The nature of change in deep and surface study approaches: a study of student characteristics over time and across subjects

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To my parents

and

my family
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ABSTRACT

This thesis was concerned with persistence and change in Entwistle’s Approaches to Studying, the Deep and Surface Study Approaches.

Approaches to Studying were seen as part person-dependent and part context-dependent: the former implying persistence and the latter change. Therefore, it was hypothesised that these two aspects might interact differently when contexts, for example, subject disciplines studied, were not the same. In which case it was hypothesised that a context of exposure to a specialised subject discipline may arguably confirm or modify the student’s personal approach.

To explore this possibility in the first instance the association between Study Approach and choice of subsequent specialisation was investigated after which this association was followed through A-level specialisation contexts which were congruent or incongruent with the earlier expressed choice, with the expectation that the association (found) between Study Approach and choice would,

(1) intensify in congruent contexts
(2) weaken in incongruent contexts

At O-level it was found that Study Approach is associated with expressed choice of A-level specialisation, but one year later when Study Approach was re-tested, contrary to expectations this association did not intensify or weaken in contexts of specialisation that were congruent and not congruent, respectively, with the expressed choice. Linked with the one significant result, an overall increase in the use of surface approach over time, these outcomes suggest a need for an investigation into links between teaching approaches in Sri Lankan A-level classes and study approaches.
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 CHAPTER ONE

The nature of change in deep and surface study approaches: a study of student characteristics over time and across subjects

1.00 Introduction

Students are primarily in school to perform a function: to learn. We hear of successes often in research journals; perhaps news of failure is muted except in the popular press. However, educational research continues, endeavouring to modify processes in anticipation of encouraging more successful learning. This implies the need for a better understanding of the learning processes of the students.

The sources of information available to understand the students in the role of the learner are varied. Until recently, the emphasis was on the individual and individual differences. Much earlier, environmental influences were seen as the primary potential influence on successful learning. However, the complex milieu of the learning environment appears to require a different solution (Entwistle, 1998; Biggs, 1993) that combines both person and learning environment, the context. Deep and surface approaches to studying are an outcome of this model and its implications to success and failure in learning: deep study approach is positively related to academic achievement, whereas surface study approach is negatively related (Entwistle and Ramsden, 1983).

These study approaches purportedly have both person-dependent and context-dependent aspects. The person aspect of these study approaches implies persistence while the context aspect implies change. The situation may be complicated, however, if these two aspects (person-dependence and context-dependence) interact: a student’s habitual approach to the task of study may influence academic performance in, and motivation towards, certain subject disciplines. A context of exposure to a specialised subject discipline may arguably confirm, or modify, the intensity of the student’s personal approach.
1.10 The Problem
The interaction mentioned above appears to have been largely left open for exploration in research in student learning that have combined person-dependence and context-dependence aspects in its learning constructs. Could contexts chosen by students result in increased application of a study approach, whereas contexts inimical to their choice lessen existing practices? It is answers to these questions that are sought in this investigation, relating as they are to the nature of change of study approaches.

However, in the investigation, getting or not getting a context chosen by students (therefore, congruent or incongruent) are also regarded as contexts, though this necessity has not arisen in past research because these have mainly related to learning environments per se or perceived environments (Entwistle, 1991).

1.20 The overall question and the investigation

What would be the nature of any change in intensity of application (use of) study approaches over time, depending on whether students studied subjects of their own choice or not?

1.30 The Investigation
The present investigation takes advantage of the secondary school system in Sri Lanka, where the majority of the students move at the age 16 from a standardised broadly based multidisciplinary curriculum to a narrower and specialised subject range, motivated in most cases by personal choice. The research seeks to establish by cross-sectional survey to what extent students' level of use of approaches to study, before specialisation, are related to their preference for certain 'subjects' (classified broadly as Arts and Sciences) in the curriculum, and to their choice of subject in which they subsequently specialise. It will then seek to establish, by longitudinal data collection, to what extent the level of their characteristic study approaches are modified as they experience specialised study in conformity with, or in some cases at variance with, their original preference and choice.

In Sri Lanka since the early 1970s the secondary school system has had period of common General Education to all students to age 16, prior to that of specialisation
beginning at 17-18. Thus this situation appears to facilitate the examination of how
the level of a study approach is subject to change as a consequence of specialisation
when specialisation is preceded by a uniform education for all.

1.40 Some Basic Assumptions

Certain assumptions, however, underlie the present investigation. Among these are,
for example, that the school system in Sri Lanka is similar enough to those used in
previous research and subjects taught are the same. The study allows the testing of the
validity of applying Western concepts of learning in another cultural milieu.

1.50 Research Design of the Study

This overall question of the investigation suggests a longitudinal study, its reference
to ‘over time’ is an indication of this. Besides this, however, the need for a cross-
sectional study to identify relationships at the commencement that are examined in the
longitudinal study, follows. Thus there is the need for both methods to answer the
overall research question.

1.60 Research question in the cross-sectional study:

*What will be the relationships between expressed preference for subjects
they have been doing in the O-level curriculum and level of a study
approach, and between their choice of A-level specialisation and level of a
study approach?*

The intent of the question is to find out whether the relationships that exist at O-level
change due to context (e.g., A-level subject matter and congruency) in the
longitudinal study. These relationships are associated with study approach whose
change is the interest of the present investigation.
Research question in the longitudinal study:

*Does the type of association observed in the cross-sectional study between choice of A-level specialisation and intensity of study approaches increase over time with certain disciplines?*

This question examines whether the intensity of study approach increases if the student’s choice of specialisation is given, and whether the study approach decreases if the choice is not given, after a period of time. This takes into account in these circumstances, the nature of the earlier observed associations in the cross-sectional study. Whether it is an increase or a decrease in level of study approach that has occurred would depend on the nature of the earlier shown association between the level of a study approach and the choice of a subject discipline.

In the light of the possible different relationships that the intensity of study approaches may have with selected variables in the present study, their scores are bound to play different roles. It may be presumed that at the cross-sectional stage of the study the scores in the study approaches would function as the independent variable in relationship to preference and choice. It is in this sense that the ‘traits’ reflected by these scores might have a relationship with motivation towards certain subject disciplines as was mentioned earlier.

However, in the second stage, when examining persistence and change in the scores following specialisation, the study approaches will become the dependent variables. In other words, the intensity of study approaches will depend on the context of specialisation. Further, there appears to be potentially yet another occasion that they would become the dependent variable in this study. It is possible that the scores at this stage could be formed by differences in the context of General Education thus these study approach scores at this stage would become the dependent variable. But, since all students follow a common curriculum to Year 11 (end of General Education about age 16), this will not be considered a variable for this study.

It is anticipated that experimental control of variables would enter at this stage of the investigation. For instance, student groups with similar choices but with
General Introduction

different specialisation, and student groups with dissimilar choices but with similar specialisation.

1.80 Further Assumptions and Clarifications
This investigation takes place at a time when students' studying characteristics can be assumed to be to some extent labile or plastic (16-17 age range) and hence amenable for development or change. This also supports the need for a longitudinal approach.

Reference was made in earlier sections to the possible changes in a study approach. This could be recognisable in two ways. One is when there is a categorical change of a study approach of a student. For example deep study approach of a student changes to surface study approach and vice versa. This does not mean one study approach decreases and the other increases, but that the emphasis would change completely from one approach to the other. This is not the case here, even though earlier research has mostly considered such a change detected through interviews. The evidence for different view of a change in study approaches has come from the use of questionnaires. As a consequence, this study will investigate the increase or decrease in the level of either a deep or surface study approach as two separate variables through questionnaire data. Therefore, a change in level could be either an increase or a decrease for either approach and independent of each other.

1.90 Concepts in cultural context
A less formal question is how applicable is this set of constructs (study approaches) to a non-western school system such as that in Sri Lanka? Regarding the Study Approaches, most of the research in this field has been conducted in England, other European countries (Netherlands and Sweden), and Australia. There appear to be differences across countries that might influence the use of these. That is, the meanings of these constructs may be socially construed so the meaning that the study approaches have to the students may vary with their culture. Whether the constructs of deep and surface approaches to studying themselves have similar meanings to that in the Western setting are aspects that have only recently begun to be questioned (for example, Richardson, 1994; Kember and Gow, 1990). In this case, following a traditional curriculum as in Sri Lanka has repercussions for the investigation, due to its strong emphasis on memorisation which is associated with one of the study
approaches (surface) investigated here. Also, parental influence maybe stronger in the decisions that the students make, e.g., choice of A-level specialisation (the expected specialisation). In this instance the concept of choice held would be culturally biased. In spite of these difficulties research has to proceed and qualify the findings taking these into account. However, these are some of the pitfalls that the investigator has to be aware of.

1.91 The significance of the study
Some of the aspects of the study that are envisaged as having an impact on education are as follows:

- The proposed study is valuable in that it may help resolve whether the person aspect (persistent) or context aspect (changing) of study approach is dependent upon certain contexts (that is, contexts (or disciplines) of choice). If this shown to be the case, then these findings have implications for the definition of the concept of study approach as proposed by Entwistle. Thus the investigation has the potential to find out whether the person aspect and context aspect separation in study approach are a valid one.

- There is potential in the investigation to determine whether an educationally desirable study approach could be sustained in a context to which it has shown a positive motivation. If possible, this would pave the way to the personalisation of instruction.

- In the wider sphere, there may be benefits for a more successful instructional design that would arise by taking into consideration learning and study approaches, for instance, taking into account students’ different perceptions in the same learning context. Thus, to try to improve the processes employed in schools by changing just one factor (e.g., the assessment system or the study methods of students) is likely to be counterproductive if other components of the system remain unchanged (Ramsden, Martin and Bowden, 1989). The apparent inadequacy of instructional design based on simple general laws of learning (e.g.,
as in behaviourism or information processing models) is suggested in the model of learning investigated in the present study.

- approaches to studying that describe how students study emphasise the process component of studying. As such, the present investigation appears to be using a general purpose instrument and hence one of greater utility in quantifying such characteristics.

1.92 Format of the thesis
The thesis will proceed in Chapter Two, with a survey from the literature of Educational Psychology, of the main theories and research findings, which illuminate the ways in which students study and learn. Particular attention will be given to the various conceptual models which have been used in attempts to identify components of the learning process, and to ways in which these have been employed in the design of diagnostic testing methods to characterise the personal strategies of learners. In Chapter Three some application of these schemes will be examined to see in particular to what extent it has been claimed that the measured characteristics have permanence and/or are subject to change. This will lead to a development of, and a statement of, the specific research questions and hypotheses of the present investigation. The Sri Lankan system of secondary education will be described and compared with others in Chapter Four, to provide a basis for a discussion of methodological issues, protocol of the research strategy, and a description and choice of the research instruments to be employed in Chapter Five. This will be followed by Chapters 6 and 7 which provide results of the analysis of data and the interpretation, respectively.
CHAPTER TWO
Theoretical Frameworks and Instruments in
Learning and Studying Research

2.00 Introduction

It is evident from the relevant literature that recent research studies in learning and studying are employing a variety of constructs and corresponding instruments. The activity is especially visible in the higher education sector (e.g., Entwistle and Ramsden, 1983; Schmeck et al., 1977; Biggs, 1987a). However, attempts are also being made to extend such research to the secondary school sector (e.g., Entwistle and Kozeki, 1985; Eklund-Myrskog and Claes-Goran, 1999). This chapter intends to present some of the more popular constructs and frameworks, and examine the common features among them with attention given to their differences, as well as to conflicts that have arisen in this field. How such conflicts have been resolved will be examined, along with some evaluation of the quality of the resolutions that have been offered. This process will refer to the research question for this study at appropriate points. One of the aspects regarding the present research question is the issue of how person and context might influence the constructs such as those examined in this chapter. The examination of these constructs and instruments will lead eventually, at the end of this chapter, to the selection of the most appropriate ones to answer this research question. However, it would appear appropriate first to consider research on learning associated with teaching as a means of placing the discussion in the broader context, which is desirable. To do so, an overview of thinking about learning is necessary. This includes discussing currently held beliefs about nature of learning, perspectives on learning research and its usefulness to teachers, and the movement in instructional theory toward conceptions of learning as metacognitive awareness, each of which and related aspects to these are discussed below in section 2.10.

2.10 The Background

Currently held views about nature of learning

Effective learning is seen as most likely to occur when the learner is an active participant. Research on learning suggests that even in the simplest of cognitive tasks, the learner should be actively transforming the resource material, as well as his/her cognitive structures of the concepts involved.
However, to guide the teacher in the classroom, a number of explanations of student learning, theories and concepts, exist. As summarised by Entwistle (1987, p.5), the origins of these range from behaviourism (Skinner, 1954; Bloom, 1976), through considering individual differences (e.g., Gardner, 1984; Eysenck, 1965), to that of individuality in learning (Rogers, 1969), all existing side by side.

These explanations of optimal learning conditions give regard to the learning processes involved and the process of student learning. Thus ‘making connections’ is related to behaviourism, and is dependent on environmental stimuli or ‘context’. On the other hand, the person aspect of the student dominates discovery learning in explanations in cognitive psychology.

