupation. The second approach, family constellation studies, focuses on the structure of the family, including the number, order and spacing of the children in the family. The third approach, British School studies, focuses on parental experiences and parental aspirations for children, along with material conditions in the home. The fourth approach, Chicago School studies, concentrates on the social psychological relations (behavioural processes) in the household. From the various studies examined, the authors reported that home environments could have six times more effect on academic achievement than the simple socio economic status of the home. A commonly used instrument throughout the studies was the Index of Educational Environment, first used by Dave in 1963 and Wolf in 1964. The instrument attempted to measure the alpha press (Murray, 1938) of the home environment on academic achievement. The IEE has been used in modified versions by a number of studies in the late 1990s.

Song (1982) ascertained that home environment could be conceptualised by the three dimensions of family structure, social status and psychological characteristics. Citing earlier studies, Song reported that the relationship between family structure and achievement has been historically low. Whilst the relationship between social status and achievement has been higher than that of family structure and achievement, Song reported both relationships as being low or weak. Relationships between family psychological characteristics and achievement, however, was reported as being much higher.

2.9.13 Beta Press Home Environments

Marjoribanks (1985) adopted the concept of Beta Press (Murray, 1938) where descriptions of the environment as perceived by the inhabitants of that environment were used in a study of Australian youth. This method was in contrast to the Alpha Press of the detached observer reporting on what was observed. Home environment was measured by the student's own perceptions of the environment. There were three basic dimensions included in the instrument. First was the child's perception of the parents' educational and occupational aspirations for the child, second was the child's perception of the amount of parental encouragement related to schooling, and third was the child's perception of parental interest in the child's schooling. These perceptive measures were obtained separately for mothers and fathers, resulting in two separate scores termed mother support and father support.

Keith, Reimers, Fehrmann, Pottebaum and Aubey (1986) refer to a number of previous studies by Karraker (1972), Marjoribanks (1983), Seginer (1983), Walberg (1984) and Bloom (1984) in suggesting that parent involvement has important effects on educational achievement. Aspects of parental involvement relate to expectations of school performance, encouragement and interactions regarding school work, reinforcement of academic achievement and finally, guidance and support. Keith and others included these measures as a variable of parent involvement, with socio-economic measures as different variable. Socio-economic status was determined by a combination of father's occupation, parents' education, family income and material possessions in the home. This study used the students' perceptions of their parents involvement, establishing the beta press of parental involvement on academic achievement. The authors suggested that research had not determined whether alpha press or beta press measures were more important, when related to student achievement. In relation to beta press measures, Marjoribanks (1987) suggests that adolescents' perceptions were important influences on educational outcomes. Marjoribanks also suggested, citing Davies and Kandel (1987, p.44), that much of the parenting socialisation practices may well go unnoticed by the adolescent but still have important effects on the educational outcome. Marjoribanks, however, could only show limited support for Davies' proposition.

2.9.14 An Holistic Perspective

Marjoribanks (1994) suggested that research into family environments can be divided into four broad categories, as follows:

1. social arithmetic
2. family and school structural characteristics
3. environmental press of family and schools
4. interpretive analyses.

The social arithmetic category focuses on the social origins and the social destinations of students. The concept of social arithmetic research stems from political arithmetic research, where educational inequalities were highlighted with the intention of reform through political means. The arithmetic research does not utilise the political process, rather it focuses more on social reforms. The Wisconsin model (one method of social arithmetic research), includes adolescent's perceptions of parent, teacher and peer support, social background, early cognitive measures and student aspirations as variables to compare with the eventual social status attainment of the student. Criticisms of this model of family environmental research focus on its lack of sensitivity, suggesting that too few variables are measured.

Family and school structural characteristics can first be divided into family influences and school influences. The family structure has historically been examined from three perspectives, namely the resource dilution, the family confluence and the admixture of the family structure.

The number of siblings in a family, it is posited, leads to a dilution of family resources impacting on the educational achievement of individuals. The presence of cultural and material resources impacts on the educational achievement of students, therefore, generally it has been suggested that the larger the family, the lower the educational opportunities for the children in that family. Family confluence focuses on the average intellectual ability of the family at any given time. Influences such as variations in family size, family member ages and number of adults effects the average intellectual ability of the particular household. The family confluence theory suggests that the cognitive development of a child is related to the intellectual ability of the child's family environment, however much debate exists regarding this theory. The admixture theory proposes that the correlations between sibling variables and educational achievement, as suggested by the confluence model, may not be a result of the sibling variables, but more to do with differences in sibling relationships, especially in families of different ethnic backgrounds.

Marjoribanks (1994) summarises interpretive analysis research as being focussed on the ways that people involved in the learning process construct, define and manage their everyday lives. Such research methods typically adopt ethnographic procedures such as interview and observations.

2.10 The Factor of Classroom Environment

Walberg's (1981) Educational Productivity Model is divided into the three broad categories of aptitude, instruction and environment. The classroom environment is the second factor in the environment group. In order to measure this factor, it is first necessary to source an instrument sensitive the salient characteristics of the classrooms being investigated. A number of widely used instruments can be examined to establish how closely they relate to the specific environment being measured. If existing instruments do not address all aspects required, the process of adaptation or complete redevelopment must be undertaken.

2.10.1 Operationalising Learning Environments

Moos and Trickett (1974) have conceptualised all human environments as falling into three general categories or dimensions. They operationalise these categories as the Relationship Dimension , the Personal Development Dimension and the System Maintenance and System Change Dimension. Fraser, Giddings and McRobbie (1993) summarise these terms respectively as the nature and intensity of personal relationships, the basic directions along which personal growth and self-enhancement tend to occur, and the extent to which the environment is orderly, maintains control, is clear in expectations and is responsive to change.

Moos (1980) approaches the phenomenon of classroom environments from two distinct perspectives. Firstly, Moos refers to the qualities of classrooms. The qualities of the classroom are detailed categories of teacher verbalisation and classroom activities, which consequently develop a measure of the classroom environment. The concept of quality is operationalised and dealt with as a separate entity in Walberg's (1981) Educational Productivity Model, and hence is not included as a measure of classroom environment. There is little doubt, however, that the quality of the verbalisation and classroom activities has some impact on the overall classroom environment. The second perspective from which Moos approaches classroom environment relates to the atmosphere of the classroom. The atmosphere of the classroom is a measure of the social-emotional climate as it is either perceived or observed. The atmosphere of a classroom, as presented by Moos, has been operationalised in the literature as the psycho-social environment of the classroom.

2.10.2 Alpha Press and Beta Press

In describing classroom environment, Murray (1938) differentiated between two methods of research. Alpha Press was referred to as the description of the environment by an independent, detached observer, while Beta Press was referred to as descriptions of the environment as perceived by the inhabitants of the environment in question. Fraser and Walberg (1981) offer five advantages of Beta Press methods of data collection related to classroom environment research. Firstly, the paper and pencil measures of an environmental questionnaire are far more economical than the use of trained observers. It is quicker, easier and far more cost efficient to administer questionnaires, than employ large numbers of observers, or conduct many observations by a few observers. Extensive training of observers may also be required before a reliable observation process is achieved. Secondly, the personal perceptions of students are the result of experiences from many classes over time, whereas an observer can only gain insights into a 'snap shot' of a specific moment, or at best, a limited number of observations. Student perceptions would, therefore, include a certain amount of historical data. Third, by using the students' perceptions, the researcher gains a pool of judgements, whereas it would be normal to have only one observer's judgement in the Alpha Press situation. Any biases, or actions that an observer may be insensitive to may well be overlooked by the Alpha Press method. Fourth, as student perceptions are the determinants of student behaviours, student perceptions may be of far more importance than actual observed environments. In essence, the reality of a situation may not be important, rather how the student perceives that reality to be. Finally, Fraser and Walberg suggest that student perceptions account for more outcome variance than do observed classroom environments.

2.10.3 Private and Conceptual Press

Fraser (1986) contends that Stern, Stein and Bloom (1956) extended the work of Murray (1938) by adding the terms private Beta Press and consensual Beta Press. As the name suggests, private Beta Press relates to the perceptions of the individual, whereas consensual Beta Press relates to the shared views held by a group. The simple averaging of individual responses would give a consensual Press measurement. Scores obtained from individual students may, therefore, be averaged to give a group perception of the learning environment. As is the case in any averaging process, some sensitivity to the extremes may be lost in the process. It is possible that what might appear to be a comfortable classroom environment, may in fact consist of students who are both extremely comfortable and extremely uncomfortable. For such an averaging procedure to reflect individual scores, it is imperative that the individual scores and standard deviations be examined closely. The lower the deviation from the norm of the individual scores, the more accurate will the consensual score, or overall group perception of the learning environment be, conversely, if the scores deviate from the norm markedly, then it is likely that the consensual score is not a good reflection of the individual scores.

2.11 The Factor of Peer Influences

The concept of peer group influences has evolved over a long period of time. Terms such as 'fellowships' and 'gangs' have historically been used to identify a general socialisation of youth aged about 12 years and older. Such identified groups have experienced high degrees of group cohesiveness, and seemed to be ruled by unwritten codes. The existence of such groups, and consequent group rivalry, was identified as a significant influence of competitive drive. Interest in peer groups has continued in two general directions. In the first instance, research has concentrated on the socialisation influences of the peer group, whilst in the second instance, the achievement and aspirational influences of the peer groups has been the focus of research. Walberg (1981) has identified peer groups as a significant influence on the educational achievement of individuals and has included it as an environmental factor within his Educational Productivity Model.

2.11.1 Significant Others

The effects of peer pressure have been dealt with by Williams (1972) in terms of educational aspirations. He suggests two main influences on student aspirations, firstly, the expectations held by parents, and secondly, the aspirations for the student held by the student's peers. In his research, Williams followed a model based on significant others. That is, the attitudes and behaviours of the individual are based, to some extent, on the expectations of significant members of groups around the individual. These surrounding groups are most influential if the individual aspires to be within them. Such an understanding is based on reference group theory. Parents, as a reference, tend to act as a role model, offering rewards and sanctions which tend to shape individual's behaviour. Peers, as a reference, tend to act as a standard by which individuals can compare themselves. Williams suggests that researchers have historically linked student aspirations with socio-economic status. Correlations have been reported ranging from 0.2 to 0.5 for the relationship between parent educational aspirations and individual aspirations. Such correlations suggest moderate links between parents' and the individual's educational aspirations. In exploring the influences of parents, teachers and peers on educational aspirations, Williams determined that parental influences were the most powerful influence. Parents appeared to influence an individual's educational aspirations the most. Teachers appeared to have only half the influence of parents, whilst peers had only half the influence of teachers. Williams also found that the socio-economic status of the parents tended to influence which peers the individual associated with, highlighting the indirect effects of socio-economic status on peer group influences.

2.11.2 Mirrors and Models

Exploring the relationship between peer influences and educational aspirations, Picou and Carter (1976) used the concept of significant others as determining the attitude and behaviour of an individual. It is from the social interactions with significant others that the individual develops traits such as self-concept, attitudes and behaviours. Picou and Carter identify significant others into two distinct modes, one being a mirror, the other being a model. Significant others of the mirror form (also termed definers) usually hold expectations for the individual, and are most often parents or teachers. Significant others of the model form are those people whose actions are imitated by the individual. Models are most often peers of the individual. Picou and Carter (1976, p.13) cite three separate studies by Kandel and Lesser, Hauser, and Williams in finding that parents' influence on an individual's educational and occupational aspirations was greater than the influence of the individual's peers. This situation was, however, the reverse in a rural setting, where the studies found that peer influence had the greatest bearing on the educational or occupational aspirations. Research by Picou and Carter found that parents were the strongest influence on occupational aspirations, but the individual's peer group had the strongest influence on educational aspirations. The measures of the influence of the significant others used in the study by Picou and Carter are the self-reported perceptions of the individuals being studied.

2.11.3 Individual Characteristics

Brown, Clasen and Eicher (1986b) operationalised peer influence in terms of three distinct factors. The first factor was the individual's disposition to peer conformity, the second factor was the individual's perception of peer pressures and the third factor was the frequency of prescribed behaviours. The disposition of peer conformity was measured by determining what an individual would actually do in a situation where peers urged some particular action. The perception of peer pressure was measured by determining the extent that individuals perceived their peers to be exerting pressure on them to undertake different activities. The prescribed behaviours included the influence of peers on the activities undertaken by the individual, as well as the frequency of misconduct experienced by the individual. Early research has shown a general trend of conformity to the pressure of one's peers. Such conformity, however, has been shown to change over time. An inverted U shape has been shown in the development of conforming behaviour of adolescents, that is initial low conformity, moving to high conformity, and then later moving again to low conformity. Costanzo and Shaw (1966) suggest that in early adolescence there is a high degree of group norm conformity, this conformity peaks and then diminishes around late adolescence. Later research refined the concept of conformity to include the concept of a peer conformity disposition, rather than simply peer conformity behaviour. Using hypothetical situations, Berndt (1979) found a similar inverted U pattern to that reported by Costanzo and Shaw. Brown and others (1986b) also confirmed an inverted U shape to the development of peer conformity, however, the development of perceived peer pressure flattened rather than subsided and was maintained at a relatively high level. Berndt examined the influence of peers in the context of antisocial behaviour, neutral behaviour and pro-social behaviour. Findings indicated that individuals were more influenced by peers when given situations related to pro-social activities, and were least influenced when situations related to antisocial activities. Brown and others found that peer influence was greatest for socially conforming activities and least for activities of misconduct. Given that high educational aspirations would be seen generally as socially desirable, it may be reasoned that peer influences are greater for educational achievement than for misconduct.

2.11.4 Extra-Curricular Activities

Effects of peer groups became evident in Hanks and Ecklands' (1976) research which focused on students' school-based, extra-curricular activities. Generally, there was a positive effect on educational attainment reported from extra-curricular activities such as athletics and social participation. Hanks and Eckland suggest that the extra-curricular activities of the school are in competition with the alternative activities of the youth population. Research, however, is unclear as to the effects of this youth culture. Coleman (1961) reported that both the youth culture and the pursuit of extra-curricular activities were generally detrimental to academic achievement. This finding eludes to the proposition that a displacement of desired activities may be occurring as a result of extra-curricular activities. Hanks and Eckland (1976 p.272) cite research by Rehburg and Schafer, Schafer and Armer and Spady who reported positive effects on achievement through extra-curricular activities. Such findings do not support the previous findings of Coleman. In examining relationships between peer influences and educational attainment or achievement, Hanks and Eckland utilised student self-report measures. Such measures assessed both current and retrospective peer contact. Current accounts related to the current educational plans of the individual's peers. Retrospective accounts related to the peers' educational plans when in high school. Retrospective accounts were also used to determine what extra-curricular activities were undertaken by individuals whilst at high school. Extra curricular activities were operationalised into two factors, namely athletics and social participation. The study found that extra curricular activities of athletics neither enhanced or detracted from academic achievement. Extra curricular activities of the social participation type (which included writing, drama, music, debating, school politics, clubs and groups) did have positive effects on academic achievement.

2.11.5 Peer Interaction

Another manner by which peer influences have been researched relates to organisation of the classroom learning environment. In a study researching the relationships between motivation and educational achievement, Uguroglu and Walberg (1986) measured other influencing factors. Peer influences were measured with respect to the classroom, establishing both the extent of, and preference for, group work or individual work. No significant relationship between achievement and peer influences was established. It is possible, however, that the questions employed in the study limited the scope of student peer influences to the extent that no meaningful relationship was found. Items used in this study included, 'I sometimes study or do homework with my friends', 'I often work with friends in the classroom', 'I learn best when I work by myself' and 'My class often studies for tests together'. A study by Saxe (1988) also explored the relationship of group work and achievement and did find meaningful relationships between peer influences and achievement. In her study, Saxe determined that students with moderate peer interaction performed significantly better than students with no peer interaction. The study also found, however, that high levels of peer interaction were less effective than moderate levels of peer interaction in gaining higher academic achievement.

2.11.6 Effects on Education

In a review of recent research, Berndt, Laychak and Park (1990) note three distinct views regarding the educational effects of peer influences. One view, espoused by Bishop (1989) suggests that peer influence leads to a lack of effort and interest in school. Brown, Clasen and Eicher (1986a) suggest that peer influences exert pressure on individuals to work hard and achieve good grades. They further suggest that this positive influence occurs more frequently than the negative influence of discouraging school work. Kandel (1978) suggests that peer influences may be either positive or negative, stating that if peers have negative attitudes, then over time, the individual will tend to adopt those negative attitudes. Along with these three distinct views on the influences of peers, Berndt (1979, p.664) cites research by Cohen who found that whatever the influence of peers, be it positive or negative, it will be greatest when exerted by friends, as compared to any other peers. Berndt added to Cohen's findings in stating that discussions with peers who were friends increased the similarities of the achievement motivation and related decisions.

2.11.7 Educational Outcomes

Ide, Parkerson, Haertel and Walberg (1981) conducted a quantitative synthesis on the influence of peers on an individual's educational outcomes. Four aspects of educational outcomes were identified, namely standardised achievement tests, specific course grades, the individual's educational aspirations and the individual's occupational aspirations. Overall, Ide and others found a correlation of 0.24 between peer influences and educational outcomes. A stem and leaf diagram of the results revealed a positively skewed distribution curve, suggesting that individuals who had peers with high educational and occupational outcomes, also had high educational and occupational outcomes themselves. Of the four outcome measures adopted by

Ide and others, no single measure was more influenced by peers than the others. Methods of determining peer influence included both direct queries by researchers of the individual's peers, and the individual's own perceptions of their peers. The strongest effects were found to occur when the individual's self-report perceptions of peers were the basis of measurement. Such findings suggest that the most effective method to measure peer influences is through self report measures of the individual in question, relying on an individual's perception of his or her peers, rather than researching the peers directly.

2.12 The Factor of Mass Media

The influence of mass media has been identified by Walberg (1981) as a significant influence on the outcomes of education. The factor of mass media has been included in the environment section of Walberg's Educational Productivity Model. Literature on the effects of mass media is diverse and there is a wide range of research findings. Overall, the literature is inconclusive regarding the positive or negative effects of mass media on the outcomes of education.

The effects of television has been the focus of most media research, although, for the purposes of this study, mass media is treated in the literal sense to include any forms of mass media which might effect the educational process. An historical overview of the development of research into the mass media follows. It is this research that has formed the basis of the questionnaire found in Appendix A.

2.12.1 A Range of Mass Media

Research by Parkerson, Lomax, Schiller and Walberg (1984), examining factors effecting educational achievement, showed a positive correlation between academic achievement and mass media. This study differed from most studies in this area, as it examined a range of media, rather than the usual focus on television viewing. Six items were examined, assessing how often students utilised each form of media. All items researched were based on science and included magazines, television, newspapers, lectures/seminars, books and movies/videos. Parkerson and others reported an alpha reliability of the cluster of questions of 0.65, displaying a moderate degree of reliability. Results from the study were reported to show a significant positive correlation between media and achievement, however, this relationship was of an extremely low value (0.1). Whilst the study may have detected a correlation between media and achievement, it is obvious that any relationship that may exist is a very weak one.

Uguroglu and Walberg (1986) approached mass media from a different perspective, similar to that of Parkerson and others (1984), by addressing the positive aspects of media. Six items were examined, assessing how often students utilised each form of media. As in the study by Parkerson and others, each of the six items were based on science and included the mediums of magazines, television, newspapers, lectures or seminars, books as well as movies or videos. Results from this study are intriguing. A negative correlation of approximately -0.20 was reported between reading and mass media. Such a finding is consistent with the broad research findings that mass media generally has a negative correlation with achievement. However, what is intriguing is that the study explored positive aspects of mass media. It might reasonably be expected that the positive influences of mass media would positively effect educational achievement, however this study did not find such a relationship. Whilst this study reported only the one significant relationship between reading and achievement, it did note a positive relationship between motivation and mass media, though not a significant one.

In examining the relationship between television viewing and academic achievement, Smith (1990 p. 540) stated that "the preponderance of evidence suggests that moderate television viewing promotes academic achievement but that heavy viewing is detrimental". Smith also examined the relationship between parents, academic ability, television viewing and academic achievement. He has suggested that for high ability students, or students of high socio-economic backgrounds, television viewing may displace alternative, intellectually stimulating activities. Whereas, for low ability students, or students from low socio-economic backgrounds, Smith suggests that television viewing may be more intellectually stimulating compared to other activities available.

2.12.2 Television Viewing

In a report focussing on the effects of television viewing on learning, Hornik (1981) overviews six theories, namely those of Displacement, Intolerance, Interest Stimulation, School Equivalent Content, Learning New Cognitive Skills and Instrumental Information.

The displacement theory suggests that activities which might otherwise be pursued, are not undertaken, as the time normally devoted to such activities is occupied by television viewing. Television viewing displaces the other activities. Hornik suggests that whilst displacement of activities certainly occurs as a result of television viewing, it is only functionally similar activities that are displaced. Activities such as homework, reading or sleeping experienced slight decreases in allotted time, whereas functionally similar activities such as movies, comic books, radio listening and leisure play were largely displaced by television. Hornik refers to studies by Scramm and others (1953) Himmelweit and others (1958) and Kippax (1978) in suggesting that these findings were largely consistent across two decades.

The intolerance theory suggests that the rapid pace of television viewing builds an intolerance in students to the less rapid pace of schooling. Anecdotal measures seem to be the only research supporting this hypothesis. Hornik (1981) states that there are no longitudinal studies that confirm such anecdotal evidence.

Interest stimulation is a theory that suggests television viewing of a particular subject stimulates interest in that subject and the viewer consequently sources additional material to further study the subject. Hornik (1981) states that there is evidence to suggest that following the viewing of particular television programs the use of related books does increase. However, he also states that such an occurrence does not necessarily indicate reading that would not normally occur, it does not indicate an improved quality of further reading, and in fact, it does not indicate that any additional reading has actually occurred at all. Since the advent of television, Hornik suggests that overall book reading has not increased, and if anything, it has actually decreased.

School equivalent content is a theory suggesting that the content of television may be parallel to programs being taught in schools. Shows such as Sesame Street, current affairs and documentaries are some examples. Hornik does not question that there is parallel overlap between television and schooling, but he does question how much learning actually takes place. Hornik, suggests that only facts of a trivial nature are learned through school equivalent content, and very few, if any, skills are actually learned from television viewing.

Leaning new cognitive skills is another theory related to television viewing, although there appears to be little evidence agreeing or disagreeing with this theory. Hornik suggests that people develop minimum processing skills to utilise a given medium, using the minimum level of skills required to utilise or make sense of the medium. He suggests that they do not utilise deeper processing skills, not necessarily required to utilise the medium, but processes which could enhance new cognitive skill development.

The theory of instrumental learning relates to children learning roles or expectations through viewing television. The assumption is ill founded according to Hornik as television relates largely to a distant environment. Children operate in an immediate environment and there is little to suggest that television offers children guidance in how to respond to such an immediate environment.

In an often critical analysis of research, Hornik has determined that there is an overall negative link between television viewing and educational outcomes. Such a statement is immediately qualified when other measures are considered. If measures such as IQ or socio-economic status are controlled, Hornik suggests that there is a minimal relationship between television viewing and academic achievement. Hornik further suggests that the only significant relationship, established to date, between television viewing and academic achievement is negative, and exists between television viewing and reading ability.

Williams, Haertel, Haertel and Walberg (1982) present the case that television may be either villain or redeemer as far as schooling is concerned. In a research synthesis of previous studies Williams and others found conflicting results. Research had reported high or positive, negative and no effects of television on academic achievement. High correlations between television viewing and academic achievement were found by Greenstein (1954) and Schram and others (1961). Negative effects of television viewing were found by Lablonde (1966) Morgan and Gross (1980) as well as Hornick (1980). Himmelwaite, Oppenheim and Vince (1958) reported no significant effects at all of television viewing. Stem and leaf diagrams of studies examined showed that research studies were generally normally distributed, showing both positive and negative effects of television viewing. The mean of all correlations was reported at -0.06, showing a slightly negative weighting, but of little significance. Results of the research studies suggested that the effects of television viewing were consistent across both time and place of research. Differences in the effects of television viewing on specific groups were found. Differences existed between males and females, with females generally being more adversely effected. Differences also existed between students of different IQ levels. The impact of television viewing was found to be curvilinear. It was posited that television viewing of up to ten hours per week had a slight positive correlation with educational outcomes, whereas viewing beyond this amount had a negative correlations with the same outcomes. Television viewing beyond 30 hours per week appeared to be a saturation level, with only negligible differences in effects of viewing time beyond this point.

Keith, Reimers, Fehrmann, Pottebaum and Aubey (1986) found negative effects of television viewing. Self report mechanisms were used to determine the number of hours television was viewed during the week days. Options ranged from no television through to a maximum of five hours or more per week In contrast to the work of Williams and others (1982) who generally found a positive relationship up to 10 hours viewing, Keith and others found a consistent negative effect of television viewing above one hour, with a correlation of -0.2 with educational achievement. Also in stark contrast to the work of Williams and others, where a curvilinear relationship was found, Keith and others found only a linear correlation. It is of course possible that the curvilinear correlation did exist, but that the upper limits of five hours or more in the study by Keith and others did not examine the area where a curvilinear relationship might be expected to occur. No gender differences were found, but small differences between high ability and low ability students were detected. Generally high ability students were more negatively effected by television viewing than low ability students. With respect to the displacement hypothesis, Keith and others could not determine whether television actually displaced homework or not. Whilst the authors of this study acknowledge that the reported correlations are small, they suggest that such a correlation is meaningful, especially so because the variable of media is a changeable one.

In a recent study readdressing the displacement hypothesis related to television viewing, Mutz, Roberts and van Vuuren (1993) suggested that this hypothesis is based on a symmetrical understanding of television viewing. It was found, however, that television viewing was asymmetric to other activities. That is, whilst television viewing was seen to displace other activities, the reverse did not necessarily apply. If television time was reduced, the time spent on other activities was not necessarily increased. The displacement hypothesis is also based on the assumption that two activities are not undertaken simultaneously. Within the household, however, television viewing has been reported to be occur as a secondary activity for 30 percent of the time. Such a proposition brings rise to the emergence of new time, or activity time not previously measured. Mutz and others (1993) showed that 60 percent of television viewing time displaced other activities. The displaced activities, however, were predominantly functionally similar. Given that 60 percent of television viewing time came from previously undertaken activities, it follows that the remaining 40 percent of viewing time came from activities not previously measured (perhaps just hanging around) or activities which were still performed while viewing television. Media items in this study were measured by self reports of students. Such findings appear to support the displacement hypothesis, but only to a limited extent. The mass media measure used by Mutz and others (1993) in this study was determined by calculating the time spent involved in the mediums of radio, movies, out-school-reading and television viewing. Reliability of this measure was reported at 0.62, and was determined by the test, re-test method.

Roberts, Henriksen and van Vuuren (1993), in studying the displacement and distraction hypotheses of television viewing, state that previous research findings are generally unclear. Concerns for the negative effects of television under these hypotheses relate to the content and the medium. Concerns with television content are based on the assumption that much of what appears on television is in opposition to the efforts of schooling. Roberts and others (1993) however, state that there is little empirical evidence to suggest such a notion. Concerns related to the medium are two fold. Firstly, there is the simple displacement of other activities and, secondly, there is the structure and presentation of the information. Roberts and others question the validity of the displacement theory by noting a dearth of evidence showing that television viewing actually displaces any school related activities. Rather than school related activities being displaced Roberts and others suggest that generally only activities which are functionally similar are displaced. The authors also report that up to 30 percent of television viewing is done as a secondary activity. Rather than necessarily displace activities, for much of the time, television viewing is actually occurring in conjunction with other activities.

The distraction theory, like the displacement theory, is accompanied by a range of conflicting research evidence. The distraction theory suggests that students develop an intolerance to the pace of schooling due to the rapid pace of television. There is also the suggestion that students develop a sense of short term gratification as a result of passive attendance to television. Television tends to solve the problems readily, and thus engenders in students an unwillingness to work harder or persevere longer. Roberts and others (1993) contend that evidence supporting such a theory of television viewing is largely anecdotal, and is plagued by different conceptualisations of the term distraction. Previous studies have either been inconclusive or contradictory. Roberts and others suggest that despite the conventional wisdom of television being bad for students, there is little evidence to support such a stance. Correlations of television viewing and academic achievement have ranged from -0.40 to 0.30, however, when other factors such as student ability and socio-economic backgrounds are controlled, the television to achievement correlation falls to almost zero. The authors also suggest that research might look beyond the simple factor of television viewing, and explore underlying reasons as to why so much television viewing occurs. Perhaps it is the underlying reasons for television viewing that might better relate to academic performance.

2.12.3 Music

In an examination of another form of media, Smith (1990) asserted that time spent listening to music and radio would have a negative relationship with academic achievement. Coleman (1961) has stated that the music most adolescents listen to has an anti-academic, leisure orientation to it, giving Smith a basis for his assertion. Significant negative relationships were found between achievement and time spent listening to radio and music. It is unclear, however, whether this relationship exists because of other activities which are displaced, or the anti-academic orientation of the music, as claimed by Coleman. Beta press methods (Murray, 1938) were used in determining the use of mass media, where students self reported their use of mass media. These reports were given for two distinct sections or time slots. One time slot related to week-day time after school, from Monday through to Thursday, the other time slot related to weekend time, from Friday afternoon through to Sunday. The perception of such a division suggests that the impact of music is different for week-days to weekends.

2.12.4 Reading

Under the general concept of reading, one form of media examined by Smith (1990) was that of leisure reading. Leisure reading included books, papers or magazines not related to educational activities. No significant relationship between leisure reading and academic achievement was found, however, a slight positive correlation (beta weight of 0.08) between leisure reading and reading achievement was noted.

Reynolds and Walberg (1991) measured the effects of mass media by using two items. These items attempted to measure positive aspects of reading and asked whether six or more books had been read in a year, as well as whether a newspaper was read three or more times per week. The answers required were simple Yes/No responses. Reliabilities were given as 0.35 and 0.25 respectively and an overall positive effect size of 0.12 was reported. Similar findings were reported by Reynolds and Walberg using the same measures on a different student sample. Whilst the reliabilities of the measurement appears quite low, the effect size of such a changeable variable would be of some interest to educators. Given that the reading patterns of students is a factor that the schooling process can have some control over, any achievement gains that can be made are of interest.

2.12.5 Effect Sizes

Conducting a synthesis of 134 meta-analyses, Hattie (1992) found a similar effect size to that of Reynolds and Walberg (1991) reporting the negative effect of -0.12 of mass media. As the methods by which mass media was measured in the studies of these meta-analyses is unknown, little can be drawn from such a figure. It is of some value, however, to be aware that the broad concept of mass media generally has a negative effect on academic achievement and that that effect relates to approximately 0.12 of a standard deviation from a class mean score.

2.13 Summary

The review of literature has served to establish the frame of reference on which the study is based. The term Open Learning has been used in many different contexts and with a range of understandings. This review of literature has developed the historical roots of the concept of Open Learning and illustrated the path of development to the present situation. From this review of literature, the study has a concise construct in terms of Open Learning on which to address the research questions.

The construct of educational productivity has also been conceptualised. Again, the historical development of this construct has been illustrated. The development of theoretical models has been detailed, highlighting the developmental processes of Walberg's Educational Productivity Model.

Each of the factors detailed in Walberg's Educational Productivity Model have been conceptualised. The review of literature has developed concise constructs for each of the productivity factors. Each factor has been reviewed comprehensively, addressing both the broad educational concepts of each factor along with the historical development of such concepts. This process has resulted in the development of concise constructs aligned to each of the nine factors within the productivity model.

A clear understanding of the Open Learning environment and educational productivity has been developed. Concise constructs of the factors associated with educational productivity have been defined. Given such a clear understanding of the theoretical framework of the learning environment, educational productivity and the associated productivity factors, the study has been well placed to select or develop suitable instruments to validate the productivity model and address the productivity of the Open Learning environment.

3. RESEARCH DESIGN

3.1 Introduction

A main objective of this research study was to investigate salient factors that might impact on the educational productivity of an Open Learning environment. This study is a comparative research project which is essentially descriptive and correlational in nature. The research attempts to describe the current state of an educational process within a specific environment. The study does not posit an hypothesis about the learning environment, with consequent data and results supporting or disproving the hypothesis. Rather it attempts to describe the current situation, exploring factors that may impact on the learning process within the Open Learning environment. The study utilises both quantitative and qualitative data collection methods to develop a snapshot picture of the existing situation being investigated.

3.2 Walberg's Educational Productivity Model

The frame of reference by which different factors affecting the learning process can be measured is based on a widely researched and accepted model. Walberg's Model of Productivity (1981) serves as the basis of measurement for factors affecting the educational process. This model was selected as being suitable for the study for two distinct reasons. Firstly, the model has been widely used and referred to within recent research literature. Secondly, the model has been developed over an extended period of time, and is based on previous empirical educational research.

The Educational Productivity Model has been developed based on meta analyses of a wide range of research studies. The rigour of the model lies in the fact that it has been developed through statistical data analysis, based on hundreds of research studies and samples involving thousands of individual students. The model has the added advantage of being developed internationally, utilising data gathered from a range of countries. The model was seen as being well suited for the research of this current study.

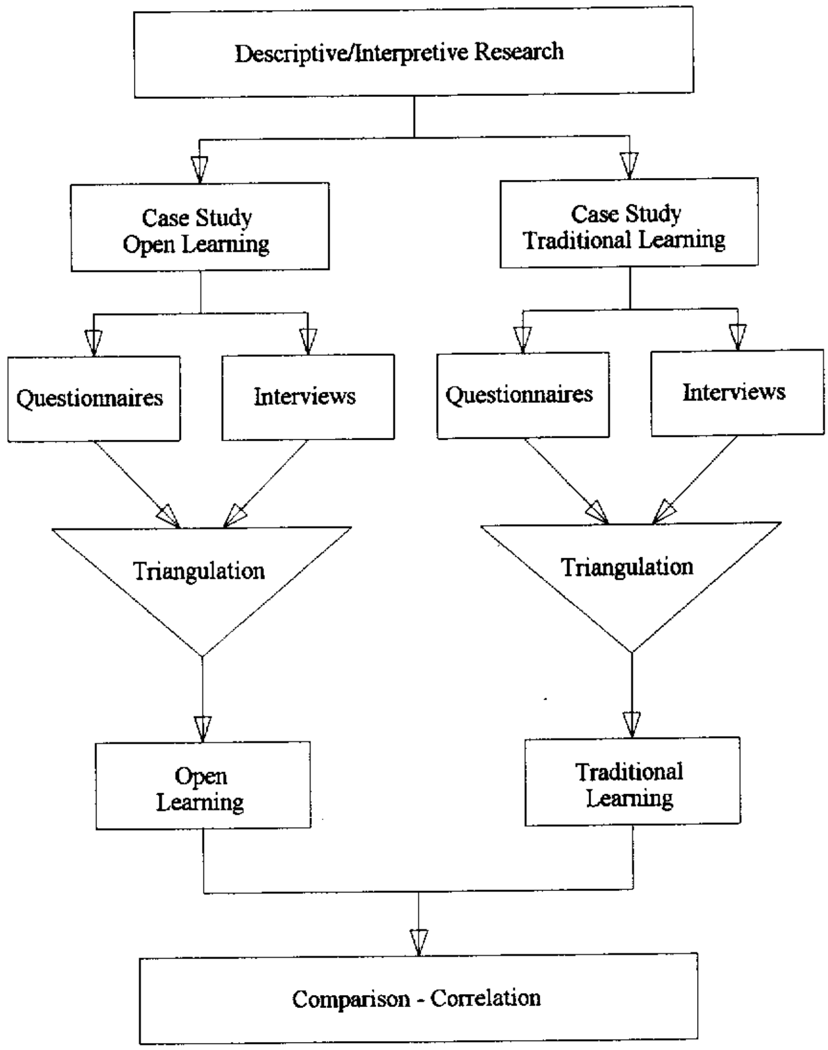


Figure 3.1: Research Design

A major task of this current study was to develop and validate suitable instruments for measuring each of the productivity factors. A limitation of the Educational Productivity Model is the fact that it is simply a model, it is not an instrument for collecting data. In order to utilise the model as a frame of reference, it was necessary to locate or develop suitable measuring instruments to measure the factors identified in the Educational Productivity Model. While examples of specific survey instruments utilising the Educational Productivity Model exist, the depth to which factors have been measured and suitable instruments developed appears to be somewhat shallow. A limited number of questions dealing with specific educational factors restricts a 'fine grained' use of the model.

In order to describe with a high degree of sensitivity the situation within a specific Open Learning environment, it was necessary to develop measuring instruments for a number of the productivity factors. Pilot testing of all developed or adapted instruments was seen as an imperative process by which the validation of the data collected could be improved. Given a developmental process that, firstly, presents a thoroughly researched basis on which to develop the instrument, and then a pilot testing program for instrument confirmation or refinement, it follows that the validity of the research should be strengthened. The use of survey questionnaires, based on the Educational Productivity Model, and the consequent statistical analysis constitutes the quantitative data collecting aspects of the research.

To further add to the validity, or confirmatory nature, of the research study, qualitative methods of data collection were also employed. Structured interviews were conducted, based on the nine educational productivity factors with consequent data providing results which are able to complement the quantitative data.

One research question probes for a measure of the effectiveness of the Open Learning environment. In order to gain a measure of effectiveness, it was deemed a basis of comparison would be appropriate. The Open Learning environment was, therefore, compared to a Traditional Learning environment. For this reason, the research study takes the form of a descriptive, comparative, dual case study. A case study of an Open Learning environment is presented, along with a case study of a Traditional Learning environment. Given that the two case studies are developed on a common frame of reference, namely Walberg's Educational Productivity Model, it follows that comparisons between the two environments can be readily made.

3.3 Sample

The sample of students were selected based on their course of study. Initial selection was based on courses that could be compared between the Open Learning environment and the Traditional Learning environment. An inspection of course offerings and student enrolments was conducted. The Diploma of Business Studies was being conducted in both learning environments and appeared to have a reasonable number of students enrolled for a suitable research study.

From discussions with college lecturing staff, and perusal of student enrolments, three distinct courses were selected under the umbrella of the Diploma of Business Studies. These courses have been referred to as courses A, B and C in the study. Table 3.1 below details the courses selected and the student profiles studying these courses. It can be seen that the study commenced with a total student pool of 103 available students. A total of 42 students actually completed all survey instruments.

Course Code	**Course**	**Available to Survey**			**Completed Survey**		
Open Learning		Female	Male	Total	Female	Male	Total
Course A	Associate Diploma of Business, Office and Secretarial Studies	21	1	22	3	0	3
Course B	Advanced Diploma of Business, Accounting	7	12	19	4	6	10
Course C	Associate Diploma of Business, Administration	5	5	10	2	2	4
			Total	51		Total	17
Traditional Learning		Female	Male	Total	Female	Male	Total
Course A	Associate Diploma of Business Office and Secretarial Studies	25	0	25	11	0	11
Course B	Advanced Diploma of Business Accounting	6	7	13	4	3	7
Course C	Associate Diploma of Business Administration	9	5	14	7	0	7
			Total	52		Total	25

Table 3. 1: Student Sample; Course of Study and Student Profile

3.4 Instrument Development: Walberg's Productivity Factors

As previously stated, measurement instruments used in this study were either developed by the researcher or adapted from previously validated instruments. Procedures undertaken to ensure that these instruments were valid measuring devices included the processes of pilot testing and instrument refinement. Each of the nine productivity factors were inspected individually and means by which they could most effectively be measured were established.

Given that an open learning campus may have quite different operating characteristics to those of a traditional campus, it was imperative that the means of data acquisition be suitable for such an environment. Within TAFE guidelines, students within the open learning environment are free to attend the campus at times that are most suitable to the student. Such a situation presents the researcher with a pool of students who come and go from the campus at will. Any survey instruments to be used with open learning students would need to accommodate such free movement, and be able to be administered to limited numbers of students with minimal time constraints.

The process of questionnaire construction involved research of the specific factor to develop a clear understanding of the constructs related to each specific factor. With a clear understanding of each factor, searches were conducted to locate instruments which might be suitable for the study. Existing instruments were either adopted, adapted or rejected, based on how sensitive they were to both the constructs being measured and the environment in which the measurement was taking place. The following sections detail the development of each of the measuring instruments.

3.4.1 The Factor of Ability: Scores Within the TAFE System

Most students entering TAFE courses enter through an admissions system known as the TAFE clearinghouse. As the admissions system is an attempt to select those students who are most likely to succeed in a given course, it is appropriate that this scoring method be referenced when comparing educational achievement. Also, given that the factor of ability in Walberg's productivity model is most closely related to previous academic achievement, it is pertinent that any comparative ability measure be largely based on previous academic achievement.

Selection criteria for student positions within the TAFE system is largely based on previous academic scores. The entrance score is allotted a maximum of 40 points, with up to 30 points being made up of the students previous academic performance, and up to 20 points being based on relevant work experience. Of the 30 points which are possible for academic performance, 20 points relate specifically to core subjects. The remaining ten points are scored as a result of other relevant accredited subjects, over and above those already selected for the initial academic score. It is possible for a student to score 20 points based on core academic performance, ten points on allied academic performance, and a further ten points based on relevant work experience. It is also possible that a student could score 20 points for academic performance and 20 points for relevant work experience. Whilst the total score can only be a maximum of 40 points, either situation includes a possible base score of 20 points for core academic performance.

It is also possible for either Australian or International students to enter the selected courses of study without going through the TAFE admissions system. For those students not passing through the admissions system, it was imperative that the means by which the factor of ability was being measured was comparable with students who had passed through the admissions system. Given that the base academic score for core subjects is consistent irrespective of how the overall score is calculated, this portion of the entrance score was utilised to determine the students' ability score. The maximum score for ability was therefore restricted to 20 points.

In the case of those students who pass through the TAFE admissions system, the ability score consists solely of the academic score, drawn from core academic subjects. In the case of students who do not pass through the admissions process, ability scores are able to be developed utilising the same criteria used for those students passing through the admissions system. Academic records of international students, however, must first be equated to

Australian academic achievement. Once equivalence of academic achievement had been established, comparable ability scores can also be developed. Therefore, irrespective of the means by which students enter TAFE courses of study, utilising previous academic records it is possible to develop a comparable score for ability.

3.4.2 The Factor of Cognitive Development: Selection of Measurement Instrument

Tobin and Capie (1981) assert that formal reasoning ability is an important mediator of cognitive achievement. Tobin and Capie highlight the implications of formal reasoning to the design of curriculum, where materials and instruction should be matched to the cognitive development of students. Emphasis is also given to the need for the development of formal reasoning abilities to be fostered. The authors suggest that many adults and adolescents are limited in their ability to use formal modes of reasoning.

Once aware of the impact of cognitive development, if educational progress is to be made, it is essential that reliable instruments be developed for measuring factors relating to cognitive development. In developing a pencil and paper test, Tobin and Capie (1981) reflected on the need to be sensitive to the reasons why students develop or select particular responses to given tasks. The Test of Logical Thinking (TOLT) was developed to group test students for formal operations, as well as have students justify their answers. The resulting test contained ten items, with two items testing each of five sub-categories of formal reasoning. These sub-categories were labelled as; controlling variables, proportional reasoning, combinational reasoning, probabilistic reasoning, and correlational reasoning.

The structure of the test paper (see Appendix A.1) gave multiple choice options for the answer to the task, along with a multiple choice justification as to why a particular answer was selected. On question asks how many glasses of juice will be made from six oranges, if six glasses of juice are made from four oranges? Five alternative answers are listed, in terms of 7, 8, 9, 10 glasses of juice or none of the above. Five justifications for the response are listed with a range of reasons as to how the answer has been selected.

The paper was tested across students ranging from grade six through to college students. An alpha reliability of 0.85 was reported for the test. A factor analysis of the test showed that the five sub-categories detailed were all contributing to the one underlying factor. A correlation coefficient of 0.8 was reported between the TOLT and interview scores, suggesting the criterion validity of the paper to be quite high. Given the range of students (n = 682) on which the paper was tested, and the high reliability and validity reported, the paper was seen as an obvious selection for the purposes of this thesis.

3.4.3 The Factor of Motivation: Questionnaire Construction

From the review of research literature, insights into the construct of motivation, as it relates to education, may be gained. Given such insights, common themes or factors of motivation may be identified. This identification can occur in either of two ways. First, the reader can simply peruse the literature and identify commonalities, second the reader can survey research studies and identify common themes as used by research scholars. By adopting both of these methods, and identifying the commonalities that emerge, a sound basis for instrument selection is formed.

Following this process, two motivational measurement instruments were closely examined. The Academic Motivation Scale (Vallerand, et al., 1993) and the Motivated Strategies for Learning Questionnaire (Pintrich & De Groot, 1990) were seen to be suitable for the purposes of this study. Both instruments reported high reliability coefficients and had strong face validity. Based on the review of motivational research, the wider scope of the MSLQ made this the preferred instrument. Not only did this instrument measure the widely recognised constructs of self-efficacy and intrinsic motivation, it also measured the higher cognitive processes of self-regulation and cognitive strategies.

There are 44 items in this self report questionnaire, spread over five different sub-categories. Alterations to the original questionnaire have been made by the researcher. Whilst the stem of each question remains unchanged, the way in which the question is asked has been reversed for almost half of the items. Questions written in the reverse mode are given a negative weighting. The order in which the items appear in the questionnaire has also been altered by the researcher.

The items are evenly distributed throughout the questionnaire, with no questions of the same sub-category clustered together. An example of this preliminary questionnaire appears in Appendix A.2.

Coding is provided to detail the weighting of the item as well as the sub-category which the item is addressing. Codes were detailed as follows; A = Self Efficacy, B = Intrinsic Motivation, C = Test Anxiety, D = Cognitive Strategy Use, E = Self Regulation.

3.4.3.1 Pilot of Motivation Questionnaire

The 44 item questionnaire was pilot tested on a range of students from two TAFE campuses. One of these campuses was an open learning environment, whilst the other conducted classes in a more traditional manner. A total of 17 cases were received for statistical analysis. Using the statistical package Lertap (Nelson, 1985), initial alpha reliabilities of 0.950 were recorded. Whilst the reliability was an encouraging result, the number of items was of major concern. Given that students would be subject to a relatively large number of questionnaires, one survey instrument for each of the nine productivity factors, attempts were undertaken to limit the number of items on this survey questionnaire. Through the use of inter-correlations of the individual items the highest correlating items of each of the five factors previously detailed were able to be identified.

Three items were selected for each of the factors, with the exception of test anxiety. In this factor only two of the available four items had correlations above 0.4, whilst correlations below 0.1 were recorded for the other two items. The original 44 item questionnaire was consequently refined to include only 14 items. Given the reduced number of questionnaire items, further factor analyses were discarded. The questionnaire was adopted utilising the five factors previously identified.

The refined questionnaire returned an alpha reliability of 0.953, and even though pilot testing was limited by the number of cases, it was considered that the questionnaire would return reliable data. An example of the refined questionnaire appears in Appendix B. One question related to the subcategory of self efficacy reads; *"compared to other students in this class, I don't expect to do very well"*. A question related to the sub-category of intrinsic motivation reads; *"it is important for me to learn what is being taught in this subject"*.

3.4.4 The Factor of Quantity: Questionnaire Construction

From the review of current literature based on the quantity of education, four methods of data collection were evident. Data could be collected by observation techniques, self report mechanisms, collation of the available time or the number of related course undertaken.

In light of the operation of an open learning campus, the observational methods were rejected. As students conduct the learning at times and that suit their individual needs, the resources required to observe individual students would be enormous. Such a requirement would be exacerbated if the findings of Fitz-Gibbon and Clark (1982) are considered. They suggest that at least eight separate observation periods be undertaken for a length of at least 30 minutes each observation. Such an undertaking in an open learning environment may have required a total of four hours observation for every student within the research project. Good and Brophy (1987) assert that such observational techniques are questionable, as it can be extremely difficult to determine whether a student is actually engaged in the learning process or not. As a result, the observational technique may not be an effective measurement of time spent learning. Classroom observations were also rejected as a data gathering method because of the inherent characteristics of the open learning environment. Given that students might attend at the campus at any time within the campus opening hours, it is highly unlikely that a 'classroom' situation would exist for any extended period.

Although both Horn and Walberg (1984) and Walberg (1991) utilised the total number of relevant courses completed, both studies acknowledged that this measurement was a relatively crude method of measurement. It is probable that this approach may be well suited where a history of relevant and recently completed courses exist. In the case of the students being surveyed in this research project, however, many of the students being surveyed are at the beginning of a post compulsory course. It is questionable as to how closely the courses completed at high school reflect the quantity of education with respect to the new course undertaken by the students. Consequently, the number of courses completed was seen not to be a viable option for data gathering of quantity of education.

With respect to the collation of time as a data gathering method, such rigid measures as years of schooling, days per year, hours per day and minutes, do not reflect the time management patterns utilised in an open learning environment. As previously discussed, the open learning environment is an extremely flexible environment. The actual time that individual students attend the college may be radically different for the same course being completed. Not only the amount of time that a student requires, or utilises, when completing a course may vary, but the amount of work the student completes at the campus may also vary. Different students studying in an open learning environment may in fact complete much of their course external to the campus. The measures of summing allocated time provided for the course, in the case of an open learning environment would not be sensitive to the particular characteristics of the learning environment.

After careful consideration of the possible data gathering methods, the only method that appeared both relevant and useable was that of self report mechanisms. Students were thus surveyed in an attempt to gain a measure of the quantity of time spent learning the material in their courses.

A survey questionnaire was constructed in preparation for pilot testing. Guidelines in the construction of the questionnaire required that it be equally relevant for both an open learning environment as well as the more traditional learning environment. An example of the original questionnaire appears in Appendix A.4. As can be seen, the first five questions relate to hard quantity data, such as the number of hours of set homework completed. Average quantities for a full week were elicited on the survey questionnaire. This value seemed most appropriate to allow for the flexibility of the open learning environment. To reflect on the quantity relevant to one day may not have accounted for the different working routines within an open learning environment. It also would appear to be reasonable to expect students to have a weekly routine, as opposed to a daily or monthly routine, especially so for those studying in an open learning environment. As a result of such assumptions, quantities of time devoted to learning were sought based on average weekly occurrences. Quantities were collated in terms of total hours allocated to the module, weekly hours allocated to the module, weekly hours spent engaged and on task, weekly hours engaged over and above allocated hours for assigned work, weekly hours completing additional work.

Methods utilised by Uguroglu and Walberg (1986) were replicated in the remaining 12 questions of the survey questionnaire. Items selected for this portion of the questionnaire were based on the basic constructs identified in the questionnaire used by Uguroglu and Walberg. Essentially, the questionnaire attempted to measure the degree to which students were focussed on their work and the extent to which students wasted time. The wasted time component was seen to come from two possible sources. The first source related to a lack of availability of the material resources in the learning environment, the other source related to the individual learning characteristics of the students. A total of 13 items were developed and arranged in a random order of appearance. The questions were structured utilising a Likert scale for student responses. An example of a question reads: *"when working on this module, I am concentrating on the material almost all of the time"*.

3.4.4.1 Pilot of Quantity Questionnaire

The survey instrument was administered to students in both a traditional environment and an open learning environment. A total of 17 cases were returned for initial statistical analysis of the instrument. The statistical analysis of the instrument was conducted utilising the computer program Lertap (Nelson, 1985). Initial analysis returned an alpha reliability from the survey of 0.78, which would be suitable for the reliable gathering of data. Closer inspection of inter item correlations highlighted two items with poor correlations, namely item six and item ten (see appendix A.4). These items were inspected for their face validity. Item six related to whether a set timetable was followed, and did not appear to be essential for the purposes of the instrument. Item ten asked whether the student worked efficiently when studying, and may have been too subjective to give a reliable response. Both items were removed from the questionnaire results and a further analysis completed. The alpha reliability of the instrument without items six and ten improved to 0.82, with scores following a bell curve distribution pattern. A sample of the refined questionnaire also appears in Appendix A.5.

3.4.5 The Factor of Quality: Questionnaire Construction

A total of 15 research studies were identified as contributing to the overall construction of a questionnaire measuring the productivity of quality. A list of these studies is contained in Table 3.2 below. From these research studies, a total of 52 individual factors related to educational quality were identified. Through the construction of a matrix, the most regularly used factors were highlighted. The research studies that were included in the matrix were coded as follows:

Code	Research Study	Code	Research Study
1.	R. Rymhs, D. Allston and L. Schulz; 1993	9.	R. M. Giaconia and L. V. Hedges; 1982
2.	A. Helmke and F. W. Schrader; 1987	10.	A. Helmke, W. Schneider and F. E. Weinert; 1986
3.	C. Giuli, M. Troy and R. Calkins; 1987	11.	H. J. Walberg and G. D. Haertel; 1992
4.	J. Hattie; 1993	12.	B. J. Fraser, H. J. Walberg, W. W. Welch and J. A. Hattie; 1987
5.	A. C. Ornstein; 1987	13.	J. A. Parkerson, R. G. Lomax, D. P. Schiller and H. J. Walberg; 1984
6.	R. S. Lysakowski and H. J. Walberg; 1981	14.	H. J. Walberg, B. J. Fraser and W. W. Welch; 1986
7.	A. Maggs and G. Morgan; 1986	15.	B. V. Rosenshine; 1986
8.	E. H. Mory, 1992		

Table 3. 2: The Factor of Quality; Matrix of Research Studies

From the research studies listed above, the matrix contained in Table 3.3 below was developed to highlight the use of different sub-categories within the factor of quality.

From the 52 items contained in the matrix, a total of 30 were identified as being valid to the current study. Initial selection was based on the number of times an item had been used in previous studies. Any item that had been used by two or more different studies was inspected for suitability. In this matrix all of these items were deemed suitable, accounting for fifteen of the questions used in the initial questionnaire. Further analysis was conducted of the individual items that had been used only once by the selected research studies.

	Factors Measured	Research Study														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Sequentially planned & prepared	X									X			X		
2	Resources and equipment available	X														
3	Individual learning needs	X								X	X					
4	Task ability match	X	X	X		X				X						
5	Variety of activities	X												X		
6	Stated objectives	X														X
7	Reinforcement	X			X		X						X	X		
8	Reinforcement sub scales	X					X									
9	Relevance	X														
10	Class room management	X		X												
11	Displays students' work	X														
12	Questioning technique	X														X
13	Clear expectations	X				X										
14	Listens to students	X														
15	Reviews	X		X										X		
16	Appropriate Language	X		X												
17	Mutual respect student/teacher	X														
18	Positive peer support	X														
19	Fair & meaningful assessment	X														
20	Feedback	X		X	X	X			X				X	X		X
21	Adaptive teaching		X													
22	Diagnostic skills of teacher		X													
23	Quality of execution of teaching strategies			X												
24	Program experience			X												
25	Peer tutoring				X											
26	Mastery Learning				X											
27	Homework	X			X	X								X		
28	Weekly testing					X										
29	Clear objectives			X		X										
30	Feedback - Wrong/blank							X								
31	Student centred									X						
32	Evaluation to guide instruction									X						
33	Materials to manipulate									X						
34	Individualised instruction									X			X			
35	No grading of classes									X						
36	Open space									X						
37	Team teaching									X						
38	Student attitude to teacher			X										X		
39	Restating			X								X				
40	Summarising			X												
41	Frequent assessment			X												
42	Comprehensible organisation of material			X												
43	Clear explanations											X		X		X
44	Self concept											X				
45	Extra help when needed											X				
46	Reading training												X			
47	Work is checked												X			X
48	Though provoking assignments												X			
49	Dollars in student budget														X	
50	Opportunity to practice															X
51	Examples			X												
52	Small manageable chunks			X												

Table 3. 3: The Factor of Quality; Matrix of Salient Components

Fifteen more items were further identified and deemed suitable. From the overall 30 items that were selected, a total of 35 questions were constructed. Guidelines for the selection of items and consequent construction of questions were as follows:

- questions were to be suitable for both an open learning environment and a traditional learning environment.
- responses were to be solely from students
- questions were to be related to the vocational training environment
- questions were to be relevant for the post-compulsory student cohort
- questions were to have face validity

From the above procedures a 35 item questionnaire was constructed. There were 26 positively weighted questions and nine negatively weighted questions. The questionnaire, as constructed, appears in Appendix A.6. A typical question is "The materials and equipment required for this course are readily available".

3.4.5.1 Pilot of Quality Questionnaire

The prepared questionnaire was piloted at two different TAFE colleges, one an open learning college, and the other operating under a more traditional mode of instruction. A total of 21 cases were subjected to statistical analysis. Using the statistical package Lertap, alpha reliability of the questionnaire was found to be 0.92, although a number of items had internal correlations of 0.3 or less. The questionnaire was consequently reduced to 25 items, based on an inspection of the questions, especially those with poor correlations. The revised 25 item questionnaire produced a marginally increased alpha reliability of 0.94, but did so with no items having internal correlations below 0.3, and only three items with internal correlations of 0.5 or less. A factor analysis, utilising the statistical package SPSS (Norusis, 1993) of the 25 items highlighted 8 factors, which were identified as Specific Teaching Strategies, Student Comfort, Quality of Teaching, Student Needs, Administration, Workload, Relevance, and Student Effort. A brief description of the sub-categories, along with the relevant item numbers appears in Table 3.4 below. Highlighted in the table are the correlation coefficients derived from the factor analysis. An example of the refined questionnaire is found in Appendix A.7.

No	Factor	Factor Description	Item No	Corr. Coeff.
1	Specific Teaching Strategies	Review, feedback, assessment and homework	2	.9323
			12	.9022
			19	.8483
			20	.8744
			27	.5234
2	Student Comfort	Student understanding, personal needs, respect and cooperation	10	.6926
			21	.8954
			31	.7421
			33	.6564
3	Quality of Teaching	Praise for achievement, administration of courses, marking homework, clear goals and ample practise time	8	.6255
			18	.6757
			24	.7299
			26	.6174
			30	.8555
4	Student Needs	Student understanding, activities and needs	9	.6228
			29	.8327
			35	.7149
5	Administration	Available materials, competent teaching staff	1	.7689
			23	.9325
6	Workload	Coping with workloads and time constraints, and pleasure derived	7	.7624
			28	.8762
			34	.6972
7	Relevance	Evoking student thought	6	.9011
			16	.8245
8	Student Effort	Amount of effort expended	15	.9061

Table 3. 4: The Factor of Quality; Description of Salient Quality Factors

The first column represents the item number, with the second column being the actual question. The third column is the Likert scale used for responses, whilst the fourth column is the reference related to the original 52 item matrix used. The fifth column indicates the weighting of the question.

3.4.6 The Factor of Home Environment: Questionnaire Construction

An historical perspective of the research literature related to home environments had been obtained through a literature search of monographs, journals and dissertations. From the literature, nine basic sub-categories of home environment were identified. The first sub-category is Socio-Economic Status (SES), and it was derived from measures of parental education, occupation and income. Family Structure (FS) was measured through the adult make-up of family unit, along with the number, order and spacing of children in the family. British School Aspirations (BSA) was a measure of parents' aspirations for the child's education and eventual occupational pursuits. British School Material (BSM), was a measure of the material resources in the home. Chicago School Social Psychological Processes (SPP), were a measure of the behavioural processes that occurred within the home environment. Student Aspirations (SA), relate to the student's aspirations relative to education and occupation. Getting By (GB) was a measure of the attitudinal home environment, typified by enjoyment of experiences with an absence of achievement orientation. Getting Ahead (GA) was the converse measure of attitudinal home environment, typified by a high achievement orientation. Ethnicity (E) was a measure of the cultural background of the family, noting the ethnic background of parents and the child. These nine sub-categories were spread over the three broad categories relating to the father (17 items), the mother (17 items) and general home environment (27 items).

An example of the structure of the questions used in the initial questionnaire appears in Appendix A.8. The number of items used to measure each of the nine sub-categories of the home environment appears in Table 3.5 below.