A theory of learning generally considered helpful for adoption in the classroom teaching situation is the somewhat eclectic concept of schema theory (Desforges, 1999; p.6). In this theory, the unit of analysis of learning is a ‘schema’ that represents a person’s organised experience as it refers to a specific context or setting. The term denotes the ‘totality of stored knowledge, attitudes and behaviour relevant to a particular subjective experience’ (Desforges, 1999; p.6). In this theory learning is considered as the modification of existing schemas. There appear to be several learning processes involved in this modification: accretion, tuning, and restructuring (Norman, 1978). Accretion refers to the acquisition of new ‘pieces’ of knowledge to a schema. It is explained that this might take the form of the acquisition of a new fact or a new example. This is the simplest of the three processes of student learning. Tuning is associated with schema becoming increasingly automatic. No new facts are involved. Rather, as Desforges (1997) says, ‘redundant steps in procedures are eliminated or short-cuts found, often subconsciously’ (p.7). The last mentioned of the learning processes, restructuring, is characterised in schema theory by creation of new insights. Re-organisation of existing knowledge occurs and past experience is looked at anew. These learning processes are generally thought of as being ‘inbuilt’, and thus appear to portray person-dependency. This view could be a consequence of cognitive emphasis in this theory as indicated by the reference in it to such aspects as ‘subjective experience’. The Piagetian concepts of assimilation and accommodation may be placed alongside the learning processes mentioned here (Piaget, 1972).
Other frequently described student learning processes are learning styles and approaches to studying and learning. The former are met with as in the work of Kolb (1984) who states styles met with the ‘learning cycle’: concrete experience, reflective observation, abstract conceptualisation and active experimentation. Deep and surface approaches to studying are examples of approaches to learning and studying. Learning styles could reasonably be placed in the person-dependent category of learning processes.

However, the teachers are aware that classroom learning takes place in a complex interacting environment, and neither simple behaviourist laws nor individual differences associated with ‘single’ interactions (e.g., extroversion with discovery learning/introversion with expository teaching) appear sufficient to explain the complexity involved. They could exist alongside other explanations to explain specific situations of learning. The complex milieu, intellectual and varied curricula signal that learning is a process explainable jointly by a number of components (i.e., cognitive abilities, mental strategies and motivation). However, this process perspective may be most appropriate for some learning situations, e.g., where a complex milieu exists.

The newer perspective, individuality, builds on the above mentioned descriptions of learning, but from the pupil’s perspective to order to better understand learning. Described as the Student Approach to Learning (SAL) position, impetus to which was given by the work of Marton and Saljo (1976a), this is summarised below. Drawing from Biggs’s (1993) and Watkin’s (1996) detailed examination of this position, five characteristics are key to its origin:

1. the position arose out of a dissatisfaction with aspects of cognitive psychology and the information processing model of learning, regarded as ‘sterile’;
2. it is derived from a ‘bottom-up’ perspective, therefore ‘naturalistic’;
3. it is the perspective of the student not that of the teacher or researcher;
4. as most students recognise that motivation and context affect their learning methods, this is reflected in SAL theory;
5. the position proceeded in two directions, qualitative and quantitative.
Once the position (SAL) was agreed upon, the quantitative approach could be used effectively to identify influencing variables (Watkins, 1996).

**Learning and Instructional Theory**

Explanations of learning have resulted in corresponding instructional designs (Tennyson et al., 1997), and the above mentioned explanations of learning are no exception.

Thus for behaviourist, individual differences and individuality explanations, their application techniques and concepts are seen in programmed instruction, personality and learning styles, and approaches to learning (Marton and Saljo, 1976a; Entwistle and Ramsden, 1983), respectively.

According to style theorists, a broad range of simple modifications in instructional planning can remove children’s’ barriers to learning and enhance their achievement. The method includes tailoring individual programs to match the child’s approach, whether it is global or analytic, whole to part, or part to whole, implemented by allowing students to sit in pairs, groups or alone, according to their style preferences. Interest in students’ learning styles is linked to the notion of a personalised view of education (O'Neil, 1990; described in Delacruz, 1998). This notion is appealing especially with the realisation that we are educating an increasingly diverse student population. However efforts to fit instructional styles to personality characteristics like learning styles have given mixed results (Graza, 1990; described in Delacruz, 1998). Researchers have not resolved whether matching teaching styles of the teacher or instructional methods of the curriculum to the learning styles of students give better results (Curry, 1990; described in Delacruz, 1998). Competing learning style models as well as feasibility problems of being adequately proven in the classroom appear to hinder their implementation.

The inadequacy of the behaviourist model to explain learning in a complex milieu is apparent. However a coherent instructional theory emanating from the SAL position is not clear, though problem-based learning more than conventional programmes appears to be associated with higher levels of meaning orientation (Newble and Clark, 1987), at least in the earlier stages in medical education. However, changing conceptions of learning rather than teaching skills per se are included in staff development programs, flowing from the SAL position and linked with metacognitive awareness (e.g., Norton and Crowley, 1995; Ho et al., 2001).
This is an advantage of the SAL position. However, with the advent of the Approaches to Studying into new pastures concern has been expressed of the deep/surface metaphor (Webb, 1997). There is now a corresponding interest in teachers ‘approaches to teaching’ (e.g., Trigwell et al., 1994; Trigwell and Prosser, 1996; Lingbiao and Watkins, 2001), perhaps with an intention of developing in the future a complete instructional theory.

Approaches to Learning and the Curriculum

It would appear inadequate for this background section not to mention desirable outcomes of education in relation to learning and instruction, though it is not intended to delve deeply into curriculum theory. The desirable outcomes of learning, both at college level (Perry, 1970) and in the Universities (Entwistle and Percy, 1974), as well as in secondary schools have been stated, with critical inquiry and understanding being especially stressed. Investigation of students’ Approaches to Studying could be expected to make a significant contribution to examine the prevalence of this condition. Hence making use of constructs related to the SAL position in the present investigation might appear to have a number of advantages which will be examined further in the rest of the chapter.

Study Approaches and academic achievement

Another reason for seriously considering study approaches concept as a potential construct for the investigation is its shown relationship with academic achievement. Thus with some consistency, in research findings intensity of deep study approach related positively with academic achievement whilst intensity of surface study approach related negatively. Therefore, there is a tendency to discourage the adoption of the latter approach amongst students in order to reap academic benefits (e.g., Entwistle and Tait, 1990).

The above mentioned advantages of the SAL position justifies looking at the issue of central importance in it, that of studying learning from the pupils’ perspective, which is done next.

Learning from the pupil’s perspective

The added advantages of looking at learning in the same vein (cognitive psychology and its developments thereafter) but from the individual pupil’s perspective are
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pointed out by Entwistle (1987; p.56-57). He argues that the study in cognitive psychology of individual differences in relation to learning has focussed on student responses to teacher or experimenter impositions or standards to be met, and hence has not reflected true freedom in learning and its individuality. He also maintains that Rogerian cognitive psychology is not meant for the school situation, but rather for the clinical situation. Thus the more recent emphasises in student learning appear to be two-fold:

1. learning from the individual pupil’s perspective,
2. in authentic situations (school situations).

The outcome of these emphasises appears to be the concept of approach to learning and study with which the present investigation is related. This endeavour is described, to reiterate, as the SAL position, and sees learning as taking place in a “soft, slimy swamp” (Schon, 1987; p.3), rather than in a laboratory, that is, in a natural setting.

The present investigation leans towards the above mentioned features to resolve the research question(s), but two shortcomings of this approach should be noted:

1. whether students are capable describing their own learning,
2. whether reliability could be expected in these introspective responses.

Resort to Models of Memory

The advent of cognitive approaches to learning and understanding appear to be by necessity associated with models of memory. Thus if transformation of knowledge is to occur during learning, this knowledge in the first instance has to be stored somewhere which leads to a notion of the existence of a long-term memory component in a suggested model of memory. The need to possess a short-term component of memory in this model of memory is also indicated as in the case of learning meaningless content. So is the need to state a component of working memory in this model so as to provide an interface or site for the incoming stimuli and long-term memory content to meet each other for transformations to occur. Thus learning in cognitive psychology and developments in it thereafter appears linked with memory processes. Cognitive styles could be considered as contrasting ways of
searching memory (Entwistle, 1987; p.55), within the folds of the information theory (IP) theory. For example, different cognitive styles could be considered as employing analytical versus global approaches. These in turn appear to depend, in part, on the different memory processes used, e.g., visual imagery, episodic and semantic aspects of memory. A possible relationship of cognitive style with ‘learning style’ is discussed in a later section.

2.20. The range of the recent research activity
Marton (1981) appears to have adopted phenomenology as his primary approach to determine students conception of learning through intensive interviews. A derivative of this approach has been large-scale questionnaire administration where questions are based upon concepts and definitions identified through interviews (Entwistle et al., 1979). Research activity has given rise to the numerous constructs and instruments based not on a single theoretical perspective but on many of these. A representative sample of these will be considered in subsequent pages the following concepts and their various forms of manifestation occupying special places since these are ones related to the present investigation.

- the concept of approach to learning and studying
- learning styles

The first mentioned is discussed in detail in The Experience in Learning, by Marton et al. (1984), of which they are the editors. This volume presents descriptions of the original research studies carried out in the 1970s and the early 1980s. It now has entered a second edition (Marton et al., 1997).

Interest is not restricted to the higher education sector, illustrated by the publication Understanding Classroom Learning by Entwistle (1987), which may be considered a parallel volume to the earlier published one regarding undergraduates, Understanding Student Learning (Entwistle and Ramsden, 1983). The publication of the former gives confidence to conduct the present study that addresses school children approaching higher education age. On subsequent occasions one can see an application of some of these constructs, with the instruments adapted, at the secondary school level (i.e., Biggs, 1991; Entwistle and Kozeki, 1985; Selmes, 1987) as well as with college students (Schmeck, 1983).
2.30 Approach to Learning/Studying

Three groups of researchers converge on this conception of learning, representing the SAL position (Student Approaches to Learning). Their work is separately noted below.

(A) Levels of processing

Marton and his colleagues in Gothenburg University, Sweden, carried out the original work regarding this concept of learning. What is different in their work from that of earlier is that of looking at learning from the pupils’ perspective rather than it being decided in advance from the notions of teachers, educationists, and researchers. Hence this has involved interviewing students individually, a methodology that befits this perspective.

Their founding work (Marton and Saljo, 1976a; 1976b) has investigated, one of the commonest academic tasks, although in an experimental setting, that of reading an academic article. The realistic character of this task makes it different from those that are employed in such experiments as rote learning, thus distancing from the latter kind. They were interested how students went about these everyday academic processes. As Marton and Saljo (1997) recalls:

Students were asked to read the article, knowing that they would be asked questions on it afterwards. Besides the questions of what they remembered of its contents, students were also asked questions designed to discover how they tackled this task (p.40-41)

The conversation between the student and the experimenter has been recorded and transcribed verbatim subsequently. The aim of the experiment was to find out how the students arrived at the qualitatively different ways that were present in the understanding of the text read (Marton and Saljo, 1997; p.41). They had found marked inter-individual differences in the types of learning processes that students engage in when confronted with such learning materials. These are referred to, by them (Marton and Saljo, 1976a; p.7), as levels of processing. Two such levels had been distinguished, deep-level and surface-level, corresponding to the different aspects of the learning material on which the learner focuses. They describe these two levels:
In the case of *surface-level processing* the student directs his attention towards learning the text itself (*the sign*), i.e., he has a ‘reproductive’ conception of learning which means that he is more or less forced to keep to a rote learning strategy. In the case of *deep-level processing*, on the other hand, the student is directed towards the intentional content of the learning material (*what is signified*), i.e., he is directed towards comprehending what the author wants to say about... (Marton and Saljo, 1976a; p.7-8).

Originally, as Entwistle (1997; p.18) says, "...this distinction was described in terms of differing ‘levels of processing’, but recognising that it was the distinctive intention which led to these processes, the term *approach to learning* was subsequently adopted" (p.18). This, as Entwistle (1987, p.58) says, is a single concept describing two distinctive groupings—deep and surface (approaches to learning).

Entwistle (1987) also points out that the intention referred to above could only have been known from hindsight rather than in advance. Thus he says,

Perhaps the most crucial discovery, which in retrospect seems obvious, was that the processes used depended on the intentions of the student. Although it is obvious that intention will influence how the learning is carried out, it was not obvious in advance that students given the same instruction would interpret it so differently as to imply markedly different intentions (Entwistle, 1987; p. 58).

Elaborating on these approaches Entwistle (1987) says:

With a *deep approach* the intention is to *understand* the meaning of the article. This intention generally leads to a lively interaction with the content of the article, relating it to previous knowledge, other topics, and personal experience. The evidence within the article is also examined carefully in relation to the author’s conclusions, and often reassessed to produce alternative conclusions. If this approach is carried out thoroughly, and the student’s knowledge of the topic is adequate, the outcome is almost inevitably a deep level of understanding... (Entwistle, 1987; p.58).
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With respect to the other approach, surface approach, his elaboration is,

With a *surface approach* the intention is limited to completing the task requirements. Attention is switched from the author’s meaning to the anticipated questions. The task is viewed as an external imposition devoid of personal meaning, and the student skates over the surface of the article seeking likely topics for questions. Once that information is identified, it is memorised by repetition and rote learning. The material is thus related to the event of reading the article, and not to previous knowledge or personal experience (Entwistle, 1987; p.58).