	Sub-categories	Abbr.	No of Items
1	Socio-Economic Status	SES	6
2	Family Structure	FS	4
3	British School Aspirations	BSA	8
4	British School Material	BSM	7
5	Chicago School Social Psychological Processes	SPP	20
6	Student Aspirations	SA	3
7	Getting By	GB	3
8	Getting Ahead	GA	3
9	Ethnicity	E	7

Table 3. 5: The Factor of Home Environment: Identification of Sub-Categories

3.4.6.1 Pilot of the Home Environment Questionnaire

The questionnaire was administered to students at both an open learning college and a college delivering programs in a more conventional manner. A total of 24 responses were received for initial analysis. While the results from the pilot study returned an alpha reliability of 0.81, attempts were made to reduce the number of items on the questionnaire. If the number of items could be reduced, whilst maintaining the integrity of the questionnaire, a much more useable survey instrument would result. Given that survey recipients were to complete eight questionnaires, the more concise the questionnaire could be, with a minimal impact on the recipients time, the greater chance of reliable data emerging from the study.

The results of the pilot test returned alpha reliabilities of 0.81 for items in the section related to fathers, 0.72 for items in the section related to mothers and 0.55 for items in the general section. Perusal of the questionnaire's lowest correlating items highlighted a number of items that could readily be disregarded. Not all low correlating items could be removed, however, as some of the items appeared to be central to the themes of the dimensions being measured. It was also decided to keep the sections related to fathers and mothers identical, even though pilot results were markedly different. In these above instances, the reliability of the questionnaire was compromised to some extent, however, the face validity of the instrument was maintained. After completing the process of elimination, the subsequent alpha reliabilities of the different sections were 0.80 for fathers. 0.69 for mothers and 0.72 for the general section. The overall alpha reliability of the total questionnaire was 0.82 after refinement. The refined questionnaire was reduced to 50 items. The nine sub-categories originally identified were reduced to eight. The sub-category of student aspirations appeared to have very little correlation with the overall instrument (0.14, -0.04, -0.2), and when isolated, the three items of this sub-category had very low correlations with each other (0.05, -0.08, -0.2). The number of items related to each sub-category in the refined questionnaire appears below (see Table 3.6).

	Sub-Categories	**Abbr.**	**No of Items**
1	Socio-Economic Status	SES	6
2	Family Structure	FS	1
3	British School Aspirations	BSA	6
4	British School Material	BSM	7
5	Chicago School Social Psychological Processes	SPP	18
6	Student Aspirations	SA	0
7	Getting By	GB	3
8	Getting Ahead	GA	2
9	Ethnicity	E	7

Table 3. 6: The Factor of Home Environment: Items for Each Sub-Category

3.4.7 The Factor of Classroom Environment: Questionnaire Construction

One of the basic uses of the learning environment instrument employed in this study, is to give insights into the individual student's perceptions of the learning environment. As the open learning environment is, to a large extent, an individual learning environment, it is important that any instrument be sensitive to this factor. As Fraser and Tobin (1991) inform us, most existing classroom environment measures fail to identify differences between individual students or sub-groups within classes. There is a need for a classroom environment questionnaire to give insights into the environment of an open learning 'classroom' within a vocational education setting. A search of the current literature revealed that no such instrument was available, hence steps were undertaken to develop an instrument that would be sensitive to the vocational education learning environment, both in a traditional and an open learning mode. The development of any instrument, be it completely new or simply an adaptation of an existing one, should be founded on the underpinning theory related to the construct or dimensions to be measured. Given an understanding of the theoretical base, a researcher is better placed to examine existing instruments and determine suitability of instruments or components of them. The following is a brief outline of the development of classroom environmental research.

Based on the previous theoretical understanding of classroom environments, two existing measurement instruments appeared to be suited to the research. The instruments were the Individualised Environment Classroom Questionnaire (IECQ) (Fraser, 1985) and the Computer Classroom Environment Inventory (CCEI) (Maor, 1993). The former instrument was designed to be administered in areas of individualised instruction including open and inquiry-based learning. The CCEI was designed to be used in inquiry-based learning environments which included the use of computers. Neither of these instruments related directly to the TAFE open learning environment. Consequently, a wider search of other likely classroom environment instruments was undertaken.

In order to determine whether an instrument was suitable for the open learning environment, it was imperative to first determine the salient factors of the open learning classroom setting within the TAFE sector. A review of the current literature on open learning (Giaconia & Hedges, 1982; Lewis, 1986; Aumann, 1992; Mitchell, 1992; Johnson, 1992; Kleinschafer 1992; Rowntree, 1992) identified four salient factors related specifically to the open learning environment. The first factor was that of student centredness. Student centredness related to the flexibility of a course, and its capacity to suit the individual needs of a student. The second factor was the concept of packaged learning. Research suggests that learning materials in an open learning environment should be well designed for independent learning and be contained in stand alone packages or modules. The third factor identified was that of system support, which related to the availability of support mechanisms for both the course and content discussion. The last factor identified was that of student control, which reflected the extent to which students control the learning process. The aspect of student centredness is similar to the sub-category of Personalisation in the ICEQ (Fraser, 1985) however, the ICEQ deals more with the personal relationship between the teacher and the student, whereas the concept of student centredness in an open learning environment relates to the degree that a course facilitates an individual focus for different students. The concept of student control is similar to the sub-category of Independence in the ICEQ, however, the ICEQ relates all independence items to the teacher. In the open learning environment, the teacher is not the central figure as suggested by the ICEQ. Students only utilise a teacher (more frequently referred to as a facilitator of learning) only when required by the students.

A matrix of widely used classroom environment instruments, or instruments less widely recognised but more suited to this particular study, was constructed (see Table 3.7). Each instrument is coded numerically so that it can be cross-referenced with the matrix. The salient factors related to the vocational education open learning environment were also included within the matrix and coded as number nine in the matrix. Research studies conducted by Walberg, Fraser and Welch (1986) and Uguroglu and Walberg (1986) also contained questionnaire items relevant to this study. Although these items were not contained in a recognised questionnaire, they appeared to be relevant to the study and hence were added to the matrix. A total of 11 sources of information for the selection of questionnaire items was collated.

Code	Instrument	Research Studies
1	Individualised Classroom Environment Questionnaire.	Fraser, 1985
2	Computer Classroom Environment Inventory.	Maor, 1993
3	Learning Environment Inventory.	Fraser, Anderson, & Walberg, 1982
4	Classroom Environment Scale.	Moos & Trickett, 1974
5	My Class Inventory.	Fraser, et al., 1982
6	College and University Classroom Environment Inventory.	Fraser, Treagust, & Dennis, 1984
7	Questionnaire on Teacher Interaction.	Wubbels, Brekelmans, & Hooymayers, 1991
8	Science Laboratory Environment Inventory.	Fraser, et al., 1993
9	Factors considered essential for an Open Learning environment.	Developed list by author
10	Study considered worthy of inclusion.	Walberg, Fraser and Welch, 1986
11	Study considered worthy of inclusion.	Uguroglu and Walberg, 1986

Table 3. 7: The Factor of Classroom Environment; Measurement Instruments

From the instruments and studies shown in Table 3.7, a total of 47 descriptions for different sub scales of instruments were categorised, including the new categories identified relevant for the open learning environment. These descriptors were used to form a matrix, see Table 3.8, from which fundamental classroom environment scales were identified. Selection for these sub-categories was based both on the wide use of an item and the apparent face validity of the item with respect to the open learning environment. Those factors previously identified as being central to an open learning environment were also included. From the matrix in Table 3.8, an instrument was developed which consisted of 15 sub-categories. The sub-categories identified were Cohesiveness, Comfort, Competitiveness, Formality, Friction, Innovation, Involvement, Material Environment, Order Organisation, Packaged Learning, Satisfaction, Student Centredness, Student Control, System Support and Task Orientation. Three items were developed to measure each of the 15 sub-categories. These items were either drawn from the existing studies, adapted to more closely reflect the selected sub-category, or constructed as a completely new item.

A total of 45 items were collated to form a new classroom environment questionnaire. A copy of this questionnaire appears in Appendix A.10. Of the 45 items used, 27 were constructed and weighted positively, while 18 were constructed and weighted negatively. The placement of negatively and positively weighted items was randomly distributed throughout the questionnaire. As can be seen in Appendix A.10, the items were ordered such that one item from each sub-category appeared in a given order, followed by the second item of each sub-category appearing in the same order, and the same for the third item of each sub-category. Items from sub-category number one were listed as questions 1, 16, and 31, where items for sub-category number two were listed as questions 2, 17, and 32. Appendix A.11 includes a list of all of the items collated into the sub-categories which they are being used to measure.

The development of the new questionnaire, therefore, followed a widely used procedure. First, dimensions of human environments were identified, followed by the identification of the salient factors specifically related to the open learning environment. Categories of the classroom environment to be researched were identified by studying existing classroom environment instruments. A questionnaire was constructed, with the final structure being checked to ensure that an acceptable range of the salient factors relating to the specific environment had been included. The number of items was reduced to the minimum for ease of administration and all items were constructed for ease of computer scoring. Having completed the above procedure, it is reasonable to expect the constructed instrument to measure what it attests to measure with an acceptable degree of reliability.

Factor Description	Code for Survey Instrument										
	1	2	3	4	5	6	7	8	9	10	11
Personalisation	x			x							
Involvement	x		x	x							x
Student Cohesiveness	x	x			x		x	x			
Satisfaction	x	x			x			x			x
Task Orientation	x		x								
Innovation	x		x								
Individualisation	x								x		
Friction		x			x						
Difficulty		x			x						
Competitiveness		x	x		x						
Affiliation			x								
Teacher Support			x								
Order & Organisation			x		x			x			
Rule Clarity			x				x				
Teacher Control			x								
Independence			x								x
Investigation				x				x			
Differentiation				x							
Diversity					x						
Speed					x						
Material Environment					x		x	x			
Goal Orientation					x						
Favouritism					x						
Apathy					x						
Democracy					x						
Cliqueness					x						
Disorganisation					x						
Leadership						x					
Helpful or Friendly						x					
Understanding						x					
Responsibility						x			x		
Uncertain						x					
Dissatisfied						x					
Admonishing						x					
Strict						x					
Open Endedness							x	x			
Integration							x				
Packages									x		
Teacher Time									x		
Support									x		
Uncomfortable	x									x	
Curios										x	
Stupid										x	
Confident										x	
Successful										x	
Unhappy	x									x	
Range of Media									x		

Code for Survey Instruments

1 Individualised Classroom Environment Questionnaire.
2 Computer Classroom Environment Inventory.
3 Learning Environment Inventory.
4 Classroom Environment Scale.
5 My Class Inventory.
6 College and University Classroom Environment Inventory.
7 Questionnaire on Teacher Interaction.
8 Science Laboratory Environment Inventory.
9 Factors considered essential for an Open Learning environment.
10 Study considered worthy of inclusion (Walberg, Fraser & Welch, 1986)
11 Study considered worthy of inclusion (Uguroglu & Walberg, 1986)

Table 3. 8: The Factor of Classroom Environment: Identification of the Salient Variables

3.4.7.1 Pilot of Classroom Environment Questionnaire

The questionnaire, as originally constructed, was pilot tested at two TAFE campuses. One of these campus operated on an open learning basis, whilst the other campus operated utilising traditional teaching methods. A total of 18 cases were returned for preliminary analysis. The computer package Lertap was used to conduct a statistical analysis of the pilot data. An alpha reliability of 0.89 was obtained for the questionnaire, indicating that the survey instrument was reliable. The length of the questionnaire was of concern, so attempts were made to rationalise the original questionnaire, while retaining the integrity of the instrument.

A factor analysis of the instrument, utilising the statistical package SPSS (Norusis, 1993) was conducted to investigate whether the 15 sub-categories identified were in fact separate factors, or simply components of higher factors. The factor analysis did not differentiate the 15 sub-categories as separate factors. In one of the factors identified by the factor analysis, eight of the original sub-categories were contained. Two other factors contained two sub-categories each. As previous research had identified the 15 sub-categories as being the most salient items for measuring classroom environments, in terms of face validity, it would be imperative that all of these items be measured. As the items are not necessarily separate factors, however, it would not be imperative that each of the 15 sub-categories be measured by three separate items.

Initial correctional data was examined to highlight the two items of each sub-category with the highest internal correlations to the overall questionnaire. A total of 30 items were selected and checked for reliability. Alpha reliability of 0.92 was returned for this modified questionnaire. The questionnaire was consequently revised, and reduced to contain only thirty items. The pilot testing process appeared to reinforce what previous research had found regarding classroom environments. The questionnaire that resulted from the pilot testing procedure appeared to be administratively acceptable, whilst offering both face validity and measurement reliability. An example of the refined questionnaire appears in Appendix A.12.

3.4.8 The Factor of Peer Influence: Questionnaire Construction

Construction of the survey questionnaire has come from four distinct sections, or areas, of peer influence. The first section relates to the student's interaction disposition, which is a current measure attempting to determine the extent to which a student interacts with classroom peers. Items used in this section have been adapted from a study by Uguroglu and Walberg (1986). The second section of the questionnaire relates to students' retrospective accounts of peers when in high school. A quantitative synthesis by Ide, Parkerson, Haertel and Walberg (1981) identified several studies that utilised students' retrospective accounts of their educational and occupational aspirations when in high school. Williams (1972) along with Hanks and Eckland (1976) extended these retrospective accounts to include students' perceptions of the educational and occupational aspirations of their best friend and their peers in general. Comparisons are thus able to be made between individual student's aspirations and the aspirations of the student's peers, with possible relationships regarding the influences of peers emerging. The third section of the questionnaire relates to the influence that peers might have on students, simply as a result of the activities undertaken. Retrospective accounts were used by Hanks and Eckland, to determine the types and amount of extra curricular activities undertaken by students when in high school. The final section of the questionnaire attempts to measure the degree to which a student tends to conform to the wishes of peers as opposed to undertaking self desired activities. Berndt (1979) and later Brown, Clasen and Eicher (1986a) operationalised peer influence in terms of conformity dispositions. While both studies identified three types of peer conformity, namely antisocial conformity, neutral conformity and pro social conformity, both studies reported low reliabilities for the latter two factors. As a result of such previous results, this questionnaire only includes items related to antisocial activities. Previous studies reported reliabilities in the order of 0.8 for this factor. An example of the initial questionnaire developed for pilot testing appears in Appendix A.13.

3.4.8.1 Pilot of Peer Influence Questionnaire

The questionnaire was pilot tested by surveying students at both an open learning TAFE campus and a campus operating under a more traditional mode of delivery. A total of 20 survey questionnaires were completed. As previously mentioned, the questionnaire covered four distinct areas, namely Peer Interaction, Aspirations, Extra-Curricular Activities and Peer Conformity.

The statistical package Lertap was utilised to analyse the results of the questionnaire. The initial alpha reliability of the questionnaire was shown to be 0.73. Whilst this value would generally be acceptable for a measurement instrument, attempts were undertaken to reduce the number of items within the questionnaire. The most efficient questionnaire, from an administrative perspective, would be one with the least amount of items. Whilst maintaining the integrity of the questionnaire, individual items were inspected, both within the entire questionnaire and within the respective groups making up the questionnaire. As a result of this process, the total questionnaire was reduced from 32 items to 21 items. Four items were used to determine the peer interaction of the respondent. These items had an alpha reliability of 0.81 when treated separately. The group named Aspirations had a total of eight items, which returned an alpha reliability of 0.93 when treated separately. Five items were maintained for the grouping of Extra-Curricula. The alpha reliability of this group was 0.87 when treated separately. Finally, the group of Peer Conformity was reduced to two items, returning an alpha reliability of 0.81 when treated separately. When the grouped items were combined, the total 21 items returned an alpha reliability of 0.72, slightly lower than the original questionnaire. Whilst the reliability has been lowered as a result of optimising the questionnaire, the reduction is minimal, with a more efficient survey tool resulting.

3.4.9 The Factor of Mass Media: Questionnaire Construction

Given a review of the research literature focused on the effects of mass media on educational achievement, a foundation on which to develop a survey instrument is formed. Based on the research literature reviewed, a survey questionnaire has been developed. A copy of the 19 item instrument is contained in Appendix A.15.

From previous research on the educational effects of mass media, it can be seen that the dominant form of media studied has been television viewing, with one of the strongest hypotheses suggesting that television largely displaces other more educationally sound activities. The questionnaire developed for this research is designed to determine the total amount of television viewing that occurs, but then differentiate different forms of viewing. Firstly, it would appear that television viewing during the week-days is more likely to displace school related activities than television viewing during the weekend, which might largely be considered a legitimate leisure activity. If television viewing is occurring as a legitimate leisure activity, according to the research on the displacement hypothesis, it is more likely to be displacing functionally similar leisure activities, rather than be displacing more academic or school related activities. Secondly, the effects of television viewing may be minimal when undertaken as a secondary activity. Items 1, 2, 17 and 18 of the questionnaire all attempt to measure the various aspects of television viewing mentioned.

A similar activity to television, but much less researched, is that of listening to radio or music. Items 3, 4, 17 and 19 of the survey questionnaire were designed to measure the amount of radio or music that is undertaken, both as a primary and secondary activity. These items attempt to measure both the total amount of this form of media, along with an insight as to how much displacement might occur and how much might simply be of a secondary nature.

Other forms of mass media which are undertaken as activities are measured on a Likert scale. These forms of mass media include newspapers, magazines, school related material, books, computers and movies. These forms of media may be perceived to have either positive or negative effects on educational achievement. Items 5 through to 10 attempt to measure the use of these forms of media when unrelated to school work, and hence an attempt to measure the overall possible negative or unrelated effects of the media. Items 11 through to 16 attempt to measure the same media forms, but in the context where they are undertaken in relation to school material. The distinction is made that the use of the media is not to be simply as a result of assigned homework. These items attempt to measure the use of media which might be perceived to have positive or related effects on the school achievement of students.

Overall the questionnaire is, therefore, clustered into four distinct areas, week day television and music, weekend television and music, unrelated media use, and related media use. From the items on the questionnaire, profiles of media use can easily be developed, and from preliminary data the possibility of composite scores be explored. As has been repeatedly reported in the literature, it will be of importance when comparing achievement and the use of mass media, to control for other influencing factors such as student ability, socio-economic background and possibly home environment.

3.4.9.1 Pilot of Mass Media Questionnaire

The original questionnaire was pilot tested by surveying students from two different TAFE colleges. Students were surveyed from both a campus which was operated along traditional teaching methods, as well as a campus that was operating using open learning teaching methods. A total of 23 cases were returned for statistical analysis. Initial analysis of the questionnaire was undertaken using the statistical computer program Lertap. Initial analysis of the reported an alpha reliability of 0.71 for the survey instrument. Analysis of the instrument was undertaken to attempt to improve the reliability. Items which had low internal correlations were closely examined to ensure suitability. Those items with the lowest correlations related to television viewing and the attendance at movies. As discussed in the previous review of associated literature, television viewing has been widely researched as a major factor of mass media. In order to maintain the face validity of this instrument, it was imperative that questions related to television viewing remain in the questionnaire. After consideration of the different forms of mass media, as well as the intent of the instrument to survey these forms as widely as possible, it was decided again to maintain these questions in the survey. By removing the items of low internal correlations (those related to television viewing and the attendance of movies) the alpha reliability of the instrument increased to 0.738, a marginal increase. Given such a small increase in reliability along with a consequent loss of face validity if low correlating items were excluded, a compromise was accepted by maintaining all original items in the questionnaire and accepting a lower reliability. An example of the survey instrument appears in Appendix A.15.

3.5 Instrument Development: Semi-Structured Interviews

In keeping with the overall research methodology, a series of interviews were conducted with students. Data from the interviews serves as the qualitative component of the research, enabling an enrichment of the quantitative data.

An interview schedule was developed to conduct structured interviews with both open learning students and traditional learning students. A total of 21 questions were developed for the interview schedule, a copy of which appears in Appendix C. Questions were structured in such a way as to closely align with the range of survey questionnaires previously administered to the students. Given that the interview schedule included components that specifically addressed factors previously quantitatively measured, a direct comparison of the two sources of data is possible.

3.5.1 Construction of Interview Schedule

The first two questions are intended to allow the student to develop a contextual basis on which the interview is conducted. Questions three to 11 relate specifically to the nine factors of Walberg's Educational Productivity Model, intended to probe the student's views on the impact of each of the nine factors on educational achievement. Questions 12 through to 16 are intended to focus the student on factors influencing courses being undertaken and the mode by which they are being completed. These questions also serve to allow the student develop a contextual basis for the following questions. Questions 17 through to 20 relate specifically to the student's perception of both open learning and traditional learning environments. The final question, question 20 is a scale item. Students are asked to order the productivity factors in a manner that reflects their perception of influence of the factors. Given a listing of the nine productivity factors, along with a brief description of each factor, students placed the factors in an order that they believed reflected the extent to which each factor influenced their learning.

3.5.2 Administration of Interviews

A total of nine students were interviewed using the structured interview schedule. Given that a total of 42 students were surveyed using survey questionnaires, the number of interviewees represents almost one quarter of the total number of students. A random sample of both open learning and traditional learning students was selected for interviews. Only those students who were completely willing to participate in the interview were selected. Four students who were studying in a traditional manner and five students studying in an open learning manner were interviewed.

All interviews were conducted by the use of telephone. With consent, all telephone conversations were recorded on audio cassette. Anecdotal notes were taken at the time of interview and later compared with the audio recording. The length of interview lasted approximately one hour, with variations for different students. A list of the structured interview questions is contained in Appendix C. Audio cassette recordings, along with anecdotal notes, were referenced to develop brief summaries of each of the questions contained in the interview schedule. Summaries of the student responses to each question are presented in Appendix C.

3.6 Summary

The diagrammatic representation, as shown in Figure 3.1 of the research design shows the descriptive and comparative nature of this current study. The Educational Productivity Model was selected to provide a framework by which key factors could be investigated and comparisons could be made between Open Learning students and Traditional Learning students. Due to the paramount importance of validating the instruments, each of the nine productivity factors has been comprehensively reviewed and researched. Given a clear description of the main characteristics of each of the productivity factors, careful selection or intense development of research instruments was undertaken. Survey instruments were pilot tested to ensure the instruments display an acceptable level of reliability.

The conceptual framework on which the key productivity factors are based have been widely researched. From a wide range of research, the review of literature in Chapter Two has presented a clear conceptual understanding of each of the nine productivity factors. The consequent instrument selection or development has also been widely researched, referring to many previous studies for the productivity factors. Pilot studies confirmed that through rigorous development, survey instruments used in this study are both valid and reliable data gathering tools. Given such a firm foundation, the project is well placed to gather valid and reliable data and to answer the specific research questions proposed for this study.

4. RESULTS

4.1 Overview

The study sought to describe and determine relationships between student aptitudinal, instructional and environmental factors and student outcomes within an Open Learning environment. As is detailed in Chapter 3, the method used to determine the impact of these factors on learning outcomes in an Open Learning environment is to compare students in an Open Learning environment with students in a Traditional Learning environment. Walberg's Educational Productivity Model (1981) has been selected as a suitable means by which such measures can be made. Not only does the model offer a framework on which nine specific influencing factors can be measured, the model also offers a common base measurement through which two different environments and student groups can be compared. By using the model in the Vocational Education and Training environment, it may be determined whether the model is in fact suitable for measurements within this environment.

In keeping with the research design detailed in Figure 3.1 of Chapter 3, two case studies have been developed for comparison. One group consists of Open Learning students, while the other group consists of Traditional Learning students. The development of the presentation of results for these two groups is done in four distinct stages. The first three stages relate to the quantitative component of the study, and presents group characteristics and relationships between productivity factors and achievement. These stages present results from survey questionnaires. The fourth stage relates to the qualitative component of the study and presents results from student interviews.

4.1.1 Quantitative Data

Students from both an Open Learning environment and a Traditional Learning environment were surveyed in order to gain data on the nine productivity factors. Students were surveyed in line with the questionnaires previously developed. Data were gathered on eight of the nine productivity factors, as identified in the Educational Productivity Model, by the use of survey questionnaires. Data on the ninth factor, that of Ability, were gathered through existing records within the TAFE system and students' personal records.

There was a total population of 103 students, completing the same course of study, who were initially available for direct comparisons between the two learning environments. Each participating student, however, had to be surveyed in terms of the nine productivity factors, which involved reporting high school results along with the completion of eight survey questionnaires and interviews. Only those students willing to participate in the study and complete all nine phases were included. This requirement, together with course drop outs and illness, compounded to reduce the number of students available for this study to a total of 17 Open Learning students and 25 Traditional Learning students.

4.1.1.1 Measures of the Productivity Factors

The first stage of the quantitative component of the study addresses the first research question and deals directly with the nine productivity factors, using statistical analysis to present an overview of the Open Learning and Traditional Learning student bodies. Students' individual scores and group scores are presented for both learning environments, along with comparisons between the groups. It will be seen that for some productivity factors the two groups of students were similar, whilst on other factors they differed markedly. This first stage of data analysis, therefore, is intended to present a snapshot picture of the characteristics of Open Learning students and Traditional Learning students.

Data are presented in the same manner for each of the productivity factors. Raw scores for each factor are contained in Appendix B. Codes are detailed which allow for the identification of students in all results, while maintaining student anonymity. Descriptive statistics are presented in table format highlighting maximum, minimum and mean scores along with standard deviations. This data presents a statistical summary of the raw scores. From the mean scores contained in the descriptive statistics, line graphs are presented to give a visual summary of the findings which have emerged. From the results contained in this summary, correlation ratios are developed and presented. The correlation ratios, in the form of Eta^2, highlight the variance of the scores on specific factors between the two student groups.

Correlation ratios are presented along with the level of statistical significance achieved. Boxplots are presented to give a visual representation of the spread of scores. Boxplots, based on raw scores, give a visual description of the spread of scores. The shaded box represents 50 percent of the scores. The median is highlighted by a bold line within the box, with the upper limit of the box representing the 75th percentile and the lower limit of the box representing the 25th percentile. The extreme lines, referred to as "whiskers" represent the extremities of the remaining upper and lower 25th percentiles. Outliers may also be identified beyond these extreme "whiskers". A score that lies 1.5 to 3 box lengths from the upper or lower limit of the box is considered an outlier and is identified by a circle. A score that lies greater than 3 box lengths from the upper or lower limit of the box is considered an extreme value and is identified by an asterisk. Scored that may be skewed are readily identified from the visual presentation of the boxplot.

The above procedures are an attempt to describe the actual situation, highlighting similarities between student groups, and any distinct differences. In order that the two groups of students studying in different environments can be compared, it first must be established whether the student groups are similar in characteristics or markedly different. If student groups are markedly different in any areas, then consequent group comparisons must take such differences into account.

4.1.1.2 Productivity Factors and Achievement

The second stage of the data analysis addresses the second research question and presents the relationships between productivity factors and student achievement. Student achievement is measured in terms of success in specific courses completed within each of the learning environments.

Educational achievement in some of the courses surveyed was measured by percentage marks based on assessment criteria, while other courses measured achievement in terms of a simple Pass or Fail in the achievement of specific competencies. Due to the Pass/Fail nature of much of the assessment, the achievement of students is presented in rank order. In terms of percentage marks for achievement, Pearson correlation coefficients would normally be used to determine correlation between specific productivity factors and achievement. A dichotomous Pass or Fail mark does not differentiate between a minimal level of achievement or a maximum level of achievement. In order to differentiate the achievement of students assessed in terms of Pass or Fail, rank orders are developed. Student ranking is based on the number of pass, fails or attempts students have recorded throughout the specific courses surveyed. Correlations are then developed between individual student scores on productivity factors and student achievement levels. Correlation coefficients are presented in the form of Kendall's Tau, as this procedure is cited as being suited to small numbers of rank order samples (Borg, 1989). Scatterplots of student groups are presented giving a visual display of the correlation between each of the productivity factors and student achievement.

Relationships between educational achievement and productivity factors within an Open Learning environment are compared to relationships between educational achievement and productivity factors within a Traditional Learning environment. Such comparisons give an indication as to the effectiveness of achieving educational outcomes based on specific productivity factors, within a specific learning environment.

4.1.1.3 Comparisons Between Learning Environments

The third stage of the data analysis addresses the third research question and presents a more detailed analysis of the possible effectiveness of the learning environments. Individual students are matched to allow for direct comparisons between the productivity factors and educational achievement. Students from both learning environments are closely matched into comparable pairs based on their TAFE entrance scores. Scatterplots showing the relationships between productivity factors and achievement are presented for selected students within the Open Learning environment alongside matched students from the Traditional Learning environment. From the data presented, and the consequent analysis, conclusions can be drawn as to the effects that the different learning environments may have on particular students, in terms of the nine educational productivity factors.

4.1.2 Qualitative Data

In keeping with the research method detailed in Chapter 3, quantitative data have been enriched by qualitative data. In addressing each of the research questions, a series of structured interviews were conducted, providing qualitative data on the factors detailed in the Educational Productivity Model. A total of nine student interviews were conducted. Five of the students were studying in an Open Learning environment while four of the students were studying in a Traditional Learning environment.

4.1.2.1 Interview Summaries

The fourth stage of data analysis is a presentation of data received from student interviews. Comparisons between the statistical analysis and the interview data are developed. Similar findings through the two different forms of data collection add credence to the overall findings of the research. Data gained from student interviews are presented in two distinct sections. The first section presents a series of individual student responses for each of the structured interview questions. The data are presented in summary format, drawn from tape recordings and anecdotal notes. It presents a description of the actual situation in terms of individual student profiles. The second section presents comparisons between the two groups based on the same interview questions. This second section describes the actual situation in terms of two distinct student groups, namely the Open Learning students and the Traditional Learning students. Similarities or differences between the groups, or indeed the absence of similarities or differences are highlighted for each of the structured questions.

4.2 Results for the Factor of Ability

The first factor of Walberg's Educational Productivity Model (1981) is that of Ability. This factor would generally be aligned to some form of entrance examination score or previous academic history. In the case of this study, the entrance scores developed by the TAFE admissions systems were utilised. Students who are processed through the TAFE admissions system are given an entrance score based on a range of criteria. The entrance score has a maximum of 40 points, with up to 30 points being made up of the students previous academic performance, and up to 20 points being based on relevant work experience. Of the 30 points which are possible for academic performance, 20 points relate specifically to core and allied subjects. The remaining 10 points are scored as a result of other relevant accredited subjects, over and above those already selected for the initial academic score. It is possible for a student to score 20 points on academic records, 10 points on related subjects and a further 10 points on relevant work experience. Conversely, it is also possible that a student could score 20 points for academic subjects, as well as 20 points for relevant work experience. The total score however can only be a maximum of 40 points. Given that the admissions system is an attempt to most closely match students most likely to succeed in a course, it is appropriate that this scoring method be used when finally comparing the factor of Ability to the product of educational achievement.

It must be noted, however, that the entrance system is not the only means by which students can gain access to the courses being researched. It is possible for both Australian and International students to enter the selected courses of study without going through the TAFE admissions system. Given the situation that not all students being researched had necessarily passed through the admissions system, it was imperative that the means by which the factor of Ability was being measured was comparable with all students being surveyed. Given that student records of high school achievement was available for all students, it was decided to utilise these results to determine an academic Ability score. The maximum score for Ability was therefore restricted to twenty points. In the case of those students who passed through the TAFE admissions system, this score consisted solely of the academic score, drawn from core and allied year 12 subjects. In the case of students who did not pass through the admissions process, the assistance of staff within the TAFE admissions department was sought. One assessor perused all of the students who had not passed through the admission system and established equivalent academic scores for these students. These scores were based on the students' high school results and were scored in a similar manner to the admissions system to produce an academic score that was comparable. A number of the students surveyed had completed their higher school education in countries other than Australia. With the assistance of staff within the TAFE admissions systems, equivalence of over seas education compared with Australian education was established, allowing for the projection of academic Ability scores for these students. Given that three different methods have been used to establish academic scores, it is difficult to establish the reliability of the scoring process. The process for scoring all students, however, has been based on a consistent scoring criteria, utilising consistent scoring methods and been assessed by the same personnel. As a result of this consistency, it follows that the range of student Ability scores should be reasonably reliable. Final academic Ability scores are shown in Table B.1 in Appendix B, for both Open Learning students and Traditional Learning students.

No weighting has been applied to students in selecting which college they should attend, either in the Open Learning college or the Traditional Learning college. It follows, therefore, that the groups should be comparable in terms of entry level and Ability. Descriptive statistics contained in Table 4.1 highlight the lack of difference between the groups. Maximum, mean, minimum and standard deviation figures are similar for both groups, with the Traditional Learning group registering a slightly higher Ability score (mean = 12.34) than the Open Learning group (mean = 11.06) on entry into the program.

Course	**N**	**Max. Possible**	**Max. Observed**	**Mean**	**Min. Observed**	**S.D.**
Open	17	20.00	20.00	11.06	4.00	3.88
Trad.	25	20.00	20.00	12.34	5.00	3.85

Table 4. 1: Descriptive Statistics for the Factor of Ability

From the details in Table 4.1 a difference between the means of the two groups is apparent, with Traditional Learning students scoring in excess of one full point higher than the Open Learning students. The correlation ratio between the two groups was computed with $Eta^2 = 0.027$ where $F = 1.11$ (df = 1,40) $p = 0.298$, showing that while a difference exists, its practical significance is minimal. The boxplot contained in Figure 4.1 shows the spread of scores between the two student groups. Again, small differences are apparent, but through the correlation ratio, such differences are of no practical significance. The two groups are essentially similar with respect to their Ability scores.

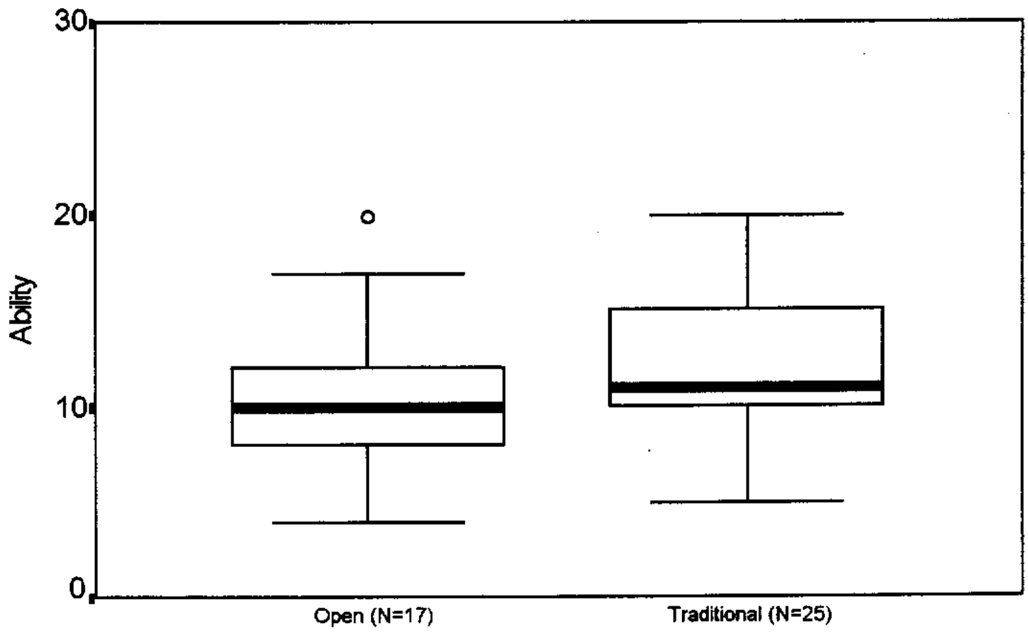


Figure 4. 1: Group Differences between Open Learning and Traditional Learning Students for the Factor of Ability

4.3 Results for Cognitive Development

The second factor in Walberg's Educational Productivity Model (1981) is that of Cognitive Development. The Test of Logical Thinking (TOLT) developed by Tobie and Capie (1981) was utilised to determine individual student scores for the factor of Cognitive Development. The Test of Logical Thinking consists of ten items, with two items measuring each of five sub-categories. The five sub-categories each addressed different aspects of Piaget's (1966) Formal Reasoning stage of cognitive development. The sub-categories, all forms of reasoning Ability, are labelled controlling, proportional, combinational, probabilistic and correlational. The instrument used in the survey was a group administered multiple choice paper, (see Appendix A). Students were able to select which answer they believed to be correct, but were also required to select a response justifying their initial answer. The developers of this instrument have reported an alpha reliability of 0.85 for the test. A pilot testing of the instrument in the vocational education sector was undertaken in November 1994. The total number of recipients for the pilot survey was seven. Whilst a relatively small number of students were surveyed in the pilot test, the small number was considered to be adequate given the development and reported reliability of the Test of Logical Thinking. Results from the pilot test appear in Table 4.2 below, where a recorded reliability of 0.80 would suggest that the instrument is suitable for use within the vocational education sector. When the instrument was used for the major survey, alpha reliabilities were recorded similar to those originally reported by Tobie and Capie and those later recorded as a result of the pilot testing process. Raw score results for individual students in the two groups of Open Learning and Traditional Learning are contained in Table B.2 in Appendix B. The five categories within the Table represent the five sub-categories as previously highlighted within the overall TOLT instrument.

Table 4.2 below details an alpha reliability of 0.79 for Open Learning students and 0.81 for Traditional Learning students. Such findings suggest that the results obtained through the use of the instrument are reasonably reliable.

Course	N	Max. Possible	Max. Observed	Mean	Min. Observed	S.D.	Variance	No. of Items	Coeff. Alpha
Open	17	10	10	4.588	0	2.938	8.632	10	0.793
Trad.	25	10	10	4.440	0	3.042	9.257	10	0.807

Table 4. 2: Descriptive Statistics for the Factor of Cognitive Development

The descriptive summary for the total scores of the factor of Cognitive Development suggests that on average there is a minimal group difference between the two groups of students conducting their studies in either an Open Learning environment or a Traditional Learning environment. This small difference had little practical significance with a correlation ratio of $Eta^2 = 0.001$ where $F = 0.02$ ($df = 1,40$) $p = 0.874$, suggesting that the two groups have similar characteristics with respect to Cognitive Development. The spread of scores are highlighted in Figure 4.2 below, where it can be seen that the majority of respondents scored in a similar range.

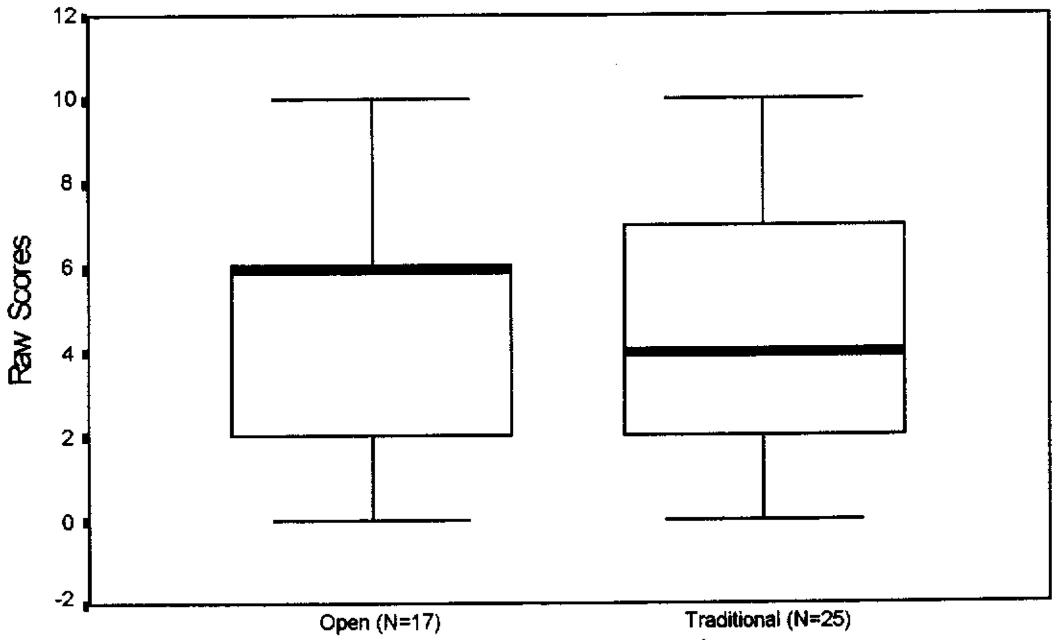


Figure 4. 2: Group Differences between Open Learning and Traditional Learning Students for the Factor Cognitive Development

Given that the total scores of the two groups were similar, it is of interest as to whether there were any distinct differences within the sub-categories of the factor. Mean scores for the sub-categories are detailed in Table 4.3 below. It can be seen that there are substantial differences between the mean scores on three sub-categories, namely Proportional, Combinational and Correlational.

	Open Learning					**Traditional Learning**				
Sub-Category	N	Max	Mean	Min	SD	N	Max	Mean	Min	SD
Controlling	17	2.00	1.00	0.00	0.94	25	2.00	1.00	0.00	0.96
Proportional	17	2.00	0.47	0.00	0.80	25	2.00	0.84	0.00	0.94
Combinational	17	2.00	1.18	0.00	0.88	25	2.00	0.80	0.00	0.82
Probabilistic	17	2.00	0.94	0.00	0.83	25	2.00	0.92	0.00	0.76
Correlational	17	2.00	1.00	0.00	0.94	25	2.00	0.88	0.00	0.78

Table 4. 3: Descriptive Statistics for the Factor of Cognitive Development: Sub-Categories

The graph contained in Figure 4.3 below further highlights the difference in mean scores between the two groups of students.

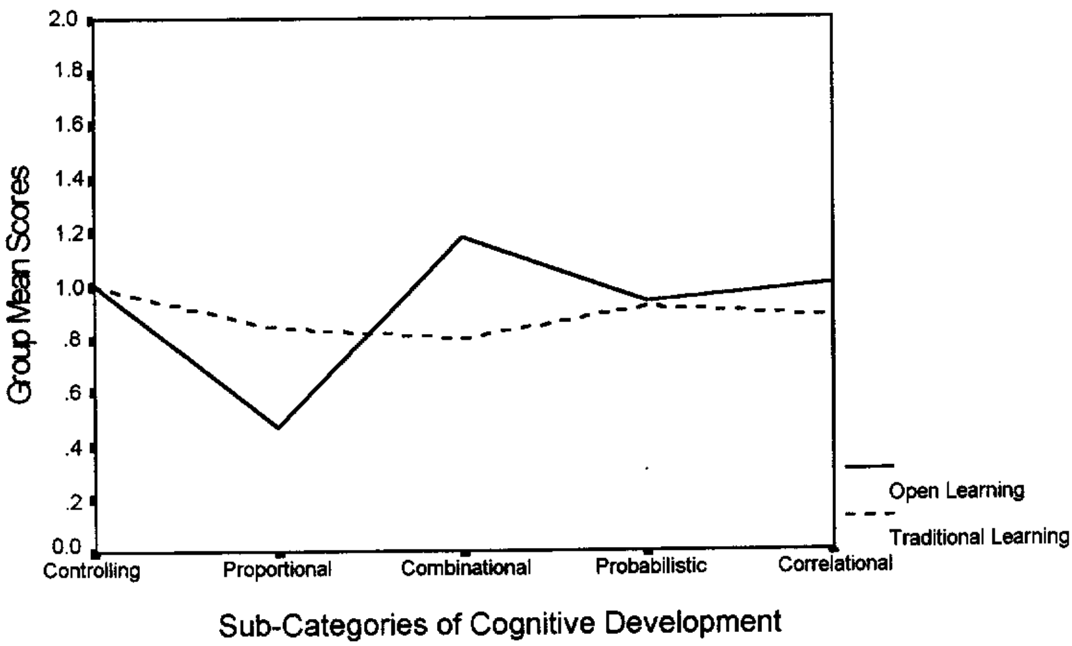


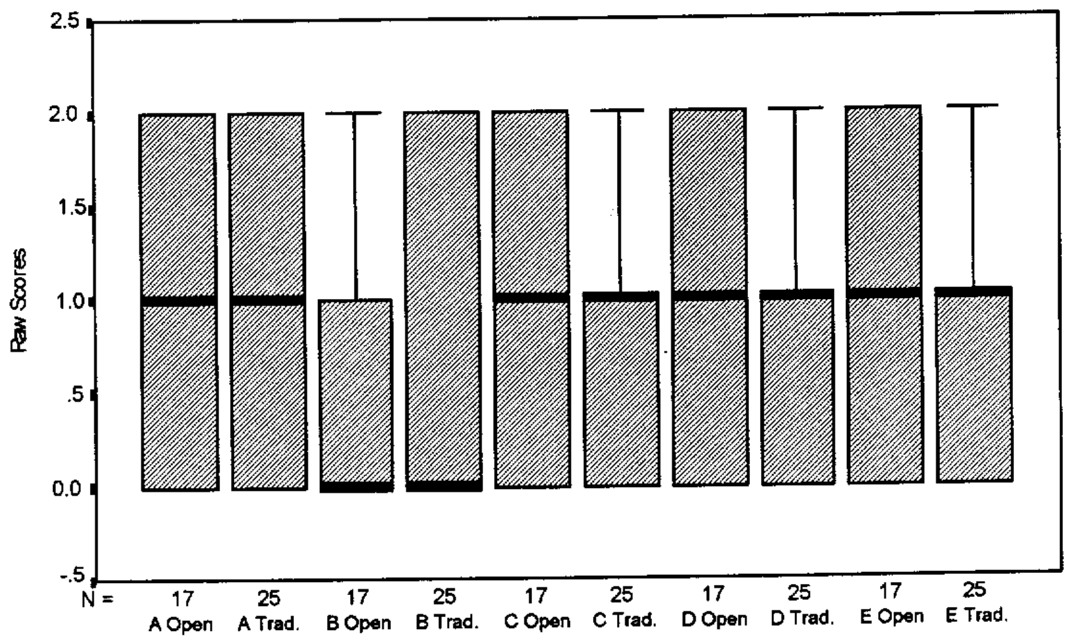
Figure 4. 3: Group Differences for the Factor of Cognitive Development: Means of Sub-Categories

Given that distinct differences have been identified with a number of the sub-categories of Cognitive Ability, it is pertinent to examine the significance of these differences. Correlation ratios for the sub-categories have been calculated and appear in Table 4.3 below.

Sub-Category	Eta^2	Significance
Controlling	No Computation	
Proportional	0.042	F = 1.76 (df = 1,40) p = 1.890
Combinational	0.049	F = 2.05 (df = 1,40) p = 0.157
Probabilistic	0.000	F = 0.01 (df = 1,40) p = 0.934
Correlational	0.005	F = 0.20 (df = 1,40) p = 0.659

Table 4. 4: Correlation Ratios for the Factor of Cognitive Development: Sub-Categories

From the correlation ratios computed, it can be seen that whilst there may appear to be distinct differences between the two groups on three of the sub-categories, these differences have little practical and statistical significance. The boxplot in Figure 4.4 details the spread of scores of the two groups for each of the five sub-categories of Cognitive Development.



Sub-Category Coding for the Factor of Cognitive Development

A = Controlling B = Proportional C = Combinational D = Probabilistic E = Correlational

Figure 4. 4: Group Differences between Open Learning and Traditional Learning Students for the Factor of Cognitive Development: Sub-Categories

4.4 Results for the Factor of Motivation

The third factor that Walberg (1981) addresses as part of student aptitude, within the wider scope of his Educational Productivity Model, is that of student Motivation. A survey questionnaire was administered to the group of survey participants. The survey questionnaire used was a five item Likert paper, with a total of 14 questions, as detailed in Appendix A. As has been discussed earlier in Chapter 3, the questionnaire used to determine student Motivation was an adaptation of the Motivated Strategies for Learning Questionnaire (MSQL) developed by Pintrich and De Groot (1990). This questionnaire operationalised student Motivation in terms of five sub-categories. These sub-categories were named Self Efficacy, Intrinsic Motivation, Test Anxiety, Cognitive Strategy and Self Regulation. The survey questionnaire was administered to the Open Learning group as well as the Traditional Learning group. Results of the major survey are presented in terms of raw scores. These results are contained in Table B.3 in Appendix B.

Raw scores from the survey questionnaires were processed using the statistical package Lertap. Descriptive statistics of the two student groups appear in Table 4.5 below. The integrity of the instrument appears to be upheld, returning an alpha reliability of 0.86 and 0.87 respectively for Open and Traditional Learning. Whilst these figures appear to be somewhat lower than the pilot figure of 0.95, the coefficients are still high, suggesting that the instrument remained reliable.

Course	N	Max. Possible	Max. Observed	Mean	Min. Observed	S.D.	Variance	No. of Items	Coeff. Alpha
Open	17	70	68	55.71	41	7.935	62.971	14	0.864
Trad.	25	70	62	52.12	27	8.378	70.193	14	0.870

Table 4. 5: Descriptive Statistics for the Factor of Motivation

From the details displayed in Table 4.5 marginal group differences can be seen between Open Learning and Traditional Learning students with respect to Motivation scores. Open Learning students, on average, score approximately 3.5 points higher on the total Motivation scale than their Traditional Learning counterparts. Group differences are shown in Figure 5.4 below. Marginal differences between the groups can be identified, with the Open Learning students showing a slight but consistently higher score on the sub-categories of Motivation. Inspection of the boxplot in Figure 5.5 details the total scores group differences, again confirming slight differences between the groups. A one way analysis of variance failed to show any practical significance of the differences highlighted . The correlation ratio was $Eta^2 = 0.046$ where $F = 1.94$ ($df = 1,40$) $p = 0.168$. The distribution of the scores based on averages is detailed in the boxplot in Figure 4.5 below. The differences highlighted by mean scores is also evident from the spread of individual scores.

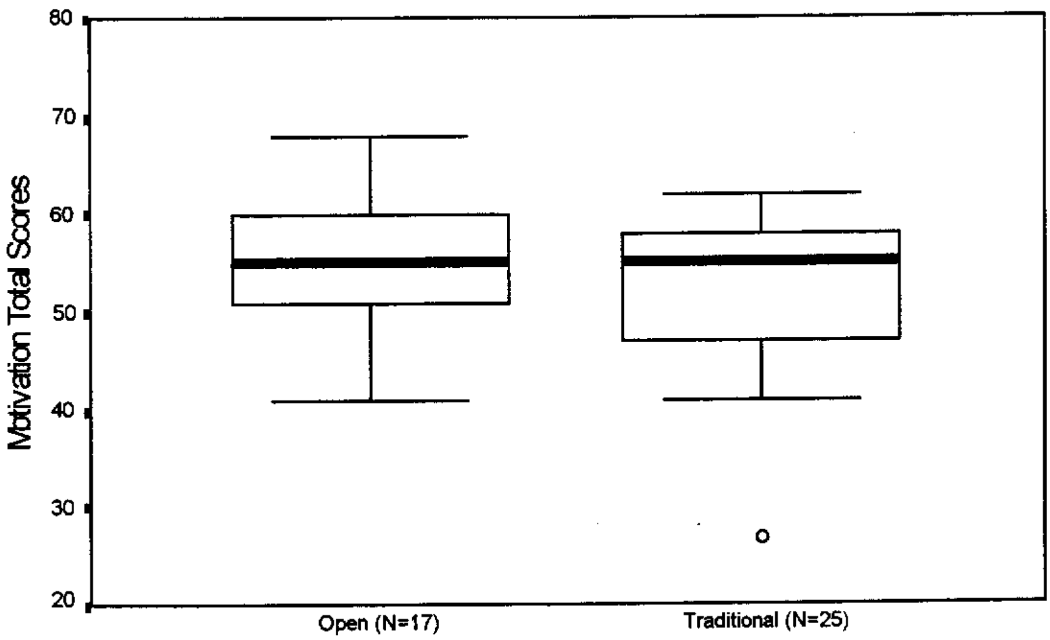


Figure 4. 5: Group Differences between Open Learning and Traditional Learning Students for the Factor of Motivation

Group differences are further explored in terms of the sub-categories of Motivation. Table 4.6 below details the descriptive statistics for each of the sub-categories for the two student groups. It can be seen that the Open Learning student group score consistently higher on each of the sub-categories.

	Open Learning					**Traditional Learning**				
Sub-Category	N	Max.	Mean	Min.	SD	N	Max.	Mean	Min.	SD
Self Efficacy	17	15.00	11.94	6.00	2.44	25	14.00	11.00	5.00	2.36
Intrinsic Motivation	17	15.00	12.94	7.00	2.16	25	15.00	12.32	6.00	2.14
Anxiety	17	9.00	6.53	3.00	1.84	25	10.00	6.20	2.00	1.96
Cognitive Strategy	17	15.00	13.00	11.0	1.50	25	15.00	12.48	9.00	1.58
Self regulation	17	15.00	11.29	7.00	2.31	25	15.00	10.12	3.00	2.79

Table 4. 6: Descriptive Statistics for the Factor of Motivation: Sub-Categories

The differences as detailed by the mean scores for each sub-category are highlighted in the graph contained in Figure 4.6 below. It can be seen that there is a consistent difference between the two groups, of a varying magnitude but in a consistent direction.

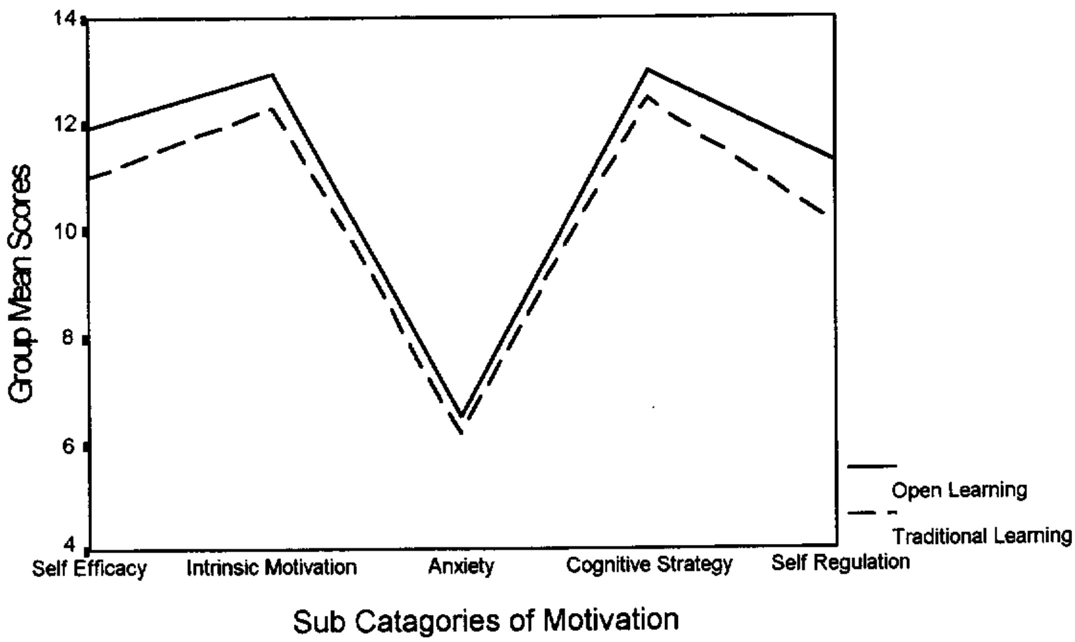


Figure 4. 6: Group Differences for the Factor of Motivation: Means of Sub-Categories

Given a distinct and consistent difference, it is important to establish a level of significance of such differences. Correlation ratios have been computed to determine the extent of practical significance of the differences within the sub-categories of Motivation. Details of these computations appear in Table 4.7 below.

Category	Eta^2	Significance
Self Efficacy	0.038	F = 1.56 (df = 1,40) p = 0.216
Intrinsic Motivation	0.021	F = 0.84 (df = 1,40) p = 0.633
Anxiety	0.007	F = 0.30 (df = 1,40) p = 0.593
Cognitive Strategy	0.028	F = 1.14 (df = 1,40) p = 0.292
Self regulation	0.048	F = 2.04 (df = 1,40) p = 0.158

Table 4. 7: Correlation ratios for the Factor of Motivation: Sub-Categories

From the details of the correlation ratios of the sub-categories, it can be seen that the differences between the groups has little practical significance. However, the consistency of the direction of the findings, that is, Open Learning students constantly scoring higher, should not be discounted. Inspection of the boxplot in Figure 4.7 below highlights the spread of student scores. The presence of outliers explains to some extent the fact that the higher mean scores of the Open Learning students have a low level of significance. As can be seen from the boxplot, while mean scores differ, the spread of scores is reasonably consistent for each of the sub-categories.

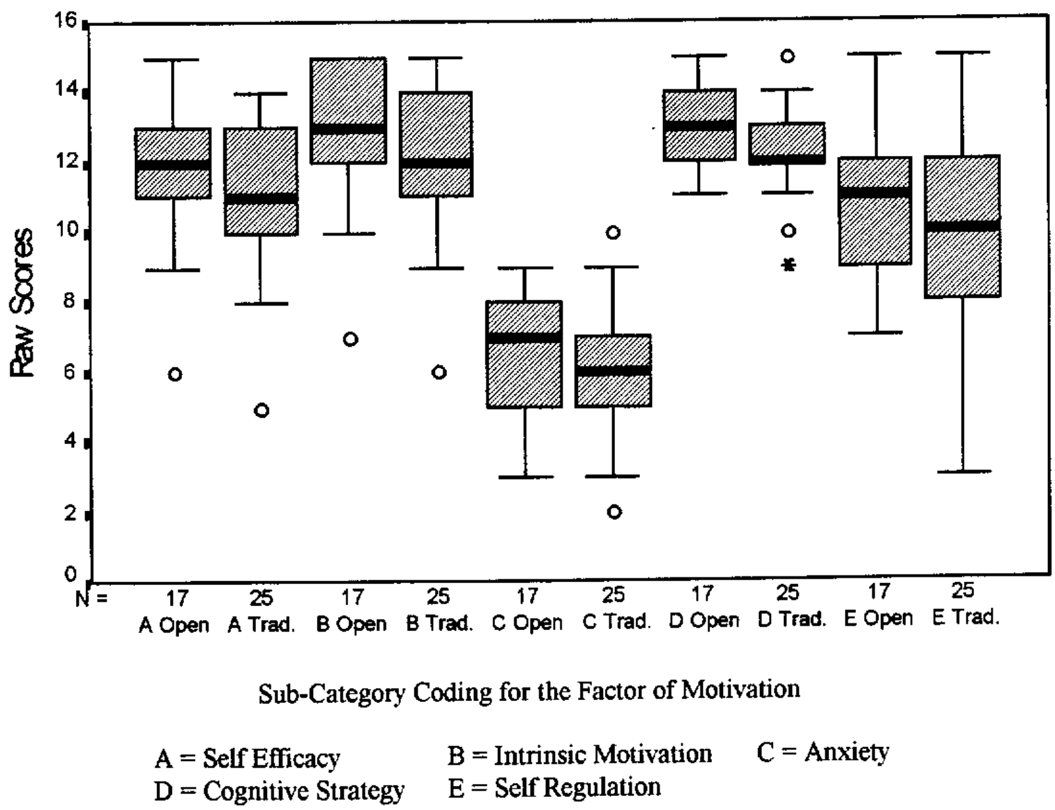


Figure 4. 7: Group Differences between Open Learning and Traditional Learning Students for the Factor of Motivation: Sub-Categories.

4.5 Results for the Factor of Quantity

The factor of Quantity relates to the amount of time a student spends in the learning mode on the given course material. The underlying assumption being that the more time a student spends on a given course the higher that student is likely to achieve in that course. Self report mechanisms were adopted to gather data relevant to the Quantity of education. The survey questionnaire used for this survey appears in Appendix A. Data related to the factor of Quantity are divided into two distinct components. The first component relates to actual hours spent in a given task, or mode of work, whereas the second component relates to the extent that students were focussed on their work and the extent of wasted time.