The event of *reading* the article reigning supreme in the surface approach, with the dire consequences of misunderstanding it is put aptly by Mackeachie (1997) writing the Forward to the Second Edition of *The Experience of Learning*:

> It is the intention to learn from the text, which makes people misunderstand it (Mackeachie, 1997; p. viii).

Entwistle (1991) points out that Deep and Surface approaches to learning make use of two fundamental cognitive processes described by psychologists as *rote* and *meaningful* learning (Ausubel et al. 1978), and that these are available to everyone (p.80). Marton’s contribution has been to show that, though available, they are not always appropriately used (Entwistle, 1991; p.80). However an important point arises here: are they *equally* available to a person? From what has been presented above Marton appears to think so. However if Ausubel’s division is also about individual differences its more likely that they reside unequally within a person. This in turn has implication to a study such as the present one which investigates persistence or change of study approaches.

The findings of the Gothenburg group are with respect to *particular* tasks and not so much as to the consistent operation of approaches to learning across different tasks. This feature leads to the notion that the approaches to learning found by the Marton group are *context-dependent* or, as Biggs (1993) describes them, *on-line* strategies. The present investigation’s research question, it may be reminded, is

2-10
related to the context versus person debate in study strategies and is thus inclined to give regard to the findings described above to see that side of the issue, i.e., the possibility of a context effect.

**Conceptions of learning among school children**

The qualitative outcomes of learning Marton described are not only related to how the content is processed, they are also linked chain-wise to different conceptions of the learning material. While the SAL approach thereafter bifurcated with some researchers focusing on assessment of the learning approaches, Marton continued his early work and probed different conceptions of learning among students (Watkins and Biggs, 1996). Research has identified six conceptions of learning (Marton et al., 1993; p. 283) these being:

A. Increasing one’s knowledge  
B. Memorising and reproducing  
C. Applying  
D. Understanding  
E. Seeing something in a different way  
F. Changing as a person

These different conceptions of learning were also found to be present in secondary school children and thus a base appears to exist for their different learning approaches.

**Approaches to Studying**

The Entwistle group working in Britain also became interested in the process of student learning and how the students learn. They found from their earlier studies (Entwistle and Wilson, 1977) that different study methods, work habits, motivation, and personality combined to give far better predictors of university academic performance than the traditional measures of it such as aptitude. Thus Entwistle (1998) says:
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...that variables which directly described behaviour and attitudes within the academic context were likely to be much better predictors [of degree performance] than more psychological variables (Entwistle, 1998; p. 113).

Further, interview studies (Entwistle and Wilson, 1977) had suggested that different students perceived their academic environments in very different ways. These observations have indicated "that correlational studies did not suggest, in a meaningful way, what might be done to improve teaching and learning in higher education" (Entwistle, 1998; p.113). Considerations such as this have led, from their previous focus, to a "change of direction - an attempt to understand the processes of studying - and not just to describe correlates of different outcomes of learning" (Entwistle, 1998; p.114).

This search for concepts that have greater ecological validity had been forthcoming (Entwistle, 1998) in the form of Marton's concept of approach to learning described in the previous section. Their previous findings on motivation, study habits, etc., were later incorporated into this concept, where they use the label "study approach" (mostly), instead of approach to learning.

Motivation in Study Approach

The outstanding contribution of the Entwistle group appears to be their emphasis on intention and motivation in academic learning that are lying behind and directing the more cognitive processes. The group is emphasising academic learning, and by implication academic tasks. The attempt is to denote uniqueness in academic tasks. In most psychological tasks, however, motivation is taken for granted, by means of establishing rapport. Thus motivation ceases to be a 'problem'. Hence deep and surface approaches are more frequently used in the academic context, though they need not be ruled out in other tasks.

The learning environment

The preliminary observation made by the Entwistle Group presented above that "different students perceived their academic environments in very different ways" (Entwistle, 1998; p.113), refers to the learning context. Though the influence of context upon approach will be taken up for examination in the next chapter, its
relevance to the present research question would be apparent. However whereas
Entwistle appears to emphasise the variation in perception of the academic
environment by students, incorporation of the term preference as used in the present
investigation is expected to be in the direction to concretise it (perception). Thus, for
example, the preference for a subject in the curriculum is asked in the present
investigation.

Approaches to Studying as individual differences
Whilst the Entwistle Group shared the interest with the Marton in learning and
studying from the pupil's perspective, it built upon the latter's qualitative findings and
their own (Entwistle et al., 1979), to develop a questionnaire that enables large scale
survey research (Entwistle and Ramsden, 1983). By this very token they shift their
stance in this field of research to a study of individual differences (whereas Marton is
interested in, as mentioned at the outset of the previous section, inter-individual
differences). The observation of consistencies across tasks by individuals, they say,
justifies the measurement of the approaches of learning through inventories
(Entwistle, 1987, p.17). However, they prefer to label them approaches to studying
instead, since one can make inferences about learning from reported study
approaches. The concept of individual differences being related to the 'person' aspect
and the latter in turn implying persistence, approaches to studying become a strong
contender to be employed in the present investigation.

Categorisation of approach and not the student
Yet, it is not the student who is deep or surface, rather his or her approach. The
following statement conveys this:

It would be wrong to give the impression that students can be
categorised as 'deep' or 'surface'. Their approaches vary from to
some extent from task to task and from teacher to teacher. It is the
approach that is categorised, not the student. Nevertheless, the
relative balance between using deep or surface approaches does
reflect differences between individuals and can be measured using
an inventory (Entwistle, 1987, p.61)
Thus individual differences as well as contextual influences lie at the heart of approaches, yet the greater contribution lies, for Entwistle, toward individual differences.

Factor analysis results of 'approaches to studying' in secondary schools
The first study to determine factorial validity relating to 'approach to studying' at the secondary school level appears to be that of Entwistle and Kozeki’s (1985). The inventory used, Inventory of School and School Work, was a school version of the adult ASI that also contained sub-scales of motivation towards school work, as the aim of the investigation was to relate these to the study approaches. The sample was 614 British and 579 Hungarian pupils aged 13/17. Of interest here are the results relating to the 'approaches to studying' or orientations to studying described fully later.

Results of the study indicated three factors corresponding to the hypothesised 'approaches to studying', meaning, reproducing and strategic orientations, with the factors relating to the meaning and reproducing orientations being clearly represented. These results largely demonstrate the factorial validity of 'approaches to studying' or the orientations to studying in secondary school samples. Deep, surface and strategic approaches to studying are represented in these three orientations to studying, respectively. Of these, deep and surface approaches to studying are used in the present investigation, and the results of this study appear to demonstrate their independence.

In a similar study Selmes (1987) has attempted to identify approaches to learning in secondary schools of Northern England. Factor analysis has helped him to select items for the inventory. The approaches within the orientations that the factor analysis had identified were: deep, surface and study organising, thereby demonstrating the factorial validity of the approaches to studying constructs at the secondary school level. Entwistle (1988) appears to go further and states that they are probably present at the primary school stage. For evidence regarding this view he quotes the work of Francis (1982, 1984) who talked to children who were beginning to read and write. It is from these conversations that the similarity has been discernible.
Mentioned above are a few of the studies that attempted to identify approaches to studying at the secondary school level from Western countries. Studies at the secondary school level with respect to approaches to studying in non-western countries are also reported. These will be considered in Chapter Four where cultural influences upon study approaches are discussed. Overall, the studies discussed in this section appear to support construct validity of the proposed study approaches constructs though some were loaded on separate factors. The merging of the Deep and Strategic study approaches was one such instance.

Up to this point the study approaches have been stated somewhat in the abstract. Hence it appears timely to state the defining features of them. These are presented in Figure 2.1, following which the factor analytic results with adults are presented. Since many more studies have been conducted in this sector perhaps the secondary school sector could benefit from these findings. Hence it is to this aspect we turn now, after noting the defining features of study approaches referred to above.

Defining features of Study Approaches
A third study approach had also been indicated in their early qualitative study. This is referred to as the Strategic approach. This depends on well-organised studying and alertness to assessment criteria (Entwistle, 1998; p.114). The construction of the above mentioned Inventory has necessitated the operationalisation of the study approaches. Figure 2.1 shows how a recent publication describes the defining features of these. Entwistle (1997) describes them as the features of the three approaches to learning that have emerged from the studies making up the new edition, and from other research (p.19-20). The defining features of each study approach are grouped into components that include intention.

Factor analysis results of the adult inventory (Approaches to Studying Inventory-ASI)
After substantial development work this instrument has been produced and it has been administered to a national sample of 2208 students from 66 university and polytechnic academic departments drawn from six contrasting subject areas.
Deep Approach
*Intention* - to understand ideas by yourself

*Transforming*

*By*
Relating ideas to previous knowledge and experience
Looking for patterns and underlying principles
Checking evidence and relating it to conclusions
Examining logic and argument cautiously and critically
Becoming actively interested in the course content

Surface Approach
*Intention* - to cope with course requirements

*Reproducing*

*By*
Studying without reflecting on either purpose or strategy
Treating the course as unrelated bits of knowledge
Memorising facts and procedures routinely
Finding difficulty in making sense of new ideas presented
Feeling undue pressure and worry about work

Strategic Approach
*Intention* - to achieve the highest possible grades

*Organising*

*By*
Putting consistent effort into studying
Finding the right conditions and materials for studying
Managing time and effort effectively
Being alert to assessment requirements and criteria
Gearing work to the perceived preference of lecturers

Figure 2.1 Defining features of approaches to learning (After Entwistle, 1997)
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(Entwistle and Ramsden, 1983). The factor analyses of these results have suggested the existence of four main study orientations:

- **meaning** (incorporating the deep approach)
- **reproducing** (surface approach)
- **achieving** (strategic approach)
- **non-academic** (later called apathetic, involving disorganised studying and negative attitudes)

(After Entwistle, 1998)

The reasons Entwistle gives to use the term orientation to these factors is important to note from the point of view of this investigation. Thus his explanation (Entwistle, 1988),

> The term orientation was chosen to indicate both a consistency of approach and the existence in, three of the factors, of both approach and motivation (Entwistle, 1988; p.32).

refers to consistency. This term appears to carry a notion of persistence and hence is of importance to the present investigation.

Important to the research question also is the reason he chose to use the term 'orientation' rather than 'style' which also refers to individual consistency as does the results of factor analysis. But 'style' has, in addition, implies stability due to its innate nature, which apparently Entwistle wants to desist from attributing to his construct. He makes the comment that style is used in a more limited sense (Entwistle, 1988, p.25). The four factors, with their approach and motivational components are shown in Figures 2.2 to 2.5. Also included are Pask's (1976) learning styles in the way they have loaded on these composite approaches.
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Figure 2.2 Meaning Orientation

Figure 2.3 Reproducing Orientation
Figure 2.4. Achieving Orientation

Figure 2.5 Non-academic orientation
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Integrated conception of approaches to learning and study
Thus it is evident from the work of the Entwistle group that their aim has been to construct composite dimensions of learning and studying, combining many components in each dimension. The assumption that could be made under these circumstances is that the attempt has been to ‘capture’ as many as possible of the elements that go towards explaining learning and studying in the realistic learning environment. Rayner and Riding (1997) in a recent categorisation of ‘learning styles’ is of similar view when they say that “Entwistle attempted to link instructional preference to information processing...” (p.16) suggesting realistic learning connections. The building up of an integrated view of learning is also evident. Thus Rayner and Riding’s (1997) classification describes Entwistle’s work as that he, developed a model of learning style (the common term used by them for all learning centred approaches) which consisted of four aspects: meaning, reproducing, achieving and holistic orientation. As part of this model of learning style, Entwistle developed an integrated conception of the learning process, which described a series of learner actions linked to specific learning strategies identified in his original model. Thus, a student engaged in ‘reproducing learning’, who is characterised by ‘extrinsic motivation’, will adopt a style called ‘surface approach’ and achieve a learning outcome which will consist of ‘surface level understanding’

Scales in the orientations to studying
The orientations give the appearance of integration of different behaviours as indicated by combinations of the separate sub-scales. Hence it may not be necessary to use all the sub-scales of an orientation in a study. A single sub-scale from an orientation would not be devoid of meaning in a study. It would convey the general meaning of the orientation by virtue of being a component of only that one orientation. It is the results of the factor analysis described above that make this a possibility.
**Theoretical Frameworks and Instruments**

*Definition of Study Approach*

The definition that will be used here is derived from the following:

Approaches to studying are a product of the interaction between the characteristics of the individual students and their perceptions of courses, teaching and assessment procedures (Entwistle and Waterson, 1988; p. 264)

Thus the concept of study approach is a complex one, it is made up of by a number of variables, some of which are within the student, and some of which are within the context. Adding to the complexity are the interactions amongst these that produce a particular study approach. Entwistle stresses that it is the *perception* of the physical environment (learning context) that matters and not the physical context *per se* (Entwistle, 1991, p.89). With this emphasis it appears that the traditional duality of person and context merges to become a single concept.

A more recent definition of Study Approach advanced by Entwistle (1998) considers it as a *disposition*. He says,

Approaches to studying, as derived from quantitative analyses at least, can... be seen as a disposition, describing a relatively stable characteristic of individual student in relation to learning in a specific situation (p. 115).

This formulation, according to Entwistle (1998; p.115), takes also into consideration the third components in the triad of abilities, inclinations and sensitivities that constitute dispositions (Perkins et al., 1993; Snow et al., 1996). The third, sensitivity to context is now added to the Factor Analysis results. This inclusion is apparently prompted by the recent observation that students with contrasting approaches might in fact *prefer* particular learning environments (Entwistle and Tait, 1990: second study).

Viewed from the perspective of the research question the use of the term *disposition* in this definition is significant. It relates strongly to the person component of study approach, persistence and change of which is the focus of the present investigation.
Converging towards the concept of approach in student learning and studying, i.e., viewing this aspect from that of the pupil's perspective and in realistic terms, is a result of the independent work of Biggs (1987a) in Australia. Whereas Entwistle added motivation to the original conception of approach, Biggs (1978) reinforced the idea that students can take one of three paths to learning (Speth and Brown, 1988; p.248), each consisting of a motive and strategy for studying.

Thus Biggs (1987a) has proposed similar multidimensional constructs of learning, in which he speaks of motive-strategy congruency, meaning that approach to learning is a function compatible with motivation and cognitive strategy. The cognitive component in the Entwistle formulation is carried by the process component of study approach.

Thus the aim of both Entwistle and Biggs has been to develop and build upon Marton's initial surface and deep processing concepts, which are largely cognitive in nature. The assumption of Biggs (1993) is that in the complex environment of learning in higher education purely cognitive constructs may not suffice.

In his earlier work Biggs (1979) found three main factors naming them, Internalising, Utilising, and Achieving, containing the cognitive and motivational parts shown in Figure 2.6. Subsequently he has renamed Internalising and Utilising as Deep and Surface approaches respectively due to their similarity to the Entwistle construction.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cognitive</th>
<th>Motivational</th>
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<tbody>
<tr>
<td>Internalising</td>
<td>Meaning assimilation</td>
<td>Intrinsic</td>
</tr>
<tr>
<td>Utilising</td>
<td>Fact-rote strategy</td>
<td>Extrinsic</td>
</tr>
<tr>
<td>Achieving</td>
<td>Study skills and organisation</td>
<td>Fear of failure</td>
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<td></td>
<td></td>
<td>Need for achievement</td>
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**Figure 2.6** Cognitive and Motivational Components of Learning Processes (After Biggs, 1979)
Approaches to Learning in the secondary schools with the Learning Process Questionnaire (LPQ)

The work of Biggs was found to be similar to that of the Entwistle Group and has also probed approaches to learning among secondary school pupils. The inventory used for this purpose was the Learning Processes Questionnaire (LPQ) (e.g., Biggs, 1987a; Ramsden et al., 1989; Watkins and Hattie, 1990; Eklund-Myrskog and Claes-Goran, 1999). Other than for the first two mentioned studies, identifying study approaches dimensions has not been their main focus. However, even their studies appeared to present evidence for the existence of the deep and surface approaches to learning, though more often than not Strategic (Achieving) approach was in combination with the deep approach. Using the parallel Study Processes Questionnaire (SPQ) with adults, the overlap appears to be less often the case (Biggs, 1987b).

2.40 Learning styles

This section will present the second category of the pair introduced in section 2.20: learning styles. The term style seems to have made its entrance to psychology usage with the ‘inadequacy’ felt in the predominantly then existing term, ability (Sternberg, 1995; Satterly, 1970). The latter while being a representation of individual differences in cognitive psychology is generally regarded as passive for instructional purposes. However, while styles in the form of cognitive styles may not be able to claim additional activity, learning styles in fact may do so by its interaction with learning material. Though it would be difficult to justify learning styles as descriptions of learning based on pupils’ experiences, they would come closer to this than other constructs. However there is an additional reason to do so. The present investigation relates to constructs that are described as part person-dependent and part context-dependent. Thus to choose an appropriate construct for the investigation it appears desirable to examine constructs that have being described in some-what similar terms prior to selection.

Learning styles in the classroom

Pask’s (1976) learning styles appear to have a longer history than approaches to studying and learning. Thus, understandably, one comes across relatively more research in these at school level than for approaches to learning, for example, Pask (1976) speaks of holist and serialist styles. These represent consistent preferences for
using certain learning processes. A holist style involves a preference for setting the
task in the broadest possible perspective, where a serialist style is described by Pask
(1976) as step-by-step learning. From these descriptions it may appear that in
humanities a holistic style is preferable and in the sciences a serialist one. A versatile
style is the use of either in appropriate situations. Over-reliance on one or the other
(holistic or serialistic) styles is described as students showing pathologies of learning:
globetrotting as relating to the holistic style and improvidence as relating to the
serialist style. Pupils with different styles have reacted differently to contrasting
forms of instruction and not in the same way as one would expect from a Skinnerian
perspective thereby bringing learning styles closer to more recent classroom practices.

The nature of learning styles
This category is conspicuous in not originating from the pupil’s perspective, but
rather being derived from cognitive styles applied to learning, resulting in survey
research (e.g., Schmeck, 1988) in North America. Also, in the traditional notion of
learning style, an innate nature is ascribed to them with their supposed connection to
cognitive styles. In this regard what Murray-Harvey (1994) says appears to be
pertinent: in North America, some researchers have continued to build upon the
earlier work of cognitive psychologists by extending cognitive processing concepts to
the education settings. The individual differences in this context are referred to as
cognitive learning styles. Some of the cognitive learning style models refer to
research into cognitive processing differences in cognitive styles related to learning
(e.g., Witkin et al.'s, 1971, field-dependence-independence; Kagan, 1965,
reflective/impulsive).

The implication of this is that since cognitive learning styles are based on the concept
of cognitive style, they are seen as relatively permanent traits. Therefore, the research
in North America in student learning in higher education has been engrossed more
towards the person characteristics in learning and studying.

Many style dimensions are reported in the literature, as can be seen from
Rayner and Riding’s (1997) attempt at categorising these numerous ones. One that is
used in the present debate is Schmeck’s (Schmeck et al., 1977) Learning Processes
which is a process based description included in Rayner and Riding (1997) taxonomy.
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This dimension exemplifies a person-part focus where the person-part is one aspect of the present investigation. It has also been related to Study Approaches, constructs of interest to the present investigation.

Learning Processes
A scheme popular in North America that has been put forward by Schmeck (1983) is one based on Craik and Lockhart’s (1972) ideas of levels of processing within the memory. Schmeck et al. (1977) developed the Inventory of Learning Processes where each item in the inventory asked about a learning tactic (e.g. using imagery to remember the definition of a word). Factor analysis of student’s answers to these questions has revealed clusters of tactics, which have been combined into scales. The scale scores have served as measures of intensity of the Learning styles. These are four in number: deep processing; elaborate Processing; fact retention; methodological study. These categories are reminiscent, as Rayner and Riding (1997, p.17) says, to those of Entwistle(1979), Ramsden (1979) and Biggs (1985). Yet they have been derived from a cognitive information processing perspective only and hence do not include motivational components, as does Entwistle. Figure 2.7, compares the corresponding scales of the two schemes.

<table>
<thead>
<tr>
<th>Approaches to Studying subscales</th>
<th>Learning Processes sub-scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Approach</td>
<td>Elaborate processing</td>
</tr>
<tr>
<td>Avoidance of Surface Approach</td>
<td>Deep Processing</td>
</tr>
<tr>
<td>Strategic Approach</td>
<td>Fact Retention</td>
</tr>
</tbody>
</table>

**Figure 2.7** Correspondence between Entwistle’s (1988) approaches to studying and Schmeck et al.’s (1977) learning processes (styles).
Thus a substantial agreement between the results of the two schemes appear to be present, suggesting thereby one could be used safely instead of the other in spite of the theoretical gap between the two. It does not, then, gauge well to have two theoretical positions. However, Entwistle (1988) prefers to comment upon the complementary nature of the two schemes only. Since his earlier work on Learning Style, Schmeck (1988, p. 5) proposes to call his work learning orientations instead, in keeping with the more prevalent terminology in the field.

Another ‘learning style’ that Rayner and Riding (1997) place in their process-based category is Kolb’s (1976) Experiential Learning Style. Process-based model of learning style is an example of one division of their learning-centred dimension. There are also Preference-based ones (e.g., Dunn et al.’s (1989) Learning Styles) placed in this dimension.

2.50 A comparison of the schemes

Here we will note the similarities and differences in the efforts and results of the main schemes that have recently been advanced to explain the processes of learning and studying. Some of these may be summarised as follows:

- there is a distancing from the input-output model of investigating learning and studying.
- the adoption of modern cognitive psychology is clear, with some adopting a pupil’s perspective to investigate (Marton, Entwistle, Biggs, Ramsden etc.) whereas as some others such as Schmeck adopting information processing models. Thus that a number of different perspectives are adopted is also clear.
- Some have investigated inter-individual differences thereby emphasising the context (Marton), others individual differences (Schmeck) and still others interactions (Entwistle). Thus the last two mentioned emphasise, respectively, the person, and part-person part-context influences.

If taken as coalitions of workers in the approach and in the learning processes traditions (Schmeck), the main efforts in the research have found constructs broadly similar to each other despite the difference in the theoretical perspectives adopted. That is, both result in mutually exclusive categories: a) a student orientation towards
reproducing dimension in learning and studying, and b) an orientation towards a meaning orientation.

2.60 Points of conflicts

The main differences found in the literature are indicated below.

(1) Christensen et al. (1991) alleges that the inventories built by Entwistle and Biggs like that of Brown and Holtzman (1966), as atheoretical. The latter’s is described as a catalogue of activities considered to be part of “good” study methods (Entwistle and Waterson, 1988; p. 258).

(2) The construct/instrument labels meant for one perspective are inappropriately used in another (Murray-Harvey, 1994). For example, usage of the descriptive term ‘learning style’ should not be used when the construct is an environmentally based one. The argument is that the former term should be used for more innate traits.

(3) Other researchers have not always been able to replicate the number of factors obtained by Biggs when using different samples.

(4) The nature and stability of approaches relate to the person versus context debate, in which whilst accepting the concept of approach some researches lean more towards the person aspect while some lean more towards the context aspect.

(5) approaches are culturally construed (Richardson, 1994)

Of the above mentioned, (4) and (5) are particularly relevant to the present research question as they refer to study approaches in an investigation conducted in a non-western setting.

2.70 Attempts at resolution of conflicts

The conflicts mentioned in the previous section have arisen relatively recently, considering that it is more than two decades since interest in learning approaches
Theoretical Frameworks and Instruments

commenced. Further, criticisms have been raised only by a few researchers (e.g., Christensen et al., 1991; Webb, 1997).

In some instances, the attempts at resolving conflicts may be divided broadly into two:
- as when criticism towards some particular research work is answered
- as when theorising regarding the research field as a whole is advanced (e.g., when models and taxonomies are advanced)

Clarification of this nature is related to conflicts (1) and (2) mentioned in the previous section.

Thus regarding (1) Christensen et al.’s (1991) criticism that the inventories of the Entwistle Group and that of Biggs are not based on theory, Biggs (1993) in a lengthy rejoinder refutes this. He points out that resorting to a quantitative versus qualitative debate is not the best way to settle the issue. It is better to make a distinction between the two main theoretical positions exemplified by Information Processing position derived from cognitive psychology and the Student Approaches to Learning (SAL tradition) position derived from ‘qualitative analysis of students’ reports of their own processes’, as pointed out by Entwistle and Waterston (1988, p. 258). The SAL position is elaborated later on.

Regarding (2), that is regarding that the construct/instrument labels meant for one perspective are inappropriately used in another (Muny-Harvey, 1994), there has recently been a flurry of activity. Clarification has been attempted by presenting several classification schemes of study strategies, learning styles and cognitive styles (e.g., Curry, 1983; Biggs, 1994; Rayner and Riding, 1997; Riding and Rayner, 1998). Reviewing these theoretical frameworks here will provide additional clarification to some of the contentious issues noted above. Three such attempts that results in taxonomies are:
- Curry’s Onion model
- Cognitive control model of Rayner and Riding
- The Biggs Typology

The Curry onion model
An early and an important classification is that of Curry (1983) who proposed that all cognitive/learning style measures may be grouped into three main types or “strata
Theoretical Frameworks and Instruments

resembling layers of an onion. By arranging "learning style" measures like this, "learning behaviour is fundamentally controlled by the central personality dimension, translated through the middle strata information processing dimensions and, given a final twist by interaction with environmental factors encountered in the outer strata" (quoted in Riding, 1997, p. 42). Thus this classification, like the others, depicts the extent to which each learning "strategy" is person-bound and to what extent to it is context-bound. The Curry typology with instrument exemplars is presented in Figure 2.8. Here cognitive style, like in other classifications, is considered a part of the very personal nature of the individual (in the cognitive domain): is taken to mean the individual's approach to adapting and assimilating information based on underlying and relatively permanent personality dimensions. Thus Tennant (1988) defines cognitive style as "an individual's characteristic and consistent approach to organising and processing information" (p. 30). Messick (1976) also make a similar inference when he states those cognitive styles,

appear to serve as high level heuristics that organise lower-level strategies, operations, propensities - often including abilities - in such sequential processes as problem-solving and learning (p. 9).