4.5.1 Actual Hours Spent

Data related to the actual time spent on course work were collated with respect to the allocated time proposed for the particular module. Allocated Time was therefore the name of the first category when comparing sub-categories of Quantity. Three other categories have been used in relation to the total amount of allocated time. The first category relates to the amount of time actually spent working on the module completing general course work, and is titled Actual Contact Time. The second category relates to the amount of additional work spent on the module as assigned homework at home and is titled Assigned Homework. The third category relates to the amount of additional work spent on the module under the students own volition, and is titled Extra Homework. Raw results for each of these sub-categories is contained in table B.4 in Appendix B.

A description of the statistics based on the self report time spent on course work can be seen in Table 4.8 below. The major difference between the groups appears to be in the actual amount of time spent on general course work. The Open Learning students spend an average of six hours per week completing general course work, whereas the Traditional Learning students have, on average, only spend four hours per week completing general course work. It is also apparent that the Open Learning students spend a greater amount of time on what is labelled assigned homework, spending 4.3 hours per week compared to 3.3 hours per week of the traditional learner.

	Open Learning					Traditional Learning				
Sub-Category	N	Max.	Mean	Min.	SD	N	Max.	Mean	Min.	SD
Allocated Time (Hours)	17	24.00	7.15	2.00	6.16	25	24.00	6.84	2.00	8.55
Actual Contact Time (Hours)	17	20.00	5.94	2.00	4.29	25	19.00	4.01	1.00	4.93
Assigned Homework (Hours)	17	10.00	4.29	0.00	2.82	25	16.00	3.32	0.50	3.83
Extra Homework (Hours)	17	15.00	3.53	0.00	3.76	25	30.00	3.09	0.00	6.05

Table 4. 8 : Descriptive Statistics for the Factor of Quantity: Actual Hours

It can be seen that the major differences occur in the sub-categories of Actual Contact Time and Assigned Homework. These differences are also reflected in the graph contained in Figure 4.8 below. It can be seen that the Open Learning students appear to devote more time to their studies in terms of contact time, assigned homework and extra homework.

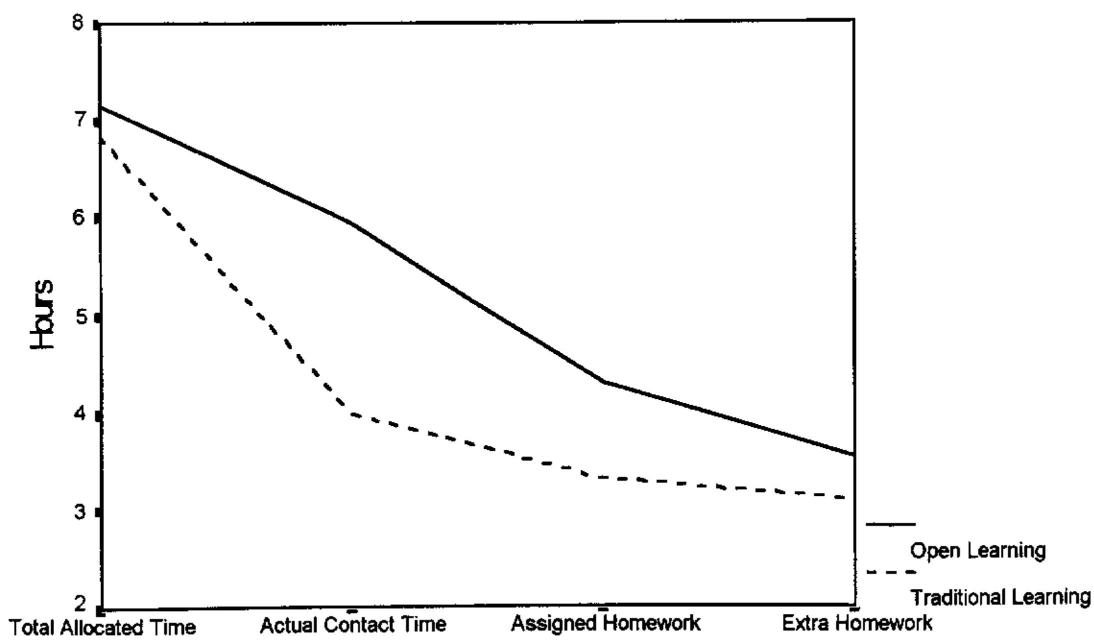


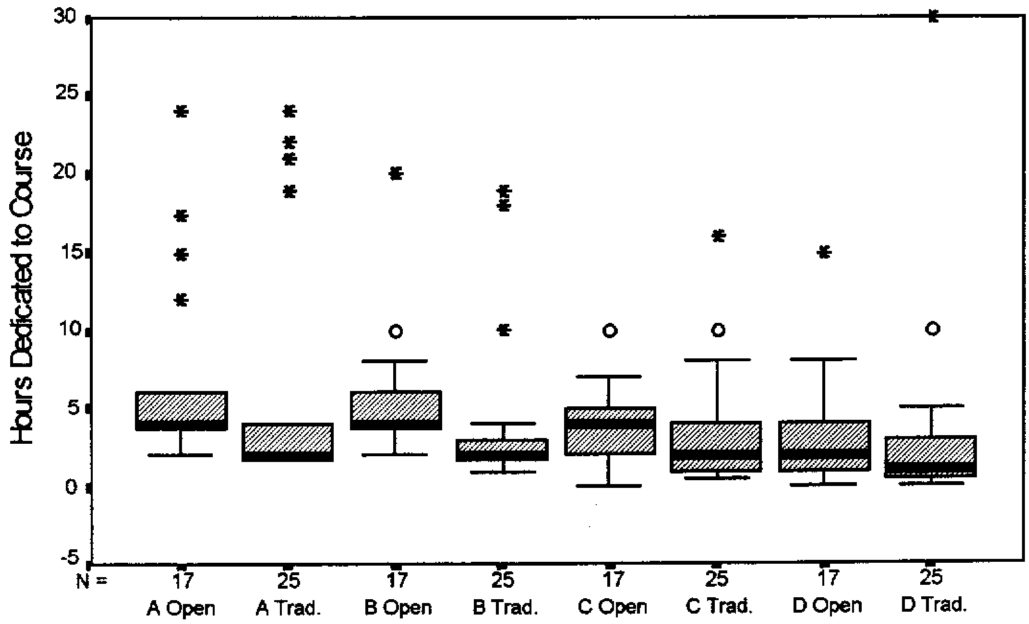
Figure 4. 8: Group Differences for the Factor of Quantity: Actual Time, Assigned Homework and Extra Homework.

In order to establish whether these differences, which appear to be substantial, have any significance, correlation ratios were calculated. Details of the correlation ratios for each of the sub-categories is contained in Table 4.9 below. It can be seen that the Eta^2 values are small, indicating a low level of any practical significance to the differences shown.

Category	Eta^2	Significance
Allocated Time	0.000	$F = 0.02$ ($df = 1,40$) $p = 0.894$
Actual Contact Time	0.041	$F = 1.72$ ($df = 1,40$) $p = 0.195$
Assigned Homework	0.019	$F = 0.79$ ($df = 1,40$) $p = 0.618$
Extra Homework	0.002	$F = 0.07$ ($df = 1,40$) $p = 0.787$

Table 4. 9: Correlation Ratios for the Factor of Quantity: Sub-Categories

Differences between the mean scores of sub-categories highlighted in Table 4.8 are confirmed to some extent by the boxplot in Figure 4.9 below. Open Learning students generally tend to score more highly on the factor of Quantity, however, the large number of outliers in the responses tend to distort the mean scores. The boxplot indicates just how similar the two groups are with respect to the Quantity of learning.



Sub-Category Coding for the Factor of Quantity (Actual Hours)

A = Total Allocated   B = Actual Time Spent   C = Assigned Homework   D = Extra Homework

Figure 4. 9: Group Differences between Open Learning and Traditional Learning Students for the Factor of Quantity: Actual Time, Assigned Homework and Extra Homework.

4.5.2 A Percentage of Allocated Time

The relationship between student perceptions of allocated time for course work and the amount of time that students actually spend completing course work can be further explored based on percentages. Student scores for the amount of time students spend on course work as a percentage of allocated time appears in Table B.5 in Appendix B. A description of the raw scores form each of the survey students is detailed below in Table 4.10. Again it can be seen that there is a differences between the two groups, with the Open Learning students using a greater percentage of the amount of time allocated for their work in actually completing their work than their Traditional Learning counterparts.

	Open Learning					Traditional Learning				
Sub-Category	N	Max.	Mean	Min.	SD	N	Max.	Mean	Min.	SD
Contact Hours as a % of Total Allocated Time	17	200.0	101.7	33.00	50.49	25	150.0	81.36	14.00	34.99
Assigned Homework as a % of Total Allocated Time	17	250.0	80.06	0.00	65.18	25	200.0	70.36	14.00	54.48
Extra Homework as a % of Total Allocated Time	17	200.0	57.88	0.00	53.68	25	250.0	56.00	0.00	66.71

Table 4. 10: Descriptive Statistics for the Factor of Quantity: Time as a Percentage of Total Allocated Time

From the mean scores detailed in Table 4.10 it can be seen that the Open Learning students on average spend more of the perceived allocated time on course work that the Traditional Learning students, based on the percentage of total allocated time. The greatest difference occurs in the actual contact hours within a college setting, with the group difference being less for assigned homework and almost nil for additional homework. These differences can also be seen graphically in Figure 4.10 where consistent but diminishing differences occur.

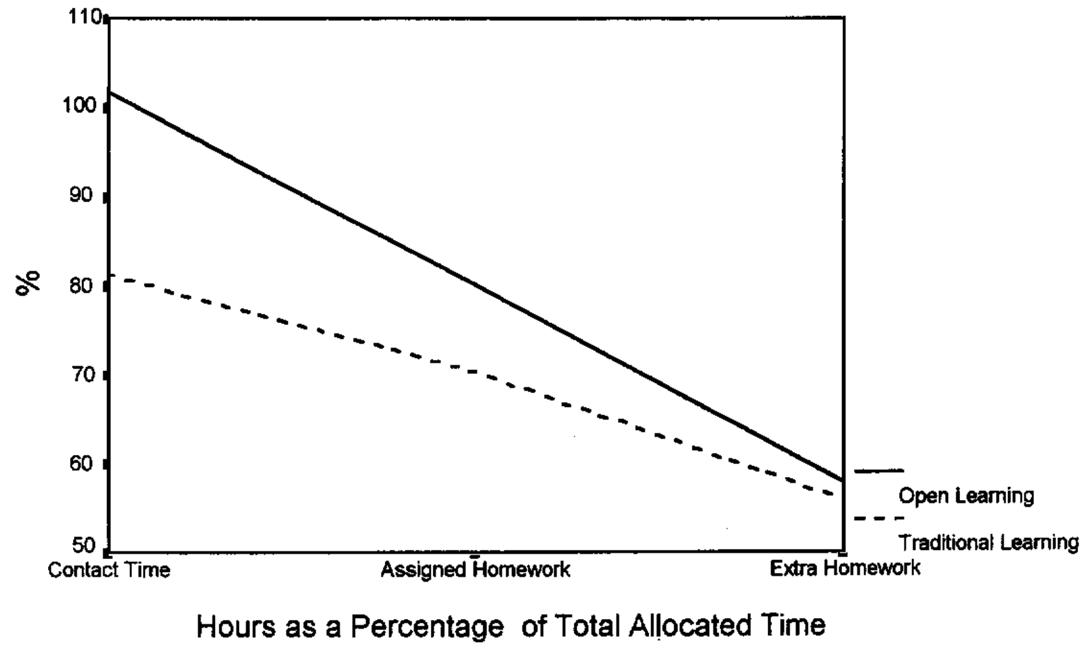


Figure 4. 10: Group Differences for the Factor of Quantity: Contact Time, Assigned Homework and Extra Homework as a Percentage of Total Allocated Time (Line Graph)

While it appears from the above data that there are distinct group differences based on percentages of allocated time, the extent to how significant these differences might be is undetermined. Correlation ratios, as detailed in Table 4.11 below, offer a measure of the level of significance of the differences between the two groups. It can be seen that the Eta^2 levels are very low in all sub-categories suggesting that these differences have little practical significance. However, the consistency of the direction of the difference cannot be discounted. In all categories, the Open Learning students consistently scored more highly than the Traditional Learning students.

Sub-Category	Eta^2	Significance
Contact Hours as a % of Total Allocated Time	0.056	F = 2.39 (df = 1,40) p = 0.127
Assigned Homework as a % of Total Allocated Time	0.007	F = 0.27 (df = 1,40) p = 0.610
Extra Homework as a % of Total Allocated Time	0.000	F = 0.01 (df = 1,40) p = 0.920

Table 4. 11: Correlation Ratios for the Factor of Motivation: Sub-Categories (% of Allocated Time)

Inspection of the boxplot contained in Figure 4.11 below shows the spread of raw scores for each of the sub-categories. The spread of the scores, in contrast to the cluster of the majority of recipients explains to some extent the differences of the mean scores have little practical significance.

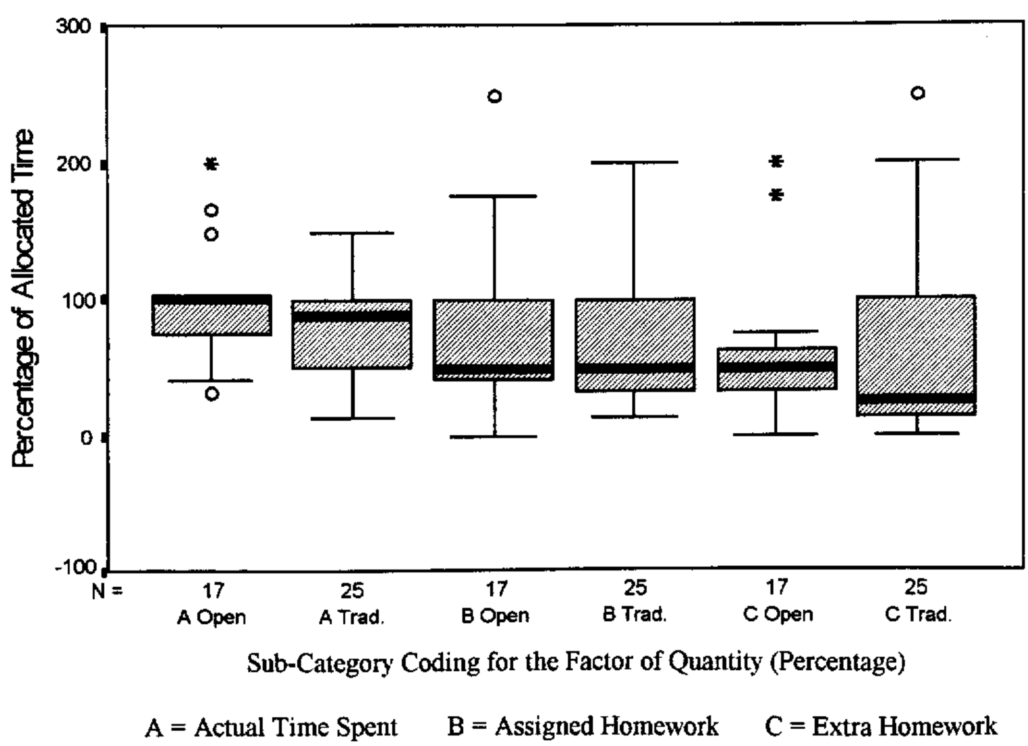


Figure 4. 11: Group Differences between Open Learning and Traditional Learning Students for the Factor of Quantity: Actual Time, Assigned Homework and Extra Homework as a Percentage of Total Allocated Time.

4.5.3 Student Focus and Wasted Time

The second component of the factor of Quantity was presented in the form of a Likert survey questionnaire. Data from this section relate to the students' perception of their focus on their course work and the extent to which their time might be wasted. A total of 13 questions were developed based on the constructs previously identified by Ugoroglu and Walberg (1986). The instrument was initially pilot tested on a total of 17 students, and a consequent alpha reliability of 0.78 was reported (see Table 5.14). Following the rationalisation of the questionnaire items, the survey was reduced to a total of 11 items. This survey was administered as part of the total Quantity survey instrument. Raw scores for the two student groups from the Likert survey questionnaire appear in Table B.6 in Appendix B. A description of an analysis of the raw scores appears below in Table 4.12, where it can be seen that the survey questionnaire returned alpha reliabilities of 0.82 and 0.73 for Open Learning and Traditional Learning respectively.

Course	N	Max. Possible	Max. Observed	Mean	Min. Observed	S.D.	Variance	No. of Items	Coeff. Alpha
Open	17	55	49	36.176	24	7.291	53.154	11	0.821
Trad.	25	55	46	35.720	24	5.527	30.543	11	0.734

Table 4. 12: Descriptive Statistics for the Factor of Quantity: Likert Survey Questions

The difference between the mean scores of the student groups appears to be minimal and of little practical significance. The correlation ratio between the two groups was extremely low at $Eta^2 = 0.001$ where $F = 0.05$ ($df = 1,40$) $p = 0.814$. Based on the standard deviation of the scores in Table 4.12, it is evident that the scores for Open Learning students are more widely distributed than the scores for the Traditional Learning students. The spread of student raw scores is highlighted in Figure 4.12 below. Essentially the two groups appear to be similar with respect to their perception of Quantity.

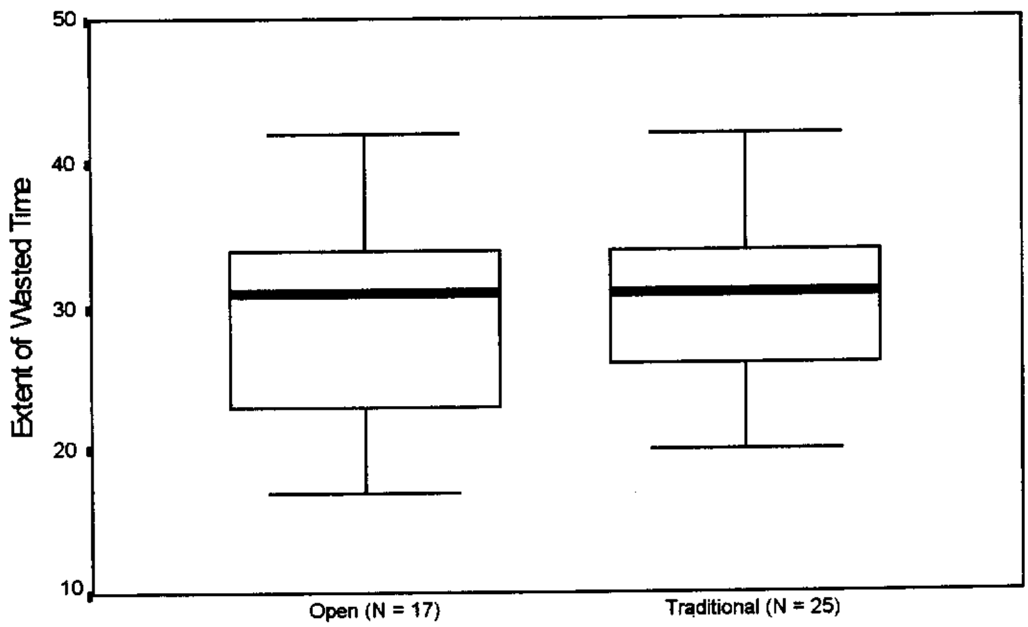


Figure 4. 12: Group Differences between Open Learning and Traditional Learning Students for the Factor of Quantity: Likert Scale Data

4.6 Results for the Factor of Quality

The construct of Quality of education in the Educational Productivity Model has been operationalised using the framework of a number of educational models, based on seminal work from early educationalists. For a detailed analysis of the factor of Quality see Chapter 2. Questionnaire construction and subsequent factor analysis identified eight major factors which were pertinent to the Quality of education, and were contained within the framework of previous teaching/learning models. Initial pilot testing of the questionnaire and consequent refinement resulted in a survey questionnaire returning a 0.92 alpha reliability. Details of the pilot study appear in Table 4.13 below.

Self report mechanisms were used to gather data on the factor of Quality. Data from the survey questionnaires were processed using the statistical package Lertap. Raw scores for the two student groups appear in Table B.7 in Appendix B. Codes of the eight sub-categories identified within the construct of Quality are detailed at the top of the Table B.7.

A description of the total results for the factor of Quality, for the two student groups is detailed in Table 4.13 below. It can be seen that the survey questionnaire has returned a high degree of reliability in both groups of students. It can be seen that the average score for students learning in a Traditional Learning environment had a total score approximately five points higher than their Open Learning counterparts. Students studying in the traditional group perceived the Quality of the educational process to be higher than those students studying in Open Learning group.

Course	N	Max. Possible	Max. Observed	Mean	Min. Observed	S.D.	Variance	No. of Items	Coeff. Alpha
Open	17	125.00	74.00	55.06	34.00	12.63	159.43	25	0.897
Trad.	25	125.00	103.00	60.32	37.00	14.90	221.89	25	0.900

Table 4. 13: Descriptive Statistics for the Factor of Quality

To determine whether the differences highlighted by the mean scores has any practical significance, a correlation ratio was computed. The correlation ratio of $Eta^2 = 0.034$, where $F = 1.42$ ($df = 1,40$) $p = 0.239$, was computed, indicating that the difference as highlighted by mean scores has little practical significance. The distribution of the raw scores are shown in the boxplot in Figure 4.13 below. From this graph it can be seen that the range of scores is higher for the Traditional Learning students, along with the existence of one outlier, which equates to a higher mean score. It can also be seen that while the cluster of the majority of scores is still higher for the Traditional Learning students, the difference is not as great as shown by total mean scores.

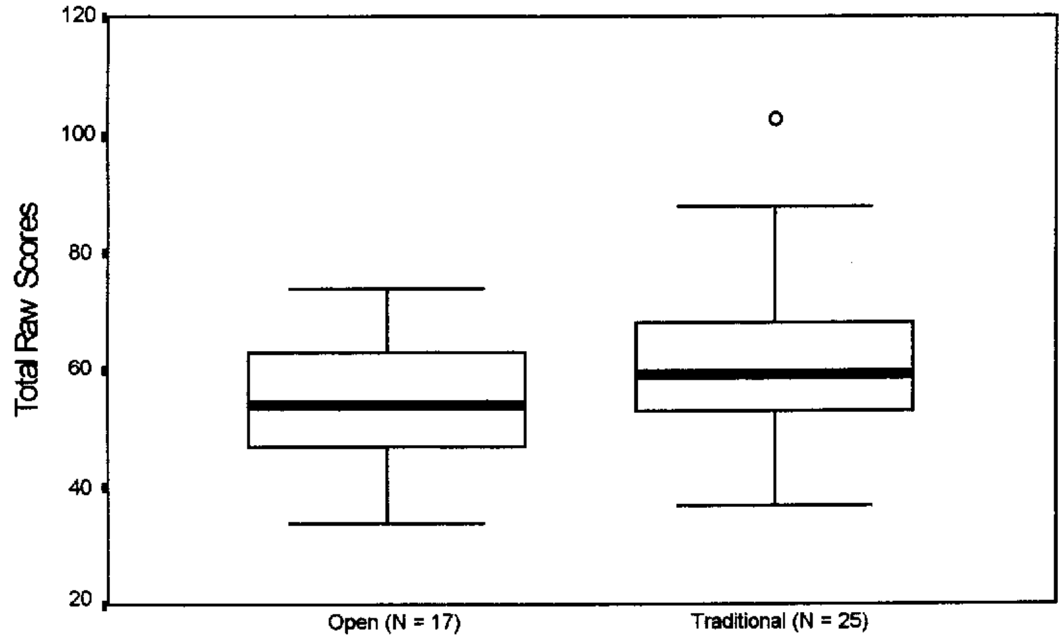


Figure 4. 13: Group Differences between Open Learning and Traditional Learning Students for the Factor of Quality

An inspection of the sub-categories of the Quality factor reveals minor differences between the two groups of students. Details in Table 4.14 below show that the major differences between the two groups of students are in the areas of Student Comfort, Administration, Workloads and Relevance. A graphical representation of the sub-categories of the Quality factor appears in Figure 4.14 below. The differences between the Open Learning and Traditional Learning students appears to be consistent for most of the sub-categories. With the exception of the sub-category of Teaching Strategies, students learning in a traditional manner returned consistently higher scores than the students learning in an Open Learning environment. The sub-category of Teaching Strategies, within the Open Learning environment, extends beyond the initial concept one might align to teaching strategies used by the teacher. This sub-category is extended to include alternative methods by which such strategies as feedback, reinforcement, review, assessment might be experienced by the students other than solely by the teacher or facilitator. The students in contact with a teacher for the lesser amount of time, namely Open Learning students, actually perceived the Quality of the teaching/learning process to be of a higher quality, with respect to specific teaching/learning strategies. It is possible that the sub-categories mentioned are inherent in the open learning process and materials, which may well compensate for the absence of a teacher figure.

Open Learning					
Sub-Category	N	Max.	Mean	Min.	SD
Strategies	17	17.00	13.24	7.00	2.77
Comfort	17	13.00	7.82	4.00	2.63
Teacher	17	17.00	12.12	7.00	2.64
Student Needs	17	8.00	5.82	3.00	1.67
Administration	17	5.00	3.35	2.00	1.22
Workload	17	11.00	6.53	3.00	2.32
Relevance	17	7.00	3.94	2.00	1.52
Effort	17	4.00	2.24	1.00	0.97
Traditional Learning					
Sub-Category	N	Max.	Mean	Min.	SD
Strategies	25	22.00	12.68	7.00	3.39
Comfort	25	17.00	8.92	5.00	3.38
Teacher	25	23.00	12.72	5.00	3.85
Student Needs	25	13.00	6.64	3.00	2.23
Administration	25	8.00	4.40	2.00	1.73
Workload	25	13.00	7.56	4.00	1.98
Relevance	25	9.00	5.00	2.00	1.66
Effort	25	5.00	2.40	1.00	1.08

Table 4. 14: Descriptive Statistics for the Factor of Quality: Sub-Categories

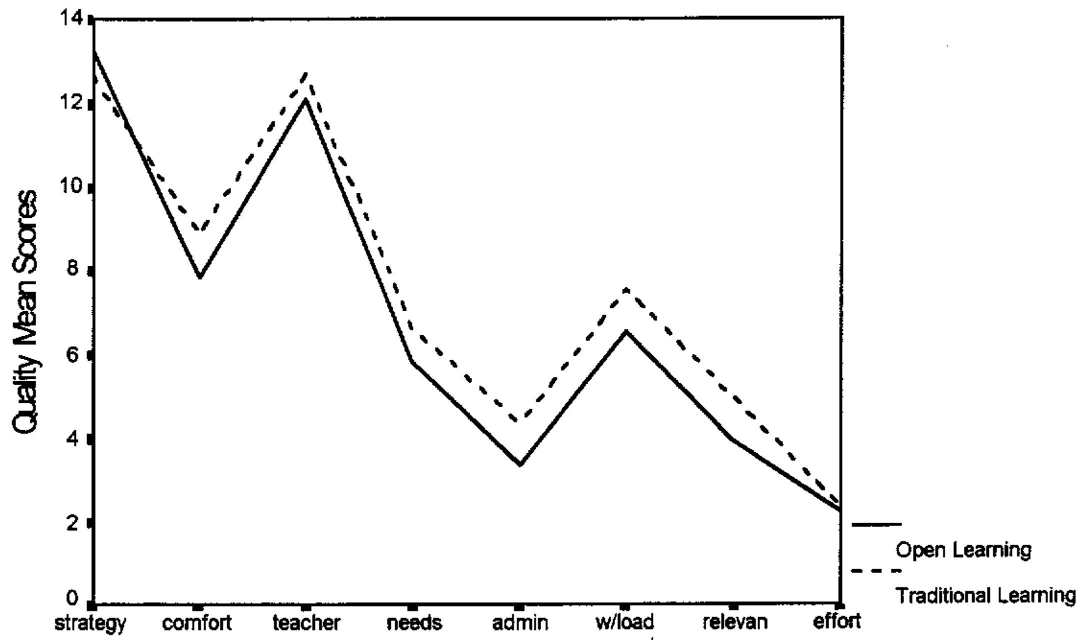
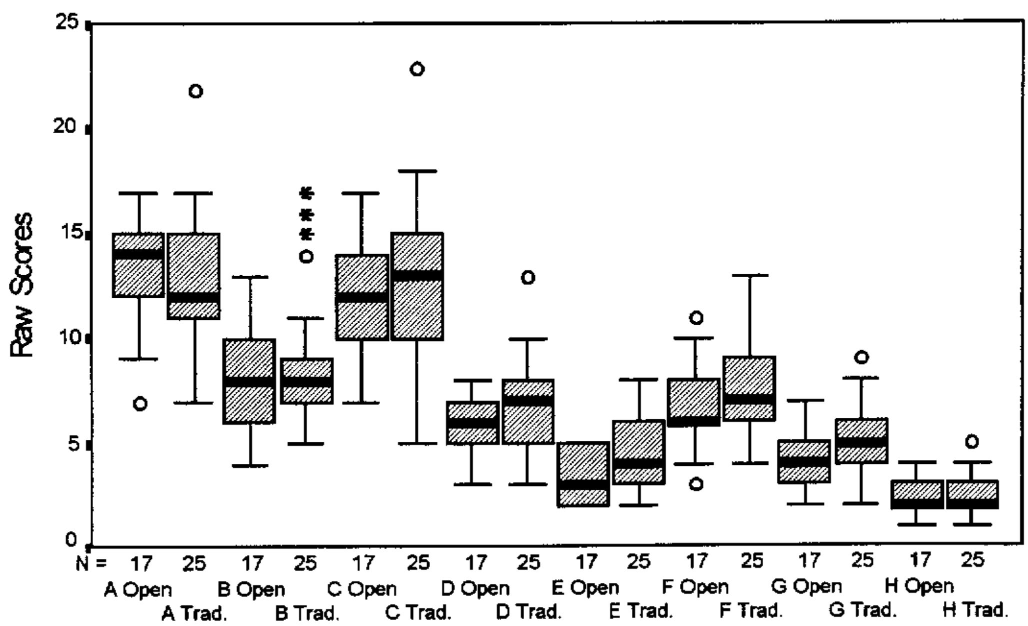


Figure 4. 14: Group Differences for the Factor of Quality: Means of Sub-Categories

Given that group differences have been identified based on the sub-categories contained within the factor of Quality, it is important to establish the extent to which such differences have any practical significance. Correlation ratios were computed for each of the sub-categories and appear in Table 4.15 below. From the correlation ratios of the sub-categories, it can be seen that two of the group differences highlighted are statistically significant. The sub-categories of Administration and Relevance returned an Eta^2 of 0.104 and 0.099 respectively. The differences between the groups based on the sub-categories can be examined in the boxplot contained in Figure 4.15 below. The similarities are not easily distinguished from the boxplots, suggesting that while differences exist, they are of little practical significance.

Sub-Category	Eta^2	Significance
Strategies	0.008	$F = 0.32$ (df = 1,40) $p = 0.582$
Comfort	0.031	$F = 1.27$ (df = 1,40) $p = 0.265$
Teacher	0.008	$F = 0.31$ (df = 1,40) $p = 0.586$
Student Needs	0.040	$F = 1.66$ (df = 1,40) $p = 0.202$
Administration	0.104	$F = 4.67$ (df = 1,40) $p = 0.035$
Workload	0.056	$F = 2.38$ (df = 1,40) $p = 0.127$
Relevance	0.099	$F = 4.41$ (df = 1,40) $p = 0.040$
Effort	0.006	$F = 0.24$ (df = 1,40) $p = 0.632$

Table 4. 15: Correlation Ratios for the Factor of Quality: Sub-Categories



Sub-Category Coding for the Factor of Quality

A = Strategies	B = Comfort	C = Teaching	D = Needs
E = Administration	F = Workload	G = Relevance	H = Effort

Figure 4. 15 : Group Differences between Open Learning and Traditional Learning Students for the Factor of Quality: Sub-Categories

4.7 Results for the Factor of Home Environment

The productivity factor of Home Environment has been operationalised in terms of eight sub-categories. The first sub-category measures the socio-economic status of the family, based on parental occupation, education and income. The second sub-category relates to the structure of the family. Parental aspirations for the student in question was the third sub-category, whilst the material resources available to the student within the home was the fourth sub-category. The fifth sub-category was a measure of the behavioural processes occurring within the household. The sixth and seventh sub-categories related to the disposition of the family with respect to simply enjoying the educational process or actually pursuing challenges for ultimate goals. The last sub-category related to the ethnic background and current state of the Home Environment.

Self report procedures were adopted to gather data on this factor. The statistical package Lertap was used to quantify the student data. Raw scores for the responses of both Open Learning students and Traditional Learning students are contained in Table B.8 in Appendix B. It can be seen that scores are shown in sub-categories along with overall total scores. Descriptive statistics summarising the raw scores shown are detailed in Table 4.16, where the alpha reliabilities of the survey instrument are also reported. In the case of the pilot study, an alpha reliability of 0.79 was reported, suggesting a reasonably reliable instrument.

The overall group difference based on the total mean scores is 5.4 points, as detailed in Table 4.16 below. It can also been seen that the reliability for the survey instrument is relatively low. When the instrument was administered to the Traditional Learning students, an alpha reliability of 0.52 was reported. The lower figure of reported reliability casts some doubt on the usefulness of the data received from the Traditional Learning students. Whilst this situation does not by any means negate the data, or the usefulness of it, it is important, however, to note this low reliability when drawing conclusions from the data. The Open Learning students surveyed returned a substantially higher degree of reliability. As can be seen from the table, an alpha reliability of 0.76 was returned. A greater degree of confidence can be applied to this data when attempting to draws conclusions about the groups.

Course	N	Max. Possible	Max. Observed	Mean	Min. Observed	S.D.	Variance	No. of Items	Coeff. Alpha
Open	17	239	180.00	140.24	120.00	15.56	244.34	50	0.760
Trad.	25	239	153.00	134.88	106.00	12.00	142.59	50	0.519

Table 4. 16 : Descriptive Statistics for the Factor of Home Environment

The correlation ratio was computed at $Eta^2 = 0.038$, where $F= 1.59$ (df 1,40) $p = 0.213$ between the two groups. It can be seen that this correlation ratio highlights that there is no practical significance in the differences between these two groups. The boxplot contained in Figure 4.16 below shows the distribution of scores. It can be seen that the outlier on the Open Learning scores will have influenced the mean score. It can also be seen that whilst the range and spread of scores is different, the majority of scores are clustered in essentially the same area. The boxplot confirms that group differences are minimal. Figure 4.16 highlights the spread of total scores of the two study groups. As can be seen, the majority of scores are similar for both groups, with the major differences between the groups occurring in the extremities of the score values.

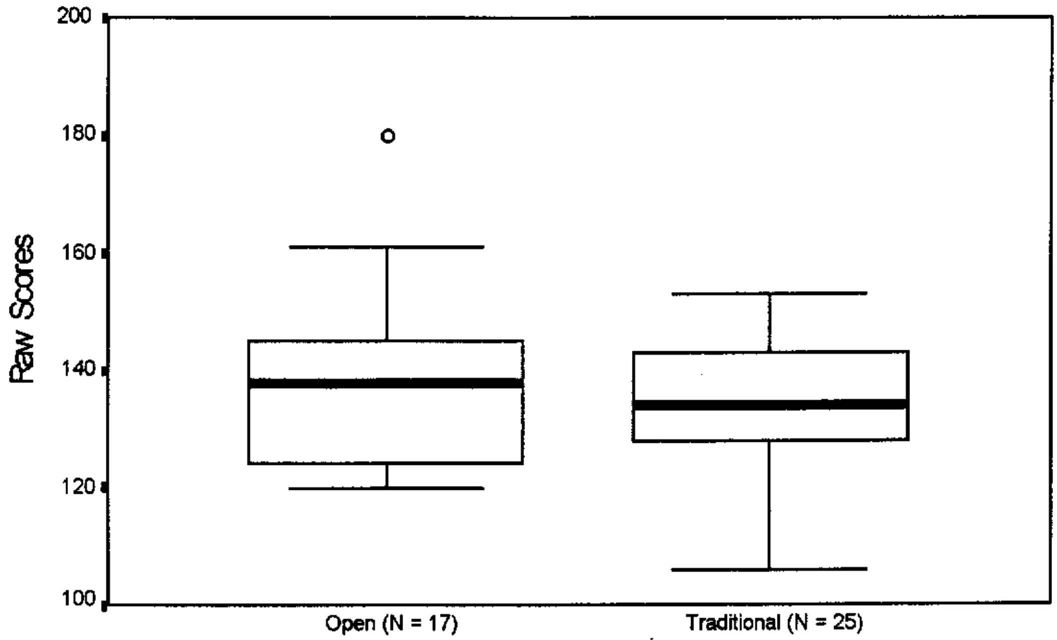


Figure 4. 16: Group Differences between Open Learning and Traditional Learning Students for the Factor of Home Environment

Table 4.17 displays the descriptive statistics for the sub-categories of the Home Environment factor. From the detail given, it can be seen that any differences between the groups are minimal. The largest difference appears to be in the sub-category of Ethnicity, a difference of a little over five points on the mean score. The notable differences appear in the sub-categories of Socio-Economic Status (1.5 points), Parent Aspirations (1.0 points) and the Social Psychological Processes (1.5 points).

Open Learning					
Variable	N	Max.	Mean	Min.	SD
A	17	27.00	17.00	12.00	3.71
B	17	6.00	5.24	1.00	1.44
C	17	14.00	10.47	8.00	1.74
D	17	17.00	12.82	9.00	2.35
E	17	61.00	46.88	31.00	7.52
F	17	15.00	10.12	6.00	2.06
G	17	7.00	3.47	2.00	1.81
H	17	32.00	26.35	15.00	5.48
Total	17	180.00	140.24	120.00	15.56

Traditional Learning					
Sub-Category	N	Max.	Mean	Min.	SD
A	25	29.00	18.52	10.00	4.44
B	25	6.00	5.12	1.00	1.45
C	25	16.00	11.40	7.00	2.14
D	25	20.00	12.56	10.00	2.31
E	25	60.00	45.40	36.00	6.28
F	25	14.00	10.32	6.00	1.84
G	25	7.00	3.80	2.00	1.78
H	25	32.00	21.04	7.00	10.15
Total	25	153.00	134.74	106.00	11.94

Sub-Category Coding for the Factor of Home Environment

A = Socio-Economic Status
B = Family Structure
C = Parent's Aspirations
D = Material Resources
E = Social Psychological Processes
F = Getting By Disposition
G = Getting Ahead Disposition
H = Ethnicity
T = Total Score

Table 4. 17 : Descriptive Statistics for the Factor of Home Environment: Sub-Categories

From the graph in Figure 4.17, the similarities between the two groups previously detailed are obvious. The greatest differences as described are apparent, but the overall graph confirms the findings that there are no practical differences between the two student groups.

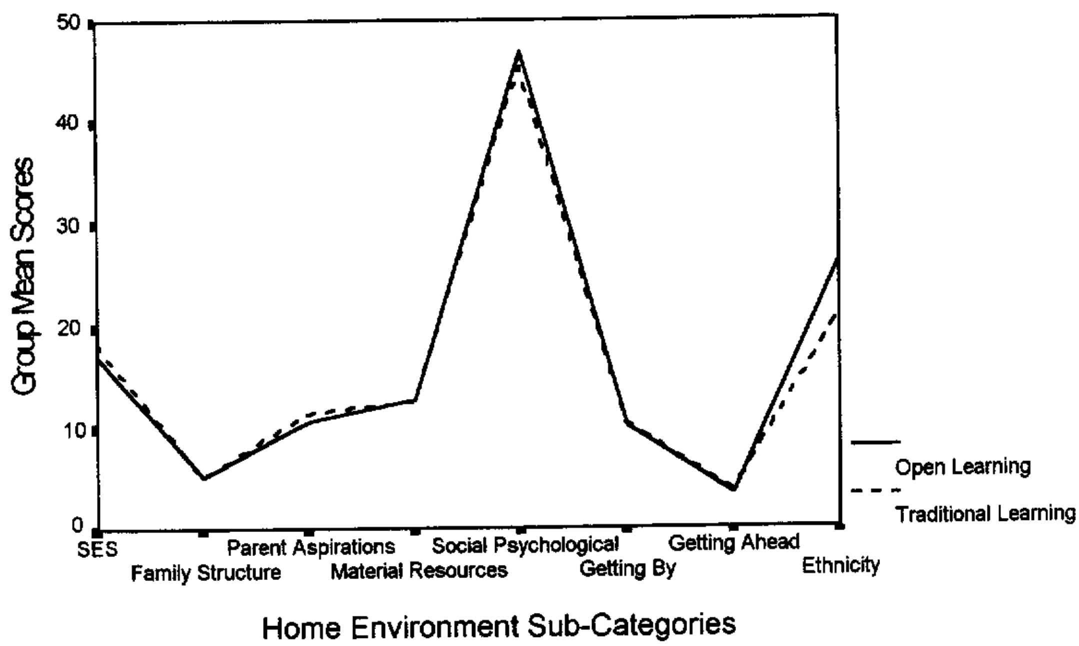


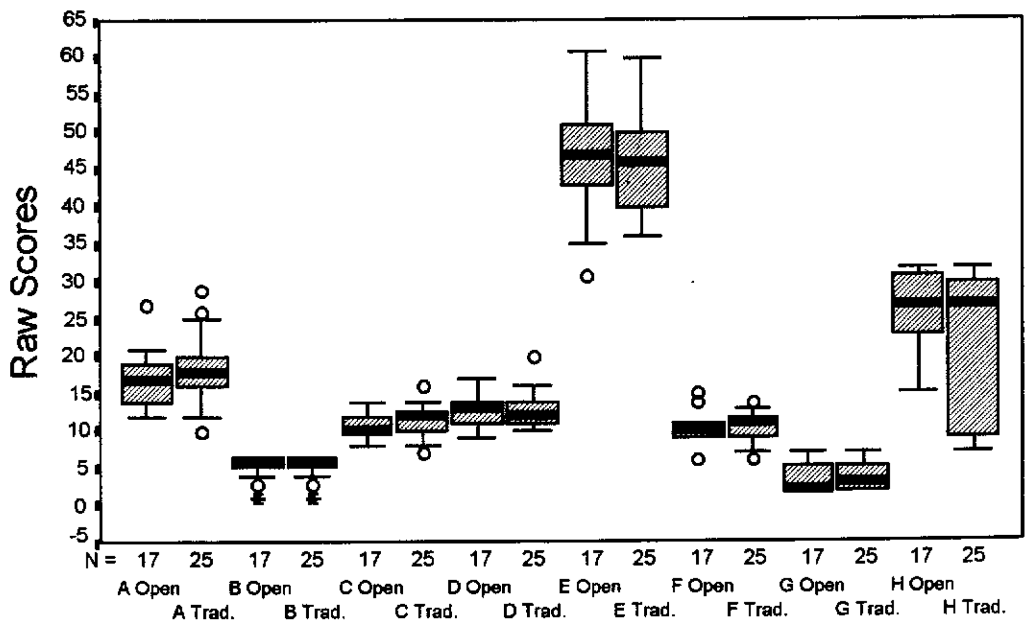
Figure 4. 17: Group Differences for the Factor of Home Environment: Means of Sub-Categories

Whilst there appears to be differences between the groups, as shown in Table 4.17 above, it is important to establish whether these differences have any statistical significance. Correlation ratios of the above sub-categories are detailed in Table 4.18 below. It can be seen that there is little practical significance between the two groups on any of the sub-categories. The sub-category of Ethnicity has a small difference, approaching the 0.05 level of significance, however, such a small Eta^2 reading suggests that this difference is of little practical significance.

Category	Eta^2	Significance
Socio Economic Status	0.033	$F = 1.35$ (df = 1,40) $p = 0.251$
Family Structure	0.002	$F = 0.07$ (df = 1,40) $p = 0.789$
Parent's Aspirations	0.052	$F = 2.21$ (df = 1,40) $p = 0.141$
Material Resources	0.003	$F = 0.13$ (df = 1,40) $p = 0.724$
Social Psychological Processes	0.012	$F = 0.48$ (df = 1,40) $p = 0.500$
Getting By Disposition	0.003	$F = 0.11$ (df = 1,40) $p = 0.743$
Getting Ahead Disposition	0.009	$F = 0.34$ (df = 1,40) $p = 0.568$
Ethnicity	0.086	$F = 3.86$ (df = 1,40) $p = 0.053$

Table 4. 18: Correlation Ratios for the Factor of Home Environment: Sub-Categories

Figure 4.18 displays the distribution of scores in the sub-categories of Home Environment. It can be seen that the two groups are quite similar. The sub-category of Ethnicity is shown to have distinct differences, as has been highlighted by the mean scores and correlation ratio of this sub-category.



Sub-Category Coding for the Factor of Home Environment

A = SES	B = Family Structure	C = Aspirations	D = Resources
E = Social	F = Getting By	G = Getting Ahead	H = Ethnicity

Figure 4. 18: Group Differences between Open Learning and Traditional Learning Students for the Factor of Home Environment: Sub-Categories

4.8 Results for the Factor of Classroom Environment

The productivity factor of Classroom Environment was measured using a self report survey questionnaire. The overall factor of Classroom Environment was made up of 15 sub-categories, a list of which appears in the relevant tables below. The same survey instrument was administered to both Open Learning and Traditional Learning students. The statistical package Lertap was used to process the initial data, resulting in the raw scores for individual students. These raw scores are contained in Table B.9 and B.10 in Appendix B.

Descriptive statistics for the above raw scores are contained in Table 4.19 below. Previous to the major survey being conducted, a pilot test of the instrument was conducted. The original questionnaire consisted of 45 items and returned an alpha reliability of 0.79. The major survey used a refined instrument containing only 30 items. This refined instrument, when tested, suggested a high degree of reliability, returning alpha reliabilities of 0.87 and 0.81 for Open Learning and Traditional Learning students respectively. From the information contained in Table 4.19 below, it can also be seen that there appears to be distinctive difference between the two groups of students. Students studying in a traditional mode scored their Classroom Environment on average more than ten points higher than the students studying in the open leaning mode.

Course	N	Max. Possible	Max. Observed	Mean	Min. Observed	S.D.	Variance	No. of Items	Coeff. Alpha
Open	17	150	135.00	110.5	87.00	14.74	217.26	30	0.874
Trad.	25	150	125.00	99.88	71.00	11.23	139.77	30	0.806

Table 4. 19: Descriptive Statistics for the Factor of Classroom Environment

Given that there appears to be distinct differences between the Open Learning and Traditional Learning students, it is appropriate to investigate whether such difference has any practical significance. The correlation ratio of the two groups was $Eta^2 = 0.143$ where $F = 6.68$ ($df = 1,40$) $p = 0.013$, suggesting a practical significance. The boxplot in Figure 4.19 below details the spread of the total scores for each of the student groups. It can be seen that there is a distinct difference between the two groups. The majority of Traditional Learning students scored more highly than Open Learning students, along with the range of scores of the Traditional Learning students being higher than the range of the Open Learning students.

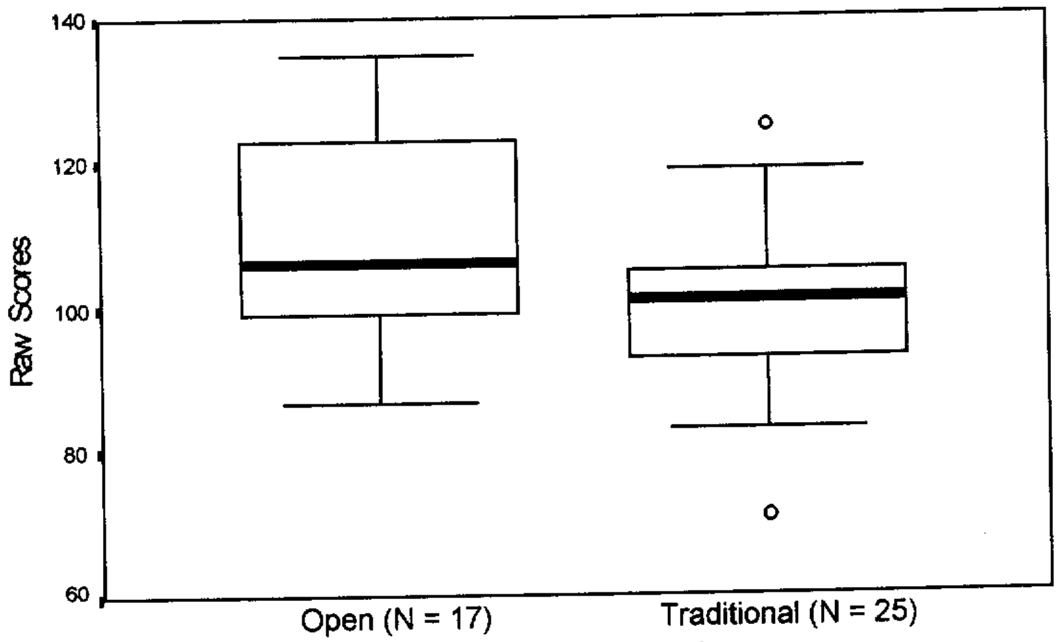


Figure 4. 19: Group Differences between Open Learning and Traditional Learning Students for the Factor of Classroom Environment

Given a distinct difference between the two groups of students, it is pertinent to more closely examine the factor being measured. Descriptive statistics of the sub-categories are detailed in Table 4.20 below. Comparisons of the mean scores for each of the sub-categories show similarities in six sub-categories, with distinct differences in the remaining seven sub-categories. Similarities between the Open Learning students and the Traditional Learning students exist in the areas of Student Comfort, Order, Student Involvement, Cohesiveness, Formality, Satisfaction, Innovation and Task Orientation. Differences between the groups, all of a reasonably high order, are in the areas of the Material Environment, Student Centredness, Packaged Learning, Student Support, Student Control, Competition and Friction. In all cases, the Traditional Learning students returned higher average scores for these sub-categories than did the Open Learning students.

Open Learning

Sub-Category	N	Max.	Mean	Min.	SD
A	17	15.00	10.82	7.00	2.23
B	17	5.00	3.65	2.00	1.11
C	17	10.00	6.65	3.00	2.23
D	17	10.00	8.00	4.00	1.66
E	17	10.00	7.12	3.00	2.12
F	17	10.00	5.59	2.00	1.62
G	17	10.00	8.41	4.00	1.73
H	17	9.00	7.00	4.00	1.73
I	17	10.00	8.35	5.00	1.41
J	17	10.00	8.59	4.00	1.54
K	17	10.00	8.76	6.00	1.35
L	17	10.00	7.41	3.00	2.00
M	17	8.00	5.59	2.00	1.87
N	17	10.00	8.53	6.00	1.28
O	17	9.00	6.00	4.00	1.62

Traditional Learning

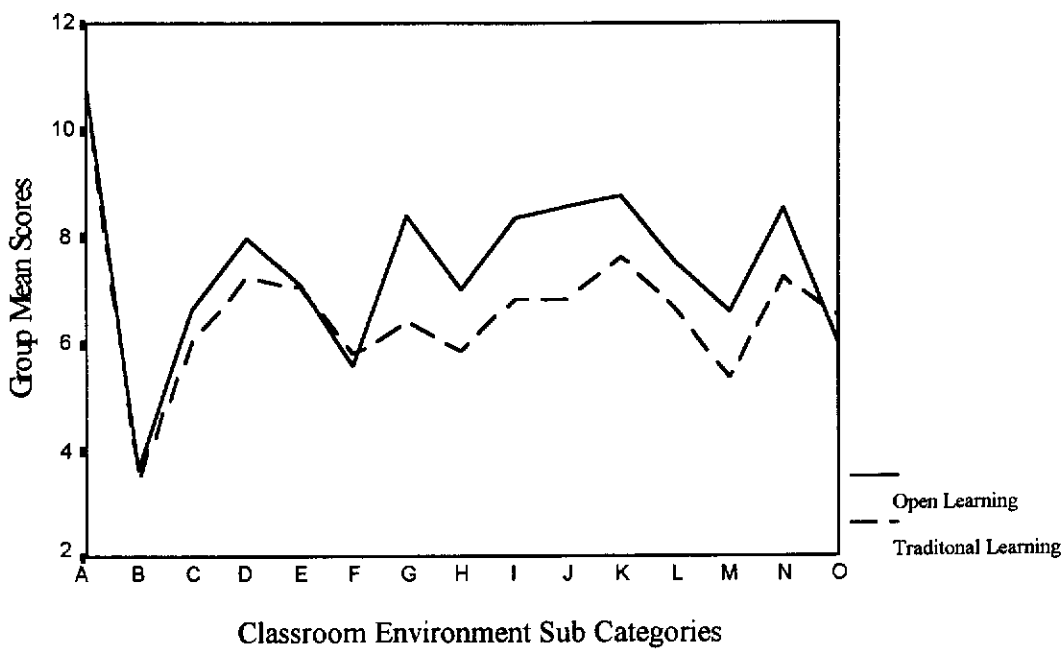
Sub-Category	N	Max.	Mean	Min.	SD
A	25	15.00	10.80	5.00	2.18
B	25	5.00	3.52	1.00	1.08
C	25	8.00	6.04	2.00	1.72
D	25	10.00	7.24	3.00	1.76
E	25	10.00	7.08	3.00	1.78
F	25	9.00	5.80	3.00	1.50
G	25	9.00	6.40	2.00	1.73
H	25	8.00	5.88	3.00	1.09
I	25	10.00	6.84	3.00	1.65
J	25	10.00	6.76	4.00	1.45
K	25	10.00	7.68	4.00	1.52
L	25	8.00	6.64	4.00	1.11
M	25	8.00	5.32	3.00	1.31
N	25	10.00	7.36	5.00	1.58
O	25	10.00	6.52	3.00	1.69

Sub-Category Coding for the Factor of Classroom Environment

A = Comfort	E = Cohesiveness	I = Support	M = Innovation
B = Order	F = Formality	J = Student Control	N = Friction
C= Involvement	G = Student Centredness	K = Competition	O = Task Orientation
D = Material Environment	H = Packaged Learning	L = Satisfaction	T = Total

Table 4. 20: Descriptive Statistics for the factor of Classroom Environment: Sub-Categories

The graph displayed in Figure 4.20 highlights the degree to which the two groups of students differ on their perceptions of the Classroom Environment. It can be seen that there is consistently higher scoring from Open Learning students in those sub-categories that do differ greatly.



Sub-Category Coding for the Factor of Classroom Environment

A	Comfort	F	Formality	K	Competition
B	Order	G	Student Centredness	L	Satisfaction
C	Involvement	H	Packaged Learning	M	Innovation
D	Material Environment	I	Support	N	Friction
E	Cohesiveness	J	Student Control	O	Task Orientation

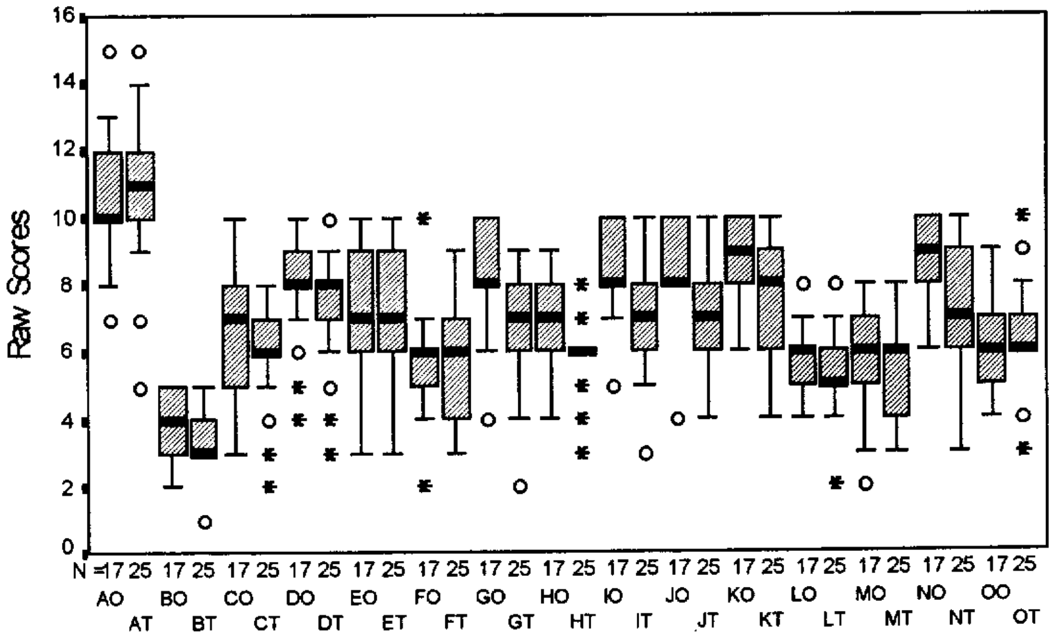
Figure 4. 20: Group Differences for the Factor of Classroom Environment: Means of Sub-Categories

Further to investigating the presence of group differences, it is imperative to establish to what degree the groups differ. Correlation ratios between the two study groups for each of the study groups appears in Table 4.21 below. It can be seen that there are six sub-categories where the difference appears to have some practical significance, namely the sub-categories of Student Centredness, Packaged Learning, Student Support, Student Control, Competition and Friction. In all of these sub-categories the students in the Open Learning mode scored higher than those students in an Traditional Learning setting. It is important to note that the scores for the sub-categories of Competition and Friction are scored in the reverse mode. A high score as shown on the graph illustrates a low level of the sub-category.

Code	Category	Eta^2	Significance
A	Comfort	0.000	F = 0.01 (df = 1,40) p = 0.905
B	Order	0.004	F = 0.14 (df = 1,40) p = 0.708
C	Involvement	0.024	F = 1.00 (df = 1,40) p = 0.325
D	Material Environment	0.047	F = 1.97 (df = 1,40) p = 0.164
E	Cohesiveness	0.000	F = 0.00 (df = 1,40) p = 0.946
F	Formality	0.005	F = 0.19 (df = 1,40) p = 0.672
G	Student Centredness	0.255	F = 13.66 (df = 1,40) p = 0.001
H	Packaged Learning	0.142	F = 6.65 (df = 1,40) p = 0.013
I	Support	0.192	F = 9.50 (df = 1,40) p = 0.004
J	Student Control	0.276	F = 15.26 (df = 1,40) p = 0.001
K	Competition	0.124	F = 5.64 (df = 1,40) p = 0.021
L	Satisfaction	0.060	F = 2.57 (df = 1,40) p = 0.036
M	Innovation	0.007	F = 0.30 (df = 1,40) p = 0.595
N	Friction	0.138	F = 6.43 (df = 1,40) p = 0.014
O	Task Orientation	0.024	F = 0.99 (df = 1,40) p = 0.673

Table 4. 21: Correlation ratios for the Factor of Classroom Environment: Sub-Categories

Figure 4.21 details the spread of scores for students across all of the sub-categories to Classroom Environment. Major differences as identified by the average scores shown in Table 4.20, and Figure 4.20 are reflected in the boxplot. With respect to the factor of Classroom Environment, it can be stated that there is a distinct and practically significant difference between the two groups of students.



AO - OO = Open Learning Students, AT - OT = Traditional Learning Students

Sub-Category Coding for the Factor of Classroom Environment

A = Comfort	B = Order	C = Involvement	D = Material Env.	E = Cohesiveness
F = Formality	G = Student Cnt.	H = Packaged	I = Support	J = Student Control
K = Competition	L = Satisfaction	M = Innovation	N = Friction	O = Task Orientation

Figure 4. 21: Group Differences between Open Learning and Traditional Learning Students for the Factor of Classroom Environment: Sub-Categories

4.9 Results for the Factor of Peer Environment

The productivity factor of Peer Environments has been operationalised into six distinct sub-categories. These sub-categories have been derived from four broad areas of Peer Environment, namely student interaction, high school aspirations, influences of people and activities undertaken along with peer conformity. Data gathered via the survey questionnaires were processed using the statistical package Lertap. From this analysis, a table of raw scores was developed which appears in Table B.11 in Appendix B. It can be seen that these raw scores are given in both sub-categories and also an overall total score. Analysis of the initial pilot testing of the survey questionnaire revealed an alpha reliability of 0.73, whilst a figure of 0.72 was returned after questionnaire refinement.