It is not cognitive styles themselves as such that is important to the current discussion but the connotation they have for the concept of "style" which is often used nowadays in experimental educational research including that of studying and learning.

Curry's taxonomy of perspectives is based on an examination of the measuring instruments used. Thus it appears that the perspective categories have been

<table>
<thead>
<tr>
<th>Level/Layer</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Instructional Preference</td>
<td>Productivity Environmental Preference Survey (PEPS) (Price et al., 1991)</td>
</tr>
</tbody>
</table>
<pre><code>                            | Embedded Figures Test (Witkin et al., 1971) |
</code></pre>

Figure 2.8 Curry's typology of student learning processes with instrument examples
arrived at inductively, as inferences were arrived at via observation. Biggs' Study Process Questionnaire (SPQ) measuring Study Approaches is placed in the Information Processing strata, intermediate between the very personal cognitive styles and the Instructional Preference ones. The latter is largely taken to mean environmental dependent and its instrument Productivity Environmental Preference Survey (hereafter called PEPS), is placed in at this level. It measures, for example, students' preference for conditions of physical light, amount of sound, etc., in their learning environment. Though Curry places the PEPS in the outermost layer, the authors classify it differently. Price et al. (1991), authors of this Dunn & Dunn Learning Styles Model, consider it as a more of a "person" measurement due to the usage of the nomenclature "style". Such "anomalies" had been, as stated above, one reason for these classification attempts.

Biggs' (1987b) SPQ is placed in the intermediate position and thereby given, on the other hand, both person-bound characteristics and context-bound characteristics and hence was considered a likely instrument for the present investigation. Curry has not examined the instrument of Entwistle, the Approaches to Studying, for classification. A placement similar that to SPQ might have been given to it had it been considered, as two authors appear to converge in theoretical respects (Entwistle, 1988; p. 29).

Biggs' work does not fit easily into the Information Processing strata, as mentioned by Curry; but at the intersection between this and Instructional Preference strata. Wherever it would fit best, it is not likely to be at the outermost level where those most close to the external world/environmental are included.

Curry's classification gives, as seen above, both a person-bound aspect and a context-bound aspect to Biggs' study approaches, taking to consideration the nature of his instrument (Biggs, 1987a).

**Cognitive control model of Rayner and Riding**
Entwistle's work is mentioned in another classification, that of Rayner and Riding (1997). A similar position to Biggs could be surmised for his work in Curry's classification, i.e., studies approach being part person-dependent and part context-dependent. Rayner and Riding's work build upon that of Curry's, i.e., the relative
person to context involvement in learning, their work being extensive in this regard. Individually named cognitive styles and "learning strategies" are found places in the classificatory scheme. He commends Curry's work apparently for taking into consideration the degree of psychology involved in the explanation of learning behaviour. They state, the onion model,

...offers a model which emphasises the notion of an individual person's psychology and seeks to explain the formation of individual learning behaviour (Rayner and Riding, 1997, p.22).

The separation of "learning styles" into two categories, cognition-centred approach (in which cognitive styles are placed) and learning-centred approach in his classification is a further simplification of the problem (Rayner and Riding, 1997, p. 6). Its a simplification because by this division, cognitive styles are no longer regarded as being in the mainstream of student learning and studying research, a separation that was not made clearly by previous writers in the field. Instead, in Rayner and Riding's categorisation this function is now given over to dimensions coming within their learning-centred approach category. Hence the phrase "learning style" is largely dispensed with and substituted by the phrase "learning strategies" (Riding, 1997, p. 42). Schmeck (1988) points out that "style" is more general than "strategy"(p. 7). Schmeck himself changed from the usage of "learning styles" for his work (1977) and instead proposes to use the term "learning orientations" which being more style-like than style itself (Schmeck, 1988; p. 5). This may well be regarded as a shift away from a completely person focus in student learning and studying.

In Rayner and Riding's (1997) work Approaches to Studying are placed in the learning-centred category among other works. In this classification, Approaches to Studying are described as Process-based, thereby additional information about these could be noted. That is, many factors constitute and function together in an approach to study. The other works referred to above and placed in this learning-centred category are the Preference-based ones and Cognitive-skills-based ones. Though apparently not stated, one discerns a gradation from context-bound towards person-bound in the presentation: processed-based to preference-based to cognitive-skills based.


Preference

An aspect of interest to the present investigation and mentioned in the above categorisation is the position given to the concept of preference. This concept is treated as relatively internal in this construction, with approaches to studying being placed relatively external to it.

A ‘level’ model

Whilst the above presented is essentially a categorisation of learning approaches, Riding (1997) also presents a ‘level’ model that places the dimensions relative to one another. In it at the primary level, experience, personality sources are placed. Styles operate at the next level of cognitive control. The outer output level comprises the learning strategies. He makes a distinction between styles and strategies:

It is useful to distinguish between style and strategy. Style probably has a physiological basis and is fairly fixed for the individual. By contrast, strategies are ways that may be learned and developed to cope with situations and tasks, and particularly methods of utilising styles to make the best of situations for which they are not ideally suited (p. 41-42).

Further, he makes the comment that sometimes in the literature the term ‘learning style’ is used when in fact strategy is the term that is more appropriate (p. 42).

The Biggs Typology

Biggs (1994) himself has formulated a classification scheme. Strangely enough he places his work in the outermost layer. Otherwise, barring the placing of the phenomenographic category, his typology is similar to that of Curry’s described above. His topology is presented in Figure 2.9.

<table>
<thead>
<tr>
<th>Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenomenographic</td>
</tr>
<tr>
<td>Information</td>
</tr>
<tr>
<td>Personal Styles</td>
</tr>
</tbody>
</table>

Figure 2.9 Biggs’ typology of student learning processes
An explanation lies in that his work is described as a systems theory. It appears to flow from the SAL (Student Approaches to Studying) tradition, which is described below.

Prior to that, the success or otherwise of this clarification attempt should be considered. The point of conflict was the usage of inappropriate construct/instrument labels. The attempted solution was presenting, as above, taxonomies. Some taxonomies are similar to each other, but Biggs' taxonomy appears different from others. To this extent, hence, the endeavour is less successful.

The Student Approaches to Learning (SAL) tradition: a system in equilibrium

Biggs (1993) incorporates a three-staged model of student learning, from presage to process to learning. Thus:

\[ \text{presage} \rightarrow \text{process} \rightarrow \text{outcome} \]

The essence of the construction is to describe the learning situation in system terms, with the components of the system (i.e., presage, process, and outcome) in dynamic equilibrium with each other such that any change in one of the component cause system adjustments to ensure equilibrium once again. When the learning situation is viewed thus, student behaviour at any given time would be a function of all these components (rather the elements of these components) acting in concert but each such element's engagement ranging from a greater to a lesser degree. Hence this model rules out "all or none phenomena" in explaining student behaviour as is apparently the case with cognitive psychology models that predict student behaviour solely on the basis of unchanging internal cognitive processes (and hence without much resort to the context in which learning takes place).

To come back to the SAL tradition and its 3P model of classroom learning consisting of the components (presage, process and product), presage refers not only to "within" students' characteristics like prior knowledge, abilities, preferred ways of learning, values, expectations, but also includes teaching presage factors such as the curriculum, teaching method, classroom climate and assessment. These two
components interact and the door to this interaction is perception: perception of the teaching context by the student. For example, perception of the teaching context directly affects their motives and predispositions and their immediate decision for action, and the perception of the student by the teacher, and student’s motives or abilities influence their teaching decisions. Interaction between the aforesaid variables is the key feature of the model and is akin to a reversible reaction in chemistry, which in turn gives rise to systems in equilibrium.

In this view therefore, in a systems view, there is no separation of inside and outside. All elements act in concert and the conclusion looks inescapable. As a consequence, Study Approach is considered part context bound, and part person bound. The present investigation is based on this assumption.

Regarding the conflict (3) relating to number of factors, Christensen et al.'s (1991) criticism is that Biggs' (1987a, 1987b) SPQ gives a different number of dimensions in factor analyses than the three stipulated. But Biggs (1993) points out, this depends on the method of factor analysis adopted (p.11-12). He points out that the principal component factor analysis with varimax rotation carried out by Christensen et al. (1991) is not appropriate to judge this as his dimensions were not meant to be orthogonal (Biggs, 1993:p.11). As Christensen et al. (1991) had obtained six factors, Biggs’ explanation is that because of the six subscale scores of motive and strategy (two in each dimension), an orthogonal analysis is bound to separate these and give six factors. On the other hand, if they were treated as related, as Biggs (1987a, 1987b) does, and second order factor analysis adopted, the number of factors would be less than six, probably three. Hence, on this particular criticism it appears that Christensen et al.’s (1991) categories are not well founded. The number of factors appear too crude a yardstick, however, to measure the validity of a theory. Alternately, a dispersion of the subscale scores across factors would be a matter for concern.

Regarding another conflict (4): Person versus Situation, some give, we saw, greater weight to the situation (e.g. Ramsden, 1992), whereas Biggs and Entwistle give greater weight to the person in respect to the same dimension-study approach. However, Entwistle et al., 1979, discourages pessimism in this situation:
In our view, it is legitimate for the researchers to concentrate on either consistency or variability, providing that to focus on one of the two types of description is not to deny the existence or importance of the other. Separate explorations appear to be justified, for the present at least, even if in the longer term it necessary to attempt a theoretical resolution (1979, p. 367).

Regarding the final point (5) mentioned in the preceding section, though the proponents of study approaches like to say that they cut across different culture, empirical evidence suggests caution (Richardson, 1994). Webb (1997) questions the metaphor deep/surface itself.

As a summary of the foregoing, the comment made by Rayner and Riding (1997) regarding the investigation of learning and study through both approach and learning styles is interesting:

The learning-centred tradition is by definition concerned with the learning process. This has led to models of style being developed, which are “fluid”, environmentally oriented and very susceptible to change. Criticism of the approach reflects concern for construct validity, poor verifiability and an uncertainty about the relationship between learning style, learning strategy and cognition. The research continues to be dominated by assessment and with a general approach heavily influenced by experimental psychology. This explains, in part, a prevailing psychometric paradigm in style theory, as well as a continuing focus upon measurement and experimental research design, and a lack of consensual theory... (1997, p. 20-21).

Perhaps this is too hard a comment. But there certainly appears to be places in the field that needs further scrutiny.
2.80 Outcome of the discussion and implications for the investigation

This chapter commenced with the intention, in the main, to review the explanations advanced regarding how students go about their task of learning and study. The object was to obtain from this review a model of learning and studying appropriate for the purpose of answering the question posed in the Introduction chapter. The best selection appears to be that of the model advanced by the Entwistle group, and the reasons for this are as follows.

- It is appropriate to answer the research question. To elaborate, the present investigation envisages a part person-bound and part context-bound study approach, to which conception the above-discussed Entwistle Study Approaches appears to approximate.

- It appears applicable in Sri Lanka as the system of education in Sri Lanka is one that was ‘inherited’ from England and one still sees resembles in many features to the system in England.

- Entwistle’s approaches to studying conception are institution based, in which the learning environment is given prominence. The questions embodied in the questionnaire found relevance to the real learning situation. The questionnaire developed for the schools were an adaptation of these and hence show relevance to school based learning.

- This instrument is apparently a general purpose one which means that it is unrelated to a subject discipline (probably the intention of the authors is also the same). The basis for this observation is the comment of Meyer and Parson (1996) that no particular attempts have been made to relate this instrument to a discipline such as mathematics.
CHAPTER THREE

Studies Of Factors Influencing Study Approaches and
Affects of Study Approaches

3.00 Introduction

In the previous chapter, an introduction and description of some of the different schemes connected with student study approaches were presented. In this review, the scheme formulated by Entwistle and his colleagues was found suitable to apply to the current research question (presented in Chapter One). The review of the different ways in which researchers describe how students engage themselves in learning and studying resulted in a choice to focus this study on deep and surface learning and study approaches. As the present investigation is also concerned with possible changes in levels of study approach during their education, it is necessary to consider earlier research on their stability over time.

Persistence and change

The original research question for this study refers to possible change in the level of intensity of study approaches for students. It is now necessary to describe these terms.

In the earlier chapters the person aspect of study approach was taken to imply no change over time, i.e., persistence. Whilst this influence is still assumed, further description of it are necessary in the context of the investigation. The possibility of change is expected to be associated with the following factors during the investigation,

- preference for certain subjects in the General Education curriculum
- choice of expected subject specialisation
- whether there is congruency or incongruency between choice and ultimate specialisation.
Factors affecting Study Approaches and their effects

Of these factors the last mentioned helps to describe the overall conditions under which changes of levels of intensities of study approaches may exit. The others constitute steps leading-up to these conditions. Thus the level of persistence or change as used in this investigation is related to different levels of congruency between subject choice and specialisation across time. Hence the possibility of change is context related, the context of specialisation. Thus the expectation is that there will be an association between an increase/decrease in level of study approaches and congruency (or lack) between choice of Arts or Science at age 16 and ultimate A-level specialisation in Arts or Science. This would mean that this research will not be strictly comparable with other research that may use the term persistence.

The features of persistence and change as used in this investigation can be summarised by the graphical representation shown in Figure 3.1

The two points over time in respect to which persistence and/or change are assessed are before starting A-level when a choice of subject is made and one year into the actual resulting specialisation at A-level. Figure 3.1 relates to differences between these two assessments in study approach measurements.

Incongruent
(Arts choice but Science specialisation, or Science choice but Arts specialisation)

Congruent
(Arts choice and Arts specialisation, or Science choice and Science specialisation)

<table>
<thead>
<tr>
<th>Change in intensity of study approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>negative change</strong></td>
</tr>
<tr>
<td>(no change)</td>
</tr>
</tbody>
</table>

Figure 3.1 Changes in intensity of study approaches in relation to nature of congruency between O-level choice and ultimate specialisation at A-level
Factors affecting Study Approaches and their effects

Person and context dependency of study approaches.

In the previous chapter it was found that Entwistle's approaches to studying are especially described as part-person and part-context dependent: person dependency implies persistence and context dependency change. Figure 3.1 that described attributes of persistence and change as used in the present investigation embody these basic assumptions. The aim of the present chapter is to evaluate the claims of persistence and/or change of study approaches in the past literature.

To evaluate the evidence regarding persistence it appears necessary to examine studies that have related person attributes to study approaches. These would include, for example, level of anxiety, level of interest etc. On the other hand to evaluate the evidence regarding change of study approaches it appears necessary to examine studies that have related contextual variables to these, for example, level of workload in studying.

In the past research on intensity of study approach, 'persistence' of study approach has been found to be linked with some personal attributes, e.g., self-esteem and internal locus of control (Purdie and Hattie, 1995). Also reported in past research, links have been found between change of intensity of study approach and contextual variables. Such relationships when found, appear to be reported as influences on study approaches. For example, Entwistle (1991) makes a summary of these findings in higher education. Other sources of information appear to include studies in consistency and variability of study approaches, which will be dealt later.

3.10 Influences on study approaches

The summary of influences given by Entwistle (1991) is reproduced in Figure 3.2. These refer to correlational studies and therefore refer to level associations of study approaches with other variables, e.g., a high level of deep study approach being associated with a large 'interest'. It is Deep study approach's positive association with interest that is indicated by entering this relationship on the top half of Figure 3.2. The bottom half of Fig. 3.2 is constructed similarly with respect to variables that are positively associated only with the Surface study approach. The entries under the column "Departmental influences" are also level measures representing differential perceptions of the contextual influences.
### Factors affecting Study Approaches and their effects

<table>
<thead>
<tr>
<th>Student Characteristics</th>
<th>Departmental Influences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deep Approach</strong></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>Good teaching (seen in terms of)</td>
</tr>
<tr>
<td></td>
<td>level, pace, structure,</td>
</tr>
<tr>
<td></td>
<td>explanation, enthusiasm,</td>
</tr>
<tr>
<td></td>
<td>and empathy</td>
</tr>
<tr>
<td>Previous Knowledge</td>
<td>Freedom in learning</td>
</tr>
<tr>
<td><strong>Surface Approach</strong></td>
<td></td>
</tr>
<tr>
<td>Fear of Failure</td>
<td>Factual Examination</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Heavy workload</td>
</tr>
<tr>
<td>Focus on qualification</td>
<td>Lack of choice in learning</td>
</tr>
</tbody>
</table>

**Figure 3.2: Influences on students’ approaches to learning (After Entwistle, 1991)**

The division of student characteristics and departmental influences is an important one in the context of the present investigation, as the former implies persistence of study approaches and the latter their change.

The summary of the relationships (see Figure 3.2) found between person attributes and study approaches suggests a link between these. There is also suggestion of change of study approaches by the relationships shown between contextual variables and study approach. These are associations and not causal relationships, however they contribute as evidence of links between person and context with study approaches.

**School and college level studies**

The school and college sector research has also looked into influences on study approaches. These findings are largely similar to those found in the higher education sector. The influences have also been studied from the viewpoints of student
Factors affecting Study Approaches and their effects

characteristics ('personological') and context effects. The results largely of quantitative studies are noted here. The instruments in these studies, in the main, have been the ASI and Biggs's (1987a) Learning Process Questionnaire (LPQ). The latter mentioned is the school version of Biggs (1987b) Study Process Questionnaire (SPQ). The findings regarding the personological and the contextual influences are noted below.

(i) Personological

(a) Age and gender

Effect of age and sex-differences have been among the personological influences that have been studied in this regard. The results do not tend to show a consistent pattern for both variables.

Thus regarding age, Watkins and Hattie (1990), with a Australian school sample, and Eklund-Myrskog and Claes-Goran’s (1999), with a Finnish secondary school sample, observed deep and achieving approaches to learning to be less with older students. Earlier, Watkins et al. (1986) observed a decline over time in the Reproducing Orientation with a Filipino secondary school sample. In the last mentioned study a short version of the ASI has been used. Osterback (1997, quoted in Eklund-Myrskog and Claes-Goran, 1999) has also observed that it is the younger students who more frequently use the surface strategy. In another study, older Malaysian secondary school children have been found to utilise surface approach more (Watkins and Ismail, 1994). These are conflicting results. Perhaps as Entwistle (1987, p.67) mentions, study approaches are not meant primarily to reflect development trends but represent contrasting approaches to studying across a wide age-range. Hence what appears more relevant to the issue of age and study approaches is the observance of the contrasting approaches at a particular age. This view suggests that for a given age, there is a consistency in the level of study approach, which has been supported by cross-sectional studies for different age levels (e.g., Eklund-Myrskog and Claes-Goran’s, 1999; Zeegers, 2001).

Gender differences in the main approaches to studying and learning appear to indicate that, on the whole, girls appear to be applying meaningful approaches more often than boys are. Thus Watkins et al. (1986) using the shortened ASI found that
Filipino girls scored higher than boys in the Meaning Orientation and lower than boys in the Reproducing Orientation. Similar results have been observed in studies that have used Biggs’s (1987a) Learning Process Questionnaire (LPQ). A gender difference was found in the Watkins and Hattie (1990) study with secondary school Australian students: girls scoring higher than boys in the achieving strategy scale. In the Eklund-Myrskog and Claes-Goran’s (1999) with a Finnish sample, there were no significant sex-differences with respect to the deep strategy and deep motivation components (which together constitute the deep Approach). However the boys were found to use the surface strategy to a greater extent than the girls. The results of studies summarised above tend to indicate those girls more than boys, on the whole, tend to employ more meaningful study and learning processes. A dissenting observation from this trend comes from the results of Watkins and Ismail’s (1994) study where it was found that girls were inclined to use surface strategies more often than boys.

(b) psychological variables

The present study relates itself to students’ person-aspects of behaviour in its investigation of study approach and the relationships with psychological characteristics. Several studies have investigated this aspect at the secondary school level. In these, self-esteem relating to ability and achievement, student preference for classrooms to be enjoyable, and an orientation to independent study and competition, are some of the factors that have been found to be related to study approaches at this level of education. Thus with an Australian student sample, Watkins and Hattie (1990) found that self-esteem facets of ability and achievement correlated strongly with deep and achieving (i.e., in both strategy and motivation components) approaches to learning in the LPQ. In another study Hattie and Watkins (1988) found that deep approach rather than surface approach was related to a preference for classrooms perceived as being enjoyable and encouraging students to do their own research, able to work at their own pace, and oriented to independent study and competition. These results are an outcome of a factor analysis and hence relate to level of study approach and not to their categories. That there are fewer studies in this regard is understandable considering the relatively recent studies of the learning and study processes at secondary school level. However, the factors thus far shown to
Factors affecting Study Approaches and their effects

relate to study approaches (e.g., self-esteem, preference), at this level, appear to reinforce an active learning model that is commensurate with the student approaches to learning model (SAL). Anxiety, motivation and level of dependence appear to be similar factors. Selmes (1987) presents interview data that illustrates that high anxiety, extrinsic motivation and a high level of teacher dependence are associated with a Surface study approach, whereas a deep study approach is associated with low anxiety, intrinsic motivation and a low level of teacher dependence. In this study, the sample has been Scottish senior secondary school students. The relationships between study approaches and personological aspects noted above suggest a link with psychological attributes. These findings are somewhat similar to those found in higher education samples and presented earlier in Figure 3.2.

However other research (Watkins et al., 1986) has shown that personological factors such as IQ, locus of control or field-independence are not related to study approaches. Perhaps these factors do not reflect as much active participation in the learning process. There is a strong similarity in these results and those obtained with higher education samples (Entwistle and Ramsden, 1983).

Contextual influences
Past research relating to contextual influences on study approaches is relevant as contextual influences are generally associated with change. The present investigation relates to their potential to ‘change’. Several studies have been conducted in this regard at the secondary school level, such as Selmes’s (1987) study. In that he also found contextual influences upon study approaches, as perceived by interviewees. He reports a positive association between the surface study approach and formal or repetitive teaching methods, closed study tasks, focus on facts or closed response in assessment and insufficient time. He also found a positive association between the deep approach to studying and informal teaching methods, open study tasks and focus in meaning or open response and ample time. These findings are similar to those found with higher education samples and presented in Figure 3.2. However they are based on perception of causes by the interviewees and not by measurement.

Influences of ‘larger’ variables, for example between-school differences, have been studied by Ramsden et al. (1989) with Australian sixth form students using
Biggs' (1987a) LPQ instrument. In this study, among other things, between-school differences in perceptions of school environments and approaches to learning were observed to be related. In the main, school environments offering supportive teaching were related to a deep study approach and teaching that was narrowly focused on examination success was associated with a reproductive approach. Eklund-Myrskog and Claes-Goran's (1999) suggest that the apparent pressure of impending examinations had a detrimental effect on the deep strategy component of the deep approach and on both strategy and motivation components in the achieving approach to learning.

Some of the research summarised above is in need of verification, but it suggests the influence of personological and contextual influences on study approaches. These aspects are of interest to the present investigation as they imply persistence and/or change, respectively, of study approaches. Figure 3.3 summarises the main aspects of the present section.

<table>
<thead>
<tr>
<th>Source of influence</th>
<th>Associated study approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(a) Personological</strong></td>
<td></td>
</tr>
<tr>
<td>High self-esteem of ability</td>
<td>High Deep, High Achieving</td>
</tr>
<tr>
<td>High self-esteem of achievement</td>
<td>High Deep, High Achieving</td>
</tr>
<tr>
<td>Preference for classrooms seen as enjoyable</td>
<td>High Deep</td>
</tr>
<tr>
<td>Low anxiety</td>
<td>Deep (interview data)</td>
</tr>
<tr>
<td>High anxiety</td>
<td>Surface (interview data)</td>
</tr>
<tr>
<td><strong>(b) Contextual</strong></td>
<td></td>
</tr>
<tr>
<td>Supportive Teaching</td>
<td>High Deep</td>
</tr>
<tr>
<td>Examination success focused</td>
<td>High Surface</td>
</tr>
<tr>
<td>Formal teaching methods</td>
<td>Surface (interview data)</td>
</tr>
<tr>
<td>Informal teaching methods</td>
<td>Deep (interview data)</td>
</tr>
<tr>
<td>Restricted time</td>
<td>Surface (interview data)</td>
</tr>
<tr>
<td>Ample time</td>
<td>Deep (interview data)</td>
</tr>
</tbody>
</table>

*Figure 3.3: Influences on students’ approaches to studying and learning*
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3.20 Consistency of study approaches

The person aspect of study approach has the potential to be examined more searchingly in studies of consistency. In studies of consistency of behaviours with underlying traits, they have examined whether individuals behave as predicted by their traits across different tasks and situations. This would also apply in the case of study approaches. The examination of consistency of a suggested trait across requires repeated observation on a given sample.

One of the earliest of these studies, it appears, is that of Svensson’s (1977). In this, interview data was collected from 30 first year Education undergraduates who have described how they had gone about their normal studies. Svensson described their approach as being consistent over different occasions when students were asked to read and to recall their knowledge of the two texts in the experiment.

Entwistle and Ramsden (1983) maintain that there is considerable consistency in approach over a broad range of university students’ activities, including essay writing and preparing for examinations. The inferences drawn regarding the above situations and described by Entwistle (1988) are based on the following observation.

Although few students were wholly consistent, most of them could be classified as adopting either a deep or surface approach to a majority of tasks (p. 25).

It is to be noted here that the approach adopted in this study employed making inferences from interview data, and hence consistency must to be looked upon in these instances in terms of category of approach, i.e., either deep or surface.