From the table of raw scores, descriptive statics are derived, these statistics appear in Table 4.22 below. The findings reveal that the reliability of the questionnaire has suffered somewhat. Data from students studying in a traditional manner returned an alpha reliability of only 0.517, a relatively low figure. Data from the Open Learning students, however, returned a much higher alpha reliability of 0.767, which is more in keeping with the original pilot testing of the instrument.

Course	N	Max. Possible	Max. Observed	Mean	Min. Observed	S.D.	Variance	No. of Items	Coeff. Alpha
Open	17	111	84	68.82	51	9.84	96.90	21	0.767
Trad.	25	111	85	71.80	55	7.23	52.25	21	0.517

Table 4. 22 : Descriptive Statistics for the Factor of Peer Environment

Results in the table indicate that there is a small difference between the two student bodies with respect to Peer Environment. Traditional Learning students, on average, scored this factor almost three full points higher than their Open Learning counterparts. The correlation ratio for these results was examined to ascertain the extent of practical significance of the difference. An Eta^2 of 0.031 was calculated where $F = 1.28$ (df 1,40) $p = 0.263$, showing that whilst differences have occurred, they bear little practical significance. The spread of the total raw scores for this factor are detailed in Figure 4.22 below. Again, it can be seen that the groups are similar on the factor of Peer Environment.

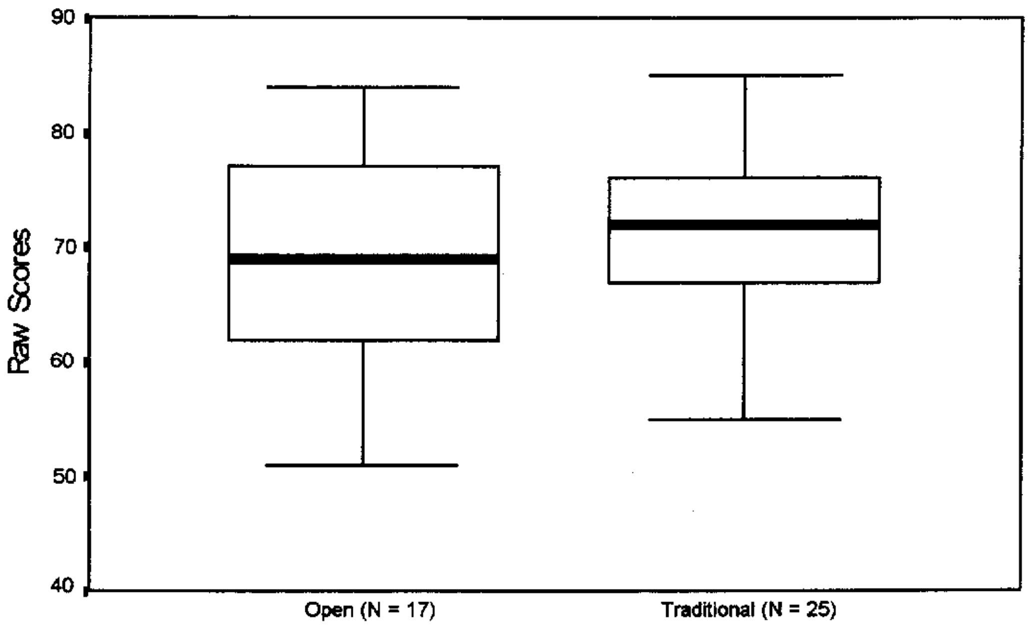


Figure 4. 22: Group Differences between Open Learning and Traditional Learning Students for the Factor of Peer Environment

Open Learning					
Sub-Category	N	Max.	Mean	Min.	SD
Interaction	17	20	12.59	6	3.61
Self Aspirations	17	12	10.65	8	1.54
Peer Aspirations	17	13	10.12	5	2.67
Model Influences	17	50	39.88	20	8.05
Activities	17	14	8.35	5	2.87
Peer Conformity	17	10	8.00	2	2.21
Traditional Learning					
Sub-Category	N	Max.	Mean	Min.	SD
Interaction	25	20	13.56	6	3.68
Self Aspirations	25	13	10.00	6	1.91
Peer Aspirations	25	13	9.52	4	2.06
Model Influences	25	49	38.80	31	5.29
Activities	25	17	11.24	5	3.57
Peer Conformity	25	10	8.20	4	2.14

Table 4. 23: Descriptive Statistics for the Factor of Peer Environment: Sub-Categories

Table 4.23 indicates the descriptive statistics for the sub-categories of this factor. Inspection of the table reveals only minor differences between the two student groups, with the exception of the sub-category named Activities. Students learning in the Traditional manner have scored in excess of three points higher than the Open Learning students. The distinct difference in the sub-category of Activities is highlighted in the graph below in Figure 4.23. The degree to which the two groups are similar is also highlighted, with both groups scoring closely on all but the sub-category of Activities.

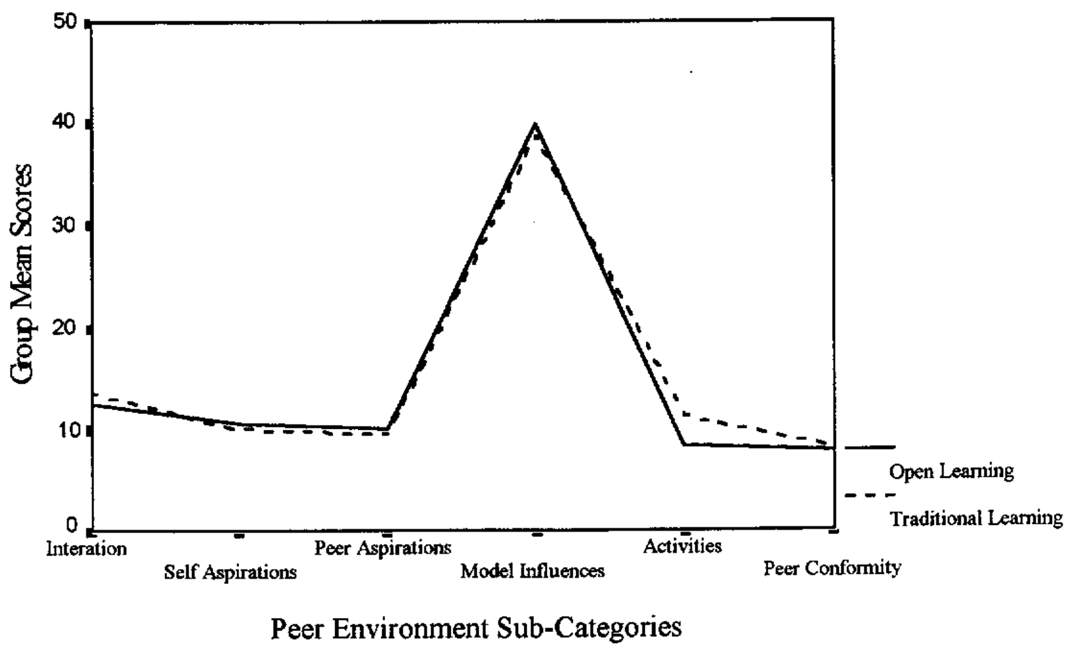


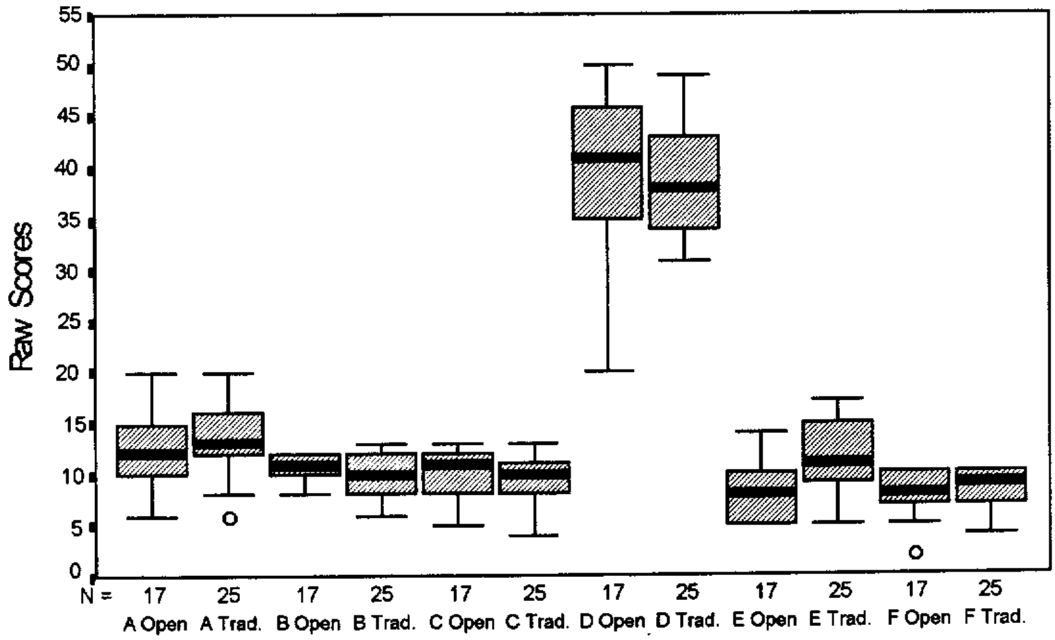
Figure 4. 23: Group Differences for the Factor of Peer Environment : Means of Sub-Categories

Given that there is a distinct difference apparent between the two groups, it is of importance to establish the extent of practical significance. Acknowledging that there does appear to be minor group differences for the Peer Environment factor, correlation ratios were calculated to establish a level of practical significance for this difference. From Table 4.24 it can be seen that that only one sub-category has any practical significance. With an Eta^2 of 0.162, the sub-category of Activities shows some practical significance for the group difference. From the data provided by the two student groups, it appears that there is a distinct, and to a small extent, significant difference between the two student groups. It appears that the Open Learning students generally had a much higher degree of activities prior to their vocational training than did their Traditional Learning counterparts. It is of importance to note that such a difference has occurred before contact with the learning environment in which the students were studying. If distinct differences occur between the students with respect to achievement, it is important to note that this measure of peer influences largely isolates the current learning environment of the student. There is the possibility, therefore, that this factor may have some predictive qualities in terms of future educational achievement.

Category	Eta^2	Significance
Interaction	0.018	F = 0.71 (df = 1,40) p = 0.592
Self Aspirations	0.033	F = 1.76 (df = 1,40) p = 0.249
Peer Aspirations	0.017	F = 0.67 (df = 1,40) p = 0.579
Model Influences	0.007	F = 0.28 (df = 1,40) p = 0.608
Activities	0.162	F = 7.72 (df = 1,40) p = 0.008
Peer Conformity	0.002	F = 0.09 (df = 1,40) p = 0.768

Table 4. 24: Correlation Ratios for the Factor of Peer Environment: Sub-Categories

The spread of scores for each of the sub-categories of Peer Environment is detailed in Figure 4.24 below. The similarities between the two groups is evident, with the only marked difference being the sub-category of Activities. Previous results in the form of average scores and correlation ratios are confirmed in the boxplot.



Sub-Category Coding for the Factor of Peer Environment

A = Interaction	B = Self Aspirations	C = Peer Aspirations
D = Model Influence	E = Activities	F = Peer Conformity

Figure 4. 24: Group Differences Between Open Learning and Traditional Learning Students on the Factor of Peer Environment: Sub-Categories

4.10 Results for the Factor of Mass Media

The last factor identified in Walberg's Educational Productivity Model (1981) is that of Mass Media. It has been posited by Walberg and others that the student's exposure to Mass Media can have a significant effect on the educational achievement of that student. The factor of Mass Media has been operationalised in terms of four broad areas, namely television viewing, playing of music, print media and the use of computers. Further sub-categories have been identified within these broad areas. Television viewing and the playing of music has been categorised into weekday and weekend time slots. Print media and the use of computers has been categorised into either leisure or study related use. Data gathering for this factor was through the use of a survey questionnaire. After development, the questionnaire was pilot tested on a total of 23 cases. Analysis of the pilot study data revealed an alpha reliability of 0.71. Details of the pilot study results appear in Table 4.25 below. A complete list of the sub-categories developed for the factor of Mass Media, along with student raw scores is contained in Table B.12 in Appendix B.

A description of the statistics related to the raw scores is detailed in Table 4.25 below . It can be seen that the overall average of Open Learning Students appears to be distinctively higher than the average score for the Traditional Learning students. It can also be seen that the data gathered can be analysed with a relatively high degree of reliability. The survey questionnaire returned alpha reliabilities of 0.75 for Open Learning students and 0.72 for Traditional Learning students.

Course	N	Max. Possible	Max. Observed	Mean	Min. Observed	S.D.	Variance	No. of Items	Coeff. Alpha
Open	17	95	59.00	43.76	29.00	7.75	60.07	19	0.750
Trad	25	95	61.00	40.72	30.00	7.68	59.04	19	0.721

Table 4. 25: Descriptive Statistics for the Total Factor of Mass Media

From the results reported in Table 4.24, it can be seen that students studying in an Open Learning mode scored three points higher than the students studying in the traditional mode. The correlation ratio of Eta^2 was 0.038 where $F = 1.57$ ($df = 1,40$) $p = 0.215$, highlighting the fact that the difference of the mean scores has little practical significance. The spread of the mean scores can be seen in the boxplot of Figure 4.25 below.

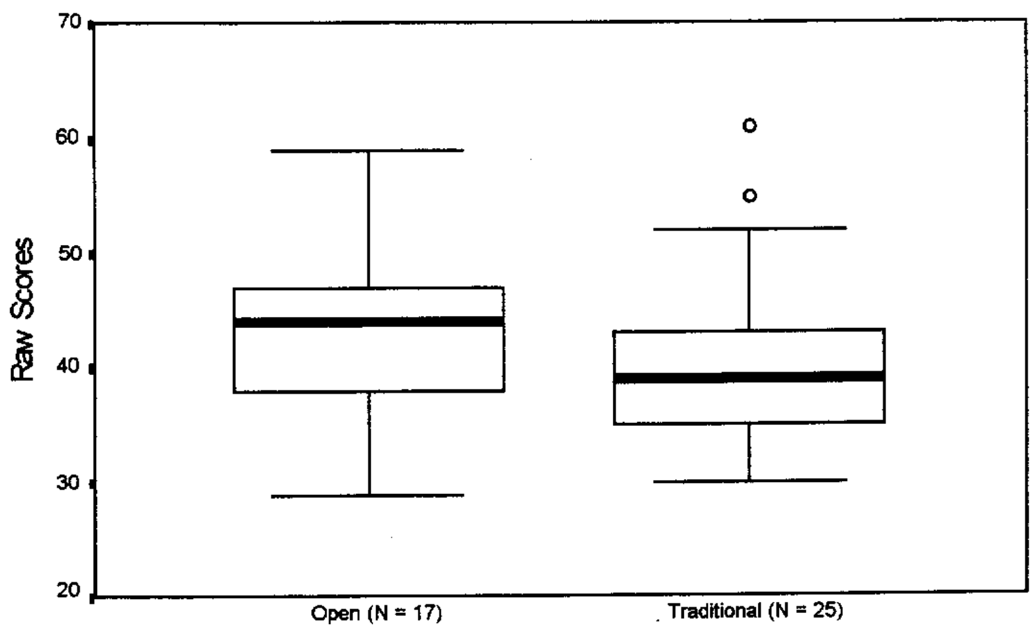


Figure 4. 25: Group Differences Between Open Learning and Traditional Learning Students on the Factor of Mass Media

While the average of total scores appears to be different for the two groups of students, a closer inspection of the sub-categories can show exactly where those differences are most distinct. Examination of Table 4.26 shows that the majority of sub-categories are similar for both student groups. Those sub-categories with the greatest group differences are the listening of music on the weekend, the use of print media for leisure, and the completion of homework whilst playing music or watching the television.

Open Learning

Sub-Category	N	Max.	Mean	Min.	SD
TV Viewing Week Days	17	4.00	2.76	2.00	.75
TV Viewing Weekend	17	4.00	2.53	1.00	.94
Playing Music Week Days	17	5.00	2.94	1.00	1.20
Playing Music Weekend	17	5.00	3.12	1.00	1.17
Print Media for Leisure	17	13.00	9.76	6.00	2.36
Print Media Related to Studies	17	13.00	8.94	5.00	2.16
Computer Use for Leisure	17	5.00	2.82	1.00	1.19
Computer Use Related to Studies	17	5.00	3.00	1.00	1.37
Homework with Music	17	5.00	3.29	1.00	1.31
Homework with TV	17	4.00	1.41	1.00	.87

Traditional Learning

Sub-Category	N	Max.	Mean	Min.	SD
TV Viewing Week Days	25	4.00	2.72	1.00	0.79
TV Viewing Weekend	25	4.00	2.36	1.00	0.86
Playing Music Week Days	25	5.00	2.72	1.00	1.21
Playing Music Weekend	25	5.00	2.48	1.00	1.16
Print Media for Leisure	25	17.00	9.08	6.00	2.74
Print Media Related to Studies	25	15.00	8.68	5.00	2.84
Computer Use for Leisure	25	5.00	2.68	1.00	1.07
Computer Use Related to Studies	25	5.00	2.72	1.00	1.02
Homework with Music	25	5.00	2.60	1.00	1.35
Homework with TV	25	4.00	2.00	1.00	0.91

Table 4. 26: Descriptive Statistics for the Factor Mass Media: Sub-Categories

The graph contained in Figure 4.26 below, further details the differences between the Open Learning students and the Traditional Learning students based in the average scores of sub-categories. Whilst small differences can be seen, and as previously stated one with practical significance, overall it can be seen that the two groups are quite similar.

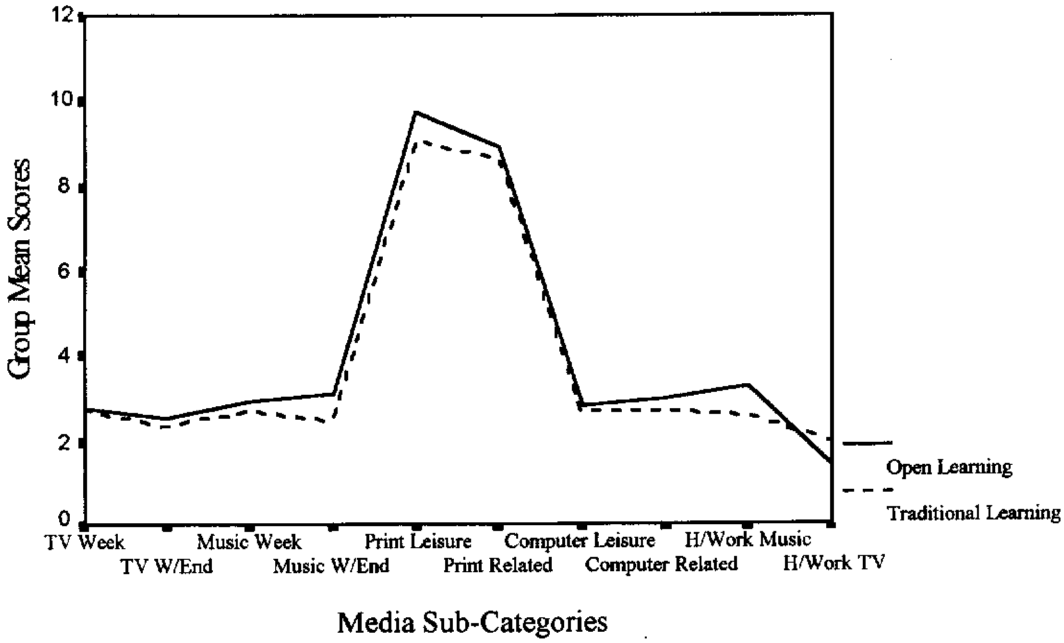


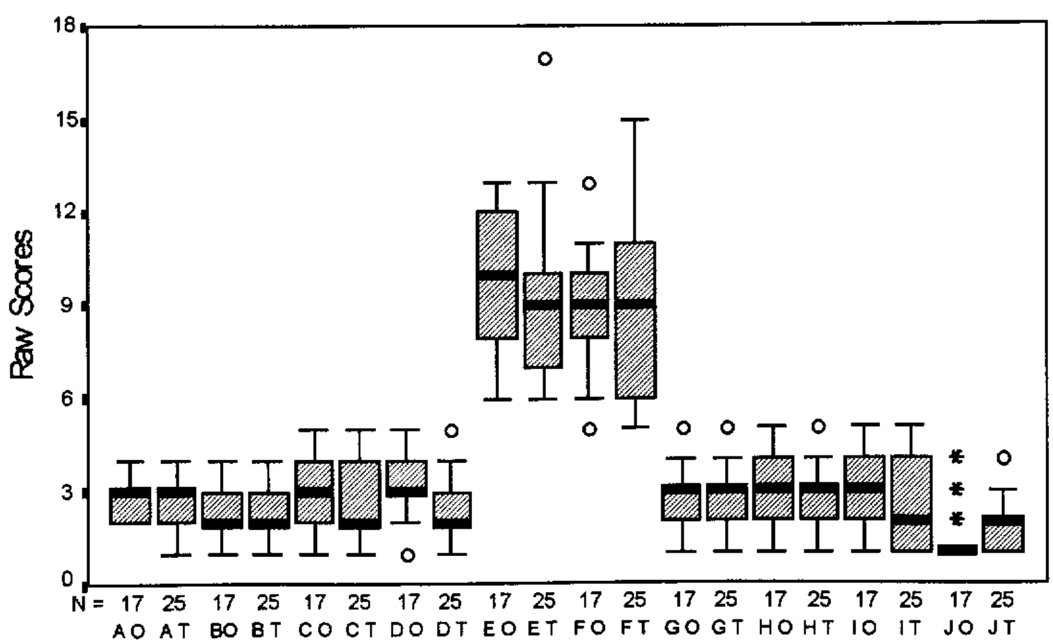
Figure 4. 26: Group Differences for the Factor of Mass Media: Means of Sub-Categories

Whilst the results for the total scores and results for the sub-categories suggested that there may be distinctive group differences, it is pertinent to establish whether there is any practical significance to such differences. Correlation ratios have been calculated for the differences between the sub-categories, with the results detailed in Table 4.27 below. The sub-category of Homework with TV is at a level where the difference may be considered to be practically significant. The playing of music on the weekends approaches statistical significance, however, the Eta^2 result of 0.063 is below the 0.1 level that might normally be considered as practically significant.

Category	Eta²	Significance
TV Viewing Week Days	0.001	F = 0.03 (df = 1,40) p = 0.864
TV Viewing Weekend	0.009	F = 0.37 (df = 1,40) p = 0.555
Playing Music Week Days	0.008	F = 0.34 (df = 1,40) p = 0.572
Playing Music Weekend	0.071	F = 3.06 (df = 1,40) p = 0.084
Print Media for Leisure	0.017	F = 0.70 (df = 1,40) p = 0.586
Print Media Related to Studies	0.003	F = 0.10 (df = 1,40) p = 0.749
Computer Use for Leisure	0.004	F = 0.16 (df = 1,40) p = 0.695
Computer Use Related to Studies	0.014	F = 0.58 (df = 1,40) p = 0.542
Homework with Music	0.063	F = 2.71 (df = 1,40) p = 0.104
Homework with TV	0.099	F = 4.41 (df = 1,40) p = 0.040

Table 4. 27: Correlation ratios for the Factor of Mass Media: Sub-Categories

Figure 4.27 below details the spread of scores for the sub-categories of the Mass Media factor. It can be seen that the groups are similar with the exception of the category of Homework with TV. Such a finding confirms the results of the correlation ratios.



AO - OO = Open Learning Students, AT - AO = Traditional Learning Students

Sub-Category Coding for the Factor of Mass Media

A = TV Weekdays	B = TV Weekend	C = Music Weekdays	D = Music Weekends.
E = Leisure Print	F = Related Print	G = Leisure Computer.	H = Related Computer
I = Music Homework	J = TV Homework		

Figure 4. 27: Group Differences Between Open Learning and Traditional Learning Students on the Factor of Mass Media: Sub-Categories

4.11 Summary

The results that have been presented are a direct comparison between the Open Learning and Traditional Learning students. This section of results has addressed the first research question and detailed characteristics of Open Learning students, presenting,through the graphs and tables, a snapshot picture of the actual situation. For each of the nine productivity factors aggregated scores have been presented. Descriptive statistics give the reader an insight into the range of scores, while boxplots give a visual indication of the spread of scores. Scores for the sub-categories for each of the productivity factors have been presented in a similar manner. Levels of statistical significance have been displayed which have also given indications of practical significance. From the results presented above, it can be determined that the two student groups are similar on all of the productivity factors with the exception of Classroom Environment.

An overview of these results reveal that only one productivity factor was found to be significantly different for one group of the students. Students studying in an Open Learning environment scored significantly higher total scores on the factor of Classroom Environment than did the Traditional Learning students. Given the distinctly different learning environments, it follows that there should be a distinct difference in the student scores on this factor. Such a finding adds credence to the overall validity of the Classroom Environment questionnaire. From the results presented for this factor, significant differences have been highlighted for specific sub-categories. Such differences highlight that the Open Learning environment differs most from the Traditional Learning environment in the areas of increased Student Centredness, Packaged Learning, Student Support, Student Control, with decreased Competition and Friction. Such a finding has identified the salient factors of an Open Learning environment, again confirming the validity of the Classroom Environment questionnaire.

Of the other eight productivity factors, a number of sub-categories were shown to be significantly different for the two student groups. The factor of Quality had two significantly different sub-categories, those of Administration and Relevance. Three factors had one sub-category each that was significantly different between the two groups. For the factor of Home

Environment the sub-category of Ethnicity was significantly different. For the factor of Peers the sub-category of Activities was significantly different. For the factor of Mass Media the sub-category of Homework with TV was significantly different between the student groups. While differences have been shown to be statistically significant for the sub-categories, the magnitude of these differences across the factors tend to suggest that the differences are of little practical significance.

From the presentation of the results for individual productivity factors, the conclusion may be drawn that the two groups are essentially similar with the exception of their Classroom Environment. Students appear to be similar with respect to their aptitude, their perceptions of the instruction and their environments, with the obvious exception of their Classroom Environment. Given that two student groups are similar with respect to eight of the productivity factors, it is of interest to examine correlations between these factors and the students' educational achievement. This comparison forms the next section of this results chapter.

4.12 Educational Achievement

Educational achievement within the vocational education sector has historically been competency based. That is, the objective of the education has been to achieve a degree of competence at performing specific tasks. Current assessment procedures within the vocational education sector are undergoing major changes. These changes are in line with the national training reform agenda, which has seen major changes to curriculum in most courses, and consequently the assessment. Courses within the vocational education sector are progressively being assessed in terms of competence having been achieved, or competence not having been achieved. Due to such changes, results for TAFE courses are progressing towards the dichotomous Pass or Fail mode of assessment.

At the time of this research, not all courses had changed to this system of assessment. The student groups that were surveyed were completing similar courses in the two different environments of Open Learning and Traditional Learning. As is shown in Chapter 3, Table 3.1

detailing the student sample, three different courses were being completed by the students surveyed. Course A was representative of the Associate Diploma of Business - Office and Secretarial Studies, and included a total of three Open Learning students and 11 Traditional Learning students. Course B was representative of the Advanced Diploma of Business - Accounting, and included ten Open Learning students and seven Traditional Learning students. Course C was representative of the Advanced Diploma of Business - Administration, and included four Open Learning students and seven Traditional Learning students. The methods of recording student achievement in the courses being surveyed appears in Table 4.28 below. It can be seen that the methods of assessment have involved dichotomous Pass/Fail assessment along with percentage scores for assessment.

Specific Course	Assessment Method Employed
Course A Open Learning	Percentage Marks
Course B Open Learning	Dichotomous Pass/Fail (with No of Attempts)
Course C Open Learning	Dichotomous Pass/Fail (with No of Attempts)
Course A Traditional Learning	Percentage Marks
Course B Traditional Learning	Dichotomous Pass/Fail (with No of Attempts)
Course C Traditional Learning	Dichotomous Pass/Fail (with Teachers Anecdotal Percentiles)

Table 4. 28: Assessment Methods Employed in Specific Courses

Walberg's productivity factors have been utilised a basis for the comparison between the educational achievement of the groups of students. In order to make meaningful comparisons, a common measure of educational achievement is required. Students have been placed in rank order within their respective course groups, thus allowing cross comparisons between the different assessment procedures. Table B.13 in Appendix B details the results for the Open Learning students and the consequent ranking of educational achievement. Rank orders for students in course A are based on simple percentage marks, whereas the rank order of students in course B and course C are based on the number of failures, withdrawals and attempts required to achieve a Pass mark, as assessment was dichotomous for these courses. Table B.14 in Appendix B details the achievement ranking of Traditional Learning students within their respective courses. Rank order for students in course A is based on the average of three percentage marks. The rank order for students in course B is based on the number of attempts a student required in order to achieve a Pass mark. The rank order of students in course C is based on the anecdotal percentage marks as established by the students' teacher.

Given that the educational achievement is necessarily based on rank orders, comparisons cannot be made across courses. There is no parity between the Open Learning student ranked highest on course A for example, when compared with the Open Learning student ranked highest in course B or C. It is possible that a student who had a relatively low level of achievement could rank highly within a specific course group, but in reality have a low level of achievement when compared to the wider student body across courses. For the purposes of this study, comparisons based on educational outcomes, therefore, are only possible within course groups. Given that relationships between productivity factors and educational outcomes can only be examined based on separate courses, sample numbers of students are necessarily low. The general body of Open Learning students are divided into three specific groups, as is the case for the Traditional Learning students.

Correlations examining the relationship between Walberg's productivity factors and educational achievement were calculated using Kendall's Tau through the statistical package SPSS. Kendall's tau was selected based on the ability of this procedure to deal with small sample numbers. In order that such a procedure be conducted, raw scores of individual students for each of the productivity factors were placed in order of ranking. Tables B.15, B.16, and B.17, contained in Appendix B detail the raw scores and the rank orders of Open Learning students for each of the productivity factors and their educational achievement. Table B.18, B.19, and B.20 in Appendix B detail the raw scores and rank orders of the Traditional Learning students for each of the productivity factors and their educational achievement.

Given a common basis of assessment, in the form of student ranking, the study is well placed to investigate relationships between the productivity factors and educational achievement.

4.13 Correlations Between Productivity Factors and Achievement.

This section of the results chapter addresses the second research question and closely examines the relationship between each of the nine productivity factors and educational achievement. Correlations were examined between the rank order of student results compared to the rank order of student scores for each of the productivity factors. Correlation values describing the relationship between a student's achievement and a specific productivity factor are developed. The correlation coefficient, along with the value of statistical significance of the specific correlation, have been developed using the statistical package SPSS. From the rank order of student scores on educational achievement, and the specific productivity factors, correlational scatterplots have been presented. Figure 4.28 through to Figure 4.33 on the following pages detail correlations between the nine productivity factors and educational achievement. It can be seen that each figure displays a scatter plot for the correlation of each productivity factor with the associated educational achievement.

The relationship between educational achievement and each of the productivity factors for the Open Learning students completing course A is detailed in Figure 4.28 below. From the scatterplots illustrated, it can be seen that for this group of students there is a positive correlation between educational achievement and the productivity factors of Cognitive Development, Quantity (focussed time), Quality, Peer Environment and Mass Media. There appears to be a negative correlation between the factors of Ability, Quantity (actual hours), Home Environment and Classroom Environment with achievement.

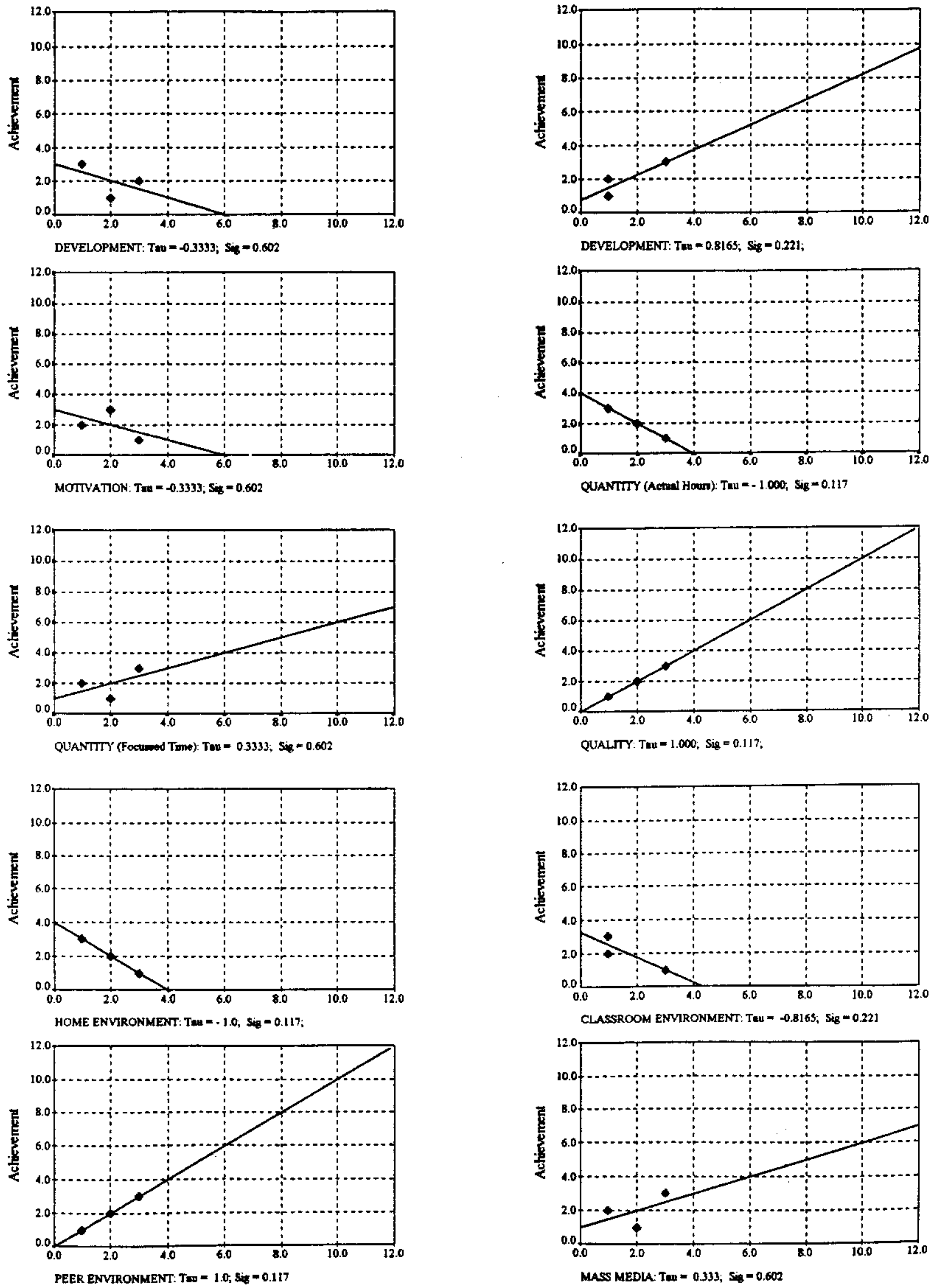


Figure 4.28: Correlations Between Productivity Factors and Achievement for all Open Learning Students in Course A

Relationships between productivity factors and educational achievement for the Open Learning students completing course B are highlighted in Figure 4.29. From the series of scatterplots contained, it is evident that there is a positive trend for most of the productivity factors and achievement. There is a positive relationship evident between educational achievement and the factors of Ability, Cognitive Development, Motivation, Quantity (focussed time), and Classroom Environment. There is a negative correlation with the factors of Quality and Mass Media with achievement, while the factors of Quantity (actual hours), Home Environment and Peer Environment appear to have little or no correlation with educational achievement.

Scatterplots illustrating the relationship between educational achievement and the various productivity factors for those Open Learning students completing course C are contained in Figure 4.30. From these scatterplots it is apparent that there is a positive relationship between educational achievement and most of the productivity factors. The factors of Quantity (actual hours), Quality and Home Environment showed a negative correlation with achievement for this group of students.

With respect to the Traditional Learning students, Figure 4.31 illustrates the relationships between productivity factors and achievement for students completing course A. From the scatterplots displayed, both positive and negative relationships are evident. For this group of students there is a positive relationship between educational achievement and the factors of Ability, Cognitive Development, Motivation, Classroom Environment and Mass Media. Negative correlations are evident between educational achievement and the factors of Quality and Home Environment. For these students, there appears to be no correlation between the factors of Quantity, (either actual hours or focussed time) or Peer Environment with overall educational achievement.

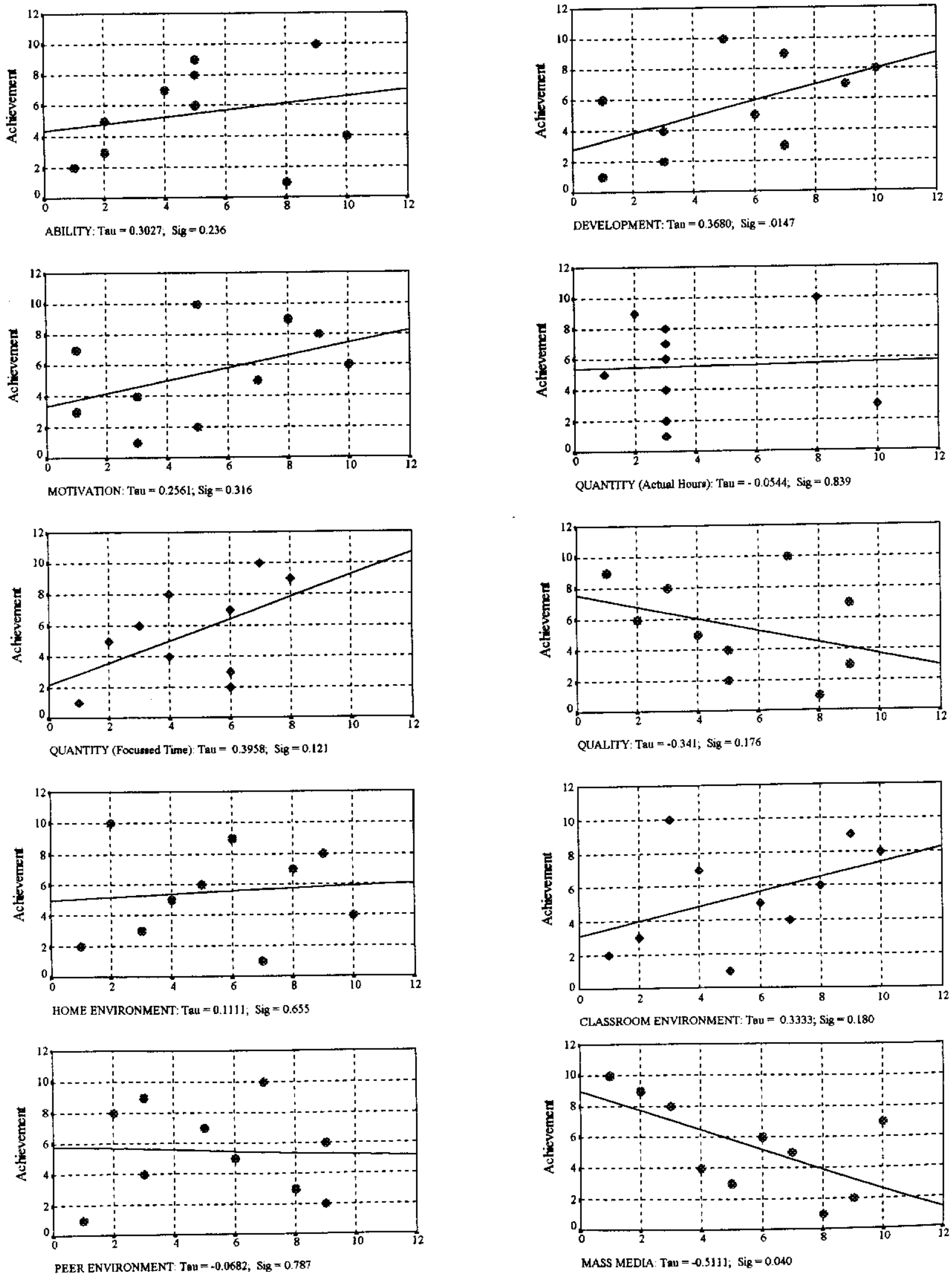


Figure 4.29: Correlations Between Productivity Factors and Achievement for all Open Learning Students in Course B

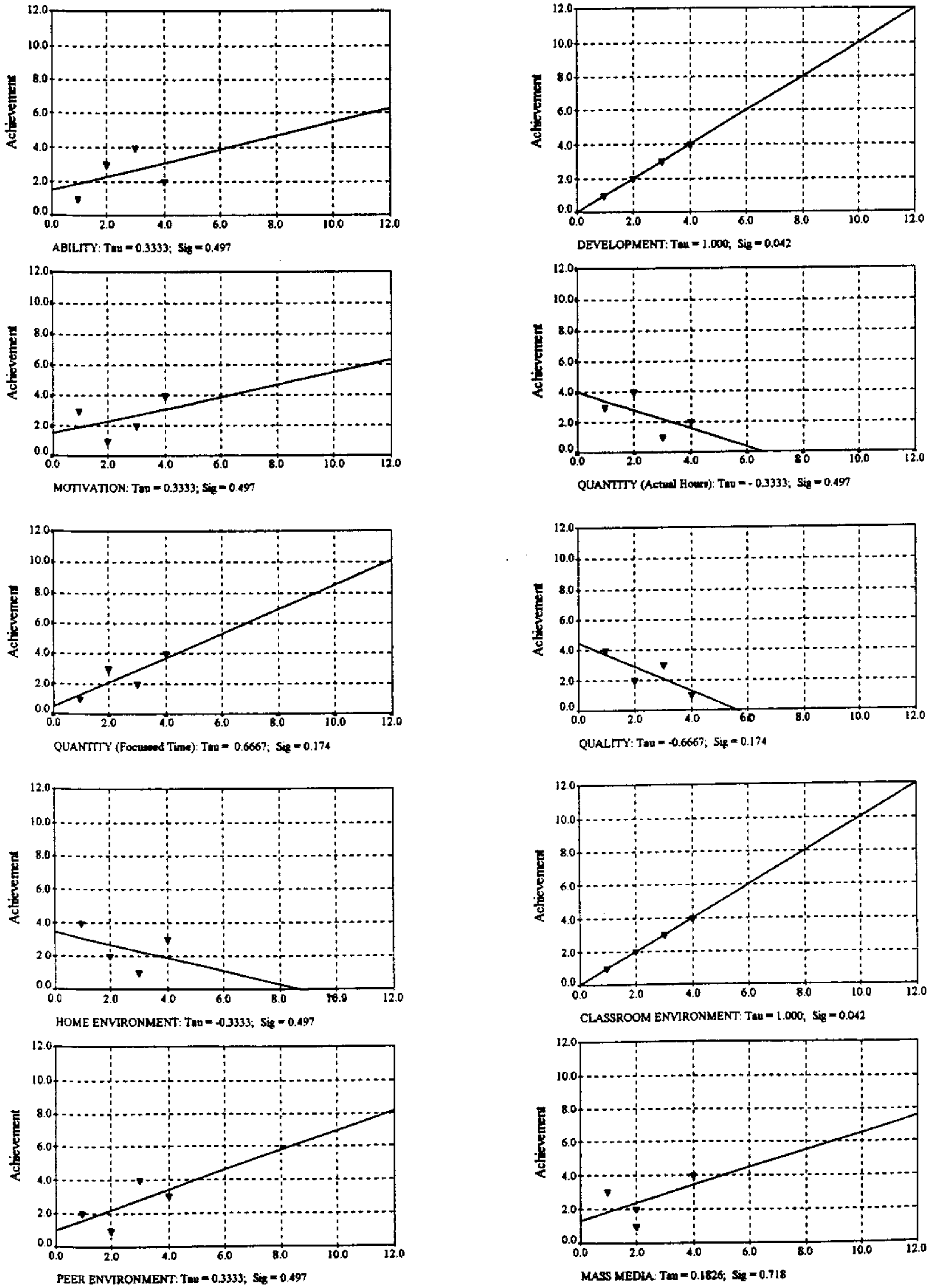


Figure 4.30: Correlations Between Productivity Factors and Achievement for all Open Learning Students in Course C

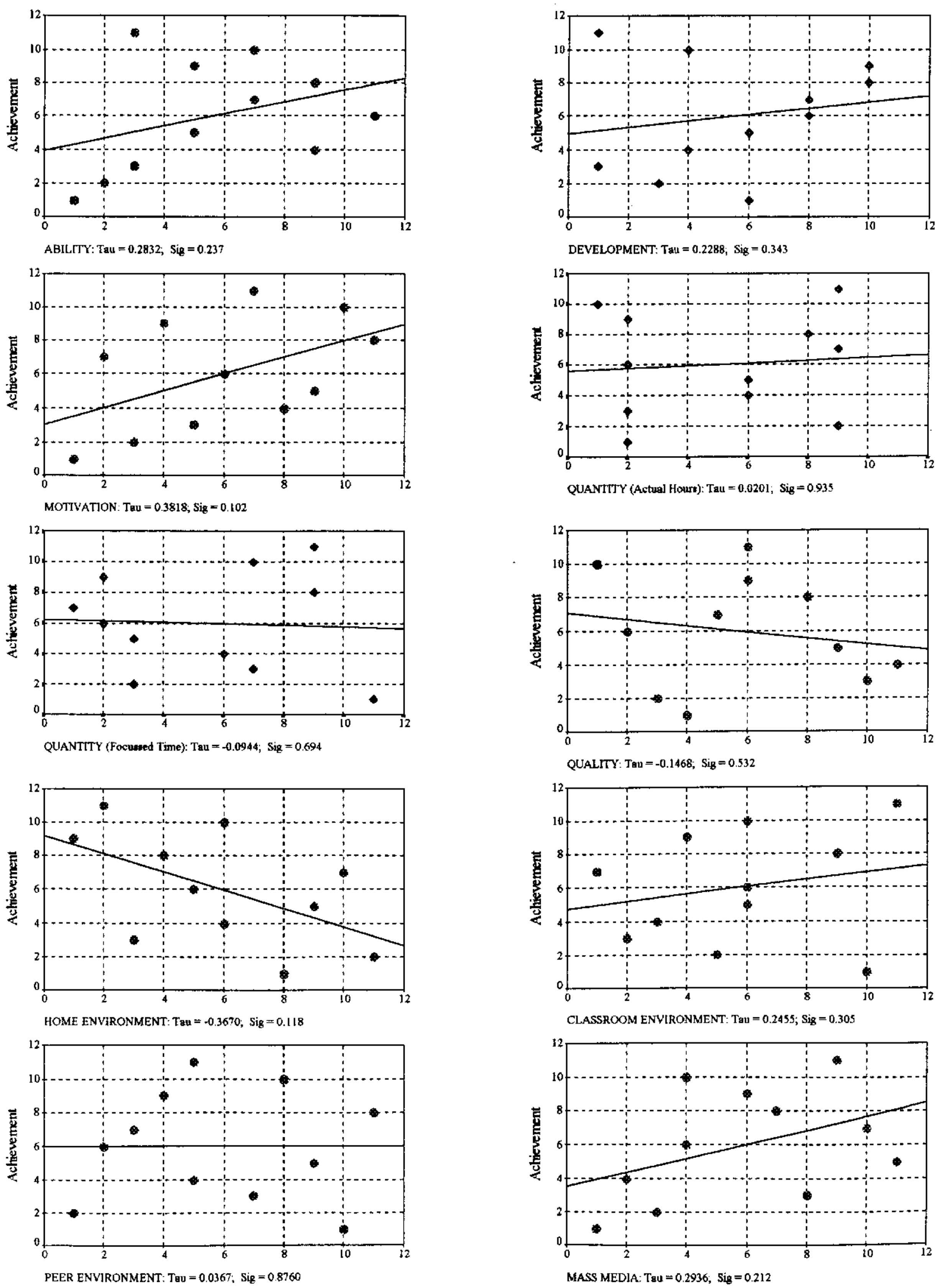


Figure 4.31: Correlations Between Productivity Factors and Achievement for all Traditional Learning Students in Course A

Figure 4.32 illustrates relationships between the nine productivity factors and achievement for those Traditional Learning students completing course B. From the scatterplots displayed, it is evident that for this student group, eight of the nine productivity factors have a positive correlation with educational achievement. The ninth factor, that of Home Environment, has a slight negative correlation with educational achievement.

Traditional Learning students completing course C also displayed a general positive relationship between achievement and the productivity factors. Figure 4.33 highlights a positive relationship between educational achievement and the factors of Motivation, Quantity, (both actual hours and focussed time), Home Environment and Classroom Environment. The opposite was the case for the two factors of Ability and Cognitive Development, where negative correlations were evident. There appeared to be little or no relationship between either the factor of Quality or Mass Media and educational achievement.

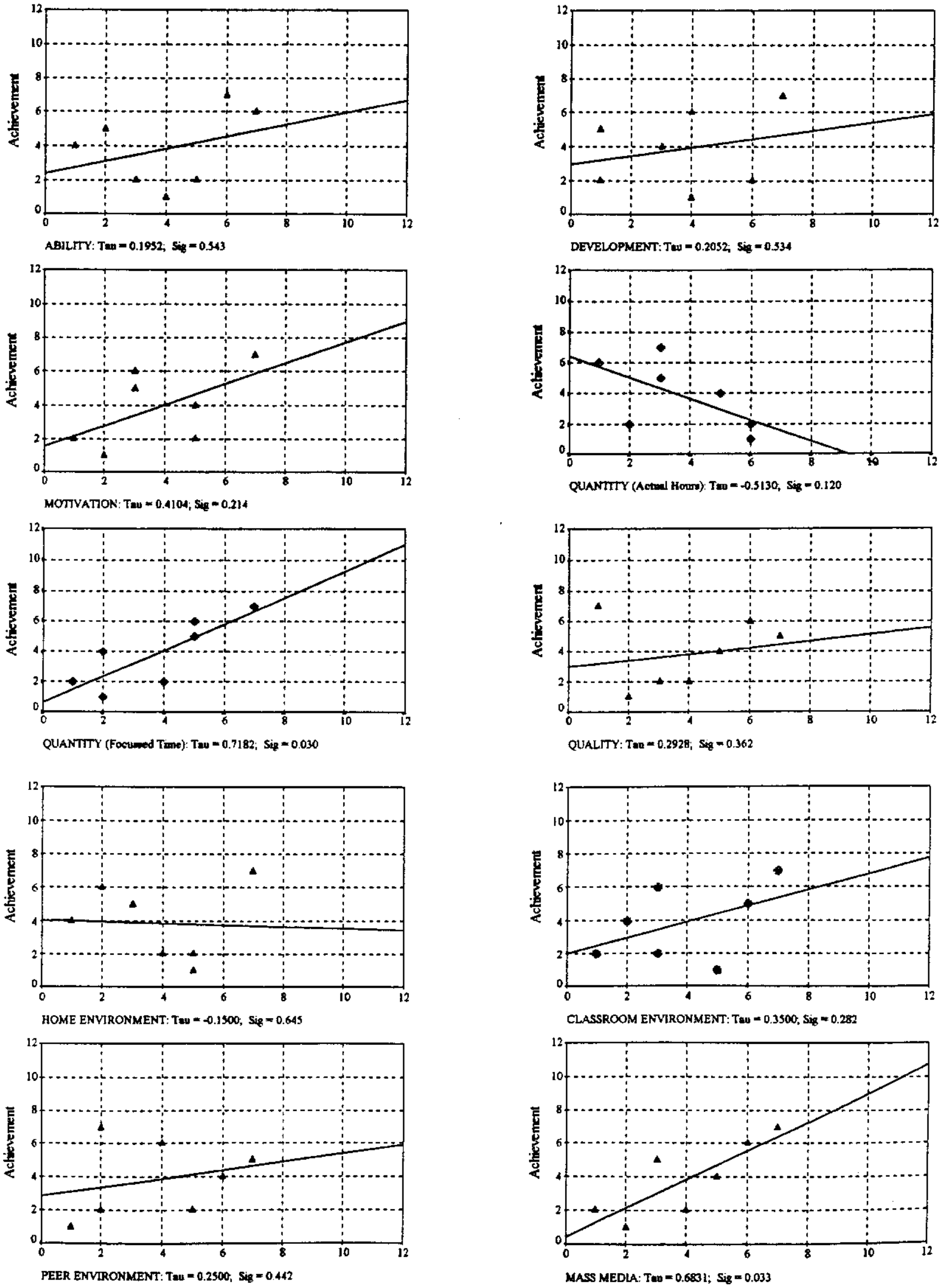


Figure 4.32: Correlations Between Productivity Factors and Achievement for all Traditional Learning Students in Course B

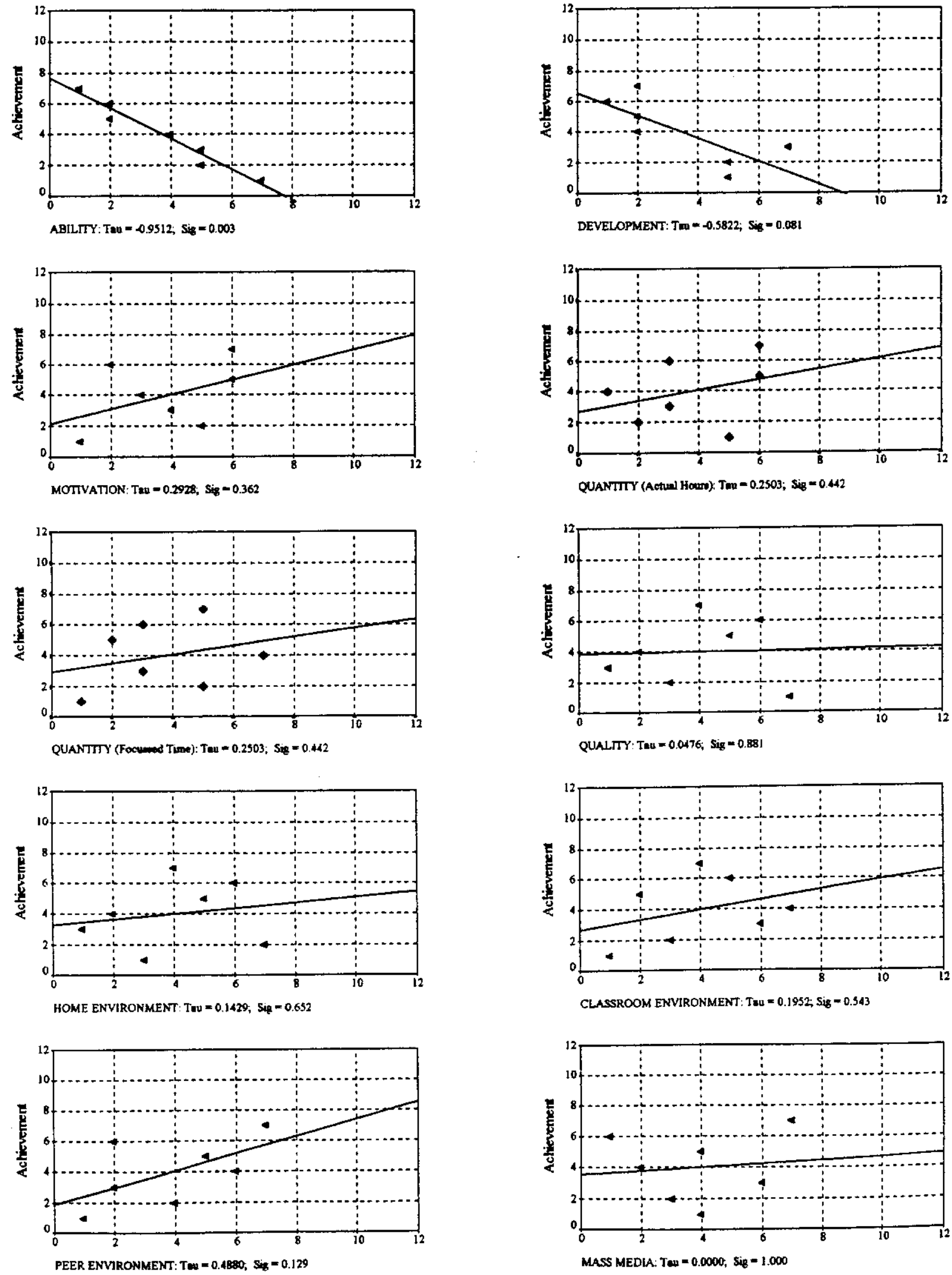


Figure 4.33: Correlations Between Productivity Factors and Achievement for all Traditional Learning Students in Course C

4.13.1 Summary

A summary of the correlations between educational achievement and the nine productivity factors appears in Table 4.29 below. The Table highlights general trends of positive, negative or negligible relationships between specific productivity factors and educational achievement. It is evident that throughout the six different student groups there were many inconsistencies with correlations between factors and achievement. There is no factor that is positively correlated with educational achievement for all student groups. It can be seen, however, that the factors of Ability, Cognitive Development, Motivation, Quantity, Class Environment, Peer Environment and Mass Media had a general, positive correlation with educational achievement.

Factor	Open Learning			Traditional Learning		
	Course A	Course B	Course C	Course A	Course B	Course C
Ability	+	+	+	+	+	-
Development	+	+	+	+	+	-
Motivation	-	+	+	+	+	+
Quantity (Actual Hours)	-	0	-	0	-	+
Quantity (Focussed Time)	+	+	+	0	+	+
Quality	+	-	-	-	+	0
Home Environment	-	+	-	-	0	+
Classroom Environment	-	+	+	+	+	+
Peer Environment	+	-	+	0	+	+
Mass Media	+	-	+	+	+	+

Code: + = Positive correlation between productivity factor and Educational Achievement.
- = Negative correlation between productivity factor and Educational Achievement.
0 = Negligible Relationship between productivity factor and Educational Achievement.

Table 4.29: Summary of Relationships Between Productivity Factors and Educational Achievement, Total Groups.

With respect to the factor of Ability, five of the six student groups showed a positive correlation with achievement. For the factor of Cognitive Development, five of the six student groups showed a positive correlation with achievement. For the factor of Motivation, five of the six groups had a positive correlation with achievement. The factor of Quantity was split into two components. With respect to actual hours engaged in learning time, a distinct negative relationship was apparent, with three of the student groups displaying negative relationship. The reverse situation was apparent for Quantity in terms of focussed time, where five of the six groups displayed a positive relationship with educational achievement. Classroom Environment was shown to have a positive relationship with achievement for five of the six student groups. In terms of Peer Environment, two groups of students from both learning environments displayed positive relationships with achievement. For the factor of Mass Media, a positive correlation with achievement for five of the six student groups was shown.

These findings suggest that, generally, seven of the nine productivity factors were positively correlated with educational achievement. Such findings are in keeping with the assertions of Walberg's Productivity Model where an increase in a given factor would generally be associated with an increase in achievement. It is also noteworthy that the two factors that did not correlate positively with achievement, namely the factors of Quality and Home Environment, did not display a negative correlation. The findings regarding these two factors were inconclusive. A range of positive, negative and negligible correlations were displayed in the results. While these findings do not concur with the assertions of Walberg's Productivity Model, neither do they contradict the assertions of the model.

4.14 Comparisons Between Open Learning and Traditional Learning Environments

The first research question has been addressed, highlighting the characteristics of Open Learning students with respect to the nine productivity factors. The second research question, and supplementary questions, have also been addressed, with a detailed presentation of the relationships between the productivty factors and educational achievement, and the consequent relevance of Walberg's Educational Productivity Model in the vocatinal education and training sector. Through an investigation of the effectiveness of the Open Learning environment, the following section of the results chapter addresses the final research question.

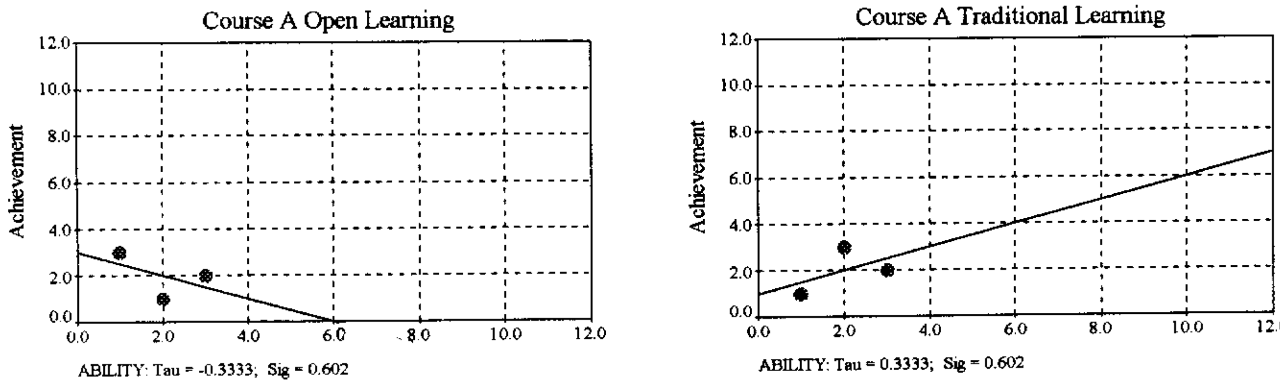
In order to investigate the effectiveness of the Open Learning environment, such an environment must be compared to some other learning environment. In the case of this study direct comparisons between the Open Learning and the Traditional Learning environments have been made. In order for such comparisons to be made, however, a common platform from which such comparisons can be made must first be established.

Given that most students who were surveyed entered their TAFE course via the TAFE clearing house, it is appropriate that the criteria used by the clearing house also be used for the purposes of comparing students.

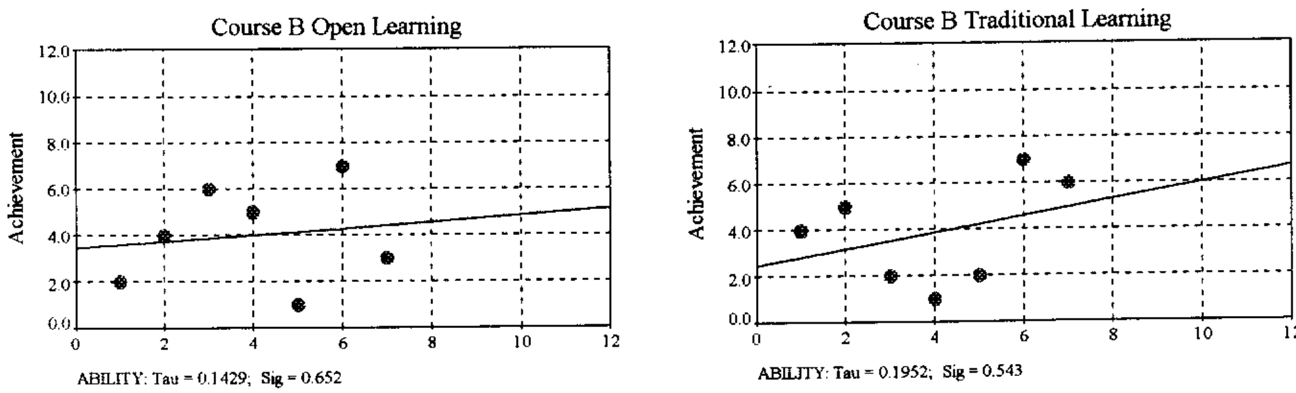
Student high school academic results were used by the TAFE clearing house to develop student entrance scores. These scores were utilised as data to establish scores for the factor of Ability. Given that it is this score by which students are selected to enter a course, it is appropriate that this score be used as a base to compare student performance throughout their courses. Students undertaking the same course of study, for example Course A, in both an open learning environment and a traditional learning environment, were matched based on their Ability scores. In the case of Course A, three students were surveyed in the Open learning mode, therefore only three students were matched from the traditional learning mode. In the case of course B there were seven students surveyed from the traditional learning mode, therefore there were only seven students matched from the open learning mode. In the case of course C, there were four students surveyed in the open learning mode, and as a consequence, there were only four students matched from the traditional learning mode. Where Ability scores did not match exactly, the closest score to the desired score was selected based on it being the most closely matched student score available. Table B.21 in Appendix B details those students most closely matched in Course A. This Table contains the raw scores from the selected students, both students from the open learning environment and the traditional learning environment. For each of the productivity factors, the rank order of those raw scores is also detailed. Table B.22 in Appendix B details similar data for the two student groups completing Course B, while Table B.23 details data for the students completing Course C. From the total pool of students, students were matched from each group studying Course A, seven students matched from each group studying Course B and four students matched from each group studying Course C.

From the rank order results contained in Tables B.21, B.22 and B.23, correlations between specific productivity factors and educational achievement have been calculated using Kendall's Tau. As in previous data analysis in this results chapter, scatterplots have been developed to highlight relationships between specific productivity factors and educational achievement. In this section of results, the scatterplots are presented with matched student groups positioned adjacent to each other for each of the productivity factors. Any differences between the performance of matched students studying in the two learning environments are highlighted by the scatterplots. Accompanying each scatterplot is the correlation coefficient as developed using Kendall's Tau, which indicates the strength of any relationship illustrated, along with the statistical significance of the relationship. A total of nine Figures are presented in the following section, one Figure for each of the nine productivity factors.

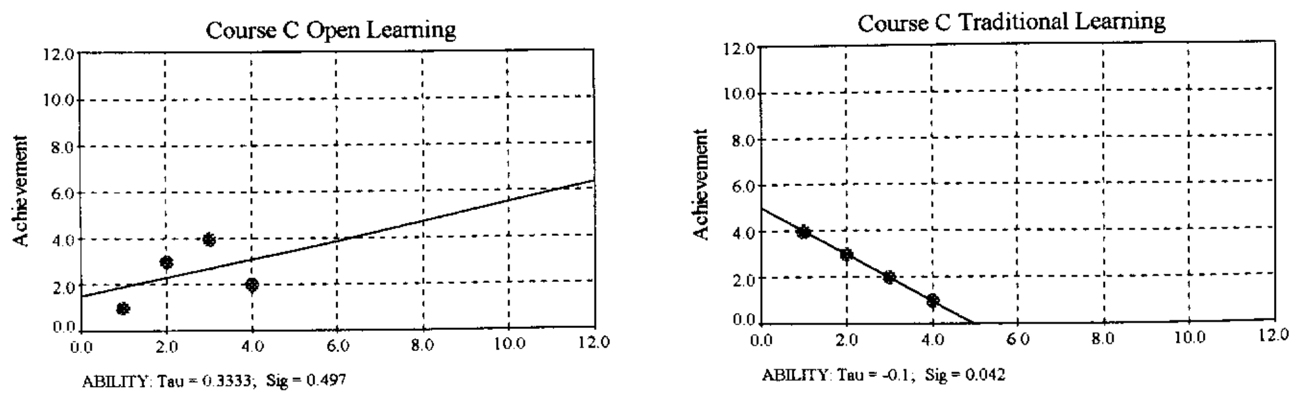
Relationships between the first productivity factor, that of Ability, and educational achievement is illustrated in Figure 4.34 below. From the graphs, it is evident that there is generally a positive correlation between Ability and educational achievement. Of the six student groups surveyed, four groups revealed a positive relationship, while two groups revealed a negative correlation. There appears to be no distinct difference between the performance of students studying in either of the two learning environments. One group of students in each of the learning environments revealed a negative correlation, while two groups in each environment revealed positive correlations. Essentially, the relationship between Ability and achievement appears to be the same for the two learning environments.



Ability vs Achievement Course A Matched Students



Ability vs Achievement Course B Matched Students



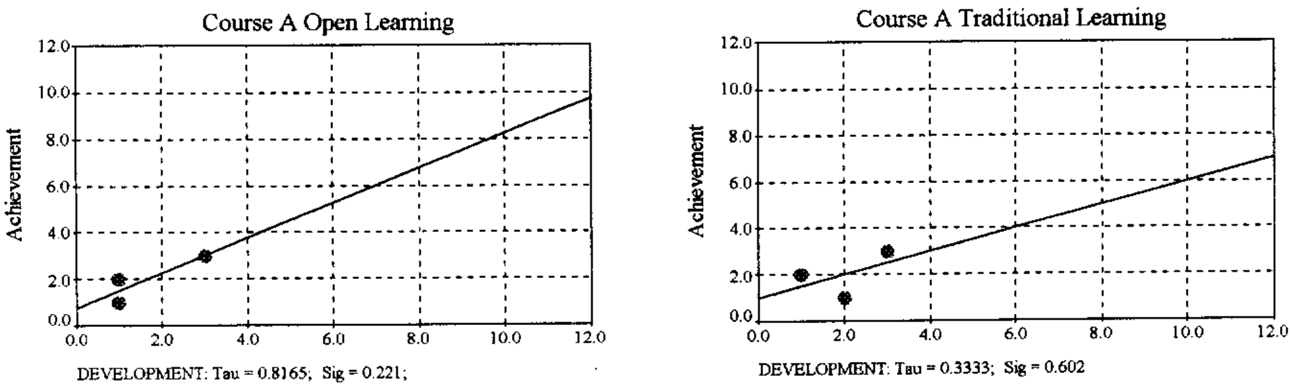
Ability vs Achievement Course C Matched Students

Figure 4.34: Scatterplots of Ability for Matched Students

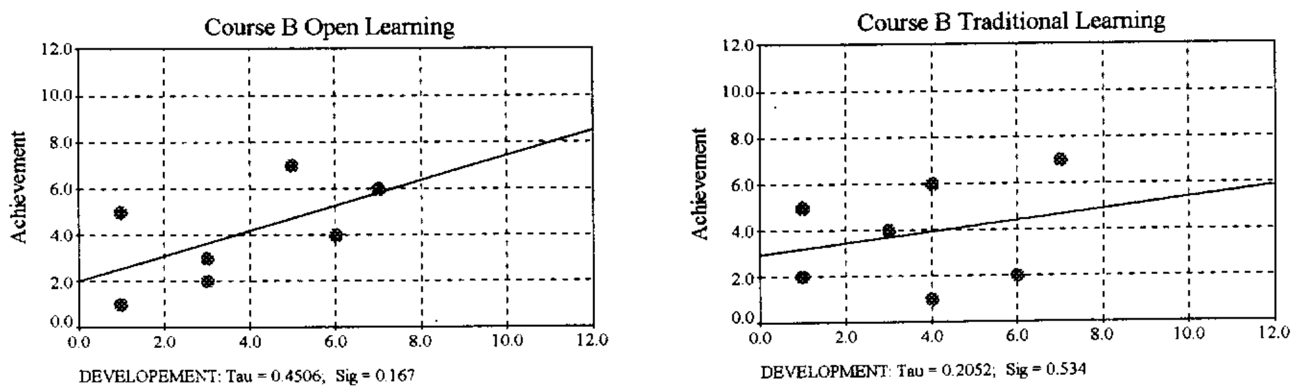
A generally positive correlation also appeared to be evident for the factor of Cognitive Development. As is detailed in Figure 4.35 below, all but one of the student groups revealed a positive correlation between Cognitive Development and achievement. The strength of the relationship ranged from a perfect correlation of 1.0 for course C Open Learning students, through to a relatively weak correlation of 0.2 for Traditional Learning students completing course B. Again there appeared to be no distinct difference in the performance of students based on different learning environments.

The productivity factor of Motivation is detailed in Figure 4.36 below. The scatterplots displayed highlight that of the six study groups, only the Open Learning students in group A had a negative relationship between Motivation levels and achievement. All of the other matched student groups displayed a positive relationship between Motivation and educational achievement. From the scatterplots displayed in the graphs, it is apparent that the Traditional Learning students experienced a stronger relationship between Motivation and achievement than did their Open Learning counterparts. While overall there is a positive relationship between Motivation and educational achievement, such a relationship appears to be distinctly stronger in the Traditional Learning environment.

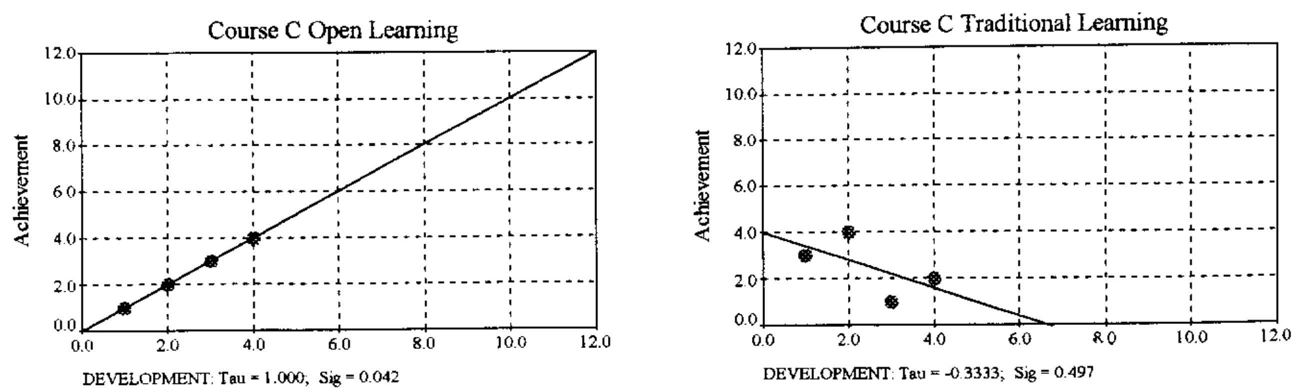
In terms of the productivity factor of Quantity, inspection of the graphs in Figure 4.37 and 4.38 reveals a consistent relationship between this factor and educational achievement. Quantity in terms of actual hours engaged, inspection of Table 4.37 reveals a general negative trend. Four of the student groups displayed a negative relationship between actual hours and achievement, while the remaining two groups displayed negligible positive trends. The results suggest that students who were achieving more highly were in fact spending less time engaged in learning time. In terms of students' focussed time, the trends are opposite to engaged time. All student groups displayed a positive relationship between focussed time and achievement. There appears to be little difference between students in either learning environment in terms of the productivity factor of Quantity, with either the negative or positive relationships being consistent in either learning environment.



Development vs Achievement Course A Matched Students

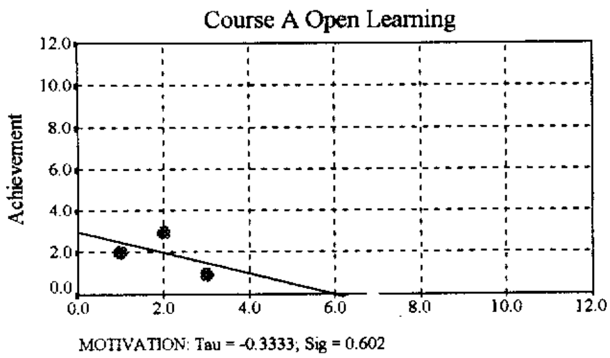


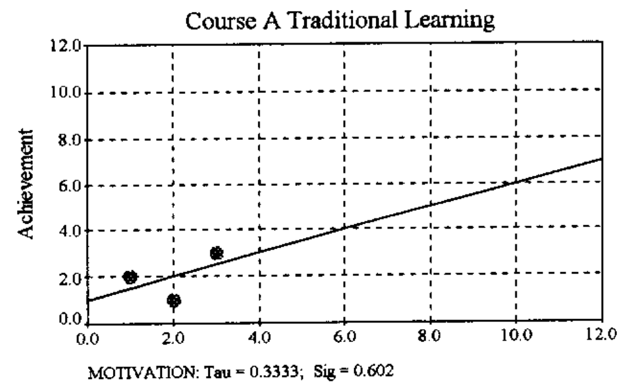
Development vs Achievement Course B Matched Students



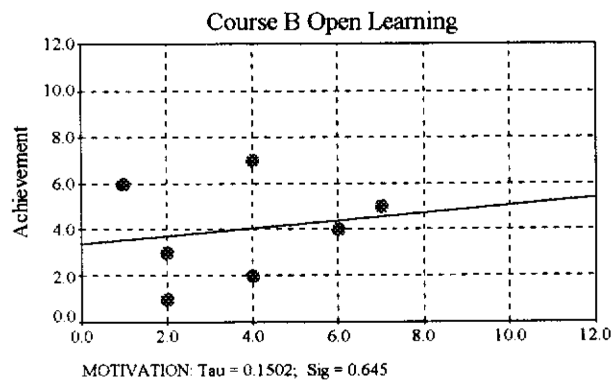
Development vs Achievement Course C Matched Students

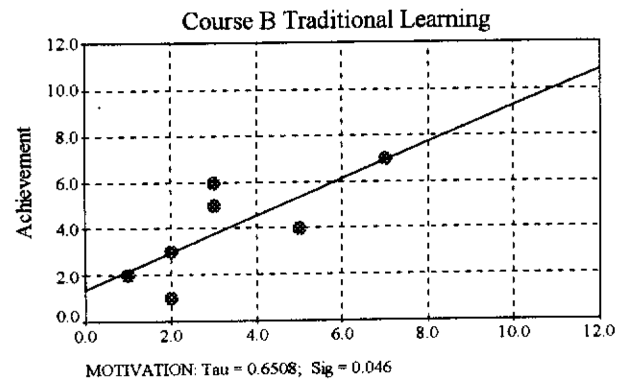
Figure 4.35: Scatterplots of Cognitive Development for Matched Students



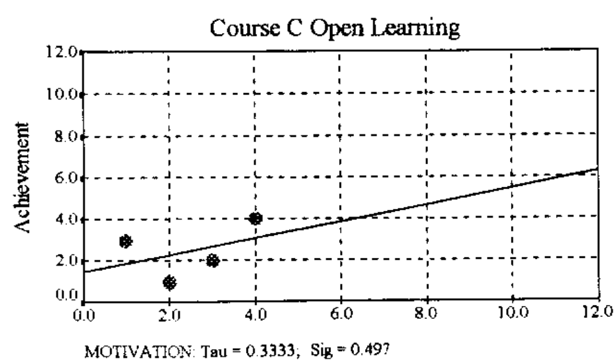


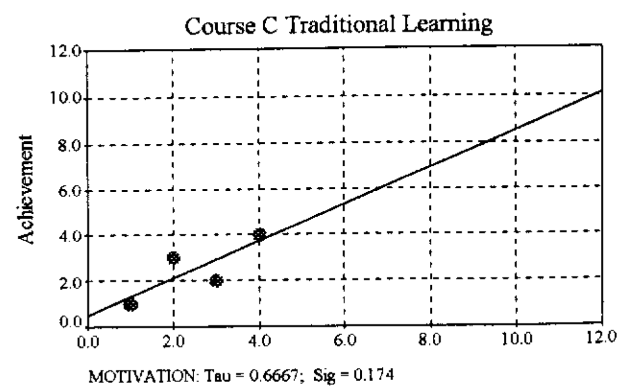
Motivation vs Achievement Course A Matched Students





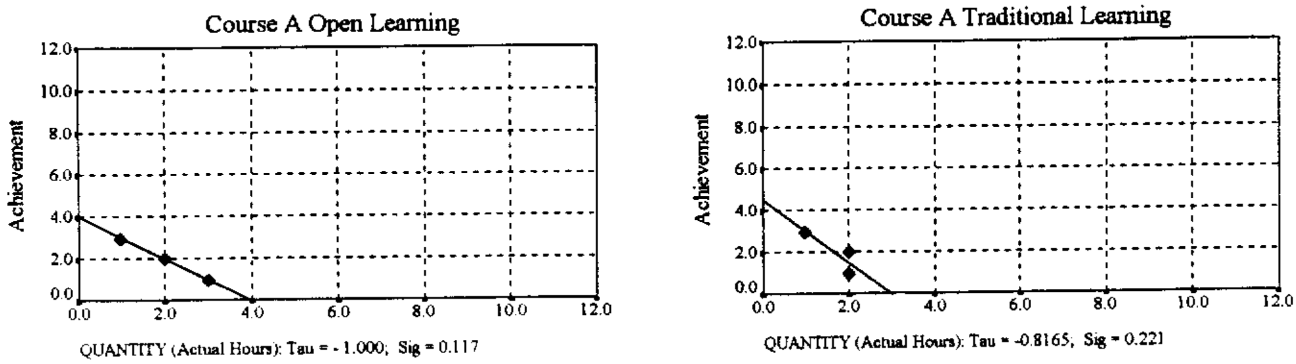
Motivation vs Achievement Course B Matched Students



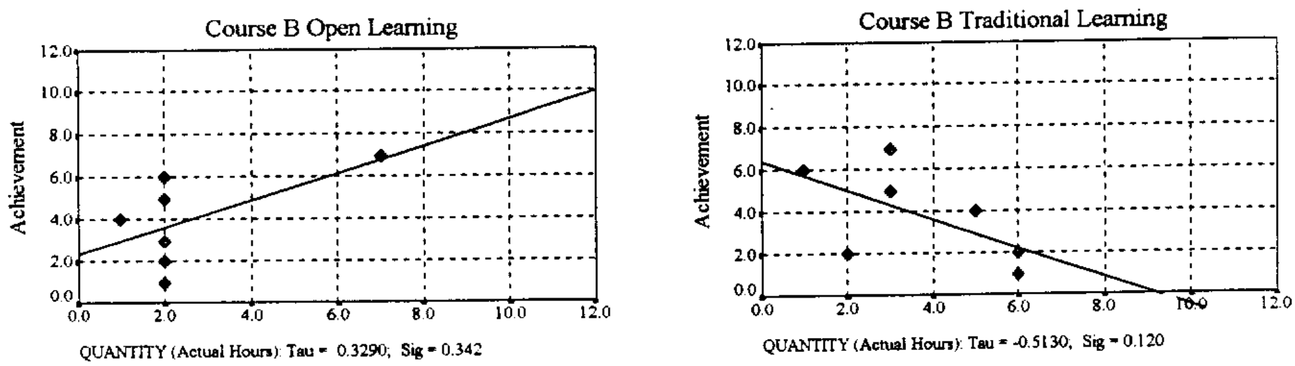


Motivation vs Achievement Course C Matched Students

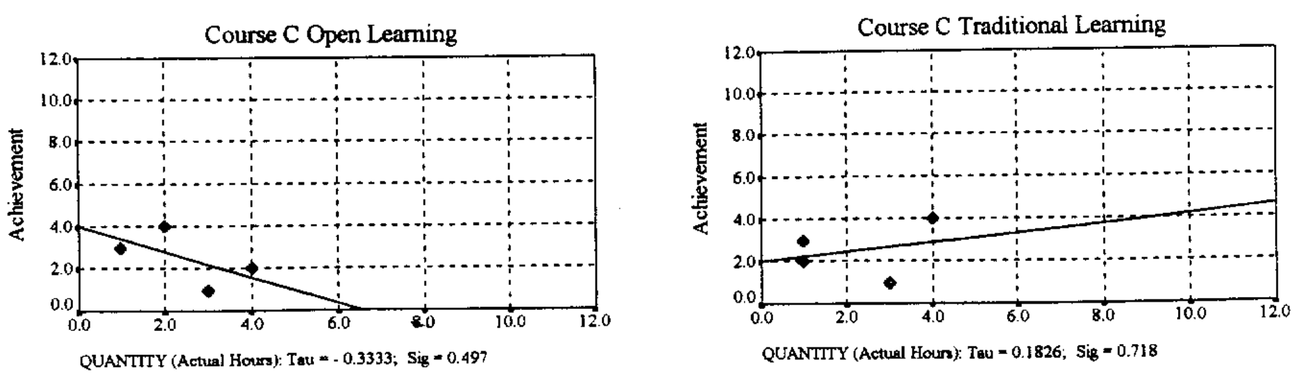
Figure 4.36: Scatterplots of Motivation for Matched Students



Quantity (Actual Hours) vs Achievement Course A Matched Students

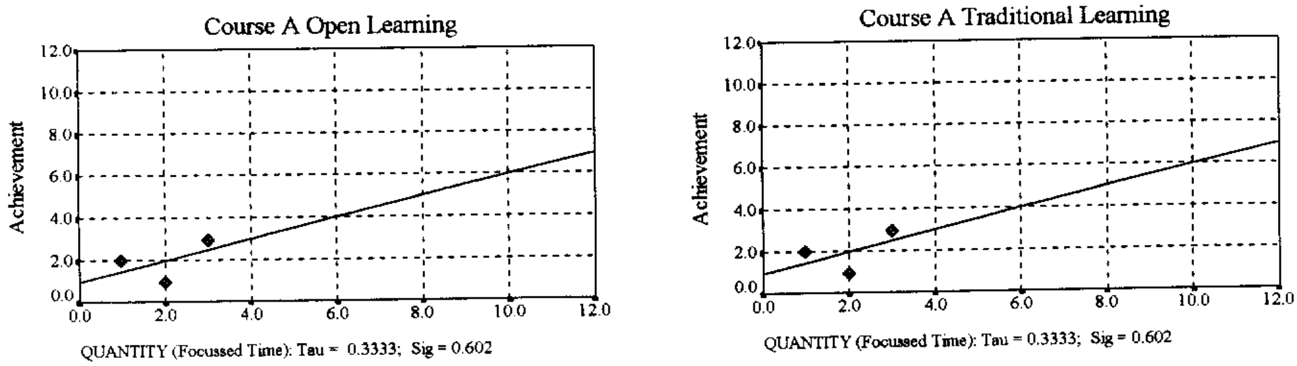


Quantity (Actual Hours) vs Achievement Course B Matched Students

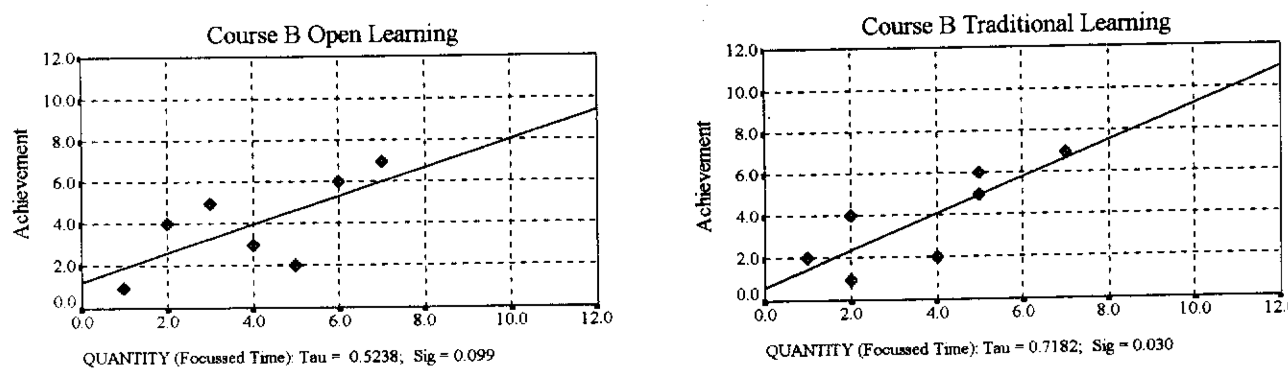


Quantity (Actual Hours) vs Achievement Course C Matched Students

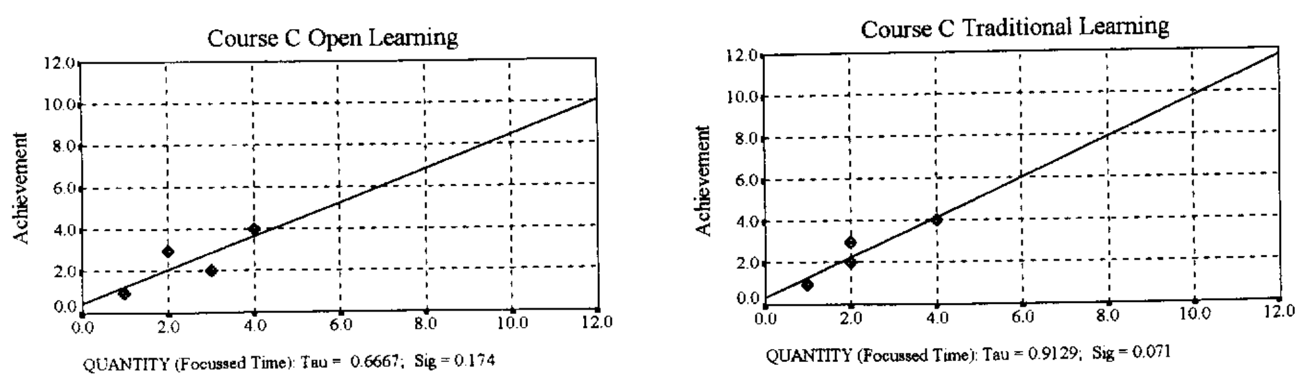
Figure 4.37: Scatterplots of Quantity (Actual Hours) for Matched Students



Quantity (Focussed Time) vs Achievement Course A Matched Students



Quantity (Focussed Time) vs Achievement Course B Matched Students



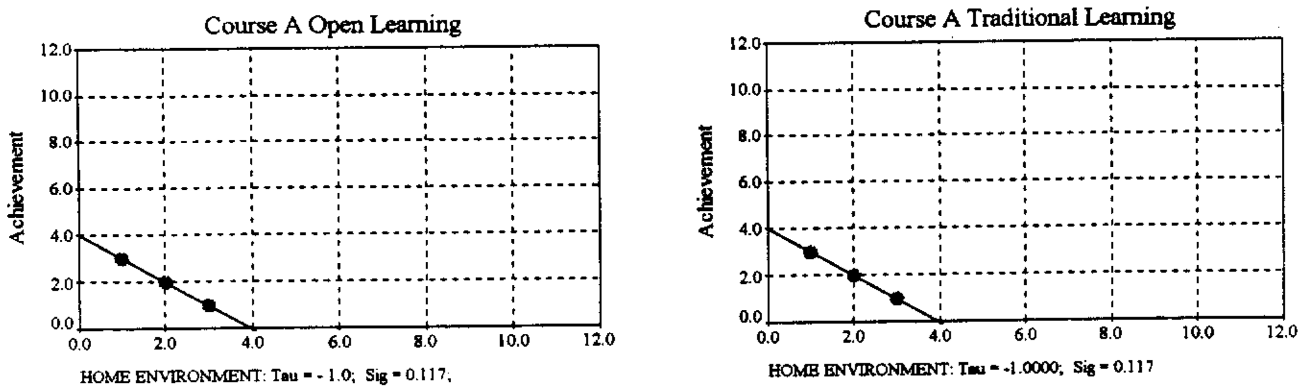
Quantity (Focussed Time) vs Achievement Course C Matched Students

Figure 4.38: Scatterplots of Quantity (Focussed Time) for Matched Students

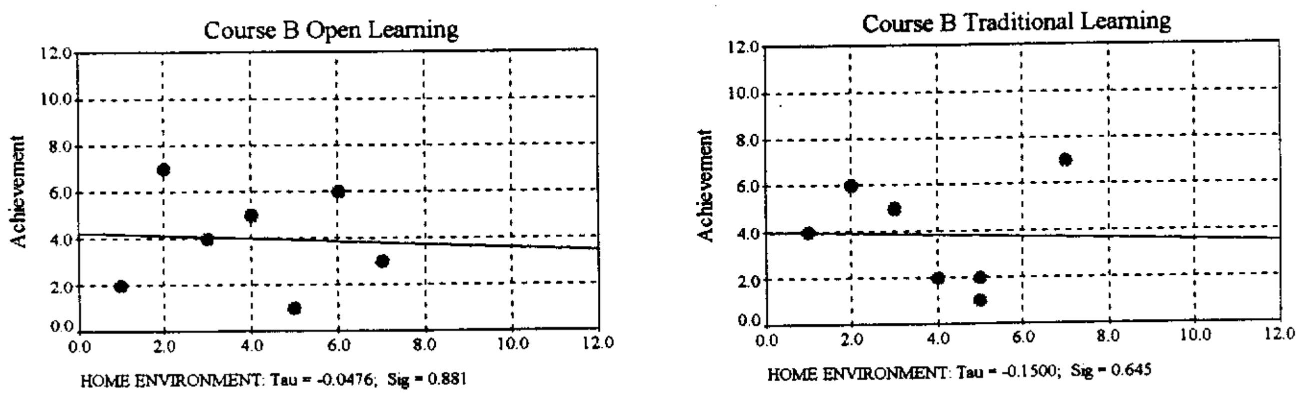
Examination of the relationship between the Quality of the teaching/learning process and the students' performance revealed no distinct relationships. From Figure 4.39 below, it is apparent that there are no distinct group differences between students studying in either learning environment. Of the six groups surveyed, three groups returned a positive correlation, while three groups returned negative correlations.

Examination of Figure 4.40 reveals a negative trend for the relationship between Home Environment and educational performance. Both student groups in course A show a strong negative relationship between their Home Environment and their educational performance. It can be seen, however, that both student groups in course B have little if any correlation between their Home Environment and their educational performance. Open Learning students in Course C show a negative correlation, while the Traditional Learning students show a positive correlation. A summary of the total groups, however, suggests a general negative trend, albeit weak, between Home Environment and educational performance.

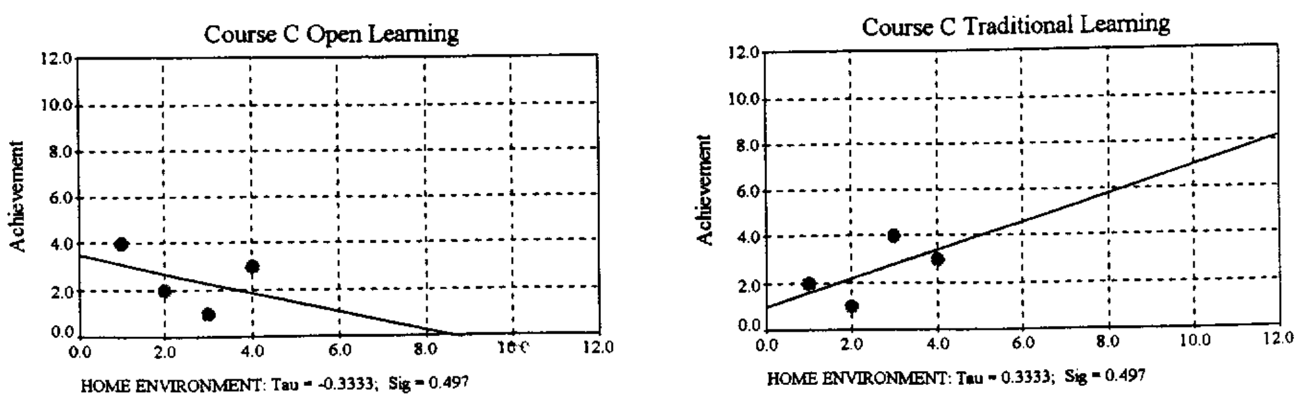
The scatterplots depicting the relationship between Classroom Environment and educational performance are displayed in Figure 4.41. Those students studying in a traditional manner display a consistent positive relationship between their levels of Classroom Environment and their levels of educational achievement. In contrast, however, results from the Open Learning students are not consistent at all. One group of Open Learning students had a negative correlation, another group a strong positive relationship, while the third group displayed little if any relationship with educational achievement. Such results suggest that students studying in a Traditional manner would generally achieve more highly in a positive Classroom Environment, whereas the Open Learning students may achieve higher results, or in fact lower results, in a positive environment. Open Learning students may well achieve their educational levels irrespective of the Classroom Environment.



Home Environment vs Achievement Course A, Matched Students

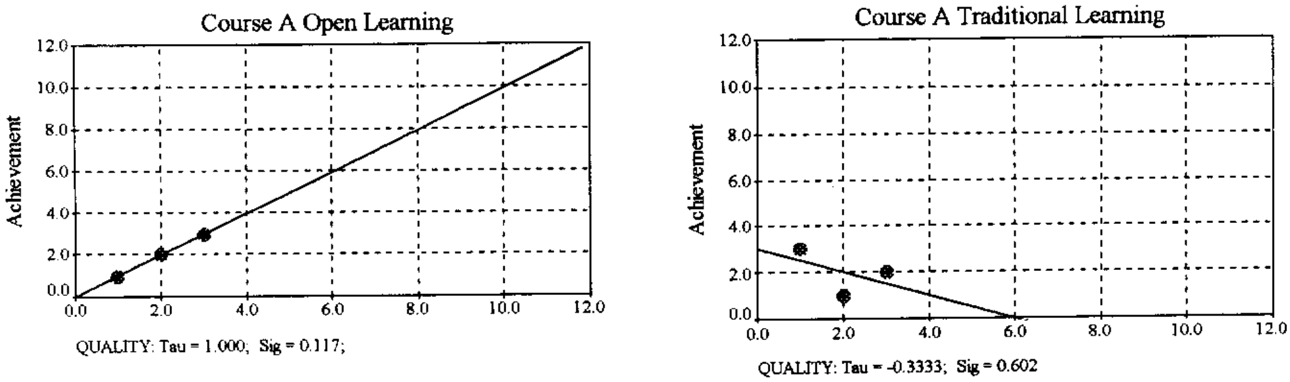


Home Environment vs Achievement Course B Matched Students

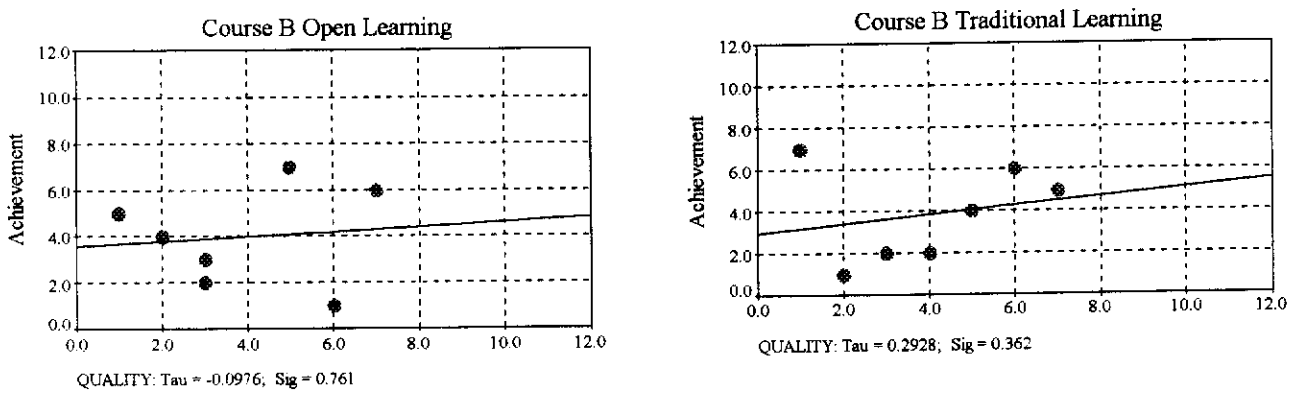


Home Environment vs Achievement Course C Matched Students

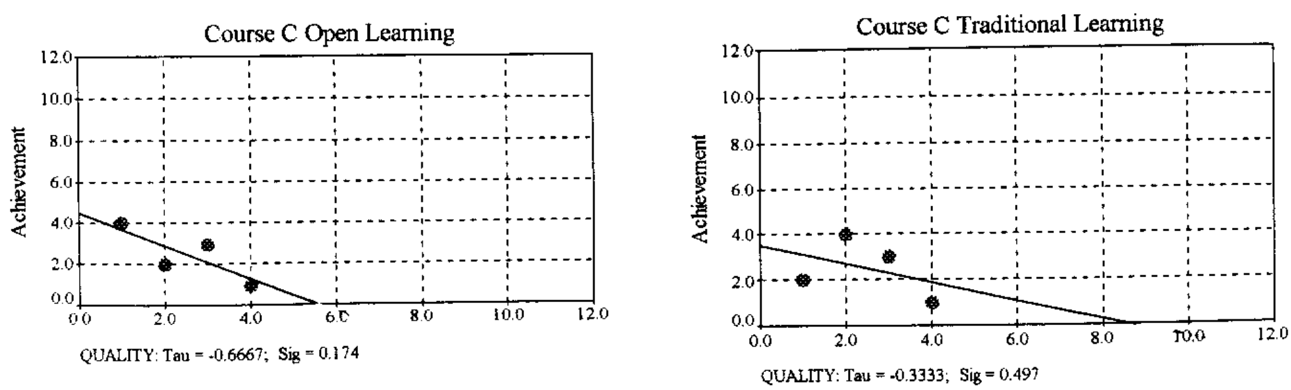
Figure 4.40: Scatterplots of Home Environment for matched Students



Quality vs Achievement Course A, Matched Students

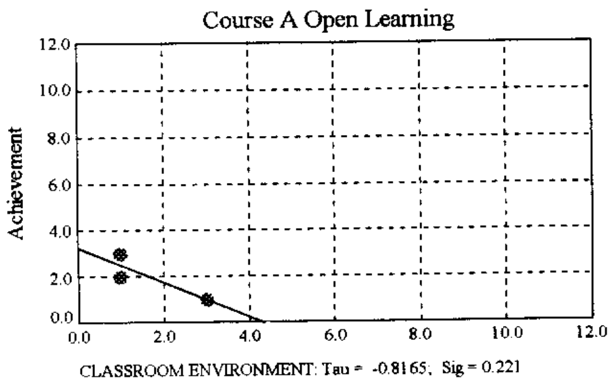


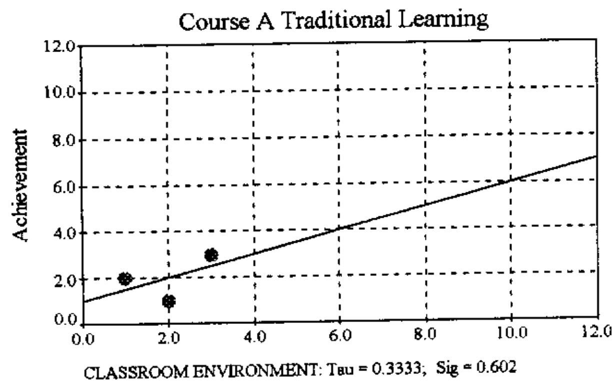
Quality vs Achievement Course B Matched Students



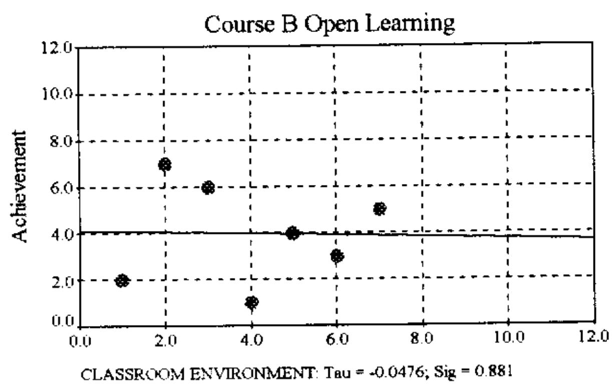
Quality vs Achievement Course C Matched Students

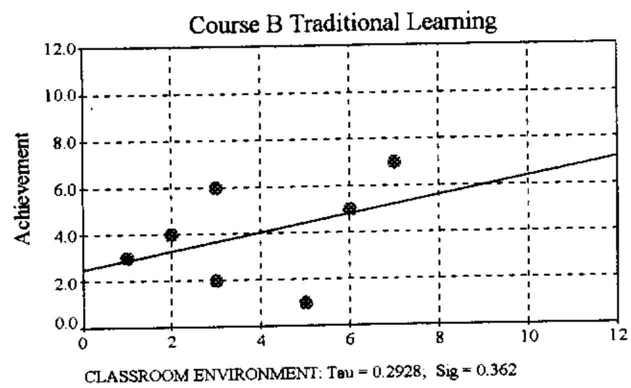
Figure 4.39: Scatterplots of Quality for Matched Students



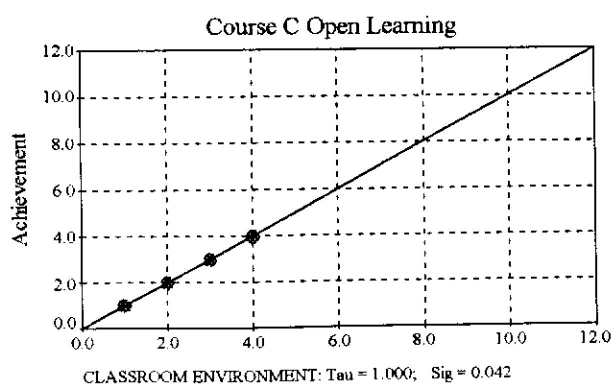


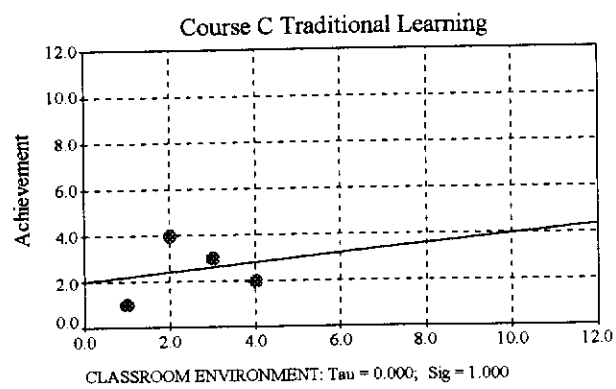
Classroom Environment vs Achievement Course A, Matched Students





Classroom Environment vs Achievement Course B Matched Students



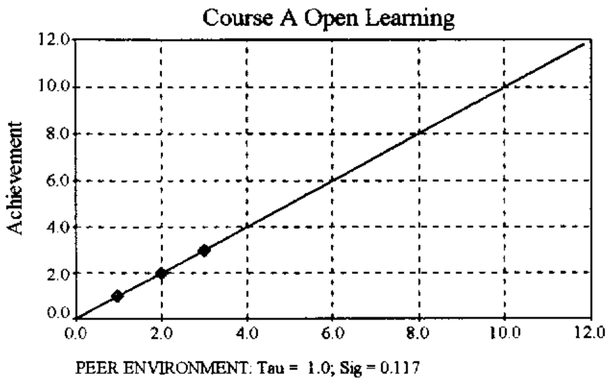


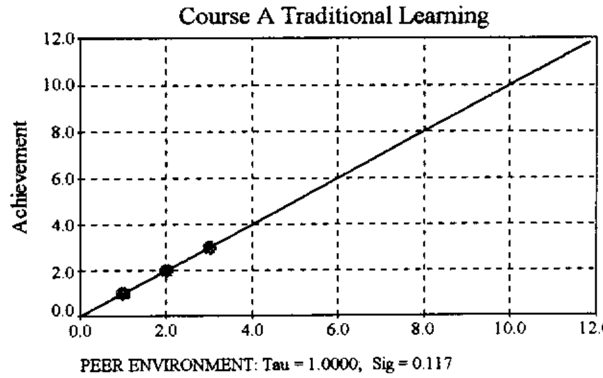
Classroom Environment vs Achievement Course C Matched Students

Figure 4.41: Scatterplots of Classroom Environment for Matched Students

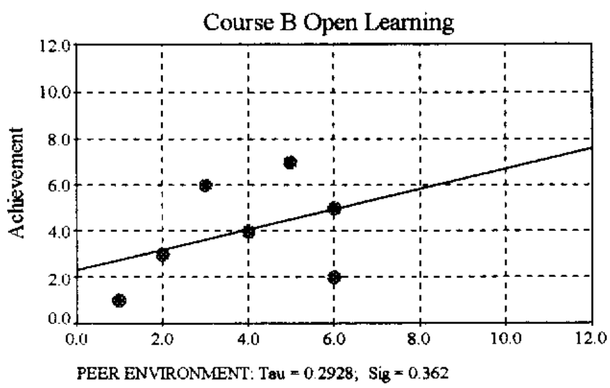
The scatterplots displayed in Figure 4.42 detail correlations between students' achievement and the influence of student peers. It is apparent that all of the student groups in both learning environments have a positive relationship between their peers and their educational performance. Students in both Course A and Course C show a relatively strong relationship, whereas students in Course B appear to have a weaker relationship. It is evident that there are no apparent differences between students learning in either of the learning environments.

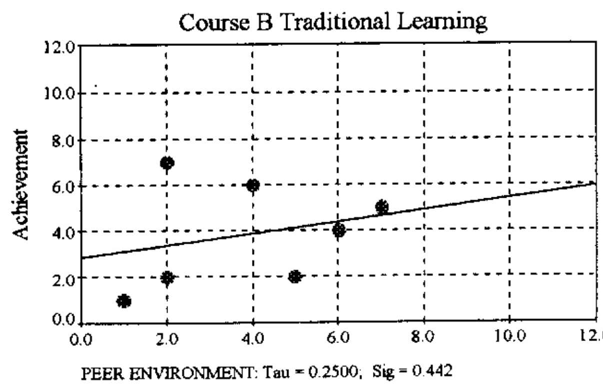
With respect to the factor of Mass Media, the scatterplots contained in Figure 4.43 reveal a general positive relationship between educational performance and Mass Media. With the exception of the Open Learning students in Course B, all students showed that the higher they scored on the Mass Media factor, generally, the higher they scored on educational achievement.



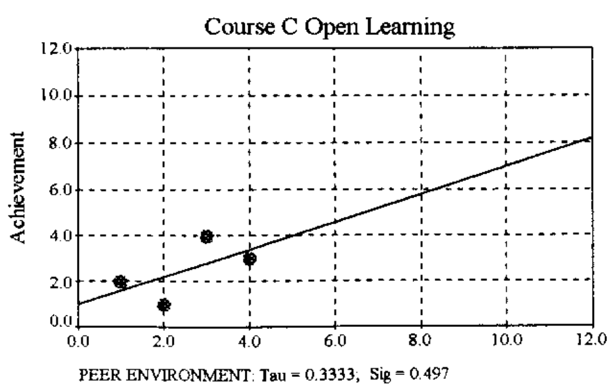


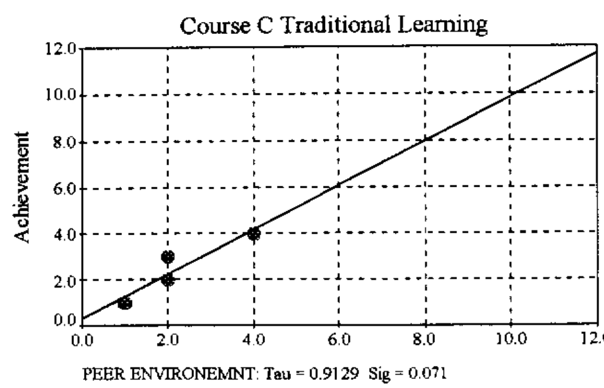
Peer Environment vs Achievement Course A Matched Students





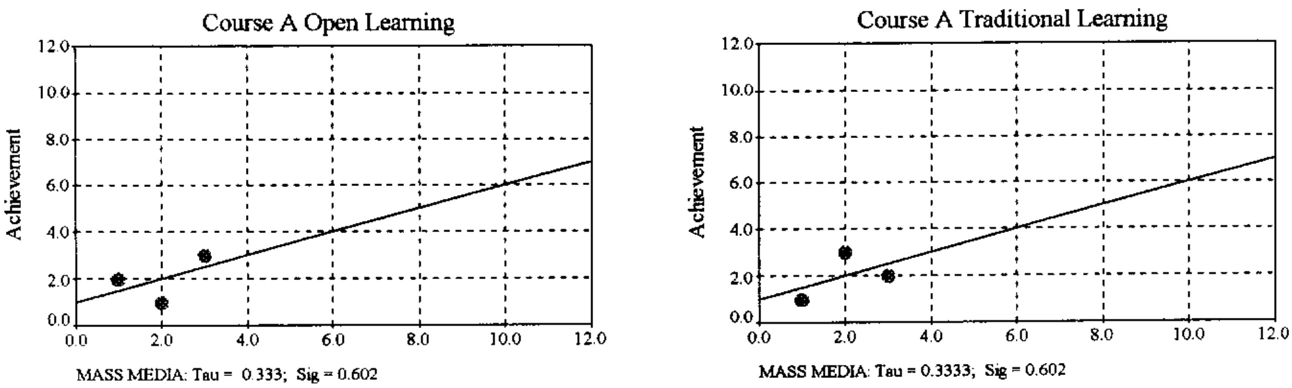
Peer Environment vs Achievement Course B Matched Students



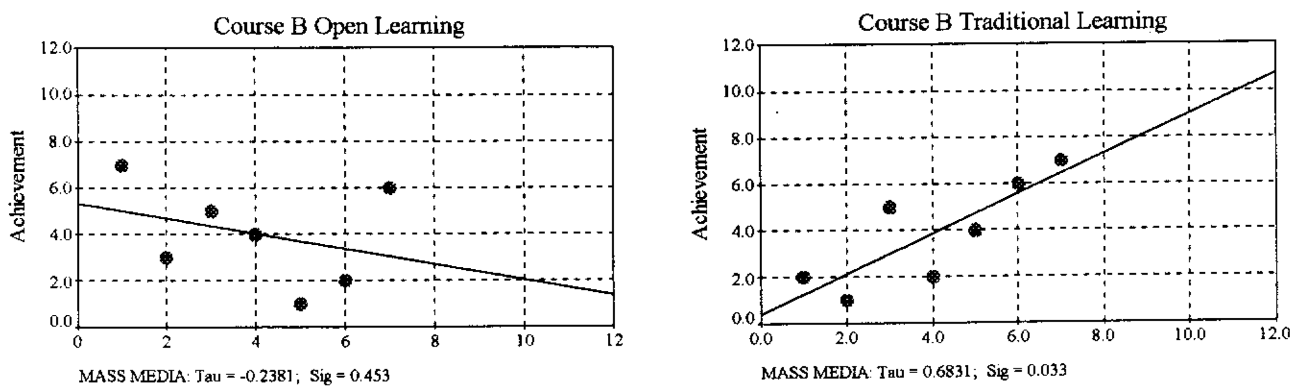


Peer Environment vs Achievement Course C Matched Students

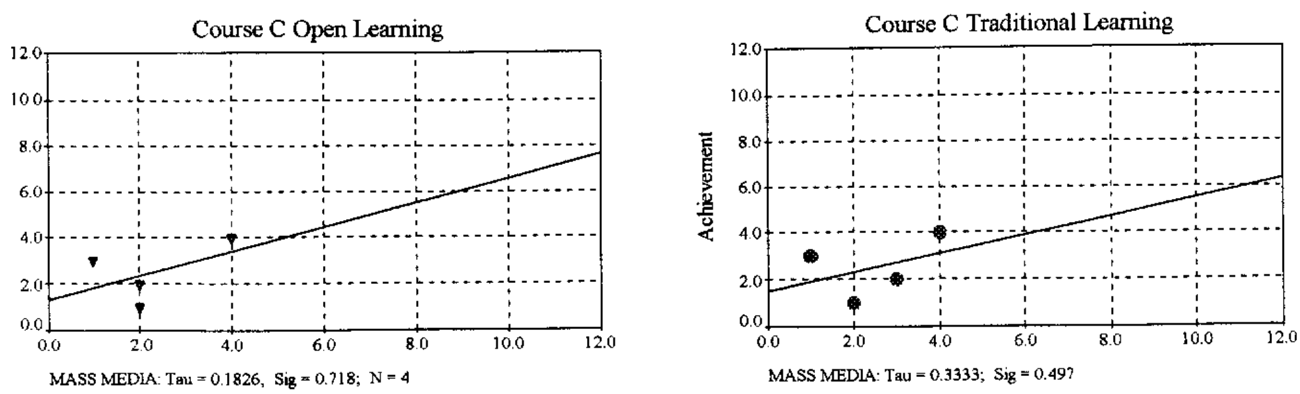
Figure 4.42: Scatterplots of Peer Environment for Matched Students



Mass Media vs Achievement Course A Matched Students



Mass Media vs Achievement Course B Matched Students



Mass Media vs Achievement Course C Matched Students

Figure 4.43: Scatterplots of Mass Media for Matched Students

4.14.1 Summary

In this section of the results chapter, comparisons have been made between Open Learning and Traditional Learning students matched on Ability scores. Ability scores were in fact student entrance scores based on the TAFE entrance scoring system. Students with similar Ability scores, from within the two different learning environments, were compared with respect to each of the productivity factors and their level of achievement. Table 4.30 below highlights a summary of the relationships between matched students and their achievement.

As might be expected, for many of the factors there is a positive correlation between the factors and achievement, which concurs with the general assumptions of the Productivity Model. For both the Open Learning and the Traditional Learning students, positive correlations were shown for the factors of Ability, Cognitive Development, Motivation, Quantity, Classroom Environment, Peer Environment, and Mass Media. These findings are similar to previous findings based on total scores and achievement (see Table 4.20 and 4.22). Again, those findings are also in keeping with the general assertions of the Productivity Model.

Scores for three factors displayed different correlations for Open Learning students compared to Traditional Learning students. The factor of Motivation was seen to have a strong positive relationship with achievement in a Traditional Learning environment, with a much weaker overall positive relationship with an Open Learning environment. A similar situation existed for the factor of Classroom Environment. Positive correlations between Classroom Environment and achievement were shown to be much more consistent and stronger for Traditional Learning students than for the Open Learning students. exist between the this factor and the educational achievement.

Table 4.31 below highlights a summary of the relationships between each of the productivity factors and educational achievement.

Factor	Course	Open Learning	Traditional Learning
Ability	A	-	+
	B	+	+
	C	+	-
Cognitive Development	A	+	+
	B	+	+
	C	+	-
Motivation	A	-	+
	B	+	+
	C	+	+
Quantity (Actual Hours)	A	-	-
	B	+	-
	C	-	+
Quantity (Focussed Time)	A	+	+
	B	+	+
	C	+	+
Quality	A	+	-
	B	+	+
	C	-	-
Home Environment	A	-	-
	B	0	0
	C	-	+
Classroom Environment	A	-	+
	B	0	+
	C	+	+
Peer Environment	A	+	+
	B	+	+
	C	+	+
Mass Media	A	+	+
	B	-	+
	C	+	+

Code: + = Positive correlation between productivity factor and Educational Achievement.
- = Negative correlation between productivity factor and Educational Achievement.
0 = Negligible correlation between productivity factor and Educational Achievement.

Table 4.30: Summary of Matched Student Correlations

4.15 Qualitative Data: Structured Interviews

As highlighted in Chapter 3 regarding research design, a component of the research data is qualitative. A series of structured interviews were conducted with a sample of students. Five students studying in the open learning environment were interviewed, and four students studying in the traditional learning environment were interviewed. Data from these interviews serve as the qualitative component of the research, enabling an enrichment of the quantitative data.

4.15.1 Interview Schedule

Interviews were conducted following a structured interview schedule. A total of 21 questions were contained in the interview schedule, a copy of which is contained in Appendix C. In order that the qualitative data be readily aligned with the quantitative data, a number of questions contained in the interview schedule were structured in terms of the nine productivity factors.

4.15.2 Administration of Interviews

All interviews were conducted over the telephone. Consent was gained from all participants to record the conversations on audio cassette. While the interviews were being conducted, anecdotal notes were also taken.

4.15.3 Summary of Interviews

Tape recordings and anecdotal notes were referenced to develop brief summaries of each of the questions contained in the interview schedule. A summary of individual student responses to each question are presented in Appendix C.3. The summaries of the individual responses were examined to identify commonality or distinct differences between the students in both the Open Learning and Traditional Learning environments. A summary of these findings appears below.