Later quantitative findings have led Entwistle (1988) to confirm these findings and to introduce a new term to describe consistency of both processes and motivation, Orientation to Studying. He has chosen this term rather than style, due to the limited sense in which the latter has been used in earlier research, i.e., as unchanging. However, a relatively high degree of stability of study approaches is implied by the usage of the term orientation. The present investigation being related to persistence and change in study approach thus makes note of it. This ‘stability’ refers to the
Orientations and not to the deep and study approaches themselves. But such an analysis may prove counterproductive as the 'stability' conferring components appear to be present in both constructs, i.e., intention in study approaches and motivation in orientations. The technique of factor analysis appears to have provided a convenient way of studying consistency.

An often quoted research finding that is taken as supporting the view that students tend to be fairly consistent in their use of one or other study approach is the study of Thomas (1986) described by Entwistle (1991). For example, changing from essay-type examinations demanding understanding to multiple-choice tests that emphasise facts is likely to cause most students to shift towards a Surface Study Approach, but there has been a wide range of differences between students in the extent to which that approach became dominant. That is, a shift from deep approach to surface approach has occurred, but this shift has not been a complete one, students originally high on the deep dimension had changed only a little: they had retained their rank positions in Deep Study Approach scores. Thomas and Bain (1984) report a similar inference for a similar situation in an earlier publication. This writer assumes that the different examination types in these studies in fact tested different levels of understanding and hence does not need checking further.

The results of the above mentioned studies tend to support strongly consistency of study approaches and by implication their continuation in higher education.

At the school level, consistency as well as variability of approaches to studying have been examined by Selnes (1987) amongst a Scottish secondary school student sample. His inferences were drawn from interview data. He reported consistent adoption of Deep or Surface approach to at least two or more tasks amongst most pupils, the tasks have being in different subjects and relate to Reading, Writing, Notemaking, Problem Solving and Practicals. However he also noted some variation within a pupil's studying and even within a task.

The study of Watkins et al., (1986) may be placed alongside consistency studies. It investigated the factor structures of the Approaches to Studying six months
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apart among Filipino secondary school students. A short version of Entwistle's Approaches was used (ASI-S). The factor structure remained stable across the two testing sessions thereby implying evidence of consistency of the study approaches. Hence from these studies there appear to be some evidence regarding consistency even at the secondary school level.

Recent studies in consistency

Other recent studies have probed consistency across a number of situations at the same time. In one such study, Vermetten et al. (1999a) correlated study strategy scores of a sample of first year university students towards different university subject courses and found that these scores (of the same study strategy) correlated significantly with each other, that is, across different subject courses. The study strategies were those named as Relating and Structuring, Critical Processing, Memorising and Analysing, and bear some resemblance to that of Entwistle's Study Approach dimensions. The subject courses were Private Law, Criminal Law, Introduction to Law, and Administrative Law - courses all in the Law Department. Thus for example, scores for Relating and Structuring in Private Law correlated significantly with scores for Relating and Structuring in Criminal Law. These results tended to show that study strategies were consistent across different subject courses. This indicates, as the researchers stated, a personal, habitual component in strategy use.

Consistency as stability over time

In their second study (Vermetten et al., 1999b) investigated consistency and development of study strategies leading to stability. They found 'stability over time', in a longitudinal study. Here the first and second contexts were 'same'; that is, the students were in the same courses. This stability of study approaches implies persistence across time. Figure 3.4 summarises the main features of the research design.
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On these two occasions, the reference of the students' study strategies was semester-specific. They were asked specifically to respond, on each occasion, to the past semester's experience after each.

The sample consisted of students in the four largest departments: Law, Economics, Social Sciences, and Language and Literature (Arts). Two sets of responses from 276 students were collected in this longitudinal study. The participants were first-year students selected across the four departments noted above. Consistency of each study strategy has been observed by calculating correlation coefficients between the two occasions. Therefore, stability over time was inferred from high correlations.

Another phenomenon researched and observed was development of study skills over time in the same context. The use of the word “development” was based on the fact that the context was the ‘same’ over the two semesters. The difference between each corresponding pair of group means over time was tested using paired-sample t-tests. Developments in most instances took place, for all the variables investigated: learning strategies (processing and regulation strategies), personological
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domain (learning orientations and mental learning models), and contextual domain (perceived instructional activities). As development of the personological variable took place, learning strategies also developed as generally borne by the results obtained, which supports their development model. Whether the data provided evidence of development “trends”, that is whether an increase in one dimension was accompanied by a decrease in another, was also discussed. Further, two separate factor analyses of the data from the two semesters (first and third) gave a more integrated pattern at the third semester suggesting to the authors support for their development model. These factors were labelled learning styles, constituting of different mixes of learning strategies (processing and self-regulation), motivation and mental learning models.

Some noteworthy features of this study are:

• it was a longitudinal study (hence facilitates study of ‘persistence’)
• changes or developments were reported (development and trends emphasised)
• processing strategies representative of a meaning-directed learning style showed positive increases between the two semesters
• no significant decreases, as expected, in processing strategies indicative of a reproduction directed style were observed. These were some of the exceptions with respect to change and development otherwise observed. This condition could be described as constancy, in some of the processing strategies.

The last mentioned appear to imply persistence across time with respect to the processing strategies indicative of a reproduction directed learning style. These processing strategies were memorising and analysing. This condition appeared associated somewhat with the motivational component of the learning style, e.g., certificate orientation.

The last mentioned feature, that is the memorising related study approach not showing development with time, was supported by another study. Watkins, et al. (1986), found that there was a positive decline in this study strategy. The time between the two testing sessions was six months. While the two contexts were the
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'same', the sample was secondary school children in Philippines whose age ranged from 13 to 14 years.

Habitual study approaches
Reference has been made in the past research to habitual ways of learning (Entwistle, 1991):

Students appear to develop habitual ways of learning which interact with assessment requirements in determining how they tackle a particular course. Habits can, of course, be changed; but not readily (p. 86).

Habitual ways of learning could be considered conditioned responses. Hence their formation may not find a place in an interactionist scheme of learning like that of Entwistle's. However their existence appears to have been acknowledged. Their prevalence would not fit easily into a scheme of learning that emphasises cognitive and interactionist perspectives. Their existence appears to imply permanence and hence persistence as described in Figure 3.1.

Section summary of consistency and similar concepts.

There appears to be some evidence supporting consistency of study approaches across time and within subjects, with the interview findings being supported by quantitative findings. Links with persistence of study approaches may thereby be implied. Overall, this review of studies has given the opportunity for investigator to anticipate a sizeable degree of persistence in the study approaches in the Student Approaches to Learning (SAL) tradition in which study strategies of Vermetten et al. (1999a and 1999b) could also be placed.

3.30 Variability of study approach
The present investigation is interested in testing whether there will an increase/decrease or no change in students' intensity of study approaches. Figure 3.1 in section 3.00 suggests the possible relationships involved. Past research provides evidence regarding changes of study approaches in variability studies. However some of the adopted research designs have been questioned. The aim of this section is to first examine research designs adopted in these studies.
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A change in the context aspect of study approach could be more searchingly examined in studies relating to their variability. What appears to be meant by variability of a study approach is that the same student would change his/her intensity of the study approach dependent upon the perceived situational demands residing within any given context (e.g., Ramsden, 1984). This would mean that a change in the level of the independent variable, the perceived context, would be accompanied by observing the change in the intensity of the dependent variable, the study approach. The research plan would be an \textit{ex post facto} design (Black, 1999, p. 71). In such studies, the perception of the context could be measured by the Course Perception Questionnaire (CPQ) of Entwistle and Ramsden (1983) or an adaptation of it is used for this purpose.

As stated in the previous paragraph, variability would be noted if the same student were found to apply different intensities of the same study approach when different situations were perceived as making different demands (Ramsden, 1984). But in truth, Eley (1992) points out, the inference of variability is arrived at by observing different groups of students in different courses and that the approaches reported are systematically related to the between-group differences in the perceived course requirements. But it does not mean, he argues, that if the two groups swapped contexts they would change their intensities of approaches to studying, as the concept of variability appears to necessitate. The stronger test, he argues, when adopting a quantitative methodology, would be to adopt a within-students design, using only one group of students. Hence the earlier findings regarding ‘variability’ are questioned, since the reported intensities of study approaches that were related to perceived course requirements were by different groups of students.

The study of Eley (1992) provides a better example of research design in variability studies. It investigated the influence of context (perceived) upon intensity of study approach examining change (increase or decrease) in intensity of study approach with different perceived contexts.

Approaches to studying for the same group of students’ in two concurrent courses offered have been investigated, after they had completed the courses. Thus a within-students design has been adopted. There had been four such student groups in
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de study, each group responding to a particular pair of concurrent courses. These pairs of concurrent courses have been,

- Accountancy and Law
- Biochemistry and Microbiology
- Chemistry/Maths or Statistics
- English Literature/Political Science or Philosophy

The anticipation had been that the same group of students would show different levels of the same study approach towards the two different concurrent courses they followed and they would have different perceptions of the demands of the courses. The four groups were all second year university students and the questionnaires administered after following these courses for one semester, the first semester. Study Approaches were measured by means of Biggs' (1987b) Study Process Questionnaire. They were also given a modified CPQ instrument to obtain information about their perceptions of the learning environments. That is, information of the context has been obtained by means of students' perceptions of it. The main features of the research design adopted are schematically shown in Figure 3.5.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Treatments)</td>
<td>(1) Deep/Surface score</td>
</tr>
<tr>
<td></td>
<td>(2) Perception of demands</td>
</tr>
<tr>
<td></td>
<td>of Biochemistry course</td>
</tr>
<tr>
<td>Same group of students</td>
<td>(1) Deep/Surface score</td>
</tr>
<tr>
<td>(n=74)</td>
<td>(2) Perception of demands</td>
</tr>
<tr>
<td></td>
<td>of Microbiology course</td>
</tr>
</tbody>
</table>

Figure 3.5  Diagrammatic representation of Eley's (1992)-research design (With an illustration of a pair of concurrent courses used)
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Two dependent variables are cited. They are student responses to the Study Process Questionnaire (Biggs, 1987b) and perception of course units, both supposedly dependent upon the concurrent courses offered. This makes the latter the independent variable, two courses in this case, representing the two "treatments".

The study found an association between the treatments and intensity of Study Approaches for some pairs of subjects, but not all. In the instances associations were found, the contexts were 'confirmed' by corresponding associations observed between treatments and the perception of related course units. This appears to be the purpose underlying using study approach inventories and instruments such as the CPQ together when studying contextual influence. The present investigation's interest is not related to a context confirmation aspect, but rather with a future context (by virtue of choice of specialisation) which may or may not be forthcoming.

Summary of implications in Eley's (1992) study
The present investigation is interested in persistence and change of study approaches. Eley's (1992) study appears to indicate that with change of context (perceived), a change in the intensity of study approach does not necessarily occur. Hence it could be inferred, indirectly, that there might be a greater tendency for study approach to be 'stable'. These results could be seen to question the variability of study approaches and hence also a context-aspect of study approaches.

But alternatively, it was argued by Eley (1992) that the concurrent courses were not sufficiently different from each other. Thus, the propensity of study approaches to vary appears to have had a set back in this study, and it must be remembered this has occurred in spite of using a more powerful research design, a within-students experimental design. Such ambiguous results present the reader with a dilemma. As Eley (1992) warns, there may be complex interactions in the learning and studying situations that may defy simple explanations (arising from the multivariate learning environment).

3.40 Investigating both consistency and variability in the same study
However, in contrast, some other studies (e.g., Bustato et al., 1998; Vernetten et al., 1999a) report variability of study approaches.
Vermetten et al. (1999a) demonstrated consistency in the intensity of adoption of each of study strategies across different subject courses in a university department, the Department of Law. Correlation coefficients calculated between the same study strategies have led to this inference. This aspect of the study was mentioned earlier. The main features of the research design adopted are schematically shown in Figure 3.6.

In the same study (Vermetten et al., 1999a), they tested whether there were differences in each of the study strategies across the different study courses by this same sample of first year university students. The participants were those enrolled for the second semester, which completed inventories at the end of it. The differences in means across the courses for each of the study strategies were tested using Repeated Measures Analysis of Variance. This gave significant F values, on most occasions for

![Figure 3.6: Diagrammatic representation of Vermetten et al.'s (1999a) research design (with learning strategies shown).](image-url)

- **X**: Independent variables (concurrent course units)
  - 1. Private Law
  - 2. Introduction to Law
  - 3. Criminal Law
  - 4. Administrative Law

- **Y**: Dependent variables (study strategies)
  - 1. Relating and Structuring
  - 2. Critical Processing
  - 3. Memorising
  - 4. Analysing
  - 5. Concrete Processing

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each study strategy, across the four subject courses, thus supporting contextual influence on intensity of study approach. In this instance, as the same students were involved, a direct observation of variability with different subject courses was seen. The only non-significant F-ratio was with respect to the Memorising strategy. However this strategy gave the highest correlation coefficients across the different subject courses thereby confirming its high consistency in repeated measurement.