4.15.4 Influences on Educational Achievement

With respect to the factors that influenced successes or failures experienced by students, Traditional Learning students predominantly referred to humanistic characteristics. Characteristics such as attitude, personal desire, self attributes of teachers and attributes of friends were seen to influence educational outcomes. Positive aspects of these characteristics tended to have positive effects on educational outcomes. These influences could, however, be equally as powerful in a negative manner, influencing poor educational achievement. Conversely Open Learning students related more towards organisational or environmental factors when discussing influences on their educational performance. Comments such as "... able to get on with your own work", "no hindrances", "self paced" and "help is there when you need it" all appear to focus positively on those characteristics indicative of an open learning environment.

When expanding on the influences discussed in the first question, Traditional Learning students spoke of influences aligned with the productivity factors of motivation, peers, quality and quantity. Open Learning students, however, predominantly focussed on the productivity factor of quantity. Again, inherent in the Open Learning environment is the flexibility of the amount of time a student dedicates to specific subjects or courses.

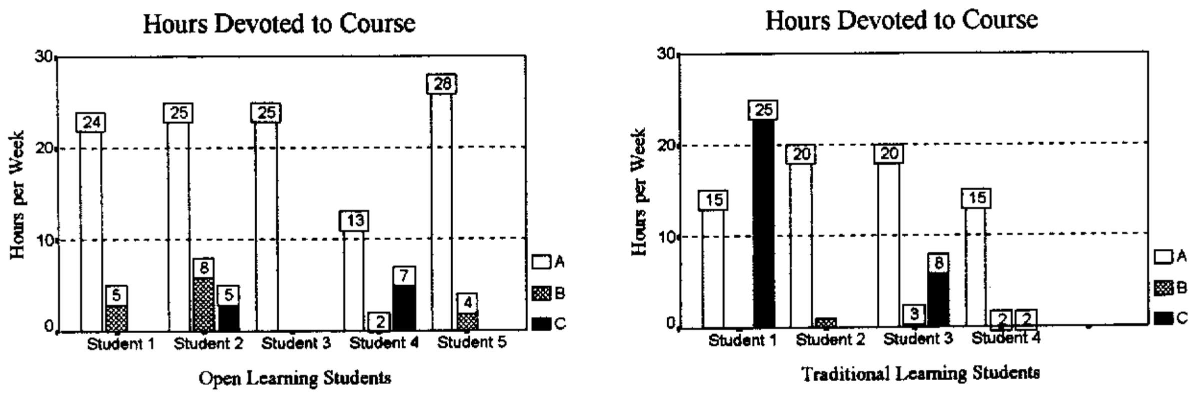
4.15.5 The Nine Productivity Factors

Both Traditional Learning students and Open Learning students had positive and negative thoughts regarding the extent to which their previous schooling had impacted on their current learning. Whilst some felt that the schooling had equipped them well for their current studies, others believed that previous schooling bore little relevance on their current studies. Students who had not achieved highly at school reported that their marks were much better in the TAFE environment, be it either Traditional Learning or Open Learning. Three Traditional Learning students and one Open Learning student cited either the relevance of the work at TAFE, or the lack of relevance of the work at high school, as contributing to a higher level of success in the TAFE sector. Two Open Learning students stated that the self pacing aspect of the learning contributed to greater success at TAFE than previously experienced at high school.

Generally, students did not need to change their learning styles when studying in a TAFE environment compared to their previous high school environment. Most students believed that the ability to think in an abstract manner, applying principles beyond familiar concrete examples was important. Inherent in the students' answers is the underlying agreement that cognitive development is important with regard to educational achievement.

Question five served to probe the students perceptions regarding motivation. Of the nine respondents, five believed encouragement to be important for successful learning. Encouragement was perceived to increase motivation. Increased motivation led to increased educational performance and consequent success. Four students stated that there was little if any need for encouragement "at this level" as people who were studying had their goals set, they new what they wanted and how to achieve those goals. In either response, it is apparent that all students perceived motivation to be important to overall educational success. The concept of supervision was seen in a negative light by most students, with the probability of supervision reducing motivation levels.

Seven of the nine students interviewed suggested that they should devote more time to their course. From Table C.1 (Appendix C) and Figure 4.44 below, student characteristics with respect to the time devoted to course work is detailed. The graph contained in Figure 4.44 below highlights the difference between the students studying in the two learning environments. It can be seen from the bar graphs that the time students spend at their respective colleges range from an average of 13 hours per week through to an average of 28 hours per week. Inspection of the graphs will also reveal that a number of students scored zero on some of the variables. For example, some students spent no time at the college not completing course work.



Code for Variables:
A = Hours per week on course work at college
B = Hours per week not on course work at college
C = Hours per week on course work away from college

Figure 4.44: Student Interview Results, Time Devoted to Courses

It is evident that the Open Learning students generally spend more time at their college than do the Traditional Learning students. It is apparent, however, that Open Learning students tend to spend more time at their college on activities other than course work. In completing activities other than course work, students ranged from zero hours through to a total of eight hours. The amount of time students spent completing course work away from the college ranged from zero hours through to 25 hours. Five students spent no time completing course work away from the college. Of those students who did complete course work away from the college, most tended to spend a lesser amount of time at the college. It is evident from the details in Table 4.32, that the average amount of time spent on course work is essentially the same for both learning environments. When the time spent at the colleges and the time spent away from the colleges are combined, a total amount of time spent on course work is collated. Open Learning students spent, on average, 25.4 hours on course work, while Traditional Learning students spent an average of 26 hours on course work. Though the ratio of time spent at college and time spent away from college was markedly different for students in the two learning environments, students spend similar amounts in terms of total time spent completing course work.

Student Group	N	A	SD	B	SD	C	SD
Open Learning	5	23.0	5.79	2.4	3.36	25.4	3.85
Traditional Learning	4	17.5	2.88	8.6	11.45	26.0	10.43

Code for Variables:
A = Hours per week on course work at college
B = Hours per week not on course work at college
C = Hours per week on course work away from college

Table 4.31: Group Aggregates of Time Spent on Course Work

In terms of quality, half of the Traditional Learning students had perceived components of their course to be of poor quality. Their perception of quality was largely based on relevance. While the materials could be of good quality, the quality of the educational process and associated materials was only of good quality if it was relevant. Open Learning students perceived the quality of their learning process to be good. The focus of these students was on the materials more than the facilitators. Of the five students only two had concerns with the quality, one with publishing errors in some material and the other expressing confusion over the wide range of material. Students perceived that high quality materials and processes would help educational achievement.

When reflecting on difficulties studying at home, student responses were varied, ranging from no difficulties at all through to not being able to study at home at all. There was a common thread, however, to the involvement of parents. Parental involvement appeared to have a positive influence on the ease of studying, but not necessarily with all students.

Students studying in a Traditional Learning were happy with their learning environment, commonly referring to it as a friendly atmosphere. These students believed that a good environment had a positive impact on educational achievement. Responses from the Open Learning students identified positive aspects of the learning environment as being the quietness and the ability to work without distractions. Conversely, a problem with the learning environment was the lack of colleagues, a lack of interaction with other students.

Peers were not seen to influence the educational achievements of the Traditional Learning students. Social activities were scheduled after study timetables, thus having little impact on the learning. Two of the Open Learning students also suggested that peers had no influence on their educational successes or failures. Conversely, three of the Open Learning students stated that the influence of their peers was generally an encouragement and increased their motivation.

With respect to the effects of mass media on the learning process, both student groups appeared to be similar. Some students believed that mass media had positive effects on the learning, both in terms of increased information and relaxation. Equally, students from both learning groups suggested that mass media had no impact on their learning process.

4.15.6 Student Details

Students, as identified, were completing a range of courses, all within the general framework of the Diploma of Business. All but one of the students were completing their studies in a full time mode. Details of the individual students and respective courses being completed appears in the raw results contained in Appendix C.

When describing the reasons why they were completing their current course of study, most students focused on future employment opportunities. Some through the immediate prospect of working, others through the medium term prospect of employment after gaining entry into University.

There is a marked difference between the two groups of students with regard to underlying reasons for studying in specific colleges. Three of the Open Learning students were studying in that mode because of the Open Learning characteristic of the college. Self pacing and flexible hours were cited as the major characteristics. One of the students studying in this mode was also at the particular college because of the Open Learning characteristics, however, this characteristic was the form of an entrance exam. Despite poor high school results, the student was able to pass an entrance examination and begin the course.

All students, with the exception of one, regarded their course in a positive manner. The Traditional Learning appeared to focus on relevance of the course as the major positive factor. The Open Learning students focussed on aspects such as self pacing, clear feedback, and being able to achieve the objectives, irrespective of how long it takes.

4.15.7 Learning Environments

All students had a similar concept of Open Learning citing aspects such as flexible learning times, the absence of a teacher, and progressing at your own pace. Students also had a similar concept of Traditional Learning, citing such factors as a central teacher figure, having to attend classes at set times and completing assessment at set times.

Given a choice of which learning environment students would prefer to learn in, the Traditional Learning students all selected the Traditional Learning environment. Such a selection was qualified by some as requiring a quality teacher. Open Learning students were divided in their preferred learning environment. Two students preferred an Open Learning environment, two students preferred a Traditional Learning environment. One student preferred the Traditional Learning environment, but for harder subjects suggested that the Open Learning environment would be preferential. The rationale for this decision was the perception that the Open Learning environment would allow a lot more time for learning, and therefore a greater chance of successfully completing more difficult subjects.

All Traditional Learning students stated that they would be most successful in a Traditional Learning environment, as well as enjoying that environment the most. Two of the Open Learning students selected Open Learning as the environment in the most successful and enjoyable. Two students selected the Traditional Learning to be most successful and enjoyable, and one student stated that it depended on the subjects.

4.15.8 Influence of the Productivity Factors

The final question of the structured interview related to the structure of Walberg's Productivity Model. Students were asked to write out a list of the nine productivity factors. A brief explanation of each of the factors was given (see Appendix C.2). Students were asked to write the list of the productivity factors in order that they would be able to place the factors in an order or scale of influence. Students ordered the factors according to the perceived impact the specific factor had on educational achievement. Given the fact that there were nine items to be scaled, it was imperative that students actually had a listing of the factors before them for due consideration. So that the order in which the factors were presented to the students did not influence the order that the students scaled them, factors were presented to different students in different orders. Two students were presented with the factors in the order of one to nine. Two students were presented the factors in the order of nine to one. Two students were presented the factors in the order of one through to four and nine through to five. Two students had the factors presented in the order of four through to one and five through to nine, whilst the remaining student had the factors presented in the order of nine through to five and one through to four.

Raw results to question 21 appear in Table C.2 in Appendix C. From this Table it can be seen that those students interviewed perceived the most important factor influencing their learning was that of Motivation, with eight of the nine respondents listing it as most important and one student listing it as the second most important. From the table it can also be seen that the factor of Mass Media is given the lowest rating for educational influence. Six students rated this factor as the least influential, whilst three students rated it as the second least influential factor.

Table 4.32 below details a grouping of the raw responses for this question into the broader categories of Aptitudinal Factors, Instructional Factors and Environmental Factors. Figure 1.1 in Chapter 1 details the Productivity factors of Ability, Cognitive Development and Motivation as Aptitudinal factors, the factors of Quantity and Quality as Instructional factors and the factors of Home Environment, Classroom Environment, Peer Environment and Mass Media as Environmental factors. From Table 4.32 presented below, it can be seen that students have perceived the Aptitudinal factors to be most influential in the learning, followed by

Instructional factors, while Environmental factors were seen as the least influential group. It is pertinent to note that such a pattern reflects the layout of Walberg's Productivity Model.

Rank Order	1	2	3	4	5	6	7	8	9
Student									
TE	A	A	A	I	I				
TI	A	A	A	I	I				
TL	A	A	I	I	A				
TW	A		I	A	I		A		
OB	A	A	I			I		A	
OJ	A	A	I	I	A				
OM	A	I		A	I	A			
OP	A		A	A	I		I		
OQ	A	A	I	A		I			

A = Aptitudinal Factors   I = Instructional Factors   = Environmental Factors

Table 4.32: Student Interview Results, Grouping of Productivity Factors

4.15.9 Summary

From the responses to the interviews, differences and similarities between the two groups of students have been identified. Traditional Learning students tended to attribute their educational success to humanistic characteristics such as attitude, teachers and friends, while Open Learning students tended to attribute their success to the ability to complete their studies at their own pace.

Both students groups had similar responses to the influences of previous schooling and cognitive development with respect to their current studies, with no clear direction as to the benefits of previous schooling to the current course. All students suggested that motivation had a positive influence on their learning.

With respect to the amount of time spent completing course work, it was apparent that Open Learning students spent more time at the college completing their studies than did the Traditional Learning students. It was also apparent that the Open Learning students spent less time on course work at home. Overall, however, when the total amount of time devoted to course work is collated, it is apparent that both student groups devoted similar amounts of time to their course.

Parental involvement was seen to be a positive influence on the ability to study at home. With respect to classroom environments, Traditional Learning students focussed on the friendliness of the atmosphere, whereas the Open Learning students focussed more on the physical characteristics of the environment. Peer environment was either seen to have a positive influence or no influence at all on achievement.

Students from both groups of students had clear concepts of Open Learning and Traditional Learning environments. Traditional Learning students preferred to learn in the Traditional Learning mode and believed that they would be most successful in that mode. Half of the Open Learning preferred the Open Learning mode of study and believed that they would be most successful in that mode. The other half suggested that they preferred the Traditional Learning environment.

4.16 Results Summary

The project has been conducted in line with the research design as detailed in the introduction of Chapter 1 and the detailed research design in Chapter 3. Within Chapter 1, Figure 1.2 detailed the research design as incorporating both quantitative and qualitative components. As has been further detailed in Chapter 3, this current study consisted of two parallel sections, one dealing with an Open Learning environment, and the other dealing with a Traditional Learning environment. As is highlighted in Figure 3.1 of Chapter 3, survey questionnaires have been used to gather quantitative data, while student interviews served as a means to gather qualitative data. As detailed in Figure 3.1, both quantitative and qualitative data has been gathered for both learning environments. The development of two parallel sections have converged at the end of the study to allow comparisons and correlations to be made regarding the productivity factors and the learning environments. Relationships between student aptitudinal, instructional, and environmental factors and educational outcomes within the Open Learning environment have been highlighted, in line with the original research question.

In addressing the research objectives of this study, the results have been presented in four distinct stages. First, scores from the total groups of students from both the Open Learning environment and the Traditional Learning environment have been presented for each of the nine productivity factors. Second, after rank order collation of educational achievement, relationships between each of the productivity factors and achievement were displayed. Third, direct comparisons between students from each of the two learning environments, matched on their Ability scores, have been made, further highlighting the relationships between each of the productivity factors and educational achievement. The last stage of data presentation was that of the qualitative component of the study. A summary of the student interviews is presented, offering a degree of triangulation to the quantitative data already presented.

Raw scores for each of the participating students, along with individual identification coding, has been presented. Tables contained in Appendix B detail the raw scores for each of the productivity factors for all students. Within this Appendix is the achievement ranking of all students, along with the ranking of all matched students. Appendix C provides a summary of all student interviews.

Data has been presented in a manner which has developed a snap shot picture of two learning environments. Data has been presented in a manner to describe the relationships between the productivity factors detailed in Walberg's Model, and the students' educational achievement. Through the method of data presentation, direct comparisons are possible between students in either of the two learning environments. Given such a method of data presentation, meaningful analysis and discussion of the data, or the snap shot picture, is possible. The following chapter, Chapter 5, discusses the findings to emerge from the study, limitations of this study and implications for future research.

5. DISCUSSION

5.1 Introduction

As has been detailed in the introduction to this study, and reinforced in the research design chapter, the basic objective of this research was to examine the educational productivity of an Open Learning environment in TAFE. The main means presented to explore this objective was Walberg's Educational Productivity Model. The model has been used to determine the relationship of nine specific productivity factors with educational achievement. The relationships between the specific factors and educational achievement within an Open Learning environment were then compared with the same factors within a Traditional Learning environment. Such a comparison has allowed underlying assumptions as to the productivity of the Open Learning environment to be explored. Walberg's model has provided the framework on which to base measurement and comparison of specific factors. Such a process has also placed the robustness of the model under scrutiny, in particular, how it may be applied to a study of educational productivity within the vocational training sector.

The Results Chapter presented data in a format that allowed for ready comparisons between the two learning environments. The data were presented in three distinct stages, with each stage addressing a specific research question. The first stage addressed the first research question and presented a snap shot of the two learning environments. Data relevant to nine productivity factors were presented for each of two student cohorts. Based on these productivity factors, direct comparisons between the cohorts have been made possible and enabled discussions exploring the differences and similarities between the two groups.

The Educational Productivity Model has been developed by Walberg and others through meta analyses, examining the effects that nine specific factors have on educational achievement. The model was used in the second stage of this current study to address research question two and the supplementary questions (2i, 2ii and 2iii), that is, relationships between the nine productivity factors and educational achievement across two different learning environments in TAFE. The appropriateness of Walberg's Educational Productivity Model for such research was also examined. Data presented were focused on the two student cohorts as whole entities as well as three separate groups within those cohorts. Students are drawn from three different courses being conducted within the TAFE Diploma of Business program, common to both learning environments.

The third stage of the data presentation has specifically addressed research question three, relating to the productivity of the Open Learning environment compared with that of the Traditional Learning environment within TAFE. While the first two stages of data presentation and analysis examined the relationship between the nine productivity factors and educational achievement, the third stage of data presentation examined the productivity of one learning environment compared to another. Students studying in both learning environments were matched as closely as possible within each of the three courses being surveyed. Comparisons of these matched groups, across each of the nine productivity factors, allowed examination of the impact of each factor on each group of students in either of the two learning environments.

5.2 Group Differences Based on Productivity Factors

Research Question 1:

> ***In terms of the factors of Walberg's Educational Productivity Model, what are the characteristics of Open Learning students within the vocational education and training sector?***

Before any conclusions could be drawn regarding group differences based on productivity factors across each of the two learning environments, it was necessary to establish any differences that may have existed between the two cohorts independent of the learning environment. To do this each of the productivity factors were examined independently across each of the student cohorts. A clear picture of the characteristics of the Open Learning students was established through comparison with Traditional Learning students.

The first productivity factor analysed was that of Ability. No major differences between the Ability levels of the two groups was indicated by this analysis. The Ability scores were based on scores allotted to students from the TAFE clearing house. It is these scores that determine student access to specific courses within the TAFE system. Similar levels of Ability between the groups does not preclude wide variance within the groups, however, generally the groups were similar in all respects. These results were also confirmed by the qualitative data gained from the structured interviews where no distinct differences across the two groups of students interviewed was apparent. Based on these findings, the relationship between the factor of Ability and education achievement in each of the TAFE learning environments was able to be explored, confident that the present learning environments had not influenced the Ability scores of the students.

Both groups were also similar in terms of their Cognitive Development levels. Of interest is the number of students from both groups that did not appear to have attained a level of formal operations in their stages of cognitive development. Shayer and Adey (1986) have stated that many people never reach the formal operations level of cognitive development. Six of the 17 Open Learning students and eight of the 24 Traditional Learning students had not achieved this level. Distinct differences were apparent in two of the sub-categories of this factor, namely Proportional and Combinational development. It is important to note, however, that one group is higher on the first scale while the other group is higher on the second scale. Overall, therefore, when drawing conclusions on comparisons of educational achievement with respect to Cognitive Development, it can be assumed that the two student groups are essentially similar on measures of this factor.

Results of group differences for the productivity factor of Motivation revealed a consistent difference between the two student groups. Given that the two groups were essentially a random selection of similar students within two distinct learning environments, it follows that their characteristics, with respect to Motivation, may be expected to be similar. Open Learning students, however, displayed slightly higher Motivation levels than Traditional Learning students on all of the sub-categories. While analysis suggests that these differences were not statistically significant, it is pertinent that these differences were all in the same direction. Given that Open Learning is largely an independent, self directed learning environment, it follows that levels of Motivation may have a considerable impact on the level of educational achievement. Further, given that both groups of students were essentially similar in Ability and Cognitive Development and that they were completing the same course of study, it is of interest that one group's level of Motivation was consistently higher than the other group. These findings indicate that either the Open Learning cohort arrived with a higher Motivation level, or that the Open Learning environment may have a positive impact on the Motivation levels of the students. During the follow up interviews, students' expressed their belief that encouragement from teachers or facilitators increased their motivation levels, whereas direct supervision (as experienced in Traditional Learning classes) tended to decrease these levels. It seems that if facilitators or teachers are perceived to largely encourage, as opposed to largely supervise, student motivation levels may be heightened. If, through the Open Learning process, facilitators were seen in an encouraging role, rather than a supervisory role, it follows that motivation levels may well have risen. Johnson (1992) has suggested that one of the major changes in an Open Learning environment is that an institution serves the needs of students, as opposed to students in a Traditional Learning environment needing to change to meet the needs of the institution. The student interviews conducted in this current study reflect Johnson's assertions, suggesting higher motivation levels occur when students are encouraged (to meet their needs) as opposed to when they are supervised (to meet the needs of the institution).

With respect to the factor of Quantity, Open Learning students generally devoted more time to their course of study than Traditional Learning students. While this difference was small and of little practical significance, there was a consistency in the direction of the difference. Student interviews revealed that the Open Learning students generally spent more time at the college, however, they also reported wasting more time at college. Conversely, Traditional Learning students spent more time at home doing course work. Such findings would fall within the general understanding of Open Learning, where students are able to utilise more time if required. From the survey data it appears that, generally, the Open Learning students tended to complete their studies at the college. There was one exception to this trend. One student actually spent the least amount of time of all the students at the college completing course work, but spent a substantial amount of time away from the college completing course work. Again, such a situation is in keeping with the general Open Learning philosophy, allowing a flexibility for where and when the course work is completed. While there may be a difference in the amount of time student groups spend on their studies, there appears to be little difference in their perceptions of wasted time. From the survey and interview data it appears that the degree to which students were focussed on their work was not influenced by the learning environment. Students were either equally focussed or equally distracted, irrespective of their learning environment.

Scores for the factor of Quality appeared to be higher for the Traditional Learning environment than for the Open Learning environment. Though the differences were relatively small, inspection of sub-categories highlighted consistencies. On all sub-categories, except that of Teaching Strategies, Traditional Learning students perceived the quality of their learning to be higher than that of the Open Learning students. Differences between the two student bodies on two of the sub-categories, namely Administration and Relevance, were found to have statistical significance at the 0.05 level. The sub-category of Administration was a combination of the availability of materials and resources, along with the competence of the staff to administer the course. Of the Open Learning students interviewed, all commented positively on the quality of the facilitators, while three students commented negatively on some aspect of the materials, suggesting that difficulties experienced related to the availability of materials and resources. The sub-category of Relevance related to the thought provoking characteristics of the course and the direct relevance of it. Traditional Learning students perceived their courses to be more relevant than Open Learning students. Given that students were completing the same course, based on the same syllabus, it follows that the direct relevance should be the same for both groups. The degree to which thought is provoked, however, may vary greatly depending upon the presentation of material. Analysis of questionnaire and interview data suggest that the method of material presentation in the Traditional Learning environment was more thought provoking than in the Open Learning environment.

The results show that, with the exception of the sub-category of Ethnicity, the two groups were essentially the same with respect to Home Environment. The data analysis revealed that the difference between the Ethnicity of the two groups was not statistically significant. It may be assumed that a home environment is generally well established before students at TAFE enter their particular study environments. Family structure and interaction would have been established over an extended period of time prior to the present study. The students' learning environment, therefore, may be expected to have little, if any, impact on their home environment. It is to be expected that there be minimal group differences between the students and that the wide range of different home environments occur equally between the two groups.

Open Learning students scored consistently higher on the Classroom Environment survey than the Traditional Learning students. Results highlight differences in both the overall scores between the two student cohorts and a number of the sub-categories. The difference was of statistical significance and, given a relatively small sample size, suggests that there is also a degree of practical significance in these differences. The sub-categories of Classroom Environment on which students differed most were Student Centredness, Packaged Learning, Student Support, Student Control, Competition and Friction. The first four categories address key aspects of the Open Learning environment where these sub-categories tend to focus on the student and away from the classroom environment. Given that these sub-categories relate specifically to an Open Learning environment, the results confirm the validity of the survey instrument as a measure of such an environment.

The Classroom Environment sub-categories of Competition and Friction were also seen to be significantly different, both statistically and practically, between the two groups of students. The extent of Competition and Friction within the study environment was perceived to be higher for Traditional Learning students than for Open Learning students. Such a finding is in keeping with the general philosophy of Open Learning, where students are able to choose, to a large extent, when and where they conduct their studies. If students were experiencing excessive degrees of competition or friction within the study environment, they would be free to change their routines, however, Traditional Learning students would have little option of changing from an established classroom, irrespective of the degree of competition or friction. Given that Open Learning students are free to move themselves away from high levels of competition or friction, it follows that those students would score these sub-categories lower than their Traditional Learning counterparts. That Open Learning students did score these sub-categories lower than Traditional Learning students reinforces the overall validity of this measurement instrument.

It is important to note that both Open Learning and Traditional Learning students who were interviewed, reported their study environments in a positive light. The differences previously mentioned do not necessarily reflect a perceived advantage or disadvantage to the student, with both groups of students reporting that they enjoyed their study environment. This insight from the student interviews is confirmed by the quantitative data where student groups both scored equally in the sub-category of Comfort. While equally comfortable in their environment, Traditional Learning students focussed on the positive aspects of a friendly environment, expressing concern for the outcomes of a poor environment. Open Learning students expressed concerns with the lack of student interaction, suggesting that a decrease in motivation may result.

From the results presented on Peer Environments, it was revealed that the two groups are essentially the same. The sub-categories which make up the peer environment questionnaire are those of Student Interaction, Self Aspirations, Peer Aspirations, Model Influences, Activities and Peer Conformity. The sub-category of Interaction is influenced by, and is a measurement of, the current study practices of the student, while all of the other sub-categories are largely influenced by relationships that have occurred prior to studying in the current learning environment. It is reasonable, therefore, to assume some differences might be apparent in terms of Interaction. Students operating in a self-paced, student-centred environment which is focused on the individual, may be expected to have a different student interaction regime than students studying in a Traditional Learning environment where the focus has historically been on the interaction within the classroom. The results show that there were no statistically significant differences between the two groups on this sub-category. Differences did occur, however, in the case of extra curricular activities where students studying in a Traditional Learning environment reported higher levels of extra curricular activities when in high school than Open Learning students. The difference is of a magnitude which suggests a degree of practical significance, as highlighted by the statistical analysis. It is of interest to determine what impact this difference might have on the overall educational outcomes of the two student groups. It is also of interest to establish whether the previous activities conducted by students had an impact on their preference for different study environments. From the student interviews, it was apparent that most students believed that their friends had little impact on their own learning.

There appeared to be no distinct differences between the two groups with respect to the factor of Mass Media. Traditional Learning students scored more highly on the sub-category of Homework with TV, with results which were statistically significant. From the graphs contained in the results chapter, however, it can also be seen that there were distinct differences, although not statistically significant, between the student groups regarding home work with music. Open Learning students spent more time listening to music when doing work at home, while Traditional Learning students spent more time completing work at home while watching TV. Given that the group differences are minimal and appear to counter balance each other, the overall effect seems to be similar for both groups. The two groups appear to be similar with respect to influences of Mass Media. Differences that might be expected to occur are in the areas of multi-media technology. Given that the Open Learning process may have a strong focus on multi-media based studies, it is reasonable to expect that students studying in this environment might utilise these technologies more than Traditional Learning students. No such differences were apparent. Data gathered from the student interviews confirmed the similarities between the groups. Students from both groups expressed concern for the negative, distracting qualities of the media. Some students believed the media to have a positive impact on their learning, while other students reported that it had no impact, positive or negative, on their learning.

In highlighting the characteristics of Open Learning students, a direct comparison has been made with Traditional Learning students, based on the nine factors of the Educational Productivity Model. Given that the students are completing the same courses within the TAFE environment and are randomly drawn from the general population, it follows that their profiles of the nine factors should be similar. The exception to this assumption is the factor of Classroom Environment where the Open Learning setting is distinctly different to the Traditional Learning environment. As would be expected, results and consequent discussions show that distinct differences did occur for this factor, with Open Learning students experiencing higher levels of a positive Classroom Environment. Open Learning students experienced higher levels of Motivation and Quantity, but lower levels of Quality. With the exceptions of these small differences, the two student groups were essentially similar in terms of the factors of the Educational Productivity Model. Given that the students had similar measures on each of the productivity factors, it is possible to use these factors as a base to explore comparisons of educational outcomes in the two learning environments.

5.3 Productivity Factors and Educational Achievement

Research Question 2:

> ***Is Walberg's Model an appropriate means by which to investigate Educational Productivity in the vocational education and training sector?***
>
> *2i. What is the relationship between student aptitude, in the form of ability, cognitive development and motivation, and learning outcomes?*
>
> *2ii. What is the relationship between instruction, in terms of quantity and quality, and learning outcomes?*
>
> *2iii. What is the relationship between student environments, in terms of home, classroom, peer and mass media, and learning outcomes?*

Walberg's Educational Productivity Model is a means by which the most influential factors of educational achievement are highlighted. Much research (Hattie, 1993; Marjoribanks, 1987; Reynolds & Walberg, 1992; Smith, 1990; Steinkamp & Maehr, 1983; Walberg, Fraser, & Welch, 1986; Walberg, 1994; Weiner, 1990) has been conducted to show the influence that these productivity factors have on achievement. The following section addresses the second research question and relates specifically to discussions on the influences that the productivity factors have on achievement in Open Learning within the vocational education and training sector. As educational achievement is the focus of these discussions, comments are based on the educational achievement of the individual students. As detailed in the Methodology and Results chapters of this study, assessment procedures for student achievement varied across the learning environments. Some results were based on percentages, others on a dichotomous Pass/Fail scale, consequently, comparisons based on achievement focus on individual courses (labelled A, B and C in the study) rather than entire student pools. As a result, each factor has been examined in terms of six matched student cohorts, three in an Open Learning environment and three in a Traditional Learning environment.

5.3.1 Aptitudinal Productivity Factors

The productivity factors associated with aptitude are the factors of Ability, Cognitive Development and Motivation. The Ability score, as developed for this study, is used by the TAFE entrance system as part of its overall entrance score. Given that entrance to courses is based largely on the likelihood that the course will be completed successfully, it follows that high Ability scores should be associated with course success. Of the six cohorts surveyed, four groups had positive correlations and two had negative correlations between Ability and achievement. Open Learning course A and Traditional Learning course C had negative correlations. The two highest scoring Open Learning students in course A had scores that were relatively close (90 and 98%) compared with the third student (73%). With such small sample sizes, the change of rank order of even one student can have a major impact on the statistical process and consequent results. A longitudinal collection and analysis of the results may well have placed the top two students in the reverse ranking, while both maintaining high results. If this were to be the case, the correlation would be reversed, giving a positive relationship between Ability and achievement, which would normally be expected (Fraser, Walberg, Welch & Hattie, 1987). Inspection of Traditional Learning course C results revealed a score range of 90 - 98% for the seven students. It appears that all students have achieved to a high level. The differences between the ranks of one and seven is only eight percentage points.

It is possible that the method used to determine the achievement levels in this study is not sufficiently sensitive to clearly discriminate between individual achievement scores and highlight distinct correlations between Ability and achievement which may actually exist. Given a broader achievement base measurement, or a longitudinal study, results may well differ to those presented. Some of the entrance scores developed by the TAFE clearinghouse are based on international equivalence of high school academic achievement. Where no direct comparisons occur, interpretations must be made and the accuracy of such scores are therefore compromised to some extent. Results from the Home Environment surveys reveal that five of the seven students in this course had markedly lower Ethnicity scores, suggesting a non-English speaking background. If the students completed their schooling overseas, it is possible that inaccuracies exist in the Ability scores. It is also possible that cultural background has impacted on the learning environment to an extent not predicted by the Educational Productivity Model. There is reasonable argument to suggest that the negative correlations displayed by the two groups warrant further investigation. For the purposes of this study, however, the conclusion is drawn that generally there is a positive correlation between Ability and achievement, within both Open Learning and Traditional Learning TAFE environments.

There is a positive correlation between the Cognitive Development of students and their course achievement. This finding is consistent across all courses except Traditional Learning students completing course C. As previously detailed, five of the seven students in this course had markedly lower ethnicity scores. Of the total pool of 42 students, only two students scored lower in the sub-category of Ethnicity (see Tables in Appendix B for student scores). It is a distinct possibility that student ethnicity is a confounding factor in this measurement. Waldrip (1994) suggests that the Educational Productivity Model could be enhanced by the inclusion of race as a factor and cites a similar finding by Fraser (Waldrip, 1994, p.199) to add credence to this suggestion. Allowing for the uncertainty of the results of the students completing Course C, the general conclusion is drawn that there is a positive correlation between Cognitive Development and achievement. Such findings concur with assertions of Walberg (1981) and Lawson (1985).

All student groups showed a positive correlation between Motivation and achievement, with the exception of Open Learning students who completed course A. Such a finding is in keeping with the Educational Productivity Model. It has previously been discussed that Open Learning students had slightly higher Motivation scores than the Traditional Learning students, which may suggest that the learning environment impacts on the level of Motivation. It is also a possibility that this difference between the two groups of students previously existed before entering the TAFE environment. What is not known is to what extent the TAFE sector generally, irrespective of either Traditional or Open Learning environments, impacts on student Motivation. Student interviews suggested that many students who had achieved poor results at high school were achieving at a much higher level at TAFE. In order to develop a greater understanding of the effectiveness of the Open Learning environment, a greater understanding may be required first of the TAFE system in general. It is possible that there is a fundamental change for students from studying at a high school to studying at a TAFE college. Student interviews highlighted the concept of relevance as impacting on their Motivation levels. It is likely that relevance, a sub-category of the factor of Quality, is far more influential in the vocational education and training sector than the high school environment, perhaps reducing the influences of other productivity factors.

5.3.2 Instructional Productivity Factors

The productivity factors associated with instruction are the factors of Quantity and Quality. The productivity factor of Quantity has been measured in two forms, namely the amount of time engaged, and the degree to which students were focussed. Quantity, in terms of the amount of time engaged in course work was shown to have an overall negative relationship with achievement. In terms of the degree of student focus on course work, Quantity was shown to have an overall positive correlation with achievement.

With respect to the number of actual hours spent on course work, the results highlighted a negative relationship with educational achievement. Only one of the six student groups (Traditional Learning, Course C) had a positive relationship between Quantity and achievement. Two groups of Open Learning students and one group of Traditional Learning students had a negative relationship, while the remaining two groups revealed a negligible correlation. Such a situation would appear to contradict the general assumptions of the Educational Productivity Model, where greater amounts of time has been generally associated with higher levels of achievement. A salient characteristic of the Open Learning environment is the Ability of students to progress through their course of study at their own pace. If students in this environment only require a limited amount of time to successfully complete their studies, then that is all the time they spend on their studies. Students who experience difficulty on a given course may require more time in order to achieve mastery, thus eluding to a negative correlation between quantity and achievement. Such a negative correlation may be due to the fundamental difference between high school education and vocational education. In high schools, learning is structured to enable students to reach their highest potential within certain administrative constraints. It follows, therefore, that the more time a student spends engaged in a particular line of study, the higher that student is likely to achieve.

The vocational sector is essentially a competency-based training system. That is, students progress through a course in order to achieve specific competencies within a field of study. Once a competency has been achieved, each student progresses to the next competency. The focus of the learning is not an exploratory journey, taking the student as far as possible, rather it is a set journey taking the student to specific check points. Once the check point is reached, the student can either take a spell or continue the journey. Students who master competencies more quickly will spend less time completing course work. Such a situation may well be exacerbated by the dichotomous Pass/Fail assessment used in some courses. If students are simply striving to achieve a Pass, there is little incentive to progress beyond a Pass level, hence the time required to achieve a Pass is all the time that a student would devote to course work. Again, higher achieving students are more likely to achieve the Pass level more quickly than lower achieving students. Further research is required to establish causal relationships, but it is evident, based on the results from this study, that a clear relationship exists between current vocational learning environments and the amount of time required for the learning. This relationship, however, is contrary to educational research findings conducted mainly in the school sector (Walberg, 1984; Marjoribanks, 1985; Fraser, 1989; Reynolds & Walberg, 1992,) which suggest that higher achievement is associated with more time for learning. Such findings may simply reflect the assertions of mastery learning (Carroll, 1963; Bloom, 1976) where the achievement required is at a set level with the quantity of time spent learning being the independent variable. A student may require more, or less time than another student to achieve mastery over the same objective or task. It may well be that this study has revealed that the students ranked highest on Ability simply need less time to achieve mastery on given tasks.

In terms of the degree to which students were focussed on their course work, results have shown a positive relationship between Quantity and achievement for both groups of students. This positive relationship appeared to be consistent across all student groups in either of the learning environments. It is apparent that the degree to which students are focussed on their course work may well be of greater influence than the actual amount of time engaged.

The survey results showed were inconclusive for the factor of Quality. Results of the six student groups highlighted three groups with a negative correlation, two groups with a positive correlation, and one group with no correlation between Quality and achievement. The study draws the conclusion that, for the survey group, there is no consistent relationship between the perceived Quality of a course and the educational achievement of the students completing that course. Qualitative data from interviews revealed that all students believed good quality resources and processes would lead to higher achievement. Such a finding is in agreement with the assertions of the Educational Productivity Model. Additional research is required, however, to investigate what influences are impacting on those student groups who revealed negative correlations between Quality and achievement. It is possible that the impact of the factor of Quality is reduced in light of the strength of other productivity factors within the vocational education and training sector. Higher levels of Cognitive Development or Motivation may exist, reducing the impact of the factor of Quality.

5.3.3 Environmental Productivity Factors

The productivity factors associated with environment are Home Environment, Classroom Environment, Peer Environment and Mass Media. Results for the productivity factor of Home Environment are inconclusive. A range of results was evident that displayed both positive and negative relationships between Home Environment and educational achievement. Students in this survey were all studying in the post compulsory sector of education, with most students in the 18 year old category. At this stage in the student's life, there appears to be two distinct influences that may foster a higher level of independence than might be expected of students studying within the high school environment. Firstly, within the TAFE sector, students are studying in an environment which appears to place much of the responsibility for learning on the individual, perhaps in contrast to that which exists in the secondary school environment. Secondly, the students surveyed are at a stage in life where many may move away from the family home environment. Students are generally in a stage of transience from the influence of the home environment, moving from a state of dependence to one of independence. Given this state of transience, it is reasonable to expect that the Home Environment may have less impact on the students' achievement.

It has been shown that all of the student groups, except one (Course A: Open Learning) displayed a positive relationship between Classroom Environment and educational achievement. There appears to be little difference in the impact of the Classroom Environment for either Open Learning students or Traditional Learning students, both showed general positive relationships with achievement. Such a finding is in keeping with the general assertions of the Educational Productivity Model. Of major interest in this study is the influence of the Classroom Environment for one specific group compared with another. The positive relationship was apparent for both the general sub-categories of Classroom Environment and those sub-categories specifically related to Open Learning environments.

Results from the survey data show that the relationship between Peer Environment and educational achievement is similar for both Open Learning and Traditional Learning students. Four of the six different student groups had positive correlations between Peer Influence and achievement. The other two groups showed no correlation. These results are in keeping with the assertions of the Educational Productivity Model. Of interest, however, are the results from the follow up student interviews. Three of the Open Learning students stated that their peers had a positive impact on their learning in the form of encouragement. None of the Traditional Learning students and two of the Open Learning students believed that their peers had no influence on their learning. Given the results, it would appear that the influence of peers may be subliminal, quantitatively having a positive effect, but qualitatively not being recognised for that effect.

With the exception of the Open Learning group of students studying course B, data for student groups in both environments showed positive correlations between Mass Media and educational achievement. It is noted that on average none of the students in either of the learning environments encountered any one form of Mass Media for more than ten hours per week. Studies, as detailed in the review of literature, have shown that more than ten hours per week of television viewing can have negative effects on the learning. Below this amount, television viewing can benefit educational outcomes. The results for this group of students would appear to support such findings.

While the two student bodies were similar in most respects, and reflected results in line with the Educational Productivity Model, a major difference was noted on the factor of Quantity.

Most productivity factors were shown to have either a positive relationship with achievement, or little relationship at all. The factor of Quantity, however, had a negative relationship with educational achievement in both learning environments. For most students, the least amount of time spent on course work correlated with a greater level of educational achievement. Such a situation is not congruent with the Educational Productivity Model, where research would suggest that the more time spent on course work, the greater the level of achievement. This situation may be specific to this particular sample of students. Alternatively, this situation may well be particular to the simple achievement of competencies within the vocational education and training sector.

In responding to the second research question, this discussion has examined the relationship between nine productivity factors and educational achievement within an Open Learning environment. In order to examine any influence that might be specific to the Open Learning environment, comparisons have been made with a Traditional Learning environment. Any distinct differences between the two learning environments highlight areas where the Open Learning environment may have a unique influence on educational outcomes. If the student groups within the two learning environments are similar in terms of individual measurement of the productivity factors, then any differences between the groups and the impact of the factors on achievement tend to highlight unique influences of the Open Learning environment. As the previous discussions have highlighted, students studying in both Open Learning and Traditional Learning environments are generally quite similar. As was also highlighted though, and not unexpected, a distinct and practically significant difference in Classroom Environment measures occurred.

5.4 Comparisons Between Open Learning and Traditional Learning Environments

Research Question 3

How does the Open Learning environment compare to a Traditional Learning environment in terms of productivity factors and learning outcomes when students are matched on ability?

Student groups have been identified as being essentially similar in terms of their perception of the levels of productivity factors within their respective learning environments. Relationships between these factors and the students' educational achievement have been shown to be largely in line with the assertions of Walberg's Educational Productivity Model. The Educational Productivity Model has been shown to be a suitable basis for measurement within the vocational education sector. The student groups being surveyed have been shown to be similar, with no distinct differences in any of the productivity factors except Classroom Environment. Such a foundation has provided the opportunity to match students and explore the productivity of the Open Learning environment by comparing the relationships between productivity factors and educational achievement for the two learning environments, and thus address the last research question.

To examine the productivity of the Open Learning environments, students from both Open Learning and Traditional Learning environments were matched on Ability measures. The educational performance of these students was compared using the productivity factors of Walberg's Educational Productivity Model as a basis of measurement. Relationships were analysed using scatterplots and Tau correlation coefficients. From the graphs displayed in Chapter 4, comparisons between the different student groups have been possible.

For the factor of Ability, it was apparent that there was little difference between the two student groups, with a generally positive relationship between this factor and achievement. In terms of the factor of Cognitive Development, there was also a general positive correlation with achievement. While both student groups displayed a positive correlation between Cognitive Development and achievement, it was apparent that the Open Learning students had a stronger relationship. Such a finding suggests that the Open Learning environment may be best suited to those students scoring more highly on Cognitive Development.

For the factor of Motivation, both student groups displayed a positive correlation with achievement, however, it was revealed that Traditional Learning students had a stronger relationship. This finding suggests that more highly motivated students may achieve more highly in a Traditional Learning environment.

For the factor of Quantity, in terms of actual hours learning time, all of the student groups revealed a negative correlation with achievement. Results revealed this negative correlation to be of a similar strength for both learning environments. Generally, students achieving most highly had the least amount of learning time. Such a situation suggests that the vocational education and training sector is distinctly different to the secondary school sector, where the Educational Productivity Model has revealed positive correlations between Quantity and achievement. In stark contrast to the findings based on actual hours, the degree to which a student is focussed on course work has a positive correlation with educational achievement. The amount of wasted time has a negative relationship with achievement. The relationship between the degree of student focus and achievement was consistent in direction for all student groups.

These results on the factor of Quantity suggest that rather than simply have students experience more time on given course work, it is important to increase the degree of student focus. Students who are focussed on their work, with low levels of wasted time, achieve more highly. It is the task of the educator to increase the level of focus, rather than simply allow for more time. Subsequent analysis of the results showed a positive relationship between students with high levels of wasted time, and the actual hours during which course work was completed. Students who reported the greatest number of hours per week completing course work, were also reporting the greatest amount of wasted time. Students who reported the lesser amounts of course work time were also more focussed on their course work. Simply put, the high achieving students appeared to use their time more efficiently than the lower achieving students. These findings concur with those of Fitz-Gibbon and Clark (1982) and

Bloom (1980) where concepts of learning time such as 'actively engaged' and 'Time on Task' are seen as being the important predictors of achievement.

In terms of the productivity factors of Quality and Home Environment, results were inconclusive. Students from both Open and Traditional learning environments displayed positive and negative correlations between Quality and achievement, and Home Environment and achievement. With respect to these productivity factors, the results suggest that neither learning environment is more productive than the other.

Results have shown that for all student groups there was a general positive relationship between Classroom Environment and achievement. The relationship appears to be stronger for the Traditional Learning students. The findings suggest that Traditional Learning students respond positively to the components of the Classroom Environment which are most directed to the Open Learning environment. Those sub-categories most intended for an Open Learning environment include Student Centredness, Student Support, Student Control and Packaged Learning. From the results it is apparent that Traditional Learning students respond more positively to these sub-categories than do their Open Learning counterparts. While the Open Learning environment requires a high level of these sub-categories to be in line with the Open Learning philosophy, it is apparent that the Traditional Learning environment can also benefit from an increase in these sub-categories. Students studying in a Traditional Learning environment may experience higher levels of achievement as a result of higher levels of the student focussed sub-categories of Classroom Environment. The Traditional Learning environment may be enhanced by the adoption of those aspects of the Open Learning philosophy related to Classroom Environment.

Results for the productivity factor of Peer Environment were consistent across all matched student groups. A positive peer influence has been shown to correlate strongly with increased educational achievement. Results for the productivity factor of Mass Media were similar to those of Peers. All but one of the six student groups recorded a positive relationship between media and achievement. Television viewing has been the aspect of Mass Media which has been seen to have a negative impact on educational achievement. Williams, Haertal, Haertal & Walberg (1982) stated that television viewing of more than ten hours per week tended to have a negative impact on achievement, while viewing up to ten hours per week had a positive impact on the learning. The average amount of television viewing for students in this study was approximately six hours per week. The trend from these results appear to be reasonably consistent, and highlight the positive relationship of a moderate amount of Mass Media on educational achievement.

In terms of the productivity of the learning environments, results from this current study reveal that the Open Learning environment may well be more productive for students with high levels of Cognitive Development, whereas the Traditional Learning environment may be more productive for students with high levels of Motivation. Data also suggest that the Traditional Learning students respond more positively to the characteristics of a positive Classroom Environment, including sub-categories specifically directed to an Open Learning environment, than do the Open Learning students in this current study.

5.5 Conclusion

Walberg's Educational Productivity Model was utilised to explore the Open learning environment in terms of investigations and comparisons with a more Traditional Learning environment. Instruments suitable for measuring each of the nine productivity factors were developed and validated. Characteristics of student groups studying in the two different learning environments were highlighted. Measurements based on the nine productivity factors each contributed to develop an overall picture of group characteristics. This picture was balanced in a qualitative sense with data gathered through student interviews.

With the exception of Classroom Environments, results suggested that both Open Learning and Traditional Learning student groups were similar in levels of the productivity factors within their specific environments. As the student groups were essentially similar in terms of the productivity factors, a common basis of measurement and comparison had been established. Relationships between each of the productivity factors and subsequent educational achievement were presented. Positive relationships between achievement and seven of the nine productivity factors occurred. Those factors were Ability, Cognitive Development, Motivation, Quantity, Classroom Environment, Peers Environment and Mass Media. No clear relationship was apparent for the factors of Quality and Home Environment.

The study has confirmed the assertions of the Educational Productivity Model, revealing, within the two learning environments, strong relationships between specific productivity factors and educational achievement. This study has, therefore, established the relevance of the Educational Productivity Model for investigations into the vocational educational and training sector.

In terms of educational productivity of the Open Learning environment, with the exception of Classroom Environments, no clear distinction between the Open Learning environment and the Traditional Learning environment was apparent. From the results of this study, none of the factors have emerged as definitive predictors of success or failure. Two factors, however, namely Cognitive Development and Motivation, were associated with differences in achievement levels for students in different learning environments. While these relationships were not definitive, they appear to be worthy of further research.

5.6 Limitations of the Research

This study has attempted to establish the validity of the Educational Productivity Model within the vocational education and training sector and results have shown that, in the case of the student groups surveyed, the Educational Productivity Model is a valid means for obtaining measures of educational productivity. This research, however, is limited, mainly due to sampling factors, in the assumptions that can be made about the use of the model. Students from two TAFE colleges were surveyed, both within the Metropolitan area of Perth, Western Australia. Further research is required in other TAFE colleges, both within the metropolitan area and country locations, as well as in the rapidly emerging private learning institutions in Australia, before definitive statements can be made about the widespread use of the Educational Productivity Model within the vocational education and training sector.

One of the major limitations of this research has been the number of student groups surveyed. While much fine grained data have been gathered on the two groups of students, in line with the extensive development of survey instruments, it is evident from the small student numbers that much of the findings presented from the data are restricted to these groups. This situation is especially pertinent when students were split into sub-groups for direct comparisons between the two learning environments. Further research is required before the findings can be extrapolated to other learning situations. Given the extensive amount of data required to establish reasonable measures for each of the nine productivity factors, such ongoing research would necessarily take on major proportions, requiring nine sets of survey questionnaires for each respondent.

Description and comparison has been the nature of this study, rather than experimental design with the accompanying control groups or pre-test/post-test measurements. As a result of this descriptive nature, along with the lack of rigorous pre and post test measures, causal links cannot be established between any of the productivity factors and the measures of educational achievement. The value of this research is in the exploration of relationships. Given the discovery of identified relationships, further experimental research involving much greater sample sizes may be conducted to explore possible causal links.

Given the extensive range of students completing studies within the vocational educational and training sector, this study is limited in terms of age stratification. Students studying within the vocational education and training sector can range from post compulsory schooling level up to and beyond retirement age. It is possible that the assertions of the Educational Productivity Model are generally upheld in terms of the post compulsory, adolescent students, but further research is required to investigate relationships across the wider age range of students.

The focus of the Walberg's model is educational productivity and there has necessarily been an emphasis in the research on student achievement. This research project, however, has been limited by the lack of sensitivity of the achievement measures available to the researcher. As has previously been discussed, the movement to a competency based training system has introduced the dichotomous Pass/Fail method of student assessment. Such an assessment method restricts the Ability of the researcher to order students in a wide range of achievement levels. Further research may well benefit from the development of standardised assessment instruments on which results can be compared.

5.7 Implications for Further Research

It has been established in this study that, for the student groups surveyed, there are few stark differences between the two learning environments. It is evident that, in terms of educational productivity and the nine associated productivity factors, both the Open Learning environment and the Traditional Learning environment are similar. Teachers or facilitators operating in either of the two learning environments can be confident that fundamental influences as described in the Educational Productivity Model are similar in both environments. While obvious differences will exist in appropriate teaching/learning strategies for each of the learning environments, the fundamental influences on achievement are similar.

While the research has established that the relationship between the nine productivity factors and educational achievement is similar for both Open Learning and Traditional Learning environments, a number of differences did occur which has implications for educators.

Analysis of the research data has identified the distinct differences between the two classroom environments at the two TAFE colleges. Such findings were in line with the relevant literature addressing the Open Learning environment. This research has established relationships between the salient factors specific to the Open Learning environment and educational achievement within that environment. Of interest is the fact that similar relationships were also identified for the Traditional Learning students. Traditional Learning students who are experiencing higher levels of the salient factors associated with an Open Learning environment, will generally achieve at a higher level. Implications are, therefore, evident for educators within a Traditional Learning environment. These educators need to examine the salient factors of Open Learning and explore means by which they may be incorporated into the mainstream, Traditional Learning process. This research suggests that increases in the levels of Student Centredness, Student Support, Student Control and Packaged Learning, along with reduced levels of Competition and Friction, will be associated with overall increases in educational achievement in both an Open Learning and a Traditional Learning environment. The task for educators is to establish measures by which they can increase the extent of Packaged Learning, Student Centredness, Support and Control and reduce the levels of Competition and Friction into the main stream, traditional institutions, where teacher controlled learning has been the norm.

Findings of this research suggests that the amount of time students spend engaged in study is not as consistently related to educational achievement as is the degree to which students are focussed on their work. The implication for educators is to strive to maintain a high level of student focus on course work, with perhaps less emphasis placed on distinct quantities of learning time. The challenge for educators operating in a Traditional Learning environment is to incorporate flexibility into courses which allows a shift in emphasis from lock stepped, time based learning, to learning that encourages appropriate amounts of highly focussed learning time. Such an implication is not new to the general body of education. Findings by Carroll (1963) Bloom (1976, 1980) Fitz-Gibbon and Clark (1982) and Lindelow (1983) all remove the emphasis of learning from a simple block of time, suggesting that 'time on task' or 'engaged time' is of far more importance. Implications for educators operating in an Open Learning environment are to develop means which foster high levels of student focus for the time that students are engaged in learning, be it on or off campus. Large amounts of learning time which have low levels of student focus have long term implications for both the student and the Open Learning institution. Students may achieve at a lower level, or simply take longer to complete given courses. Institutions may be graduating students who have lower levels of achievement, or be taking longer to graduate students to a higher level. Such a situation would not be associated with lower academic Ability, rather inefficient use of the productivity factor of Quantity.

Implications for the selection of students for specific learning environments, and for the selection of students within the TAFE sector generally have been highlighted. In terms of selecting students for different learning environments, two factors emerged as possible predictors of a higher level of achievement. While such causal links cannot be claimed by this research, positive relationships have been identified for two productivity factors that appear to be different for the two learning environments. Students with higher levels of Cognitive Development, studying in an Open Learning environment, appear to have a stronger relationship with achievement than do students of similar Cognitive Development levels studying in a Traditional Learning environment. The implication is for researchers to further explore this relationship to examine the possibility that students with higher levels of Cognitive Development will achieve at a higher level in an Open Learning environment than if studying in a Traditional Learning environment. If such a situation exists, then wider implications exist for the criteria by which students enter either of the learning environments. If measures on the factor of Cognitive Development are able to predict levels of achievement in Open Learning, the implication is for educators operating in an Open Learning environment to develop means by which Cognitive Development can be enhanced. Lawson (1985) suggests that student performance on formal operations, the highest level of Piaget's stages of cognitive development, can be enhanced by training. Such enhancement may need to become an integral part of the Open Learning process.

Open Learning students were shown to generally experience higher levels of achievement, when operating at higher Cognitive Development levels, than Traditional Learning students operating at similar Cognitive Development levels. The research has also shown that Traditional Learning students generally experienced higher levels of achievement when operating at higher levels of motivation, than did Open Learning students. Similar implications are apparent for Traditional Learning environment educators in terms of Motivation, as are apparent for Open Learning educators in terms of Cognitive Development. Further research is required to establish whether these relationships are consistently found across different studies and to establish causal direction.

Research utilising large numbers of students would enable the use of multi variate analysis of the data, allowing for the ability to isolate the influences of the other productivity factors, and more closely examine these relationships.

Implications for the selection of students for entrance into TAFE courses have been identified by this research study. Entrance scores to courses surveyed in this study did not consistently predict future success in terms of educational achievement. Further research is required to identify whether entrance scores do in fact predict success in either overall academic achievement or future employment opportunities in a TAFE setting be it in either an Open Learning or a Traditional Learning environment.

A major aspect of this research study has been the sourcing and development of survey instruments to measure the factors of the Educational Productivity Model within a vocational education and training setting. The instruments that have been developed for this purpose have been shown to be both valid and reliable. This research needs to be replicated, however, to further establish the validity and reliability of these instruments. Replicated research would not only confirm Walberg's Educational Productivity Model as a valid framework on which to base research within the vocational education and training sector, but also confirm the ability of a range of instruments to readily facilitate such research.

The decision makers within the TAFE sector specifically, and the vocational training sector more generally, as a result of this current study, should be better equipped to closely address the issue of educational productivity in different learning environments. In terms of alternative delivery modes, especially that of Open Learning, measures are now apparent to determine the educational productivity of such various approaches. This research takes the basis of analysis beyond a simple comparison of average student results of one delivery method compared to the average student results of another delivery method to determine productivity. The research allows for the examination, at a fine grained level, of those components most influential on the educational productivity of students, highlighting areas to which funding and other scarce resources might best be directed.

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Appendix A.1: Test of Logical Thinking Questionnaire

ORANGE JUICE NUMBER 1

Four oranges are squeezed to make six glasses of juice. How many glasses of juice can be made from six oranges.

(Assume that all of the oranges are the same size)

a. 7 glasses

b. 8 glasses

c. 9 glasses

d. 10 glasses

e. None of the above

REASON

1. The number of glasses compared to the number of oranges will always be in the ratio of 3 to 2.
2. With more oranges, the difference will be less.
3. the difference in numbers will always be two.
4. With four oranges the difference was two. With six oranges the difference would be two more.
5. There is no way of predicting.

Item 2

ORANGE JUICE NUMBER 2

Four oranges are squeezed to make six glasses of juice. How many oranges are needed to make 15 glasses of juice?

(Assume that all of the oranges are the same size)

a. $7^1/_2$ oranges

b. 9 oranges

c. 10 oranges

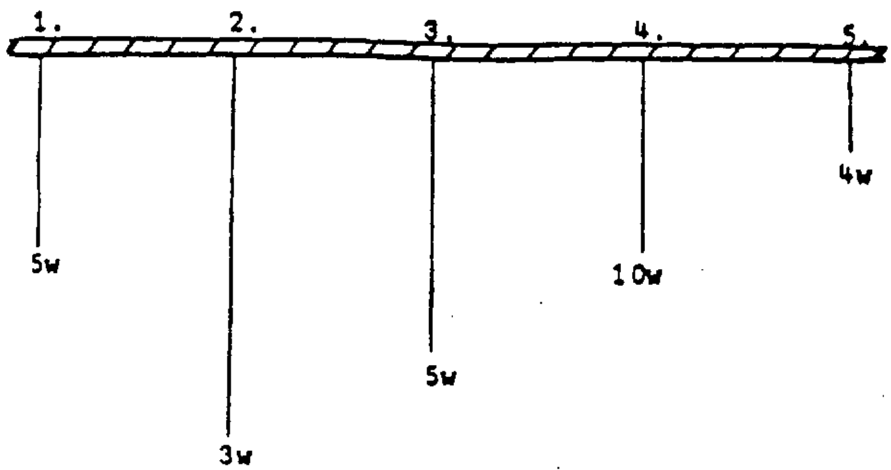
d. 13 oranges

e. None of the above

REASON

1. The number of oranges compared to the number of glasses of juice will always be in the ratio of 2 to 3.
2. The number of oranges will always be less than the number of glasses of juice.
3. The difference in the numbers will always be less than two.
4. The number of oranges needed will be half the number of glasses of juice.
5. There is no way of predicting the number of oranges needed.

THE PENDULUM'S LENGTH



Suppose you wanted to do an experiment to find out if changing the length of a pendulum changed the amount of time it takes to swing back and forth. Which of the pendulums would you use for the experiment?

a. 1 and 4

b. 2 and 4

c. 1 and 3

d. 2 and 5

e. all

REASON

1. The longest pendulum should be tested against the shortest pendulum.

2. All pendulums need to be tested against one another.

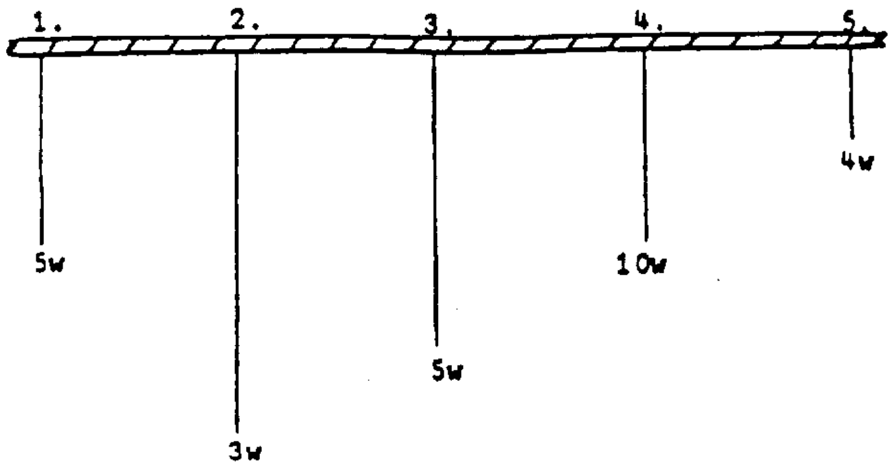
3. As the length is increased the number of washers should be decreased.

4. The pendulums should be the same length but the number of washers should be different.

5. The pendulums should be different lengths but the number of washers should be the same.

Item 4

THE PENDULUM'S WEIGHT



Suppose you wanted to do an experiment to find out if changing the weight on the end of the string changed the amount of time the pendulum takes to swing back and forth. Which pendulums would you use for the experiment?

a. 1 and 4

b. 2 and 4

c. 1 and 3

d. 2 and 5

e. all

REASON

1. The heaviest weight should be compared to the lightest weight.
2. All pendulums need to be tested against one another.
3. As the number of washers is increased the pendulum should be shortened.
4. The number of washers should be different but the pendulums should be the same length.
5. The number of washers should be the same but the pendulums should be different lengths.

THE VEGETABLE SEEDS

A gardener bought a package containing 3 cucumber and 3 bean seeds. If just one seed is selected from the package, what are the chances that it is a bean seed?

a. 1 out of 2

b. 1 out of 3

c. 1 out of 4

d. 1 out of 6

e. 4 out of 6

REASON

1. Four selections are needed because the three cucumber seeds could have been chosen in a row.
2. There are six seeds from which one bean seed must be chosen.
3. One bean seed needs to be selected from a total of three.
4. One half of the seeds are bean seeds.
5. In addition to a bean seed, three cucumber seeds could be selected from a total of six.

Item 6

THE FLOWER SEEDS

A gardener bought a package of 21 mixed seeds. The package contents listed:

3 short red flowers
4 short yellow flowers
5 short orange flowers
4 tall red flowers
2 tall yellow flowers
3 tall orange flowers

If just one seed is planted, what are the chances that the plant that grows will have red flowers?

a. 1 out of 2

b. 1 out of 3

c. 1 out of 7

d. 1 out of 21

e. other

REASON

1. One seed has to be chosen from among those that grow red, yellow or orange flowers.

2. $^1/_4$ of the short and $^4/_9$ of the talls are red.

3. It does not matter whether a tall or short is picked. One red seed needs to be picked from a total of seven red seeds.

4. One red seed must be selected from a total of 21 seeds.

5. Seven of the twenty one seeds will produce red flowers.

The Mice

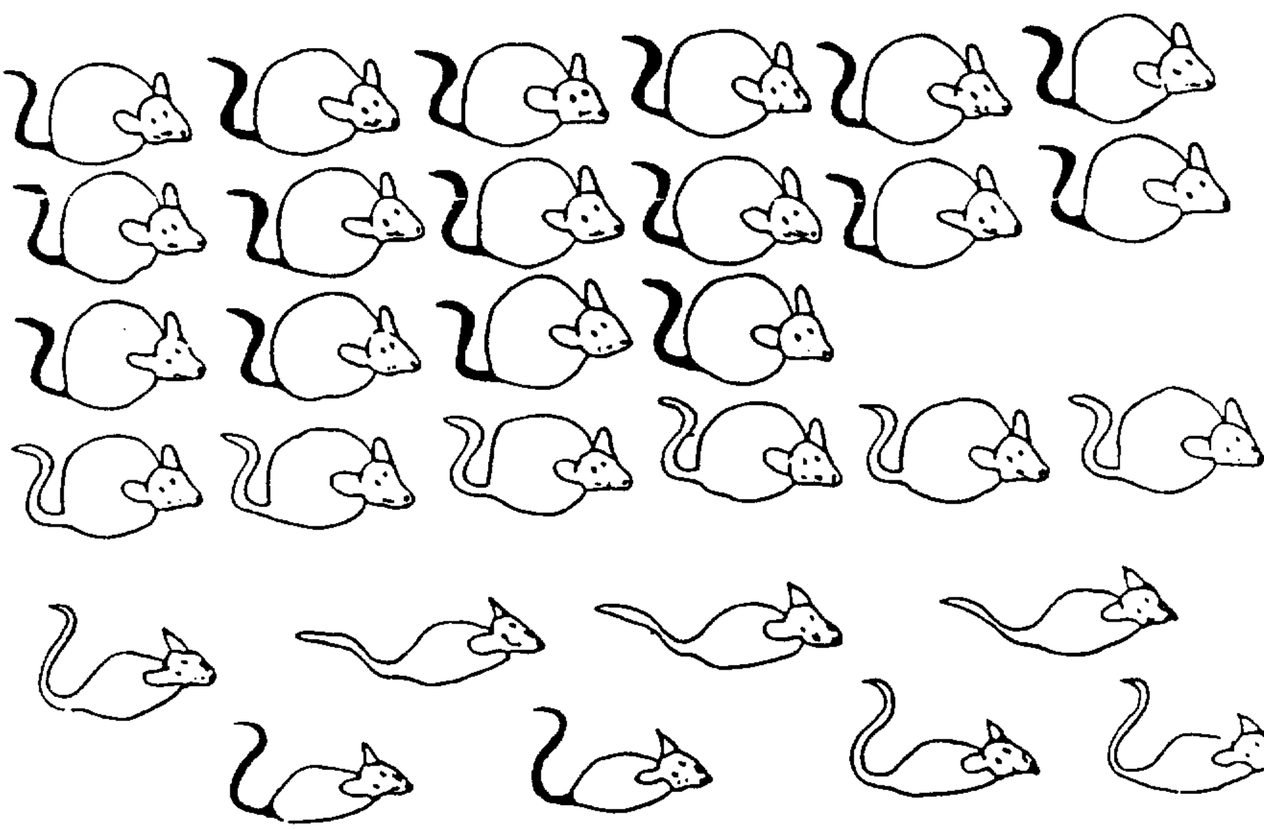
The mice shown in the diagram represent a sample of mice captured from a part of a field. From the diagram, decide whether fat mice are more likely to have black tails than thin mice.

a. Yes, fat mice are more likely to have black tails than thin mice.

b. No, fat mice are not more likely to have black tails than thin mice.

Reason

1. $^{8}/_{11}$ of the fat mice have black tails and $^{3}/_{4}$ of the thin mice have white tails.
2. Some of the fat mice have white tails and some of the thin mice have white tails.
3. 18 mice out of thirty have black tails and 12 have white tails.
4. Not all of the fat mice have black tails and not all of the thin mice have white tails.
5. $^{6}/_{12}$ of the white tailed mice are fat.



Item 8

The Fish

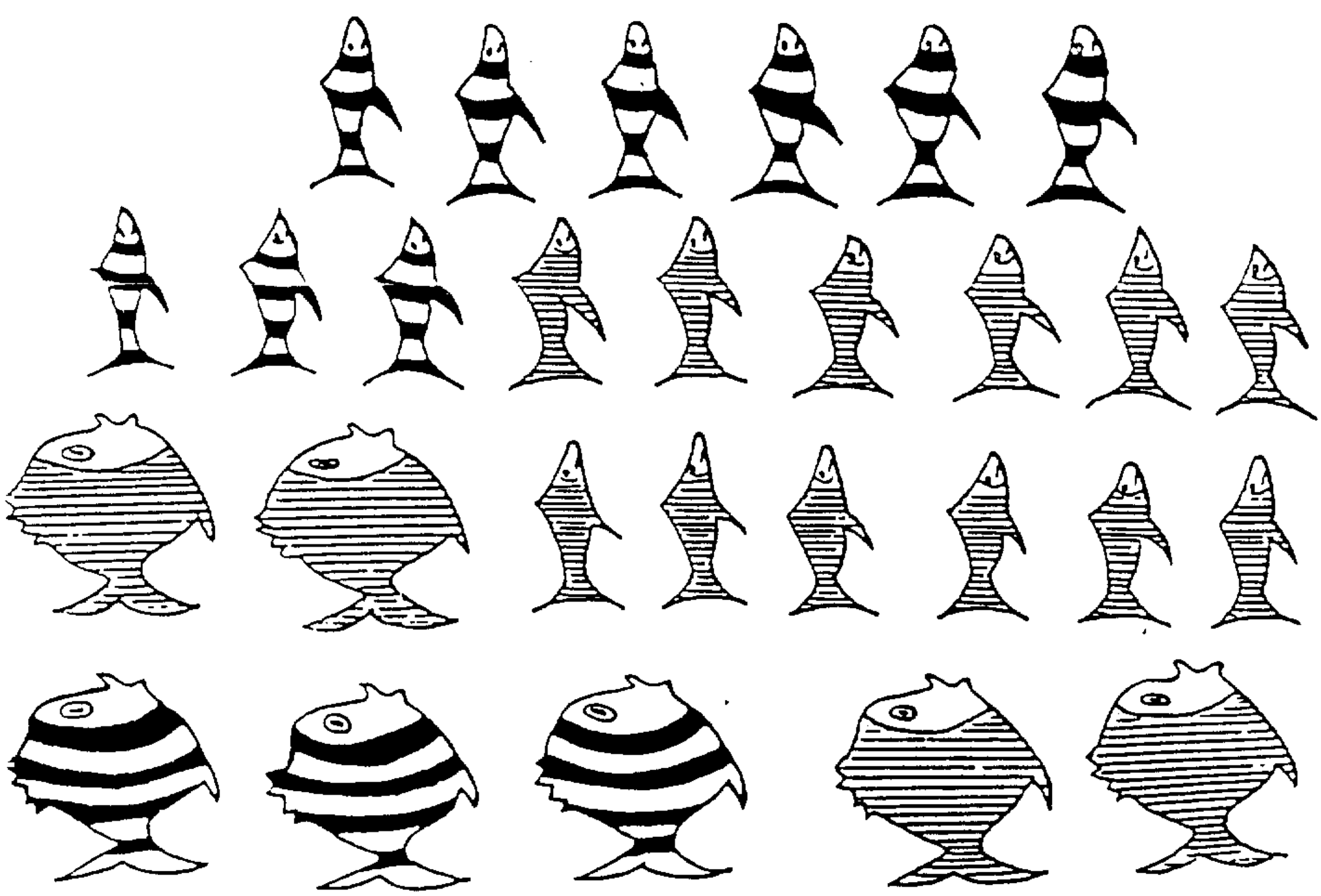
Are fat fish more likely to have broad stripes than thin fish?

a. Yes

b. No

Reason

1. Some fat fish have broad stripes and some have narrow stripes.
2. $^{3}/_{7}$ of the fat fish have broad stripes.
3. $^{12}/_{28}$ are broad striped and $^{16}/_{28}$ are narrow striped.
4. $^{3}/_{7}$ of the fat fish have broad stripes and $^{9}/_{21}$ of the thin fish have broad stripes.
5. Some fish with broad stripes are thin and some fat.



Item 9

THE STUDENT COUNCIL

Three students from grades 7, 6, and 5 were elected to the student council. A three member committee is to be formed with one student from each grade. All possible combinations must be considered before a decision can be made.

Two possible combinations are Tom, Jerry, and Dan (TJD); and Sally, Anne, and Melanie (SAM).

List all other possible combinations in the space provided on the answer sheet. More spaces are provided than you will need.

Student Council

Grade 7	Grade 6	Grade 5
Tom (T)	Jerry (J)	Dan (D)
Sally (S)	Anne (A)	Melanie (M)
Bill (B)	Chris (C)	Gwen (G)

Item 10

THE SHOPPING CENTRE

In a new shopping centre, 4 stores are to be opened on the ground level.

A Barber shop (B), a Discount Store (D), a Grocery Store (G), and a Coffee Shop (C) want to move in there. Each of the stores can choose any of the four store locations. One way that the stores could occupy the four locations is B D G C.

List all other possible ways that the stores can occupy the 4 locations on the space provided on the answer sheet. More spaces are provided than you will need.

Appendix A.2: Motivation Questionnaire (*Initial Construction*)

Strongly Agree 1 2 3 4 5 Strongly Disagree

A = Self Efficacy, B = Intrinsic Motivation, C = Anxiety, D = Cognitive Strategy,
E = Self Regulation

		SA SD		
1.	When I study for a test, I try to put together information from class and the work book.	1 2 3 4 5	D	
2.	I ask myself questions to make sure I know the material I have been studying.	1 2 3 4 5	E	
3.	Compared to other students in this class, I don't expect to do very well.	1 2 3 4 5	A	-
4.	I prefer class work that is challenging so that I can learn new things.	1 2 3 4 5	B	
5.	I'm not nervous in tests, and have no trouble remembering facts that I have learned.	1 2 3 4 5	C	
6.	It is important for me to learn what is being taught in this subject.	1 2 3 4 5	B	
7.	I'm not sure that I can understand the concepts taught in this subject.	1 2 3 4 5	A	-
8.	When the work to be completed is too hard, I either give up or only study the easy parts.	1 2 3 4 5	E	-
9.	When I do homework, I try to remember what has been covered in class so that I can answer questions correctly.	1 2 3 4 5	D	
10.	It's hard for me to decide what the main ideas of the material I read is.	1 2 3 4 5	D	-
11.	I expect to do very well in this class.	1 2 3 4 5	A	
12.	I complete available practice exercises, even when I don't have to.	1 2 3 4 5	E	
13.	When I study I put the important ideas into my own words.	1 2 3 4 5	D	
14.	I don't like what I am learning in this class.	1 2 3 4 5	B	-
15.	I always try to understand the material, even if it doesn't make sense.	1 2 3 4 5	D	
16.	I don't think I'll be able to use what I learn in this class in other classes.	1 2 3 4 5	B	-
17.	Compared with others in this class, I think that I'm a good student.	1 2 3 4 5	A	
18.	Even when study materials are dull and uninteresting, I keep working until I finish.	1 2 3 4 5	E	
19.	When I study for a test, I try to remember as many facts as I can.	1 2 3 4 5	D	
20.	I have an uneasy, upset feeling when I take a test.	1 2 3 4 5	C	-
21.	I am sure I can do an excellent job on the problems and tasks assigned for this class.	1 2 3 4 5	A	
22.	When studying I rarely copy my notes to help me remember material.	1 2 3 4 5	D	-
23.	Before I begin studying I think about the things I will need to do to learn.	1 2 3 4 5	E	
24.	I often choose easy assignments and don't worry too much about what I will learn.	1 2 3 4 5	B	-
25.	I think I will receive a good grade in this class.	1 2 3 4 5	A	
26.	Even when I do poorly on a test, I try to learn from my mistakes.	1 2 3 4 5	B	

Motivation Questionnaire (*Initial Construction*) - *Continued*

27.	I don't worry a great deal about tests.	1 2 3 4 5	C	-
28.	When I study for a test I practise saying the important facts over and over to myself.	1 2 3 4 5	D	
29.	I often find that I have been reading class material but don't know what it is all about.	1 2 3 4 5	E	-
30.	I use what I have learnt from old assignments and the textbook to do new assignments.	1 2 3 4 5	D	
31.	I think that what I am learning in this class is useful for me to know.	1 2 3 4 5	B	
32.	My study skills are poor compared to others in this class.	1 2 3 4 5	A	-
33.	When I am studying a topic, I concentrate on the individual sections and don't worry about how it all fits together.	1 2 3 4 5	D	-
34.	I often find that when I am studying class work, that I think of other things and don't concentrate on class work	1 2 3 4 5	E	-
35.	When I read material for this class, I say the words over and over to help me remember.	1 2 3 4 5	D	
36.	Compared to other students in this class, I think I know a great deal about the subject.	1 2 3 4 5	A	
37.	I think that what we are learning in this class is boring.	1 2 3 4 5	B	-
38.	I outline the chapters or topics in my textbooks to help me study.	1 2 3 4 5	D	
39.	When I'm reading, I stop once in a while to go over what I have read.	1 2 3 4 5	E	
40.	When I take a test, I think about how poorly I am doing.	1 2 3 4 5	C	-
41.	When reading I try to connect the things I am reading about with things I already know.	1 2 3 4 5	D	
42.	I only work hard to get a good grade when I like a class.	1 2 3 4 5	E	-
43.	I don't think that I will be able to learn all of the material for this class.	1 2 3 4 5	A	-
44.	Understanding this subject is important to me.	1 2 3 4 5	B	

Appendix A.3: Motivation Questionnaire (*Refined*)

Strongly Agree ☐☐☐☐☐ Strongly Disagree

		SA SD
1.	Compared to other students in this class, I don't expect to do very well.	☐☐☐☐☐
2.	It is important for me to learn what is being taught in this subject.	☐☐☐☐☐
3.	I have an uneasy, upset feeling when I take a test.	☐☐☐☐☐
4.	When I do homework, I try to remember what has been covered in class so that I can answer questions correctly.	☐☐☐☐☐
5.	When the work to be completed is too hard, I either give up or only study the easy parts.	☐☐☐☐☐
6.	I'm not sure that I can understand the concepts taught in this subject.	☐☐☐☐☐
7.	I think that what I am learning in this class is useful for me to know.	☐☐☐☐☐
8.	When I take a test, I think about how poorly I am doing.	☐☐☐☐☐
9.	When I study for a test, I try to remember as many facts as I can.	☐☐☐☐☐
10.	Even when study materials are dull and un-interesting, I keep working until I finish.	☐☐☐☐☐
11.	I am sure I can do an excellent job on the problems and tasks assigned for this class.	☐☐☐☐☐
12.	Understanding this subject is important to me.	☐☐☐☐☐
13.	When reading I try to connect the things I am reading about with things I already know.	☐☐☐☐☐
14.	I only work hard to get a good grade when I like a class.	☐☐☐☐☐

Appendix A.4: Quantity Questionnaire *(Initial Construction)*

1. How many hours in total are allocated by the college for this module? .... hrs

2. On average, how many hours per week are allocated for this module? .... hrs

3. On average, how many hours do you spend per week working on the core material of this module? .... hrs

4. On average, how many hours do spend per week completing set or assigned homework on this module? .... hrs

5. On average, how many hours do you spend per week on homework that is not set or assigned? (for example study, revision or wider reading) .... hrs

Please tick the response that most accurately describes you or your situation.

		SA				SD
6.	I have a set timetable which I follow.	☐	☐	☐	☐	☐
7.	When I begin to work on this module, I find it difficult to concentrate immediately, but gradually I get more focused as I work through the material.	☐	☐	☐	☐	☐
8.	When working on this module, I have very few interruptions.	☐	☐	☐	☐	☐
9.	The materials associated with this module are easy to follow, so I don't waste any time when using them.	☐	☐	☐	☐	☐
10.	I work very efficiently when I am studying.	☐	☐	☐	☐	☐
11.	When I begin to work on this module, I am able to concentrate on the material straight away.	☐	☐	☐	☐	☐
12.	I find myself wasting a lot of time when I am studying.	☐	☐	☐	☐	☐
13.	When working on this module, I am concentrating on the material almost all of the time.	☐	☐	☐	☐	☐

Quantity Questionnaire *(Initial Construction) - Continued*

		SA				SD
14.	When I am working on this module, a lot of time is wasted simply using the materials associated with the module.	❑	❑	❑	❑	❑
15.	When working on this module, I think that I would be fully focused on the work for at least 80% of the time	❑	❑	❑	❑	❑
16.	When studying or working on the module, I am often interrupted.	❑	❑	❑	❑	❑
17.	When working on this module, in reality, I only spend about 20% of the time fully focused on the material.	❑	❑	❑	❑	❑
18.	When working on this module, for a lot of the time I find myself thinking about other things rather than concentrating on the work in hand.	❑	❑	❑	❑	❑

End of Questionnaire - Thankyou for your participation

Appendix A.5: Quantity Questionnaire (*Refined*)

Please estimate, as accurately as you can, the number of hours requested.

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1. How many hours in total does the college allocate for this module? .... hrs

2. On average, how many hours per week does the college allocate for this module? .... hrs

3. Of the weekly hours allocated for this module (see question 2), on average, how many hours do you think you spend actually working on the material in this module? .... hrs

4. On average, how many hours do you spend per week outside of class time, completing set or assigned homework on this module? .... hrs

5. On average, how many hours do you spend per week on homework that is not set or assigned? (for example study, revision or wider reading) .... hrs

Please tick the response that most accurately describes you or your situation.

Strongly Agree ☐☐☐☐☐ Strongly Disagree

		SA SD
6.	When I begin to work on this module, I find it difficult to concentrate immediately, but gradually I get more focused as I work through the material.	☐☐☐☐☐
7.	When working on this module, I have very few interruptions.	☐☐☐☐☐
8.	The materials associated with this module are easy to follow, so I don't waste any time when using them.	☐☐☐☐☐
9.	When I begin to work on this module, I am able to concentrate on the material straight away.	☐☐☐☐☐

Quantity Questionnaire (*Refined*)

		SA SD
10.	I find myself wasting a lot of time when I am studying.	☐☐☐☐☐

11. When working on this module, I am concentrating on the material almost all of the time. ☐☐☐☐☐

12. When I am working on this module, a lot of time is wasted simply using the materials associated with the module. ☐☐☐☐☐

13. When working on this module, I think that I would be fully focused on the work for at least 80% of the time ☐☐☐☐☐

14. When studying or working on the module, I am often interrupted. ☐☐☐☐☐

15. When working on this module, in reality, I only spend about 20% of the time fully focused on the material. ☐☐☐☐☐

16. When working on this module, for a lot of the time I find myself thinking about other things rather than concentrating on the work in hand. ☐☐☐☐☐

End of Questionnaire - Thankyou for your participation

Appendix A.6: Questionnaire for the Factor of Quality (*Initial Construction*)

		SA SD		
1.	The materials and equipment required for this course are readily available.	1 2 3 4 5	2	+
2.	The previous lesson's work is often reviewed.	1 2 3 4 5	15	+
3.	I'm often not sure if I'm on the right track.	1 2 3 4 5	20	-
4.	My work is rarely checked by the teacher/facilitator.	1 2 3 4 5	47	-
5.	The teacher/facilitator often asks me my thoughts after working on a lesson.	1 2 3 4 5	14	+
6.	In this course, the assignments really make me think.	1 2 3 4 5	48	+
7.	The workbooks in this course are poorly laid out and hard to follow.	1 2 3 4 5	42	-
8.	The goals of this subject are clearly stated.	1 2 3 4 5	29	+
9.	I can understand the language in the workbooks most of the time.	1 2 3 4 5	16	+
10.	Throughout this subject I am presented with clear examples to help my understanding..	1 2 3 4 5	51	+
11.	I am regularly presented with summaries of the lessons covered	1 2 3 4 5	40	+
12.	I complete assessment exercises frequently in this subject.	1 2 3 4 5	41	+
13.	When I make a mistake I get immediate feedback.	1 2 3 4 5	30	+
14.	Throughout this course I am confronted with thought provoking questions.	1 2 3 4 5	12	+
15.	I complete most of the exercises successfully, but I have to apply some effort.	1 2 3 4 5	4	+
16.	I find that much of this course is not relevant.	1 2 3 4 5	9	-
17.	The lessons are presented in small manageable sections.	1 2 3 4 5	52	+
18.	I rarely get the opportunity to practise new skills or knowledge.	1 2 3 4 5	50	-
19.	I get regular feedback throughout the course, which helps me correct my mistakes.	1 2 3 4 5	20	+
20.	Homework is regularly set throughout this course.	1 2 3 4 5	27	+
21.	The instruction throughout this course fulfils my educational needs.	1 2 3 4 5	34	+
22.	In this course students receive chocolates, lollies or tokens for doing well.	1 2 3 4 5	8	+
23.	I think that the teachers/facilitators in this course are good at their jobs.	1 2 3 4 5	38	+

Questionnaire for the Factor of Quality (*Initial Construction*) - *Continued*

24.	Set homework is rarely marked in this course.	1 2 3 4 5	27	-
25.	Throughout this course I am given clear explanations of new material.	1 2 3 4 5	43	+
26.	In this course students are praised for high achievement.	1 2 3 4 5	8	+
27.	I have never received training in reading to help me learn more effectively.	1 2 3 4 5	46	-
28.	I gain pleasure throughout the course from realising that I am competent at what I have just learned.	1 2 3 4 5	8	+
29.	There are a variety of learning activities throughout this course.	1 2 3 4 5	5	+
30.	The administration of this course (including student marks, timetables and resources) is poorly managed.	1 2 3 4 5	10	-
31.	In this course the students and the teacher/facilitators have a mutual respect for each other.	1 2 3 4 5	17	+
32.	There are clear guidelines as to how students should behave and what is expected of them.	1 2 3 4 5	13	+
33.	This course encourages and guides students to help one another.	1 2 3 4 5	25	+
34.	I often don't have enough time to complete my work throughout this course.	1 2 3 4 5	4	-
35	This course is centred around student needs.	1 2 3 4 5	31	+

Appendix A.7: Questionnaire for the Factor of Quality (*Refined*)

Please tick the response that most accurately describes your situation in this course.

Strongly Agree ☐☐☐☐☐ Strongly Disagree

		SA SD
1.	The materials and equipment required for this course are readily available.	☐☐☐☐☐
2.	The previous lesson's work is often reviewed.	☐☐☐☐☐
3.	In this course the assignments really make me think.	☐☐☐☐☐
4.	The workbooks in this course are poorly laid out and hard to follow.	☐☐☐☐☐
5.	The goals of this subject are clearly stated.	☐☐☐☐☐
6.	I can understand the language in the workbooks most of the time.	☐☐☐☐☐
7.	Throughout this subject I am presented with clear examples to help my understanding.	☐☐☐☐☐
8.	I complete assessment exercises frequently in this subject.	☐☐☐☐☐
9.	I complete most of the exercises successfully, but I have to apply some effort.	☐☐☐☐☐
10.	I find that much of this course is not relevant.	☐☐☐☐☐
11.	I rarely get the opportunity to practise new skills or knowledge.	☐☐☐☐☐
12.	I get regular feedback throughout the course, which helps me correct my mistakes.	☐☐☐☐☐
13.	Homework is regularly set throughout this course.	☐☐☐☐☐
14.	The instruction throughout this course fulfils my educational needs.	☐☐☐☐☐

Questionnaire for the Factor of Quality (*Refined*) - *Continued*

		SA				SD
15.	I think that the teachers/facilitators in this course are good at their jobs.	❑	❑	❑	❑	❑
16.	Set homework is rarely marked in this course.	❑	❑	❑	❑	❑
17.	In this course students are praised for high achievement.	❑	❑	❑	❑	❑
18.	I have not received training in reading to help me learn more effectively.	❑	❑	❑	❑	❑
19.	I gain pleasure throughout the course from realising that I am competent at what I have just learned.	❑	❑	❑	❑	❑
20.	There are a variety of learning activities throughout this course.	❑	❑	❑	❑	❑
21.	The administration of this course (including student marks, timetables and resources) is poorly managed.	❑	❑	❑	❑	❑
22.	In this course the students and the teacher/facilitators have a mutual respect for each other.	❑	❑	❑	❑	❑
23.	This course encourages and guides students to help one another.	❑	❑	❑	❑	❑
24.	I often don't have enough time to complete my work throughout this course.	❑	❑	❑	❑	❑
25.	This course is centred around student needs.	❑	❑	❑	❑	❑

End of Questionnaire - Thankyou for your Participation.

Appendix A.8: Home Environment Questionnaire *(Initial Construction)*

FATHER/STEPFATHER/GUARDIAN'S

1.	What has been your father's main occupation when I was in high school, my father for the last 5 years?	....					SES
2.	What is the level of your father's formal education?	yr 10	yr 11/12	Diploma	Degree	Multiple Degrees	SES
3.	At what level do you think your father's hoped ***you*** would finish your education?	yr 10	yr 11/12	Diploma	Degree	Multiple Degrees	BSA
4.	What is the occupation you think your father's would most like you to be in?	....					BSA
5.	How often has your father's sat down and helped you with your learning?	never	rarely	off and on	often	all the time	SPP
		Strongly Disagree			Strongly Agree		
6.	when I was in high school, my father tried to create an environment where I could study effectively at home.	1	2	3	4	5	BSM
7.	when I was in high school, my father encouraged me to be an independent learner.	1	2	3	4	5	SPP
8.	When I was in high school, my father always encouraged me to study hard and do well at school.	1	2	3	4	5	SPP
9.	When I was in high school, my father took a real interest in my studies.	1	2	3	4	5	SPP
10	When I was in high school, my father had high ambitions for my education.	1	2	3	4	5	BSA
11.	When I was in high school, my father had high ambitions for my working career.	1	2	3	4	5	BSA
12.	When I was in high school, my father had a good knowledge of how I was going in my studies.	1	2	3	4	5	SPP

Home Environment Questionnaire *(Initial Construction) - Continued*

13.	When I was in high school, my father praised or rewarded me when I did well in my studies.	1	2	3	4	5	SPP
14.	My father almost always knows where I am and what I am doing.	1	2	3	4	5	SPP
15.	My father keeps a close track of how I am doing in my studies.	1	2	3	4	5	SPP
16.	My father often asks about what I am learning at college.	1	2	3	4	5	SPP
17.	How much has your father influenced your plans after finishing high school.	not at all	a little	some	a lot	a great deal	SPP
	MOTHER/STEPMOTHER/GUARDIAN'S						
18.	What has been your When I was at high school, my mothers main occupation for the last 5 years?	....					SES
19.	What is the level of your mother's formal education?	yr 10	yr 11/12	Diploma	Degree	Multiple Degrees	SES
20.	At what level do you think your mother hoped you would finish your education.	yr 10	yr 11/12	Diploma	Degree	Multiple Degrees	BSA
21.	What is the occupation you think your mother would most like you to have?	....					BSA
22.	How often has your mother sat down and helped you with your learning.	never	rarely	off and on	often	all the time	SPP
		Strongly Disagree			Strongly Agree		
23.	My When I was at high school, my mother tried to create an environment where I could study effectively at home.	1	2	3	4	5	BSM
24.	When I was at high school, my mother encouraged me to be an independent learner.	1	2	3	4	5	SPP
25.	When I was at high school, my mother always encouraged me to study hard and do well at school.	1	2	3	4	5	SPP

Home Environment Questionnaire *(Initial Construction) - Continued*

26.	When I was at high school, my mother took a real interest in my studies.	1	2	3	4	5	SPP
27.	When I was at high school, my mother had high ambitions for my education.	1	2	3	4	5	BSA
28.	When I was at high school, my mother had high ambitions for my working career.	1	2	3	4	5	BSA
29.	When I was at high school, my mother had a good knowledge of how I was going in my studies.	1	2	3	4	5	SPP
30.	When I was at high school, my mother praised or rewarded me when I did well in my studies.	1	2	3	4	5	SPP
31.	My mother almost always knows where I am and what I am doing.	1	2	3	4	5	SPP
32.	My mother keeps a close track of how I am doing in my studies.	1	2	3	4	5	SPP
33.	My mother often asks about what I am learning at college.	1	2	3	4	5	SPP
34.	How much has your mother influenced your plans after finishing high school.	not at all	a little	some	a lot	a great deal	SPP

GENERAL

35.	Which one of the following most closely resembles your home?	Please circle only one of the responses					
	Mother and Father and Children				A		FS
	Mother and Children				B		FS
	Father and Children				C		FS
	Mother and Stepfather, or Stepmother and Father and Children				D		FS
	Living alone or sharing with friends				E		FS
36	How many children are there in your family?	5	4	3	2	1	FS
37	What was the order of your birth?, e.g. 1st, 2nd, 3rd etc.	....					FS

Home Environment Questionnaire *(Initial Construction) - Continued*

38	How many years are there between you and your nearest sibling?	1	2	4	6	8+		FS
39	At what level have you wanted to finish your education?	yr 10	yr 12	TAFE	University		didn't care	SA
40	Name an occupation that you would really ***like*** to be doing in the future.	....						SA
41	Name an occupation that ***realistically*** you will be doing in the future.	....						SA
		Strongly Disagree				Strongly Agree		
42	My parents have encouraged me to enjoy myself at school.	1	2	3	4	5		GB
43	In my education my parents have let me choose what courses I complete.	1	2	3	4	5		GB
44	I have been encouraged to complete year 12 because these days most jobs require it.	1	2	3	4	5		GB
45	My parents have always encouraged me to get high marks at school.	1	2	3	4	5		GA
46	My parents frequently make suggestions about what courses or jobs would be good for me.	1	2	3	4	5		GA
47	My parents have stressed that good school performance was important for occupational success.	1	2	3	4	5		GA
48	Is there a set of encyclopedias in your home?	Yes			No			BSM
49	Is the daily newspaper delivered to your home?	Yes			No			BSM
50	Is there a computer in your home?	Yes			No			BSM

Home Environment Questionnaire *(Initial Construction) - Continued*

51	Is there a lot of educational books, other than encyclopedias, in your home?	Yes		No			BSM
52	Is there a dedicated place in your home where you can study?	Yes		No			BSM
53	Do you think that your parents would be able to afford to send you to university?	easily	probably	maybe	probably not	not at all	SES
54	In which country was your father born?						E
55	How many years spent in Australia?						
56	In which country was your mother born?						E
57	How many years spent in Australia?						
58	In which country were you born?	Years in Australia			....		E
59	How many years spent in Australia?						
60	What is the main language spoken at home.	....					E
61	What is the combined income of your family?	20,000 to 39,999	40,000 to 59,999	60,000 to 79,999	80,000 to 99,999	100,000 to +	SES

Appendix A.9: Home Environment Questionnaire (*Refined*)

Please consider the questions with respect to parents, step-parents or guardians according to which situation is most applicable to you.

Please either fill in the requested answer, or tick the most correct option given. **PLEASE NOTE:** Only tick **one** box for each answer.

FATHER, STEP-FATHER, MALE GUARDIAN

In the following questions, the word father relates to father, step-father or male guardian. If there is no father, step-father or male guardian regularly residing in your home, please tick the box marked NA and move onto the next section of the questionnaire. **NA** ☐

1. What has been your father's main occupation for the last 5 years? ....

2. What is the highest level of your father's formal education?

Year 10	Year 11/12	Diploma	Degree	Multiple Degrees
☐	☐	☐	☐	☐

3. At what level do you think your father hoped ***you*** would finish your education?

Year 10	Year 11/12	Diploma	Degree	Multiple Degrees
☐	☐	☐	☐	☐

4. How often has your father sat down and helped you with your learning?

never	rarely	occasionally	often	all the time
☐	☐	☐	☐	☐

PLEASE TICK THE RESPONSE THAT MOST CLOSELY REFLECTS YOUR AGREEMENT OR DISAGREEMENT WITH THE FOLLOWING STATEMENTS.

Strongly Agree ☐☐☐☐☐ Strongly Disagree

		SA SD
5.	When I was in high school, my father tried to create an environment where I could study effectively at home.	☐☐☐☐☐
6.	When I was in high school, my father rarely encouraged me to be an independent learner.	☐☐☐☐☐

Home Environment Questionnaire (*Refined*) -*Continued*

7. When I was in high school, my father often encouraged me to study hard and do well at school. ❑❑❑❑❑

8. When I was in high school, my father didn't take much interest in my studies. ❑❑❑❑❑

9. When I was in high school, my father had high ambitions for my education. ❑❑❑❑❑

10. When I was in high school, my father had high ambitions for my working career. ❑❑❑❑❑

11. When I was in high school, my father had a good knowledge of how I was going in my studies. ❑❑❑❑❑

12. When I was in high school, my father rarely praised or rewarded me when I did well in my studies. ❑❑❑❑❑

13. My father almost always knows where I am and what I am doing. ❑❑❑❑❑

14. My father keeps a close track of how I am doing in my studies. ❑❑❑❑❑

15. My father often asks about what I am learning at college. ❑❑❑❑❑

MOTHER, STEP-MOTHER, FEMALE GUARDIAN

In the following questions, the word mother relates to mother, step-mother or female guardian. If there is no mother, step-mother or female guardian regularly residing in your home, please tick the box marked NA and move onto the next section of the questionnaire. **NA** ❑

16. What has been your mothers main occupation for the last 5 years? ....

17. What is the level of your mother's formal education?

Year 10	Year 11/12	Diploma	Degree	Multiple Degrees
❑	❑	❑	❑	❑

18. At what level do you think your mother hoped you would finish your education?

Year 10	Year 11/12	Diploma	Degree	Multiple Degrees
❑	❑	❑	❑	❑

Home Environment Questionnaire (*Refined*) -*Continued*

19. How often has your mother sat down and helped you with your learning?

never	rarely	occasionally	often	all the time
❐	❐	❐	❐	❐

PLEASE TICK THE RESPONSE THAT MOST CLOSELY REFLECTS YOUR AGREEMENT OR DISAGREEMENT WITH THE FOLLOWING STATEMENTS.

		SA SD
20.	When I was in high school, my mother tried to create an environment where I could study effectively at home.	❐❐❐❐❐
21.	When I was in high school, my mother rarely encouraged me to be an independent learner.	❐❐❐❐❐
22.	When I was in high school, my mother often encouraged me to study hard and do well at school.	❐❐❐❐❐
23.	When I was in high school, my mother didn't take much interest in my studies.	❐❐❐❐❐
24.	When I was in high school, my mother had high ambitions for my education.	❐❐❐❐❐
25.	When I was in high school, my mother had high ambitions for my working career.	❐❐❐❐❐
26.	When I was in high school, my mother had a good knowledge of how I was going in my studies.	❐❐❐❐❐
27.	When I was in high school, my mother rarely praised or rewarded me when I did well in my studies.	❐❐❐❐❐
28.	My mother almost always knows where I am and what I am doing.	❐❐❐❐❐
29.	My mother keeps a close track of how I am doing in my studies.	❐❐❐❐❐
30.	My mother often asks about what I am learning at college.	❐❐❐❐❐

Home Environment Questionnaire (*Refined*) -*Continued*

GENERAL

31. Which one of the following most closely resembles your home?

Mother, Father and Child/Children	❒
Mother and Child/Children	❒
Father and Child/Children	❒
Mother and Step-father and Child/Children	❒
Step-mother and Father and Child/Children	❒
Living alone or sharing with friends	❒

PLEASE TICK THE RESPONSE THAT MOST CLOSELY REFLECTS YOUR AGREEMENT OR DISAGREEMENT WITH THE FOLLOWING STATEMENTS.

		SA SD
32.	My parents have encouraged me to enjoy myself at school.	❒❒❒❒❒
33	In my education my parents have let me choose what courses I complete.	❒❒❒❒❒
34.	I have been encouraged to complete year 12 because these days most jobs require it.	❒❒❒❒❒
35.	My parents have always encouraged me to get high marks at school.	❒❒❒❒❒
36.	My parents have stressed that good school performance was important for occupational success.	❒❒❒❒❒

37.	Is there a set of encyclopedias in your home?	Yes	❒	No	❒
38.	Is the daily newspaper delivered to your home?	Yes	❒	No	❒
39.	Is there a computer in your home?	Yes	❒	No	❒
40.	Is there a lot of educational books, other than encyclopedias, in your home?	Yes	❒	No	❒
41.	Is there a dedicated place in your home where you can study?	Yes	❒	No	❒

42. Do you think that your parents would be able to afford to send you to university?

easily	probably	maybe	probably not	not at all
❒	❒	❒	❒	❒

43. In which country was your father born? ....

Home Environment Questionnaire (*Refined*) -*Continued*

44. How many years spent in Australia? ....

45. In which country was your mother born? ....

46. How many years spent in Australia? ....

47. In which country were you born? ....

48. How many years spent in Australia? ....

49. What is the main language spoken at your home? ....

50. What is the combined income of your parents?

$20,000-39,999	$40,000-59,999	$60,000-79,999	$80,000-99,999	$100,000 or more
❒	❒	❒	❒	❒

End of Questionnaire - Thankyou for your participation.

Appendix A.10: Classroom Environment Questionnaire (*Initial Construction*)

Strongly Disagree 1 2 3 4 5 Strongly Agree

		SA SD	
1.	In this class I often feel "dumb".	1 2 3 4 5	CO
2.	Students fool around a lot in this class.	1 2 3 4 5	O
3.	Students put a lot of energy in what they do here.	1 2 3 4 5	I
4.	The books and equipment students need are easily available to them.	1 2 3 4 5	M
5.	The class is made up of individuals who do not know each other well.	1 2 3 4 5	C
6.	The class is rather informal and few rules are imposed.	1 2 3 4 5	F
7.	The work covered in this class focuses on my individual needs.	1 2 3 4 5	SC
8.	The course is very limited in the use of a range of media.	1 2 3 4 5	PL
9.	In this course I get good advice on setting learning goals and learning timetables.	1 2 3 4 5	SS
10.	I choose when to complete the required assessments of this course.	1 2 3 4 5	Con
11.	Students here don't care about the grades that other students are getting.	1 2 3 4 5	COM
12.	The students enjoy their class work.	1 2 3 4 5	S
13.	New ideas are always being tried out in this class.	1 2 3 4 5	IN
14.	certain students have no respect for other students.	1 2 3 4 5	FR
15.	Almost all class time is spent on the lesson of the day.	1 2 3 4 5	T
16.	I usually feel quite comfortable in this class.	1 2 3 4 5	CO
17.	Assignments are usually clear so everyone knows what to do.	1 2 3 4 5	O
18.	Students day dream a lot in this class.	1 2 3 4 5	I

Classroom Environment (*Initial Construction*) - *Continued*

19.	The room is bright and comfortable.	1 2 3 4 5	M
20.	Students in this class get to know each other really well.	1 2 3 4 5	C
21.	There is a clear set of rules for students to follow.	1 2 3 4 5	F
22.	I can learn the material in this class in the way which is most effective for me.	1 2 3 4 5	SC
23.	The study packages in this course allow me to study where and when I like.	1 2 3 4 5	PL
24.	Facilitators or Teachers are not always available to help me with my learning problems.	1 2 3 4 5	SS
25.	It is my responsibility to ensure that I cover all of the work required by this course.	1 2 3 4 5	Con
26.	Most students cooperate rather than compete with each other.	1 2 3 4 5	COM
27.	Personal dissatisfaction with the class is too small to be a problem.	1 2 3 4 5	S
28.	What students do in class is quite different on different days.	1 2 3 4 5	IN
29.	There are tensions among certain groups of students which tend to interfere with class activities.	1 2 3 4 5	FR
30.	Students don't do much work in this class.	1 2 3 4 5	T
31.	I feel confident when I am in this class.	1 2 3 4 5	CO
32.	Activities in this class are clearly and carefully planned.	1 2 3 4 5	O
33.	A lot of students seem to be only half awake during this class.	1 2 3 4 5	I
34.	The classroom is too crowded.	1 2 3 4 5	M
35.	Students enjoy helping each other with their work.	1 2 3 4 5	C
36.	In the first few weeks the teacher/facilitator explained the rules about what students could and could not do in this class.	1 2 3 4 5	F
37.	I can learn the material in this class at a time that is most convenient to me.	1 2 3 4 5	SC

Classroom Environment (*Initial Construction*) - *Continued*

38.	The packages used in this class mean that I learn at the same rate as the other members of the class.	1 2 3 4 5	PL
39.	In this course I get all the support I need to help me understand the subject content.	1 2 3 4 5	SS
40.	Rules regarding the learning process are imposed on the students by the facilitators or teachers.	1 2 3 4 5	Con
41.	There is much competition in this class.	1 2 3 4 5	COM
42.	After class, the students have a sense of dissatisfaction.	1 2 3 4 5	S
43.	Students are encouraged to do unusual projects.	1 2 3 4 5	IN
44.	Most students cooperate equally with other class members.	1 2 3 4 5	FR
45.	This class is more a social time than a place to learn something.	1 2 3 4 5	T

Appendix A.11: Sub Scales of Classroom Environment Questionnaire

Comfort
Co - In this class I often feel "dumb".
Co + I usually feel quite comfortable in this class.
Co + I feel confident when I am in this class.

Order Organisation
O - Students fool around a lot in this class.
O + Assignments are usually clear so everyone knows what to do.
O + Activities in this class are clearly and carefully planned.

Involvement
I + Students put a lot of energy in what they do here.
I - Students day dream a lot in this class.
I - A lot of students seem to be only half awake during this class.

Material Environment
M + The books and equipment students need are easily available to them.
M + The room is bright and comfortable.
M - The classroom is too crowded.

Cohesiveness
C. - The class is made up of individuals who do not know each other well.
C + Students in this class get to know each other really well.
C + Students enjoy helping each other with their work.

Formality
F - The class is rather informal and few rules are imposed.
F + There is a clear set of rules for students to follow.
F + In the first few weeks the teacher/facilitator explained the rules about what students could and could not do in this class.

Student Centredness
SC + The work covered in this class focuses on my individual needs
SC + I can learn the material in this class in the way which is most effective for me.
SC + I can learn the material in this class at a time that is most convenient to me.

Packaged Learning
PL - The course is very limited in the use of a range of media, for example TV, video, computer, interactive computer.
PL + The study packages in this course allow me to study where and when I like.
PL - The packages used in this class mean that I learn at the same rate as the other members of the class.

Sub Scales of Classroom Environment Questionnaire - *Continued*

Support Systems
SS + In this course I get good advice on setting learning goals and learning timetables.
SS - Facilitators or Teachers are not always available to help me with my learning problems.
SS + In this course I get all the support I need to help me understand the subject content.

Student Control
Con + I choose when to complete the required assessments of this course.
Con + It is my responsibility to ensure that I cover all of the work required by this course.
Con - Rules regarding the learning process are imposed on the students by the facilitators or teachers.

Competitiveness
Com - Students here don't care about the grades that other students are getting.
Com - Most students cooperate rather than compete with each other.
Com + There is much competition in this class.

Satisfaction
S + The students enjoy their class work.
S + Personal dissatisfaction with the class is too small to be a problem.
S - After class, the students have a sense of dissatisfaction.

Innovation
IN New ideas are always being tried out in this class.
IN + What students do in class is quite different on different days.
IN + Students are encouraged to do unusual projects.

Friction
Fr + Certain students have no respect for other students.
Fr + There are tensions among certain groups of students which tend to interfere with class activities.
Fr - Most students cooperate equally with other class members.

Task Orientation
T + Almost all class time is spent on the lesson of the day.
T - Students don't do much work in this class.
T - This class is more a social time than a place to learn something.

Appendix A.12: Classroom Environment Questionnaire (*Refined*)

Please tick the response that most accurately describes your understanding or perception of the situation in this course.

Strongly Agree ☐☐☐☐☐ Strongly Disagree

		SA SD
1.	Students fool around a lot in this class.	☐☐☐☐☐
2.	The class is made up of individuals who do not know each other well.	☐☐☐☐☐
3.	The class is rather informal and few rules are imposed.	☐☐☐☐☐
4.	In this course I get good advice on setting learning goals and learning timetables.	☐☐☐☐☐
5.	I choose when to complete the required assessments of this course.	☐☐☐☐☐
6.	The students enjoy their work in this class	☐☐☐☐☐
7.	New ideas are always being tried out in this class.	☐☐☐☐☐
8.	Certain students have no respect for other students.	☐☐☐☐☐
9.	Almost all class time is spent on the lesson of the day.	☐☐☐☐☐
10.	I usually feel quite comfortable in this class.	☐☐☐☐☐
11.	Students day dream a lot in this class.	☐☐☐☐☐
12.	The class room is bright and comfortable.	☐☐☐☐☐
13.	Students in this class get to know each other really well.	☐☐☐☐☐
14.	There is a clear set of rules for students to follow.	☐☐☐☐☐
15.	I can learn the material in this class in a way which is most effective for me.	☐☐☐☐☐
16.	The study packages in this course allow me to study where and when I like.	☐☐☐☐☐

Classroom Environment Questionnaire *(Refined) - Continued*

		SA SD
17.	It is my responsibility to ensure that I cover all of the work required by this course.	□□□□□
18.	Most students cooperate rather than compete with each other.	□□□□□
19.	I feel confident when I am in this class.	□□□□□
20.	Activities in this class are clearly and carefully planned.	□□□□□
21.	A lot of students seem to be only half awake during this class.	□□□□□
22.	The classroom is too crowded.	□□□□□
23.	I can learn the material in this class at a time that is most convenient to me.	□□□□□
24.	The packages used in this class are structured so that I learn at the same rate as the other members of the class.	□□□□□
25.	In this course I get all the support I need to help me understand the subject content.	□□□□□
26.	There is much competition in this class.	□□□□□
27.	After class, the students have a sense of dissatisfaction.	□□□□□
28.	Students are encouraged to do unusual projects in this class.	□□□□□
29.	Most students cooperate equally with other class members.	□□□□□
30.	This class is more a social setting than a place to learn something.	□□□□□

End of Questionnaire - Thankyou for your Participation.

Appendix A.13: Student Peer Questionnaire (*Initial Construction)*

Please tick the response that most accurately describes you.

Strongly Agree ❑❑❑❑❑ Strongly Disagree

Peer Interaction Disposition

		SA SD
1.	I sometimes study or do homework with my friends.	❑❑❑❑❑
2	I often work with a group of friends in the classroom.	❑❑❑❑❑
3.	I learn best when I work by myself.	❑❑❑❑❑
4.	I often study for tests with a group from the class.	❑❑❑❑❑
5.	I like to work with a group of students in this course.	❑❑❑❑❑

Retrospective High School Accounts

Self

6. When in high school, what was the occupation that you most wanted to achieve?

....

7. When in high school, what was the highest level of education you wanted to achieve?

Year 10	Year 12	TAFE Certificate	TAFE Diploma	University Degree
❑	❑	❑	❑	❑

Best Friend

8. When in high school, what was the occupation that your best friend most wanted to achieve?

....

9. When in high school, what was the highest level of education your best friend wanted to achieve?

Year 10	Year 12	TAFE Certificate	TAFE Diploma	University Degree
❑	❑	❑	❑	❑

Student Peer Questionnaire (*Initial Construction*) - *Continued*

High School Peer Group (Plans)

10. When you were in high school, how many of your peers planned to leave school and find a job?

none ☐ about a qtr ☐ about half ☐ about 3qtrs ☐ all of them ☐

11. When you were in high school, how many of your peers planned to go to TAFE, business college or similar?

none ☐ about a qtr ☐ about half ☐ about 3qtrs ☐ all of them ☐

12. When you were in high school, how many of your peers planned to go to university?

none ☐ about a qtr ☐ about half ☐ about 3qtrs ☐ all of them ☐

High School Peer Group (Encouragement)

13. When you were in high school, how many of your peers encouraged you to leave school and get try to find a job?

none ☐ about a qtr ☐ about half ☐ about 3qtrs ☐ all of them ☐

14. When you were in high school, how many of your peers encouraged you to enrol in a TAFE course?

none ☐ about a qtr ☐ about half ☐ about 3qtrs ☐ all of them ☐

15. When you were in high school, how many of your peers encouraged you to go to university?

none ☐ about a qtr ☐ about half ☐ about 3qtrs ☐ all of them ☐

High School Peer Group (Destinations)

16. How many of your high school peers left school and tried to find a job, rather than go on to study?

none ☐ about a qtr ☐ about half ☐ about 3qtrs ☐ all of them ☐

17. How many of your high school peers left school and went to TAFE, business college or similar?

none ☐ about a qtr ☐ about half ☐ about 3qtrs ☐ all of them ☐

Student Peer Questionnaire (*Initial Construction*) - *Continued*

18. How many of your high school peers left school and went to university?

none	about a qtr	about half	about 3qtrs	all of them
❐	❐	❐	❐	❐

Extra Curricular Activities

When you were in high school, how much did you participate in the following activities?

19. School based sports which were ***not*** part of the general school day.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

20. Publications or creative writing.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

21. Dramatics or music.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

22. Debate or political groups.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

23. Student government.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

24. Social services or church groups.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

Student Peer Questionnaire (*Initial Construction*) - *Continued*

25. Science clubs or projects.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

26. Other academic groups.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

27. Please tick the most appropriate box to answer the following statements (tick only ***one*** box).

Generally my peers have...

Strongly discouraged me from going to TAFE	❐
Discouraged me from going to TAFE	❐
Have not influenced me one way or the other from going to TAFE	❐
Encouraged me to go to TAFE	❐
Strongly encouraged me to go TAFE	❐

Peer Conformity

PLEASE PLACE AN **X** IN THE MOST APPROPRIATE POSITION FOR YOU IN YOUR SITUATION.

___ ___ ___ ___ ___ ___ ___

28. You have got a major exam coming up, you are behind and really need to do a lot of study. Your friends are all going out to see one of your favourite bands (its their last night in town) and really want you to join them, do you ....

Stay home and study ___ ___ ___ ___ ___ ___ ___ Go out with friends.

29. You're at a party having a great time when one of your friends offers you a cigarette. You really don't like smoking, but your friends urge you to have a cigarette, do you.....

Smoke the cigarette ___ ___ ___ ___ ___ ___ ___ Not smoke the cigarette.

Student Peer Questionnaire (*Initial Construction*) - *Continued*

30. You've finished all of your tests for the term and feel great. All your friends say they are going to a "RAVE" party to celebrate. Nobody's been to one before, but you've heard that they can get out of hand and be really dangerous and don't want to go. Your friends say that everything will be fine and urge you to join them, do you .....

Go to party ___ ___ ___ ___ ___ ___ ___ Not go to the party

31. Your friends are planning to go ten pin bowling, but you had planned to go to see a movie. You really want to see the movie, but your friends really want you to go bowling. You cant get to do both, do you .....

Go to the movie ___ ___ ___ ___ ___ ___ ___ Go bowling

32. You're at a party and have had a little to drink. You feel you should stay the night and not drive home, but your friends tell you that you've hardly had anything to drink and you'll be fine. Do you .....

Stay overnight ___ ___ ___ ___ ___ ___ ___ Drive home

End of Questionnaire - Thankyou for your participation

Appendix A.14: Student Peer Questionnaire (*Refined*)

Please tick the response that most accurately describes you.

Strongly Agree ❑❑❑❑❑ Strongly Disagree

		SA SD
1.	I sometimes study or do homework with my friends.	❑❑❑❑❑
2	I often work with a group of friends in the classroom.	❑❑❑❑❑
3.	I often study for tests with a group from the class.	❑❑❑❑❑
4.	I like to work with a group of students in this course.	❑❑❑❑❑

5. When in high school, what was the occupation that you most wanted to achieve?

   ....

6. When in high school, what was the highest level of education you wanted to achieve?

Year 10	Year 12	TAFE Certificate	TAFE Diploma	University Degree
❑	❑	❑	❑	❑

7. When in high school, what was the occupation that your best friend most wanted to achieve?

   ....

8. When in high school, what was the highest level of education your best friend wanted to achieve?

Year 10	Year 12	TAFE Certificate	TAFE Diploma	University Degree
❑	❑	❑	❑	❑

9. When you were in high school, how many of your peers planned to leave school and find a job?

none	about a qtr	about half	about 3qtrs	all of them
❑	❑	❑	❑	❑

10. When you were in high school, how many of your peers planned to go to university?

none	about a qtr	about half	about 3qtrs	all of them
❑	❑	❑	❑	❑

Student Peer Questionnaire (*Refined*) - *Continued*

11. When you were in high school, how many of your peers encouraged you to leave school and try to find a job?

none	about a qtr	about half	about 3qtrs	all of them
❒	❒	❒	❒	❒

12. When you were in high school, how many of your peers encouraged you to go to university?

none	about a qtr	about half	about 3qtrs	all of them
❒	❒	❒	❒	❒

13. How many of your high school peers left school and tried to find a job, rather than go on to study?

none	about a qtr	about half	about 3qtrs	all of them
❒	❒	❒	❒	❒

14. How many of your high school peers left school and went to university?

none	about a qtr	about half	about 3qtrs	all of them
❒	❒	❒	❒	❒

When you were in high school, how much did you participate in the following activities?

15. Dramatics or music.

very often	often	spontaneously	rarely	never
❒	❒	❒	❒	❒

16. Debate or political groups.

very often	often	spontaneously	rarely	never
❒	❒	❒	❒	❒

17. Student government.

very often	often	spontaneously	rarely	never
❒	❒	❒	❒	❒

Student Peer Questionnaire (*Refined) - Continued*

18. Social services or church groups.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

19. Science clubs or projects.

very often	often	spontaneously	rarely	never
❐	❐	❐	❐	❐

PLEASE PLACE AN **X** IN THE MOST APPROPRIATE POSITION FOR YOU IN YOUR SITUATION.

___ ___ ___ ___ ___

20. You're at a party having a great time when one of your friends offers you a cigarette. You really don't like smoking, but your friends urge you to have a cigarette, do you.....

Smoke the cigarette ___ ___ ___ ___ ___ Not smoke the cigarette.

21. You've finished all of your tests for the term and feel great. All your friends say they are going to a "RAVE" party to celebrate. Nobody's been to one before, but you've heard that they can get out of hand and be really dangerous and don't want to go. Your friends say that everything will be fine and urge you to join them, do you .....

Go to the party ___ ___ ___ ___ ___ Not go to the party

Appendix A.15: Mass Media Questionnaire

Please tick the response that most accurately reflects the amount in question.

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

1. How many hours of television do you watch over a normal week, counting only Mondays through to Thursday nights?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

2. How many hours of music, either radio, tapes or CDs do you listen to over a normal week, counting only Mondays through to Thursday nights?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

3. How many hours of television do you watch over a normal weekend, counting Friday nights through to Sunday nights?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

4. How many hours of music, either radio, tapes or CDs do you listen to over a normal weekend, counting Friday nights through to Sunday nights?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

With respect to your ***leisure activities***, please answer the following questions.

---

5. How many hours in a complete week do you read newspapers?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

Mass Media Questionnaire (*Continued*)

6. How many hours in a complete week do you read magazines?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
☐	☐	☐	☐	☐

7. How many hours in a complete week do you read school related material?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
☐	☐	☐	☐	☐

8. How many hours in a complete week do you read books?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
☐	☐	☐	☐	☐

9. How many hours in a complete week do you use computers?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
☐	☐	☐	☐	☐

10. How many hours in a complete week do you go to the movies?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
☐	☐	☐	☐	☐

With respect to activities ***related to your studies*** or school work, other than assigned homework, please answer the following questions.

---

11. How many hours in a complete week do you read newspapers?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
☐	☐	☐	☐	☐

12. How many hours in a complete week do you read magazines?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
☐	☐	☐	☐	☐

Mass Media Questionnaire (*Continued*)

13. How many hours in a complete week do you read school related material?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

14. How many hours in a complete week do you read books?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

15. How many hours in a complete week do you use computers?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

16. How many hours in a complete week do you go to the movies?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

With resect to ***assigned homework,*** please answer the following questions.

---

17. In an average week, how many hours homework do you complete?

Less than 1 hour	1 to 5 hours	5 to 10 hours	10 to 20 hours	More than 20 hours
❐	❐	❐	❐	❐

18. Of the homework that you do each week, what percentage do you complete with music playing?

0	1 to 24%	25 to 49%	50 to 74%	70-100%
❐	❐	❐	❐	❐

19. Of the homework that you do each week, what percentage do you complete while watching television?

0	1 to 24%	25 to 49%	50 to 74%	70-100%
❐	❐	❐	❐	❐

End of Questionnaire - Thankyou for your participation

Appendix B. 1: Raw Scores for Open Learning and Traditional Learning Students for the Factor of Ability

Open Learning		**Traditional Learning**	
Student Code	Ability Score	Student Code	Ability Score
OA	14	TA	9
OB	10	TB	11
OC	8	TC	11
OD	10	TD	9
OE	12	TE	15
OF	12	TF	18
OG	17	TG	10
OH	20	TH	12
OI	12	TI	12
OJ	4	TJ	8
OK	15	TK	10
OL	7	TL	10
OM	8	TM	9
ON	8	TN	15
OO	10	TO	8.5
OP	10	TP	5
OQ	11	TQ	11
		TR	20
		TS	13
		TT	17
		TU	11
		TV	20
		TW	14
		TX	17
		TY	13

Appendix B. 2: Raw Scores for Open Learning and Traditional Learning Students for the Factor of Cognitive Development

Development: Sub-Categorys

A = Controlling C = Combinational E = Correlational
B = Proportional D = Probabilistic

Open Learning							Traditional Learning						
ID	A	B	C	D	E	Total	ID	A	B	C	D	E	Total
OA	0	0	0	0	0	0	TA	0	0	0	0	0	0
OB	2	0	1	2	1	6	TB	0	0	1	1	0	2
OC	2	0	1	1	2	6	TC	0	0	0	0	0	0
OD	0	0	0	2	0	2	TD	0	0	0	2	1	3
OE	0	0	0	0	2	2	TE	0	0	2	1	1	4
OF	0	0	2	0	0	2	TF	0	0	2	0	0	2
OG	1	0	2	1	2	6	TG	0	0	0	1	0	1
OH	2	2	2	2	2	10	TH	1	2	1	2	1	7
OI	1	1	1	1	0	4	TI	2	2	0	2	1	7
OJ	0	0	2	2	2	6	TJ	0	0	0	1	0.	1
OK	1	2	2	1	0	6	TK	2	0	0	1	0	3
OL	2	0	0	1	2	5	TL	2	2	1	1	2	8
OM	2	1	2	0	2	7	TM	1	0	0	0	1	2
ON	2	2	2	1	1	8	TN	2	2	2	2	2	10
OO	2	0	2	2	1	7	TO	0	1	0	0	0	1
OP	0	0	0	0	0	0	TP	2	1	2	1	2	8
OQ	0	0	1	0	0	1	TQ	2	2	2	2	2	10
							TR	2	2	2	1	2	9
							TS	2	0	1	0	1	3
							TT	0	2	0	1	2	5
							TU	0	2	0	1	1	4
							TV	2	0	1	2	0	5
							TW	1	1	1	1	1	5
							TX	2	2	1	0	1	6
							TY	2	0	1	0	1	4

Appendix B. 3: Raw Scores for Open Learning and Traditional Learning Students for the factor of Motivation

Motivation: Sub-Category Codes

A = Self Efficacy
B = Intrinsic Motivation
C = Anxiety
D = Cognitive Strategy
E = Self Regulation
F = Total Score

Open Learning							Traditional Learning						
Student Code	A	B	C	D	E	F	Student Code	A	B	C	D	E	F
OA	15	15	7	15	15	67	TA	11	11	3	12	7	44
OB	15	15	5	15	14	64	TB	11	12	5	12	8	48
OC	15	15	8	15	15	68	TC	12	13	6	15	12	58
OD	10	13	7	13	7	50	TD	12	9	6	12	11	50
OE	9	7	8	11	9	44	TE	13	15	7	13	12	60
OF	14	12	8	13	12	59	TF	11	14	9	13	15	62
OG	12	11	6	14	9	52	TG	11	14	6	12	10	53
OH	13	14	8	13	12	60	TH	12	12	7	10	10	51
OI	11	12	7	11	10	51	TI	13	12	7	13	11	56
OJ	12	12	8	11	12	55	TJ	14	14	8	12	13	61
OK	13	15	9	15	14	66	TK	9	12	5	11	10	47
OL	12	13	4	12	11	52	TL	11	11	8	15	15	60
OM	13	15	4	14	9	55	TM	12	14	5	15	9	55
ON	11	14	7	13	12	57	TN	14	14	7	13	10	58
OO	6	10	4	12	9	41	TO	5	6	2	11	3	27
OP	9	13	3	11	11	47	TP	13	13	10	12	10	58
OQ	13	14	8	13	11	59	TQ	13	14	8	14	12	61
							TR	13	12	6	12	12	55
							TS	10	13	5	11	7	46
							TT	5	12	3	13	8	41
							TU	12	15	6	14	12	59
							TV	8	9	9	9	6	41
							TW	10	11	7	12	11	51
							TX	11	15	4	15	12	57
							TY	9	11	6	11	7	44

Appendix B. 4: Allotted and Dedicated Hours for Open Learning and Traditional Learning Students

Quantity Sub-Categories

A = Allocated Time (hours) C = Assigned Homework (hours)
B = Actual Contact Time (hours) D = Extra Homework (hours)

Open Learning					Traditional Learning				
Student Code	A	B	C	D	Student Code	A	B	C	D
OA	24	10	10	15	TA	3	1.5	1	0.5
OB	4	6	2	2	TB	2	1.75	1	0.25
OC	4	8	7	7	TC	2	2	0.5	0
OD	17.5	10	5	1	TD	2	1.75	3	2
OE	15	5	5	6	TE	2	1	2	2
OF	4	2	2	0	TF	2	2	3	2
OG	4	4	2	2	TG	2	2	1	0.5
OH	4	4	0	2	TH	2	1	1	1
OI	12	20	6	4	TI	2	2	0.5	0
OJ	4	4	4	8	TJ	2	1	1	0
OK	6	6	10	4	TK	2	3	4	4
OL	4	3	5	2	TL	2	1.5	1	1
OM	4	4	4	3	TM	2	2.5	2.5	2.5
ON	4	3	2	2	TN	2	2	1	0.5
OO	4	4	2	1	TO	2	2	2	1
OP	5	4	2	0	TP	2	3	1	0.5
OQ	2	4	5	1	TQ	2	1.5	1	0.5
					TR	2	1.75	0.5	0
					TS	19	10	10	30
					TT	22	3	3	3
					TU	4	4	8	10
					TV	22	3	4	5
					TW	22	19	5	2
					TX	24	10	10	4
					TY	21	18	16	5

Appendix B. 5: Quantity as a Percentage of Total Allocated Hours for Open Learning Students and Traditional Learning Students

Student Code	Actual time spent % of total allocated	Assigned work at home % of total allocated	Extra work at home % of total allocated	Student Code	Actual time spent % of total allocated	Assigned work at home % of total allocated	Extra work at home % of total allocated
OA	42	42	63	TA	50	33	17
OB	150	50	50	TB	88	50	13
OC	200	175	175	TC	100	25	0
OD	57	29	6	TD	88	150	100
OE	33	33	40	TE	50	100	100
OF	50	50	0	TF	100	150	100
OG	100	50	50	TG	100	50	25
OH	100	0	50	TH	50	50	50
OI	167	50	33	TI	100	25	0
OJ	100	100	200	TJ	50	50	0
OK	100	167	67	TK	150	200	200
OL	75	125	50	TL	75	50	50
OM	100	100	75	TM	125	125	125
ON	75	50	50	TN	100	50	25
OO	100	50	25	TO	100	100	50
OP	80	40	0	TP	150	50	25
OQ	200	250	50	TQ	75	50	25
				TR	88	25	0
				TS	53	53	158
				TT	14	14	14
				TU	100	200	250
				TV	14	18	23
				TW	86	23	9
				TX	42	42	17
				TY	86	76	24

Appendix B. 6: Raw Scores for Open Learning and Traditional Learning Students on the Likert Scale of Quantity

Open Learning		Traditional Learning	
Student Code	Score	Student Code	Score
OA	42	TA	31
OB	45	TB	39
OC	49	TC	40
OD	25	TD	36
OE	24	TE	39
OF	32	TF	25
OG	32	TG	40
OH	44	TH	31
OI	37	TI	34
OJ	34	TJ	43
OK	43	TK	34
OL	28	TL	40
OM	44	TM	38
ON	35	TN	35
OO	35	TO	24
OP	34	TP	35
OQ	32	TQ	46
		TR	40
		TS	33
		TT	36
		TU	46
		TV	32
		TW	31
		TX	33
		TY	32

Appendix B. 7: Raw Scores for Open Learning and Traditional Learning Students for the Factor of Quality

Code for Sub-Categories of Quality

A = Specific Teaching Strategies
B = Student Comfort
C = Quality of Teaching
D = Student Needs
F = Administration
G = Workload
H = Relevance
I = Student Effort
I = Total Score

Open Learning

ID	A	B	C	D	E	F	G	H	I
OA	9	6	7	3	3	3	2	1	34
OB	9	6	9	5	3	4	2	2	40
OC	7	4	9	5	2	3	2	3	35
OD	15	10	17	7	5	11	5	4	74
OE	14	13	16	8	3	10	6	3	73
OF	13	8	10	5	3	6	3	2	50
OG	17	7	13	8	2	6	7	2	62
OH	12	4	12	3	2	6	4	1	44
OI	15	8	14	6	5	7	5	3	63
OJ	13	10	14	8	4	6	5	2	62
OK	14	6	10	6	3	4	2	2	47
OL	14	8	12	5	5	9	4	2	59
OM	12	6	12	7	2	7	5	1	52
ON	14	8	13	5	3	6	4	1	54
OO	16	11	15	8	5	8	5	3	71
OP	17	12	12	6	5	9	3	2	66
OQ	14	6	11	4	2	6	3	4	50

Traditional Learning

ID	A	B	C	D	E	F	G	H	I
TA	12	5	15	7	5	6	4	1	55
TB	11	7	10	6	3	8	5	3	53
TC	13	8	10	3	2	6	9	5	56
TD	9	6	5	3	4	4	4	2	37
TE	11	9	15	7	4	9	5	2	62
TF	15	9	11	6	3	9	3	3	59
TG	16	7	16	7	3	10	5	1	65
TH	11	8	13	6	5	7	4	2	56
TI	17	6	8	4	3	4	4	4	50
TJ	15	7	9	6	5	7	6	2	57
TK	17	9	14	8	6	8	4	3	69
TL	15	14	15	7	8	8	7	3	77
TM	11	9	16	6	5	6	5	2	60
TN	7	5	7	5	3	6	3	2	38
TO	22	16	23	13	6	13	6	4	103
TP	9	7	11	4	3	6	5	1	46
TQ	12	7	12	5	6	9	7	1	59
TR	13	9	12	7	3	7	5	2	58
TS	15	17	18	10	8	9	8	3	88
TT	13	9	15	9	4	9	4	3	66
TU	7	5	8	7	2	7	2	1	39
TV	12	15	13	8	5	8	5	2	68
TW	12	11	14	9	6	7	7	4	70
TX	9	7	14	5	2	6	3	2	48
TY	13	11	14	8	6	10	5	2	69

Appendix B. 8 : Raw Scores for Open Learning and Traditional Learning Students for the Factor of Home Environment

Codes for the sub-categories of Home Environment

A = Socio-Economic Status
B = Family Structure
C = Parent's Aspirations
D = Material Resources
E = Social Psychological Processes
F = Getting By Disposition
G = Getting Ahead Disposition
H = Ethnicity
T = Total Score

Open Learning										Traditional Learning									
ID	A	B	C	D	E	F	G	H	T	ID	A	B	C	D	E	F	G	H	T
OA	21	5	14	14	61	15	6	31	180	TA	19	3	7	13	47	10	3	30	141
OB	19	6	12	15	51	9	2	18	141	TB	18	6	11	11	40	9	3	24	127
OC	20	1	12	13	51	11	2	32	151	TC	29	5	12	20	60	11	2	12	153
OD	13	4	11	13	51	11	2	23	136	TD	15	5	12	12	44	9	2	28	134
OE	14	6	10	13	51	9	4	26	143	TE	20	1	13	10	36	9	6	7	106
OF	19	6	13	15	49	9	2	27	149	TF	16	6	9	10	50	7	2	20	129
OG	17	3	10	17	56	11	7	26	161	TG	25	6	11	12	37	10	2	32	138
OH	17	6	10	9	44	9	2	26	129	TH	26	5	11	12	48	6	2	30	147
OI	17	6	12	13	43	9	5	32	145	TI	16	5	11	11	46	11	2	31	143
OJ	13	6	10	10	35	10	2	31	121	TJ	14	6	14	10	42	11	2	16	124
OK	27	6	8	11	31	9	2	23	120	TK	17	6	9	15	40	9	7	28	134
OL	15	6	10	17	55	6	3	31	150	TL	20	1	12	14	51	13	2	10	132
OM	14	6	11	11	44	10	2	29	133	TM	10	6	13	11	40	12	5	27	132
ON	17	6	8	12	47	10	5	31	140	TN	16	6	8	13	40	12	5	29	135
OO	19	6	8	11	43	9	5	30	138	TO	14	6	10	16	45	11	3	7	119
OP	12	4	10	14	44	14	2	15	123	TP	15	6	12	14	53	10	4	30	150
OQ	15	6	9	10	41	11	6	17	124	TQ	24	5	11	10	39	8	2	31	133
										TR	18	6	10	11	53	10	4	32	153
										TS	23	4	12	12	49	13	3	29	153
										TT	20	5	12	10	50	11	7	8	128
										TU	18	6	12	14	51	11	5	8	134
										TV	20	6	16	14	37	11	6	9	129
										TW	18	5	12	13	49	9	6	31	152
										TX	20	6	16	14	38	14	4	8	124
										TY	12	6	9	12	50	11	6	9	122

Appendix B. 9: Raw Scores for Open Learning Students on Classroom Environment

Sub-Category Coding for the Factor of Classroom Environment

A = Comfort
B = Order
C = Involvement
D = Material Environment
E = Cohesiveness
F = Formality
G = Student Centredness
H = Packaged Learning
I = Support
J = Student Control
K = Competition
L = Satisfaction
M = Innovation
N = Friction
O = Task Orientation
T = Total

ID	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	T
OA	15	5	10	9	10	10	10	6	7	10	10	10	2	10	6	130
OB	13	4	8	8	4	6	10	9	9	10	10	10	8	8	7	124
OC	15	5	10	6	7	6	10	8	10	10	6	10	8	10	9	130
OD	9	3	3	4	6	6	8	8	9	10	10	3	3	7	4	93
OE	11	3	3	7	3	5	8	5	7	8	10	6	5	9	5	95
OF	9	3	5	10	6	6	10	9	10	10	10	6	7	9	7	117
OG	12	5	7	9	10	2	10	9	10	10	10	9	6	10	4	123
OH	12	5	9	10	10	6	10	8	10	10	10	10	8	10	7	135
OI	10	2	6	8	8	6	8	8	8	8	8	7	6	7	4	104
OJ	10	2	8	8	8	6	4	4	8	8	8	7	6	8	4	99
OK	10	5	6	8	6	4	8	4	10	8	10	8	4	8	5	104
OL	10	4	8	9	9	5	10	5	8	8	9	10	3	10	7	113
OM	10	4	7	8	6	5	7	6	8	8	7	6	6	9	8	105
ON	13	4	8	9	9	7	9	7	8	8	8	8	5	9	8	120
OO	7	3	4	9	6	6	6	7	8	8	8	5	5	7	5	94
OP	8	2	4	5	8	5	7	7	5	4	7	6	8	6	5	87
OQ	11	3	7	9	5	4	8	9	7	8	8	7	5	8	7	106

Appendix B. 10: Raw Scores for Traditional Learning Students on Classroom Environment

Sub-Category Coding for the Factor of Classroom Environment

A = Comfort
B = Order
C= Involvement
D = Material Environment
E = Cohesiveness
F = Formality
G = Student Centredness
H = Packaged Learning
I = Support
J = Student Control
K = Competition
L = Satisfaction
M = Innovation
N = Friction
O = Task Orientation
T = Total

ID	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	T
TA	11	3	2	9	9	7	7	6	6	7	8	5	6	9	4	99
TB	10	5	3	7	7	6	6	6	8	6	7	8	4	9	9	101
TC	12	4	5	8	6	5	9	7	8	8	8	6	5	7	7	105
TD	12	4	6	8	9	6	8	5	8	7	8	7	6	6	6	106
TE	11	3	6	7	7	8	8	6	8	8	6	7	6	6	7	104
TF	7	3	2	8	10	4	6	8	8	6	10	5	7	10	4	98
TG	11	5	8	7	8	4	7	5	7	6	8	8	6	5	6	99
TH	9	5	4	3	6	6	4	6	7	9	4	6	5	6	7	87
TI	13	4	7	9	6	4	7	7	7	6	9	8	6	10	9	112
TJ	14	3	7	9	9	6	8	7	9	7	10	8	7	8	7	119
TK	11	3	7	8	9	6	6	3	6	5	9	8	4	10	6	101
TL	11	3	6	5	8	9	6	7	6	8	8	4	3	6	7	97
TM	11	4	8	7	7	7	8	6	7	8	8	7	6	8	7	109
TN	11	5	8	9	5	4	7	4	6	5	6	6	3	8	9	96
TO	5	1	6	8	5	3	2	6	3	5	7	6	5	6	3	71
TP	14	4	6	7	8	4	7	4	7	6	8	6	4	9	8	102
TQ	15	3	6	4	6	6	8	6	8	4	9	7	4	6	10	102
TR	11	4	7	8	6	7	8	5	9	7	8	7	5	8	4	104
TS	10	1	7	8	5	4	2	6	3	9	9	6	3	6	6	85
TT	11	4	8	9	9	8	7	7	7	8	8	8	8	8	6	116
TU	13	5	8	10	10	7	6	6	10	10	10	8	6	9	7	125
TV	9	3	6	7	6	6	6	6	6	6	6	6	6	6	6	91
TW	9	3	6	4	3	6	5	6	5	6	6	6	6	6	6	83
TX	9	3	6	6	6	6	6	6	6	6	6	6	6	6	6	90
TY	10	3	6	6	7	6	6	6	6	6	6	7	6	6	6	93

Appendix B. 11: Raw Scores for Open Learning and Traditional Learning Students for the Factor of Peer Environment

Codes for Sub-Categories of Peer Environment:

A = Interaction
B = Self Aspirations
C = Peer Aspirations
D = Model Influence
E = Activities
F = Peer Conformity
T = Total

Open Learning								Traditional Learning							
ID	A	B	C	D	E	F	T	ID	A	B	C	D	E	F	T
OA	16	8	5	20	7	8	51	TA	8	8	8	32	11	4	55
OB	12	11	11	48	14	10	84	TB	11	12	6	36	9	8	64
OC	14	12	11	43	10	10	77	TC	14	9	10	38	17	10	79
OD	14	12	12	47	9	2	72	TD	13	12	8	33	16	10	72
OE	8	11	13	41	7	7	63	TE	20	12	12	49	6	10	85
OF	15	12	7	33	5	9	62	TF	8	8	9	35	9	10	62
OG	9	8	6	33	5	8	55	TG	11	10	10	44	17	10	82
OH	6	9	10	43	10	10	69	TH	12	12	11	43	13	4	72
OI	11	10	10	41	10	7	69	TI	10	12	10	43	10	8	71
OJ	18	12	13	39	5	10	72	TJ	12	11	11	48	11	10	81
OK	12	11	12	35	5	10	62	TK	12	8	10	36	11	8	67
OL	10	12	8	43	8	6	67	TL	16	13	8	42	12	7	77
OM	20	10	12	46	5	10	81	TM	6	12	12	45	9	7	67
ON	13	12	12	48	11	8	80	TN	16	10	7	33	5	9	63
OO	10	8	6	27	13	5	55	TO	20	10	12	40	6	10	76
OP	15	11	12	50	8	7	80	TP	15	12	11	42	14	4	75
OQ	11	12	12	41	10	9	71	TQ	12	12	11	44	10	10	76
								TR	16	8	4	31	7	10	64
								TS	16	8	8	33	15	10	74
								TT	15	10	10	39	11	6	71
								TU	20	9	13	44	7	10	81
								TV	12	8	8	33	15	6	66
								TW	16	6	10	34	10	8	68
								TX	12	10	10	37	15	10	74
								TY	16	8	9	36	15	6	73

Appendix B. 12: Raw Scores for Open Learning and Traditional Learning Students for the Factor of Mass Media

Code for Sub Categories of Mass Media

A = TV Viewing Week Days
B = TV Viewing Weekend
C = Playing Music Week Days
D = Playing Music Weekend
E = Print Media for Leisure
F = Print Media Related to Studies
G = Computer Use for Leisure
H = Computer Use Related to Studies
I = Homework with Music
J = Homework with TV
T = Total

Open Learning												Traditional Learning											
ID	A	B	C	D	E	F	G	H	I	J	T	ID	A	B	C	D	E	F	G	H	I	J	T
OA	3	2	1	1	7	5	4	1	1	1	29	TA	4	1	5	1	7	10	3	1	4	2	39
OB	3	3	3	4	9	8	3	5	3	1	44	TB	3	2	2	2	7	7	1	3	1	1	31
OC	4	3	2	3	12	9	2	5	2	1	47	TC	2	2	2	2	10	9	4	2	3	3	41
OD	4	4	5	5	12	9	3	4	5	3	56	TD	2	3	2	3	13	14	4	4	1	1	52
OE	3	2	4	3	6	6	2	2	4	1	36	TE	2	1	1	1	13	13	5	5	1	1	48
OF	2	2	3	3	12	10	3	2	5	1	47	TF	3	4	4	5	13	11	3	3	3	3	55
OG	3	3	3	4	6	5	3	3	5	2	40	TG	2	1	3	4	8	8	4	4	4	2	42
OH	3	2	3	3	7	10	1	1	3	1	38	TH	2	2	3	3	7	6	3	2	4	2	36
OI	3	2	2	3	11	11	2	2	3	1	43	TI	2	2	5	4	6	6	1	4	5	2	38
OJ	2	2	4	3	9	10	4	5	5	1	49	TJ	3	2	2	2	6	5	3	1	5	2	32
OK	2	3	3	3	13	10	1	3	2	1	45	TK	3	3	2	1	10	10	4	3	1	3	42
OL	2	3	5	5	13	13	5	5	4	1	59	TL	3	4	2	3	8	9	2	2	2	4	43
OM	2	2	2	2	10	10	2	2	4	2	41	TM	3	3	2	2	10	11	3	3	2	3	46
ON	2	1	1	1	9	9	5	3	2	1	38	TN	4	3	2	3	11	7	1	2	2	4	41
OO	4	4	2	2	11	9	3	3	2	1	44	TO	4	3	2	1	6	6	2	2	1	2	31
OP	3	4	4	4	11	11	3	3	4	4	53	TP	3	2	2	3	9	5	2	2	3	1	34
OQ	2	1	3	4	8	7	2	2	2	1	35	TQ	4	3	4	3	6	5	2	3	4	2	39
												TR	3	3	3	3	8	7	1	1	2	1	35
												TS	2	1	2	1	9	9	2	2	3	2	35
												TT	3	2	4	2	7	7	3	3	4	1	39
												TU	1	2	2	2	10	9	3	4	1	1	39
												TV	2	2	1	1	7	6	3	3	1	1	30
												TW	3	2	4	4	10	11	3	3	4	2	48
												TX	3	3	5	4	17	15	3	3	2	2	61
												TY	2	3	2	2	9	11	2	3	2	2	41

Appendix B. 13: Student Achievement, Rank Order of Results for Open Learning Students

Course A Open Learning

Student ID	Result	Rank Order
OB	98%	1
OC	90%	2
OA	73%	3

Course B Open Learning

Student ID	Pass 1 Attempt	Withdrawn	Fail	Rank Order
OM	9	2		1
OG	7	6		2
OF	4	7	1	3
OJ	4	6	1	4
OI	3	7	1	5
OO	3	7	2	6
OQ	2	8		7
OP	2	2	1	8
OD		4	2	9
OL		9		10

Course C Open Learning

Student ID	Pass 1 Attempt	Withdrawn	Fail	Rank Order
OH	12	1		1
ON	8	3	2	2
OK	6	2	2	3
OE	2	1		4

Appendix B. 14: Student Achievement, Rank Order of Results for Traditional Learning Students

Course A Traditional Learning

Student ID	Result 1	Result 2	Result 3	Average	Rank Order
TF	71	83	77	77.00	1
TE	75	79	76	76.66	2
TI	60	75	80	71.66	3
TD	67	72	73	70.66	4
TB	55	68	82	68.33	5
TJ	56	74	65	65.00	6
TG	69	70	56	65.00	6
TA	51	63	73	62.33	8
TC	62	71	43	58.66	9
TK	25	68	61	51.33	10
TH	89	W	W	29.66	11

Course B Traditional Learning

Student ID	Pass 1 Attempt	Pass 2 Attempts	Pass 3 Attempts	Rank Order
TL	6			1
TM	5	1		2
TQ	5	1		2
TR	5	1		4
TN	4	2		5
TP	3	2	1	6
TO	3	1	2	7

Course C Traditional Learning

Student ID	Result	Rank Order
TU	98	1
TY	98	2
TS	97	3
TW	95	4
TT	95	5
TX	90	6
TV	90	7

Appendix B. 15: Rank Order of Results and Productivity Factors for Open Learning Students in Course A

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Results
Raw Scores											
OA	14	0	67	10	42	34	180	130	51	29	3
OB	10	6	64	6	45	40	141	124	84	44	1
OC	8	6	68	8	49	35	151	130	77	47	2
Rank Scores											
OA	1	3	2	1	3	3	1	1	3	3	3
OB	2	1	3	3	2	1	3	3	1	2	1
OC	3	1	1	2	1	2	2	1	2	1	2

Appendix B. 16: Rank Order of Results and Productivity Factors for Open Learning Students in Course B

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Results Rank
Raw Scores											
OD	10	2	50	10	25	74	136	93	72	56	9
OF	12	2	59	2	32	50	149	117	62	47	3
OG	17	6	52	4	32	62	161	123	55	40	2
OI	12	4	51	20	37	63	145	104	69	43	5
OJ	4	6	55	4	34	62	121	99	72	49	4
OL	7	5	52	3	28	59	150	113	67	59	10
OM	8	7	55	4	44	52	133	105	81	41	1
OO	10	7	41	4	35	71	138	94	55	44	6
OP	10	0	47	4	34	66	123	87	80	53	8
OQ	11	1	59	4	32	50	124	106	71	35	7
Rank Scores											
OD	5	7	8	2	8	1	6	9	3	2	9
OF	2	7	1	10	6	9	3	2	8	5	3
OG	1	3	5	3	6	5	1	1	9	9	2
OI	2	6	7	1	2	4	4	6	6	7	5
OJ	10	3	3	3	4	5	10	7	3	4	4
OL	9	5	5	8	7	7	2	3	7	1	10
OM	8	1	3	3	1	8	7	5	1	8	1
OO	5	1	10	3	3	2	5	8	9	6	6
OP	5	10	9	3	4	3	9	10	2	3	8
OQ	4	9	1	3	6	9	8	4	5	10	7

Appendix B. 17: Rank Order of Results and Productivity Factors for Open Learning Students in Course C

ID	Abil	Dev	Mot	Quantity		Qual	Home	Class	Peer	Media	Results Rank
				Hrs	Focus						
Raw Scores											
OE	12	2	44		24	73	143	95	63	36	4
OH	20	10	60		44	44	129	135	69	38	1
OK	15	6	66		43	47	120	104	62	45	3
ON	8	8	57		35	54	140	120	80	38	2
Rank Scores											
OE	3	4	4		4	1	1	4	3	4	4
OH	1	1	2		1	4	3	1	2	2	1
OK	2	3	1		2	3	4	3	4	1	3
ON	4	2	3		3	2	2	2	1	2	2

Appendix B. 18: Rank Order of Results and Productivity Factors for Traditional Learning Students in Course A

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Results Rank
Raw Scores											
TF	18	2	62	2	25	59	129	98	62	55	1
TE	15	4	60	1	39	62	106	104	85	48	2
TI	12	7	56	2	34	50	143	112	71	38	3
TD	9	3	50	1.75	36	37	134	106	72	52	4
TB	11	2	48	1.75	39	53	127	101	64	31	5
TG	10	1	53	2	40	65	138	101	82	42	6
TJ	8	1	61	1	43	57	124	119	81	32	7
TA	9	0	44	1.5	31	55	141	99	55	39	8
TC	11	0	58	2	40	56	153	105	78.5	41	9
TK	10	3	47	3	34	69	134	101	66.5	42	10
TH	12	7	51	1	31	56	147	87	72	36	11
Rank Scores											
TF	1	6	1	2	11	4	8	10	10	1	1
TE	2	3	3	9	3	3	11	5	1	3	2
TI	3	1	5	2	7	10	3	2	7	8	3
TD	9	4	8	6	6	11	6	3	5	2	4
TB	5	6	9	6	3	9	9	6	9	11	5
TG	7	8	6	2	2	2	5	6	2	4	6
TJ	7	8	2	9	1	5	10	1	3	10	7
TA	9	10	11	8	9	8	4	9	11	7	8
TC	5	10	4	2	2	6	1	4	4	6	9
TK	7	4	10	1	7	1	6	6	8	4	10
TH	3	1	7	9	9	6	2	11	5	9	11

Appendix B. 19: Rank Order of Results and Productivity Factors for Traditional Learning Students in Course B

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Results Rank
Raw Scores											
TL	10	8	60	1.5	40	77	132	97	77	43	1
TM	9	2	55	2.5	38	60	132	109	67	46	2
TN	15	10	58	2	35	38	135	96	63	41	5
TO	8.5	1	27	2	24	103	119	71	76	31	7
TP	5	8	58	3	35	46	150	102	75	34	6
TQ	11	10	61	1.5	46	59	133	102	76	39	2
TR	20	9	55	1.75	40	58	153	104	64	35	4
Rank Scores											
TL	4	4	2	6	2	2	5	5	1	2	1
TM	5	6	5	2	4	3	5	1	5	1	2
TN	2	1	3	3	5	7	3	6	7	3	5
TO	6	7	7	3	7	1	7	7	2	7	7
TP	7	4	3	1	5	6	2	3	4	6	6
TQ	3	1	1	6	1	4	4	3	2	4	2
TR	1	3	5	5	2	5	1	2	6	5	4

Appendix B. 20: Rank Order of Results and Productivity Factors for Traditional Learning Students in Course C

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Results Rank
Raw Scores											
TS	12-15	3	46	10	33	88	153	85	74	35	3
TT	17	5	41	3	36	66	128	116	71	39	5
TU	11	4	59	4	46	39	134	125	81	39	1
TV	20	5	41	3	32	68	129	91	66	30	7
TW	14	5	51	19	31	70	152	83	68	48	4
TX	17	6	57	10	33	48	124	90	74	61	6
TY	12-15	4	44	18	32	69	122	93	73	41	2
Raw Scores											
TS	5	7	4	3	3	1	1	6	2	6	3
TT	2	2	6	6	2	5	5	2	5	4	5
TU	7	5	1	5	1	7	3	1	1	4	1
TV	1	2	6	6	5	4	4	4	7	7	7
TW	4	2	3	1	7	2	2	7	6	2	4
TX	2	1	2	3	3	6	6	5	2	1	6
TY	5	5	5	2	5	3	7	3	4	3	2

Appendix B. 21: Matched Student Pairs for Course A

Course A Open Learning

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Res
Raw Scores											
OA	14	0	67	10	42	34	180	130	51	29	3
OB	10	6	64	6	45	40	141	124	84	44	1
OC	8	6	68	8	49	35	151	130	77	47	2
Rank Scores											
OA	1	3	2	1	3	3	1	1	3	3	3
OB	2	1	3	3	2	1	3	3	1	2	1
OC	3	1	1	2	1	2	2	1	2	1	2

Course A Traditional Learning

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Res
Raw Scores											
TE	15	4	60	1	39	62	106	104	85	48	1
TK	10	3	47	3	34	69	134	101	66.5	42	3
TJ	8	1	61	1	43	57	124	119	81	32	2
Rank Scores											
TE	1	1	2	2	2	2	3	2	1	1	1
TK	2	2	3	1	3	1	1	3	3	2	3
TJ	3	3	1	2	1	3	2	1	2	3	2

Appendix B. 22: Matched Student Pairs for Course B

Course B Open Learning

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Res
Raw Scores											
OG	17	6	52	4	32	62	161	123	55	40	2
OI	12	4	51	20	37	63	145	104	69	43	4
OQ	11	1	59	4	32	50	124	106	71	35	6
OO	10	7	41	4	35	71	138	94	55	44	5
OM	8	7	55	4	44	52	133	105	81	41	1
OL	7	5	52	3	28	59	150	113	67	59	7
OJ	4	6	55	4	34	62	121	99	72	49	3
Rank Scores											
OG	1	3	4	2	5	3	1	1	6	6	2
OI	2	6	6	1	2	2	3	5	4	4	4
OQ	3	7	1	2	6	7	6	3	3	7	6
OO	4	1	7	2	3	1	4	7	6	3	5
OM	5	1	2	2	1	6	5	4	1	5	1
OL	6	5	4	7	7	5	2	2	5	1	7
OJ	7	3	2	2	4	3	7	6	2	2	3

Course B Traditional Learning

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Res
Raw Scores											
TR	20	9	55	1.75	40	58	153	104	64	35	4
TN	15	10	58	2	35	38	135	96	63	41	5
TQ	11	10	61	1.5	46	59	133	102	76	39	2
TL	10	8	60	1.5	40	77	132	97	77	43	1
TM	9	2	55	2.5	38	60	132	109	67	46	3
TO	8.5	1	27	2	24	103	119	71	76	31	7
TP	5	8	58	3	35	46	150	102	75	34	6
Rank Scores											
TR	1	3	5	5	2	5	1	2	6	5	4
TN	2	1	3	3	5	7	3	6	7	3	5
TQ	3	1	1	6	1	4	4	3	2	4	2
TL	4	4	2	6	2	2	5	5	1	2	1
TM	5	6	6	2	4	3	5	1	5	1	3
TO	6	7	7	3	7	1	7	7	2	7	7
TP	7	4	3	1	5	6	2	3	4	6	6

Appendix B. 23: Matched Student Pairs Course C

Course C Open Learning

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Res
Raw Scores											
OH	20	10	60	4	44	44	129	135	69	38	1
OK	15	6	66	6	43	47	120	104	62	45	3
OE	12	2	44	5	24	73	143	95	63	36	4
ON	8	8	57	3	35	54	140	120	80	38	2
Rank Scores											
OH	1	1	2	3	1	4	3	1	2	2	1
OK	2	3	1	1	2	3	4	3	4	1	3
OE	3	4	4	2	4	1	1	4	3	4	4
ON	4	2	3	4	3	2	2	2	1	2	2

Course C Traditional Learning

ID	Abil	Dev	Mot	Quantity Hrs	Quantity Focus	Qual	Home	Class	Peer	Media	Res
Raw Scores											
TV	20	5	41	3	32	68	129	91	66	30	4
TX	17	6	57	10	33	48	124	90	74	61	3
TS	12-15	3	46	10	33	88	153	85	74	35	2
TU	11	4	59	4	46	39	134	125	81	39	1
Rank Scores											
TV	1	2	4	4	4	2	3	2	4	4	4
TX	2	1	2	1	2	3	4	3	2	1	3
TS	3	4	3	1	2	1	1	4	2	3	2
TU	4	3	1	3	1	4	2	1	1	2	1

Appendix C. 1: Interview Schedule

Q1. What are some of the things that you think have influenced any successes or failures you may have experienced throughout your course?

Q2. Can you expand on the factors you have mentioned?

Q3. What are your thoughts about your previous schooling , how well has it equipped you for this course?
What about the results you achieved in school compared to your results in this course?

Q4. Have you had to make any changes to the way you learn in this course? What are your thoughts on the importance of abstract thinking, deducing or hypothesising, compared to perhaps concrete examples.

Q5. Do you think that students need constant supervision and encouragement? What do you think the effects would be if there was little, if any, supervision and encouragement?

Q6. a) Thinking about how much time you devote to this course, how much time each week would you spend attending the course at the college?

b) What about the amount of time you would spend at the college, but not actually doing course work, for example simply browsing through the library, chatting at the canteen or talking with class mates?

c) How much time do you think you spend doing course work away from the college?

d) Do you think that you should devote more or less time to this course?

Q7. What do you think of the quality of the material that you are using throughout your course, for example, text books, study guides, assessment? How important do you think the quality of the materials is to the way in which you learn and achieve in this course?

Q8. When studying at home, are there any things that make this a difficult task? What things at home, if any, make studying easier for you. What involvement do your parents have on your learning, what about the past?

Q9. What are your thoughts on the atmosphere of the places where you learn? Can you describe any instances where you have attributed any successes or failures to this atmosphere?

Q10. How do you balance your study and your social life? How do you decide if you are going to go out with friends or study? Have you ever attributed any successes or failures to your peers?

Q11. What do you believe are the benefits, if any, of mass media when learning, thinking of things like radio, television, magazines, movies and newspapers?

Q12. What is the course that you are completing at this college? Are you attending on a full time or a part time basis?

Q13. Why are you completing this course? What has influenced your decision to undertake this course?

Q14. Why are you studying at this particular college? What has influenced the reasons you study here?

Q15. What do you feel are some of the positive aspects of the college? What do you believe to be some of the negative aspects of the college?

Q16. How do you find the course that you're currently completing, perhaps describe the good and bad points of it?

Q17. Could you describe your perception of an open learning environment?

Q18. Could you describe your perception of an traditional learning environment?

Q19. If you had to choose between studying in an open learning mode or a traditional mode, which mode would you choose? Why?

Q20. Which mode of learning, traditional or open learning, do you think you would be most successful? Why? Which mode do you think you would enjoy the most? Why?

Q21. Could you place the factors listed below in the order which you think they have the most influence on the learning and ultimate achievement?

Appendix C. 2: Description of Productivity Factors

1. Ability	Capability	The achievement level at which a student is most likely to operate.
2. Development	Cognitive development	Able to make deductions based on abstract information, rather than relying on concrete examples.
3. Motivation	Encouragement	The desire to achieve at a high level.
4. Quantity	Amount	The amount of learning time.
5. Quality	Merit	The overall quality of the teaching and materials used.
6. Home Environment	Home circumstances	Includes material possessions, family structure and parental involvement.
7. Classroom Environment	Classroom conditions	Both physical surroundings and interpersonal relationships or atmosphere.
8. Peer Environment	Friends	The character and influence of friends.
9. Mass Media		The amount of time spent utilising different forms of mass media including radio, TV, papers, books etc.

Appendix C. 3: Student Responses to Interview Schedule

The following is the series of responses made by students throughout the interview procedures. These student responses are not verbatim transcripts, rather they are a summary of the student's responses. The responses were summarised based on details of the recorded interviews on audio cassettes, as well as details from anecdotal notes made at the time the interview was being conducted.

Question 1: What are some of the things that you think have influenced any successes or failures you may have experienced throughout your course?

TE Attitude, personal characteristics, language.

TI Moving out of home and living with a bad influence, not attending TAFE, personal desire to learn.

TL Teachers, friends, self.

TW How easy the teachers make the learning.

OB Familiarity with the system makes it easier to get on with work, the realisation that if you want to do it you can, the gaining of more self confidence.

OJ Able to go to college when want to, take as much time as needed, facilitators always available so help is there when you need it.

OM Facilitators, other students as they have already completed the work, no hindrances.

OP The self paced aspect.

OQ Learning on your own and lecturers not there all the time are negative influences, working at your own pace is a positive influence, common sense, easier to study if you are doing the practical component .... at work.

Question 2: Can you expand on the factors you have mentioned?

TE Will ask if not understanding, high level of English, or more time devoted, if really want to know will find out, motivation to achieve

TI Influence of peers, exams and assignments as motivation.

TL Teachers approachability, friends are a distraction - no study, self discipline to spend the time doing the study and liking the subject.

TW How well teachers describe the information and go through it, and how well they prepare you for tests.

OB Being aware of computer viruses, young kids not taking opportunity to learn, a preparedness to achieve without the pressure of time constraints, enjoying the time doing the course.

OJ A down side is that you don't have to go to college, you can have a part time job .... which can distract.

OM Facilitators give you time to ensure you understand.

OP At your own pace your not in a rush, but you can get lazy. Other times really motivated.

OQ Sometimes the theory does not always match the practical aspects.

Question 3: What are your thoughts about your previous schooling , how well has it equipped you for this course?
What about the results you achieved in school compared to your results in this course?

TE Has equipped me well, plus the working environment has made the learning relevant. A high achiever at school and the same at TAFE

TI High school doesn't relate, hated school. Working much better at TAFE

TL Not helpful subjects, not relevant. Difference in strictness of teachers, in TAFE more relaxed so less stress, therefore more effective

TW Fairly well equipped, gave a good background of subjects. My TAFE marks are higher as its easier to learn, you learn from student's and teacher's experience.

OB Boarding school taught to stand on your own two feet, if I wanted to achieve it was up to me to do it. The discipline at school helped to hang in when going gets tough. Very high marks at TAFE as I want to learn with the opportunity of an interesting and well paid job.

OJ The model of high school good to help succeed at TAFE as it gives the discipline. Poor school results effected by one poor subject, but at TAFE much better as can complete subjects individually.

OM No real help as not doing any similar subjects, perhaps the use of learning techniques taught at school. Marks are probably the same at TAFE, perhaps a little better.

OP High school equipped well. Results are better at TAFE due to a better atmosphere at TAFE, that is doing what I like when I like.

OQ Schooling OK, did well in similar subjects to what I'm studying now. Have higher results at TAFE, as the course at TAFE touches on year 12 school material. A better student at TAFE, at school not really taking course seriously, but at TAFE course is more relevant so I'm more motivated.

Question 4: Have you had to make any changes to the way you learn in this course? What are your thoughts on the importance of abstract thinking, deducing or hypothesising, compared to perhaps concrete examples.

TE No changes to the way of learning, but not happy with simple Pass/Fail assessment. Prefers learning for understanding rather than just digesting information. Important to use own thinking.

TI Hands on at TAFE, where you actually do it at TAFE makes it easier to combine practical and theory. Abstract thinking is important.

TL No changes to learning except the teachers are more relaxed. You must be able to apply principals across a range of applications.

TW There is lots more reading at TAFE of a range of books. There is not more abstract thinking at TAFE, but you do need to apply it more at TAFE.

OB At TAFE you are given creative ways of learning and ways of remembering. Abstract thinking has very little impact on achievement.

OJ Have not had to change learning style, if learning guides are good can easily work individually. Abstract thinking is far better than concrete thinking.

OM At TAFE time management skills have had to improve, and also need higher levels of motivation. Only using concrete thinking, but it is important to get principles correct to be able to apply them elsewhere.

OP No changes from high school. There is a place for some abstract thinking.

OQ At TAFE you need more motivation skills, its too easy to slack off. You never really form a group ... of study mates.

Question 5: Do you think that students need constant supervision and encouragement? What do you think the effects would be if there was little, if any, supervision and encouragement?

TE Yes to encouragement, not to supervision. No encouragement will result in poor results. Feedback is important, simply supervising is no good. If students know what they are doing then they don't need supervision, but need encouragement. Supervision implies a lack of trust.

TI No to supervision, yes to encouragement. If practicing don't need supervision, but if learning new material then do need it. Without supervision courses would take longer to complete, results would go down as there would be more time off. Therefore supervision is important, but encouragement should be inherent in supervision.

TL No. There is no effect, it depends on the individual's responsibility to the learning. If not taking responsibility then nothing really matters. This comes from enjoyment of the course and motivation from parents. Checking of homework does help a little.

TW You don't need it as much as high school. No supervision allows students to move at own pace, which is good for some and poor for others. It depends on the person and the subject.

OB Supervision is good, especially for young people. The facilitator should be for immediate guidance until you gain confidence. People need quick results, its important to see results or know that you have learnt something. With no encouragement people would lose interest.

OJ Some people need it others don't. If you have commitment and motivation you will be OK. I would be slower if I didn't have supervisor appointments to keep me in line.

OM Not at this age, were here by choice. Most people are motivated, have their goals straight and are pretty set on doing their work. If it is only a little supervision and encouragement is good.

OP Not really, don't need supervision but do need encouragement, it helps people to motivate themselves better.

OQ Not constant supervision but a little more than now. If the lecturers is always there then you know if your on the right track. Encouragement is most important to lift the motivation.

Question 6: a) Thinking about how much time you devote to this course, how much time each week would you spend attending the course at the college?

b) What about the amount of time you would spend at the college, but not actually doing course work, for example simply browsing through the library, chatting at the canteen or talking with class mates?

c) How much time do you think you spend doing course work away from the college?

d) Do you think that you should devote more or less time to this course?

Code
a = hours per week on course work at college
b = hours per week not on course work at college
c = hours per week on course work away from college
d = should you devote more or less time to course

Student	*a*	*b*	*c*	*d*
OB	24	5	0	no more time
OJ	25	8	5	more time
OM	25	0	0	more time
OP	13	2	7	should spend more time
OQ	28	4	0	maybe devote more time
TE	15	0	25	no more time
TI	20	1	0	should be more time
TL	20	2-3	8	should be extra 2 hours per week
TW	15	1.5	1.5	no more time

Table C. 1: Student Interview Results; Time Devoted to Courses

Question 7: What do you think of the quality of the material that you are using throughout your course, for example, text books, study guides, assessment? How important do you think the quality of the materials is to the way in which you learn and achieve in this course?

TE Good resources, but pass/fail detracts from motivation. The text books are too long winded. The quality helps to a certain extent.

TI Good resources and facilities, teachers are knowledgeable and approachable, and a good syllabus. Quality is important for information to be learned. It is of good quality if it is relevant.

TL Quality at times is rubbish as it is irrelevant, there is no reason for learning. If it is irrelevant then it de-motivates. Highly qualified teachers (in industry) do not teach well, they're very clever but not good at teaching.

TW Books are too expensive for too little use. The materials are of higher quality because there are no exams, you are judged on your work, not exam results. Quality is important to learning, but also how the lecturer interprets the workbook.

OB Not bad, a number of errors in guides as there has been a change to syllabus. Library, assessment and facilitators are good. The quality is very important to results.

OJ Quality is very good. Initially it was hard to get all of the information, but OK now. The work guides are easy to read, you know what they want, they are good outlines giving clear paths.

OM Materials are good, they're easy to understand or comprehend. There is a lot of variety in the course and the facilitators are very good. Good quality makes it a lot easier to learn.

OP Text books are far too deep, even though they are of good quality. The study guides are generally of poor quality. The poor quality of materials would effect results.

OQ I'm confused and overwhelmed by too many references and such a large range of books, its hard to do it. Assessment is good and the facilitators are good. The quality of the guides is very important as it is the source of all of your information.

Question 8: When studying at home, are there any things that make this a difficult task? What things at home, if any, make studying easier for you. What involvement do your parents have on your learning, what about the past.

TE No distractions make it easier, also because I'm free to leave books set up, able to be free and comfortable. There is no current parental involvement. Parents had involvement in the past, in fact suggested not to study too hard.

TI Other people in the room. Being alone makes it easier. Parents have had little involvement.

TL Living in own house so all of the physical needs are met, but friends calling around are a problem. No parental involvement.

TW Can study easily, but a times not enough room. It is easier to study when nobody else is at home. Mother encouraging to borrow encyclopedias and keeping track of progress of assignments etc.

OB Unable to study at home, too much loud music. However, the family is offering a lot of support to the general studies.

OJ Phone calls and TV is a distraction. Being in my own environment makes it easier because I have all the things that I need. Parents are curious and willing to help, and have always been that way.

OM Distractions are what's on TV or what else there is to do. Everything hinges on the motivation level, if its low then easily distracted, but if its high then nothing distracts.

OP No distractions at home, studying is not a difficult task. Parents are quite involved, wanting to see how I'm going.

OQ Loud family activities, TV etc. can be distracting, plus the thought that I'll just do something for a minute and I end up being away for an hour. Its easier when the family is out. Being in my own environment can be good and bad. Parental involvement is minimal, but always sticking by my decisions.

Question 9: What are your thoughts on the atmosphere of the places where you learn? Can you describe any instances where you have attributed any successes or failures to this atmosphere

TE If liking the lecturer and the atmosphere then more likely to be involved. If only a few students can be bad for motivation. Environment is important where interaction is required.

TI Its a friendly atmosphere where you are treated like an adult. A bad atmosphere means bad results.

TL Its a good atmosphere as it is friendly. If I don't like the teacher then not wanting to listen and don't study at school.

TW A group of people with a common goal. The atmosphere is friendly and comfortable. If the atmosphere is poor then it would impact badly on results.

OB The atmosphere is sterile, that is the physical layout of chairs tables etc., but I guess it also has a positive impact on the learning. The relaxed atmosphere has a positive impact on the learning.

OJ The college has hot rooms. The atmosphere is not important, I'm there to learn, not socialise. Its nice to go and see people working, it increases motivation to get stuck in, especially if the people are your mates. I've been distracted by people and the E mail at the college.

OM Its very quiet, can spend quality time and do a lot of work without distractions. That can be negative though as there is no encouragement from other students.

OP Teachers are good, everyone's friendly, trying to help. Whenever stuck able to go to a teacher. A negative aspect is that it is a bit laid back, casual. You need a lot of motivation.

OQ Environment is nice, layout is good. It is harder to make friends as people are all doing their own thing. I need a study buddy, the interaction. People make it interesting.

Question 10: How do you balance your study and your social life? How do you decide if you are going to go out with friends or study? Have you ever attributed any successes or failures to your peers?

TE Friends tend to focus on studies so little distraction. Peers have little influence on studies.

TI Working part time at nights dictates social life. Peers have no influence on results. (See comments on Q1 where distraction of peers was major contributor to lack of success)

TL Balances friends to study timetable/ Friends understand so able to timetable ahead so little influence.

TW If study is complete, then not going out. Study is first priority. Friends have no influence on results in this course.

OB Peers at home are negative towards my course, but that only makes me more determined to finish. Friends at college are very supportive.

OJ Social life is at night so all study done during the day, if I'm finished then I can go out. If friends are ahead in the course it encourages me to get stuck in, lifts the motivation. Mates can distract when they are on holidays.

OM Complete my work during the week, socialise on weekends. If behind, go out first and then try to catch up afterwards. Friends at college are able to help with problems.

OP Study during the week and socialise on the weekend. Check the timetable and sort of follow it. No influence from friends on results.

OQ Can be hard to balance, but mainly study during the week and socialise on weekends. Friends are generally interested but learning in different fields, they have no impact on my results.

Question 11: What do you believe are the benefits, if any, of mass media when learning, thinking of things like radio, television, magazines, movies and newspapers?

TE The news is good, otherwise you become isolated, music can help the learning, movies are good for relaxation and are good for learning.

TI No benefits

TL No benefits, can distract from the study.

TW Media can promote the learning, its better than doing nothing, I listen to music.

OB Has a good impact as it can advertise courses available. Is not impacting on the learning.

OJ TV and radio are good for a break, but that can also be distracting.

OM No benefits or negatives to the learning

OP Informative but biased. Helps learning by keeping up with modern ideas.

OQ Media is good as I'm aware of what happens in the real world, the sorts of things that can go wrong. Music no impact as don't study with music.

Question 12: What is the course that you are completing at this college? Are you attending on a full time or a part time basis?

TE Associate Diploma of Business, Office and Secretarial Studies, Full Time

TI Associate Diploma of Business, Office and Secretarial Studies, Full Time

TL Advanced Diploma of Business, Accounting, Full Time

TW Associate Diploma of Business, Administration, Full Time

OB Associate Diploma of Business, Office and Secretarial Studies, Part Time

OJ Advanced Diploma of Business, Accounting, Full Time

OM Advanced Diploma of Business, Accounting, Full Time

OP Advanced Diploma of Business, Accounting, Full Time

OQ Advanced Diploma of Business, Accounting, Full Time

Question 13: Why are you completing this course? What has influenced your decision to undertake this course?

TE The course is cheap as it is short, it is also training.

TI To get a job, greater opportunities.

TL Parents occupation.

TW	Better chance of a job and will be more experienced.
OB	Previous course has sparked interest to go further.
OJ	Mates were doing accounting and doing well.
OM	A good job to get into and the course allows for entrance to University.
OP	Parents influence and the ability to get into University.
OQ	Already working in the accounting field, so Open Learning would suit. Needed a qualification above high school level and also allows to go onto University.

Question 14: Why are you studying at this particular college? What has influenced the reasons you study here?

TE	Because of time table clash with other college.
TI	Proximity of the college to home
TL	No choice
TW	College is close to home.
OB	Because it was Open Learning
OJ	Poor high school results meant that it was the only place I was able to get into, sitting a basic Maths and English test.
OM	Close to home so went to see what courses could be completed
OP	Selected for the Open Learning aspects of the college.
OQ	Because it seemed really good, you could complete the course at your own pace.

Question 15: What do you feel are some of the positive aspects of the college? What do you believe to be some of the negative aspects of the college?

TE	Numbers are low so motivation is low.
TI	The best thing is that its handy to home.
TL	The college is poorly located, away from services in a dangerous area.
TW	Student services and familiarity of the campus are pluses, a lack of parking is a negative.
OB	Able to work at own pace and sit exams whenever ready for them. Because its part time I can work as well.

OJ Job prospects are good, because its open learning employers will see that I'm self motivated

OM Tutors and the facilities that are available to students is a positive of the college

OP Lack of materials was frustrating.

OQ Go at own pace, lecturers really good, no need to stress out, so laid back and relaxed.

Question 16: How do you find the course that you're currently completing?, perhaps describe the good and bad points of it.

TE The course is poor with too much of a theoretical emphasis, not enough practical.

TI A two year course is a long time but it is relevant and I get a lot out of it.

TL The course is good as overall it is relevant.

TW Learning something new every day so always learning and its going to apply to me when I go out into the workforce.

OB If your having problems, you can get some help and go over it as many times as you like.

OJ The course is good, its interesting, I know that it is right. I get clear feedback. I'm able to know that an answer is right, and it doesn't take long to work it out. Too much law makes the course complicated and is hard to work out.

OM Its a good course, time consuming but good. There is a range of subjects but I am completing them slowly, on my own.

OP Progressing at my own pace is the positive aspect, but it is also negative as it allows too much freedom.

OQ The course is great, relevant to work.

Question 17: Could you describe your perception of an open learning environment.

TE Flexible times for students to study when they like, submit assignments when ready. Access to lecturers at set times. No good for lazy students, not personal and not immediate feedback.

TI You don't have to go to class, the time to study is up to the individual.

TL Learn it by yourself, spend a lot of time studying, teachers are there to ask if you have a problem. You go to school to have tests.

TW Learn at your own pace, see the teacher when you have tests.

OB Operating at your own pace. Taking exams when ready, though there is an underlying time limit otherwise you go for ever. Not all students are learning at the same pace. The learning is self directed.

OJ Forget about the classroom, go and leave when you want to. All the information you need is there, the syllabus is clearly laid out. There is no teacher telling you what to do, you can do it at your own pace.

OM Flexible hours, plan your time for your subjects.

OP It is completely self paced.

OQ If you've got a subject to study you can study it at your own pace. You can do more or simply the bare minimum.

Question 18: Could you describe your perception of an traditional learning environment?

TE Its a classroom, teacher centred where the teacher directs students and clarifies queries.

TI Specified times, teachers and classes.

TL Teacher supervises and knows how well you are doing. Can see if you are not understanding.

TW Learning in a classroom with other people.

OB Disciplined, austere, be told to sit down and learn.

OJ A school structure. Must be there at certain times, must attend class and exams at certain times.

OM Sitting down in front of the teacher and listening to him ramble on for an hour and a half - boring.

OP A teacher there all the time with students in a classroom.

OQ Teacher in the classroom covering the major topics and informing you of the most important parts of the tests.

Question 19: If you had to choose between studying in an open learning mode or a traditional mode, which mode would you choose? Why?

TE Prefer traditional, especially when young. When older perhaps open learning, as is better self disciplined, especially if had work experience. Need to be highly motivated.

TI Traditional, would do more if had to, easier with set times.

TL If teacher quality is good then prefer traditional mode.

TW Traditional, you learn a lot more from what other people have to say.

OB For mature age people, open learning as you can fit your study into your available time, much more flexible.

OJ Open learning for some subjects, but traditional learning for most. The hard subjects through open learning as can spend more time on them.

OM open learning as you can do what you want when you want as you feel the need.

OP Traditional as it has a structured classroom. I've changed from preferring open learning.

OQ Traditional as I lack motivation skills. If a few people are all wanting to do open learning together then open learning better as you are in control.

Question 20: Which mode of learning, traditional or open learning, do you think you would be most successful? Why? Which mode do you think you would enjoy the most? Why?

TE Traditional

TI Successful in traditional learning but would enjoy open learning more as I wouldn't have to be there.

TL Most successful and enjoyable would be traditional as there is immediate feedback, I can talk problems over with friends.

TW Traditional more enjoyable and successful as learning from other people.

OB Possibly open learning.

OJ All depends on the time limitations. If work is easy then choose traditional, but if hard do under open learning for more time.

OM Open learning because its more enjoyable and therefore I devote more to the studies.

OP Traditional, because you are all operating at the same pace.

OQ Traditional is more successful, but open learning is more enjoyable. Open learning is better when you don't need to spend time on the work.

Question 21: Could you place the factors listed below in the order which you think they have the most influence on the learning and ultimate achievement?

TE	1 = Motivation, 2 = Development, 3 = Ability, 4 = Quality, 5 = Quantity, 6 = Classroom Environment, 7 = Peers, 8 = Mass Media, 9 = Home Environment.
TI	1 = Motivation, 2 = Development, 3 = Ability, 4 = Quality, 5 = Quantity, 6 = Classroom Environment, 7 = Peers, 8 = Home Environment, 9 = Mass Media.
TL	1 = Motivation, 2 = Ability, 3 = Quantity, 4 = Quality, 5 = Development, 6 = Home Environment, 7 = Classroom Environment, 8 = Peers, 9 = Mass Media.
TW	1 = Motivation, 2 = Classroom Environment, 3 = Quality, 4 = Development, 5 = Quantity, 6 = Home Environment 7 = Ability, 8 = Peers, 9 = Mass Media.
OB	1 = Motivation, 2 = Ability, 3 = Quality, 4 = Home Environment, 5 = Classroom Environment, 6 = Quantity, 7 = Peers, 8 = Development, 9 = Mass Media.
OJ	1 = Motivation, 2 = Ability, 3 = Quality, 4 = Quantity, 5 = Development, 6 = Classroom Environment, 7 = Home Environment, 8 = Mass Media, 9 = Peers.
OM	1 = Motivation, 2 = Quantity, 3 = Peers, 4 = Ability, 5 = Quality, 6 = Development, 7 = Classroom Environment, 8 = Home Environment, 9 = Mass Media.
OP	1 = Motivation, 2 = Home Environment, 3 = Development, 4 = Ability, 5 = Quality, 6 = Classroom Environment, 7 = Quantity, 8 = Mass Media, 9 = Peers.
OQ	1 = Ability, 2 = Motivation, 3 = Quality, 4 = Development, 5 = Peers, 6 = Quantity, 7 = Classroom Environment, 8 = Home Environment, 9 = Mass Media.

Aptitudinal Factors

Abil = Ability
Dev = Development
Mot = Motivation

Instructional Factors

Quant = Quantity
Qual = Quality

Environmental Factors

Home = Home Environment
Class = Classroom Environment
Peers = Peer Environment
Media = Mass media

Student	1	2	3	4	5	6	7	8	9
TE	Mot	Dev	Abil	Qual	Quant	Class	Peer	Media	Home
TI	Mot	Dev	Abil	Qual	Quant	Class	Peer	Home	Media
TL	Mot	Abil	Quant	Qual	Dev	Home	Class	Peer	Media
TW	Mot	Class	Qual	Dev	Quant	Home	Abil	Peer	Media
OB	Mot	Abil	Qual	Home	Class	Quant	Peer	Dev	Media
OJ	Mot	Abil	Qual	Quant	Dev	Class	Home	Media	Peer
OM	Mot	Quant	Peer	Abil	Qual	Dev	Class	Home	Media
OP	Mot	Home	Dev	Abil	Qual	Class	Quant	Media	Peer
OQ	Abil	Mot	Qual	Dev	Peer	Quant	Class	Home	Media

Table C. 2: Student Interview Results, Order of the Influence of Productivity Factors