The results in a successive year (Study 2) with 63 students has helped to generalise the findings of the Study 1 described above. However evaluating both consistency and variability in the same study and hence using the same data repeatedly runs the risk of introducing, as Black (1999, p. 380) says, a Type I error. This leads to a rejection of the null hypothesis when in fact it is true.

Thus some evidence has been obtained in this study supporting both consistency and variability (i.e., in the same study). The findings of variability reported here indicate a potential for intensity of study approach to change, an aspect of interest in the present investigation. In the above study the rank orders of intensities of study skills for individuals have remained similar, while the group means differed. This appears to amount to a context effect with individual differences in study strategies effectively controlled.

The university courses that were made use of in this study are described as of an intermediate level of context detail. Vermetten et al. (1999a) also maintain that the greater the detail, as in specific tasks, the more likely it is that variability in the intensity of application of study strategy that would be observed. An intermediate level allows, they contend, to observe both consistency and variability (p.6). That the level of context detail may matter in these circumstances has been earlier pointed out by Entwistle and Ramsden (1983) and now by Vermetten et al. (1999a). The latter study makes a three-level context-detail classification. This, arranged in increasing order of context-detail downwards, is:

- academic departments
- university courses
- specific learning tasks
3.50 Relative emphases on consistency and variability

It was pointed out in Chapter Two that some researchers’ emphasis lie on the side of consistency of study approach (Biggs, 1987a; Entwistle, 1987) while for others the relative emphasis is on the side of the situation or the context (e.g., Marton and Saljo, 1984; Ramsden, 1984) and hence variability. The concept persistence and change were shown to benefit from concepts of consistency and variability presented in the previous sections. These apart, another concept apparently related to these and mentioned in the past research is fixity, a term used by Ramsden (1988) who feels that it is necessary to stress that consistency (in terms of stability) does not mean “fixity”. He says:

...it is important to grasp that stability of orientations does not imply fixity. Orientations to studying are changeable to the context of teaching, evaluation... (Ramsden, 1988; p175).

Apparently Ramsden (1988) wants to guard against a concept of extreme ‘stability’. Stability here appears to imply ‘unchanging’. However, the relative emphases pointed out above makes the present research question a realistic one to investigate.

3.60 Subject disciplines and approaches to studying

Studying subject disciplines may influence approaches to studying (Ramsden, 1988: p. 173). In such cases, one would expect the context aspect of study approach to be influenced, leading to a possible change in study approach. This change may be biased with respect to a particular study approach in relation to a particular subject discipline (and “neutral” in the case of the same study approach with a different subject discipline). A possible relationship will be examined here in two ways noting,

- views regarding studying subject-disciplines in relationship with learning processes
- content of questionnaire items in relationship with learning processes
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Studying Subject Disciplines

For example, Ramsden (1988) describes studying arts and science specialisms as different:

"Learning physics at college is different from learning history. But why? Intuitively, one is "a hard" speciality: cumulative, paradigmatic, replicable structured, and capable of being summarised in terms of general laws. The other is "soft": particularistic, idiographic, reinterpreting, and not amenable for broad generalisations" (p. 172).

An alternate source of information regarding the types of learning arts and science subject areas demanded were contained in the views held by students following such courses (Ramsden, 1997):

"Learning tasks in science have been described by students typically as being hierarchical, logical, heterogenous, and rule and procedure governed...Arts and social science tasks are seen by students to require interpretation, comparison, generalisation, and to be more self-governed and easier" (Ramsden, 1997, p.208-209).

These two views of learning in the Arts and Science subject-disciplines generally reinforce each other. The descriptions of learning in Arts and Sciences, noted above, are similar to Pask’s (1976) learning styles: operation learning and comprehensive learning, respectively. The description and interpretation of the relations between topics in a more general way, characteristic of comprehension learning, is the way learning approaches in arts and social sciences were described by students. Operation learning involves the manipulation of concepts and objects within the subject-matter domain, emphasis on procedure-building, rules, methods, and details. These are the terms in which science learning approaches were also described by students.

However, these learning styles as conceived by Pask (1976) do not constitute a major constituent of Entwistle’ study approaches that are investigated here. If they did, they could be expected to be influenced by subject-disciplines.

Alternatively, macro-strategies of learning, monitoring, checking, self-testing (Nisbet and Shucksmith, 1986), are as Adey (1997) says, reminiscent of science
processes presented earlier (Gagné, 1970): observing, inferring, comparing, identifying attributes, identifying relationships, predicting and verifying. However, two reasons for questioning any special claim learning science may have in this regard are presented by Adey (1997):

“One is the point made clearly by Millar and Driver (1987), that these processes all have expressions within all learning domains, and that there is in fact nothing which embeds them particularly within science. The other is a more cognitive reason, that these macro strategies are relatively shallow within the cognitive structure which determines response to problem situations. That is, while in principle they may have very general application across domains, for the application to become usable they must be met and fostered individually within each domain context. Transfer is possible, but only when it is specially practised” (p77-78).

Thus macro-strategies of learning may be discriminately developed in the subject-discipline science by teaching to specially foster these in this field. However, if an enhancement of these ‘study approaches’ is brought about by studying the subject-discipline science, this would be with respect to macro-strategies of learning rather than those of present interest, Entwistle’s approaches to studying.

Other distinctions between specialities rest on differences between life systems and nonlife systems (e.g., biology vs. computing; Biglan, 1973a, 1973b; Schwab, 1964) and between pure and applied knowledge, the former being concerned more with achieving understanding and the latter more with improving practice. However, these distinctions refer mainly to the nature of subject-disciplines and not to the studying of them, in order to examine their influence on study approaches.

From this discussion, it is possible to expect that studying subject disciplines will influence students approaches to studying.

**Item Content in Questionnaires**

Learning processes constitute one component in constructs of approaches to studying, and these are reflected in the items of the measuring inventories. The learning processes that may be influenced by subject discipline studying are at issue here. The
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previous section discussed learning processes in relationship with studying subject disciplines, i.e., Pask's learning styles. To the extent the elements in these learning processes form a constituent of approaches to studying, the influence of studying subject-disciplines could expect to be transmitted to approaches to studying. In this regard, an aspect of each of Pask’s (1976) comprehension and operation learning styles are represented in one of the approaches to studying, i.e., deep approach to studying, and are reflected in items of the measuring instrument. These relate to the sub-scales Relating Ideas and Use of Evidence of this study approach. An illustrative inventory item of each is presented in Figure 3.7.

As both operation learning and comprehension learning are linked with understanding, the representation of elements of both these in deep study approach is understandable, as deep study approach is also linked with learning with understanding.

It has been suggested (Ramsden, 1992) that operation learning is associated with learning in the sciences and, comprehension learning, in the humanities. But it appears that, as Entwistle (1987) says, elements of both are required in many tasks in the sciences. Students who could use both types of learning when required are described as versatile. On the basis of being versatile, studying the subject-discipline science should enhance deep study approach scores more, in comparison to that of studying the humanities, because there appears to be more versatile students among science students than among arts students (Ramsden, 1988; 1992).

<table>
<thead>
<tr>
<th>Sub-scale</th>
<th>Illustrative Test Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relating Ideas</td>
<td>I try to relate ideas in one subject to those in others, whenever possible (Comprehension Learning)</td>
</tr>
<tr>
<td>Use of evidence</td>
<td>I am usually cautious in drawing conclusions unless they are well supported by evidence (Operation Learning)</td>
</tr>
</tbody>
</table>

Figure 3.7: Process component illustrative items of deep study approach in the ASI
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Pask's Learning strategies and Styles of learning

References to Pask's (1976) work were made earlier in this section. However, there are relations between the different terms used by him: learning strategies, learning styles and operation/comprehension learning styles. Whilst all these concepts are within the subject matter domain, learning strategies refer to different ways by which understanding is arrived at: holist and serialist learning strategies. This compulsion of understanding is not associated with operation/comprehension learning styles, hence their description as “styles”. Students who employ his learning strategies, serialist and holist, when understanding is not required, are behaving “like a serialist” (operational learning style), and behaving “like a holist” (comprehension learning style), respectively. The sub-scales, Relating Ideas and Use of Evidence, in the ASI may be better understood as ‘abilities’ or ‘strategies’, as the items comprising them are devoid of ‘stylistic’ or ‘preference’ wording. It is these sub-scales that are represented in the deep study approach with items bearing a resemblance to the learning processes (facets of comprehension and operational learning) within the subject domain of science.

On the other hand, Pask’s (1976) styles of learning as such, operation and comprehension learning are also included in the ASI and measured befitting their stylistic nature, i.e., as preferences. However, these are components of the overall Meaning Orientation, and not that of the deep study approach. The distinctive nature of the items measuring styles in the ASI could be observed by illustrative items presented in Figure 3.8. It would be noted that words of the nature ‘prefer’ and ‘like’ are used in their construction.

<table>
<thead>
<tr>
<th>Learning style</th>
<th>Illustrative Test Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehension Learning</td>
<td>I like to play around with ideas of my own even if they don’t get me very far.</td>
</tr>
<tr>
<td>Operation Learning</td>
<td>I generally prefer to tackle each part of a topic or problem in order, working out one at a time.</td>
</tr>
</tbody>
</table>

Figure 3.8: Illustrative items of learning styles in the ASI
Factors affecting Study Approaches and their effects

These distinctions may become necessary to understand the empirical evidence presented next. However, overall, this section indicates to expect higher deep study approach scores among students studying the subject discipline science in comparison to students studying the subject-discipline Arts.

Empirical evidence
The examination of empirical evidence entails sorting out the evidence regarding study approaches from the intertwined findings regarding these, learning orientations, and Pask’s (1976) learning strategies and learning styles: comprehension and operation learning. It appears appropriate to reserve considering that relating to study approaches to the later stage of this examination, thereby providing a backdrop to its own discussion.

Pask’s Learning Styles
In a British college student sample (n=2,208) Entwistle and Ramsden (1983) found that science and engineering students scored highest on the operation learning style measure, and arts and social science students scored highest on the comprehension learning style measure. However, a high combined operation and comprehension style measure was more common in science students. These findings relate to Pask’s (1976) learning styles which are not linked in this manner to Enwistle’s Approaches to Studying. Pask’s (1976) two learning styles themselves are expected to load on the Meaning Orientation, which took place in a sample of Venezuelan university students (Diaz, 1984).

Entwistle’s Learning Orientations
In the same study referred to in the previous section, students’ learning orientation measures were compared. These results are presented in Table 3.1. Of present interest are the results regarding the Meaning and Reproducing Orientations, relating as they are to the deep and surface study approaches, respectively. Students following Arts and Science courses in the Universities differ in the Meaning and Reproducing orientations, and in the case of students following these courses in the Polytechnics, in the Reproducing Orientation. In these instances, the Arts students are more Meaning Oriented than the Science students, and the science students are more
Factors affecting Study Approaches and their effects

Table 3.1 Mean Approaches to Studying Scores by Institution and Faculty

<table>
<thead>
<tr>
<th>Study Orientation</th>
<th>Universities</th>
<th>Polytechnics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Science</td>
<td>Social Science</td>
</tr>
<tr>
<td>Meaning</td>
<td>37.1</td>
<td>37.7</td>
</tr>
<tr>
<td>Reproducing</td>
<td>35.5</td>
<td>35.7</td>
</tr>
<tr>
<td>Strategic</td>
<td>27.3</td>
<td>26.3</td>
</tr>
<tr>
<td>Non-academic</td>
<td>22.7</td>
<td>23.1</td>
</tr>
</tbody>
</table>

Reproducing Oriented than the Arts students. But these results are regarding the Study Orientations, and not directly regarding deep and surface study approaches. However this pattern of relationships is not what was expected, following the discussion in the earlier section. If at all, opposite relationships between Study Orientations and subject disciplines were expected.

Deep and surface study approaches

When this same research is reported elsewhere (Entwistle and Ramsden, 1983), the study approaches themselves are reported, as well as results relating to other subscales of the ASI. Table 3.2 summarises these results.

Table 3.2: One-way analyses of variance of Deep and Surface study approaches

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>Analysis of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Deep study</td>
<td>10.21</td>
<td>10.53</td>
<td>11.28</td>
</tr>
<tr>
<td>approach</td>
<td>.90</td>
<td>.81</td>
<td>.67</td>
</tr>
<tr>
<td>Surface study</td>
<td>13.13</td>
<td>13.23</td>
<td>12.60</td>
</tr>
<tr>
<td>approach</td>
<td>1.28</td>
<td>1.94</td>
<td>1.19</td>
</tr>
</tbody>
</table>

**p<.05

F(df=2, 63) = 8.44**
Factors affecting Study Approaches and their effects

What is reported here are the analysis of variance results. The *post hoc* analysis results are not reported. The significant F-ratio might be misleading into thinking that there are significant differences, when in fact there may not be differences. Only an application of an appropriate *post hoc* test following a significant F-ratio will show this. However, this is not evident in the research report. Therefore these results are not very helpful in the present context.

The above analyses were performed with each of the 14 sub-scales of the ASI, permitting a number of examinations.

3.70 Secondary school studies

Entwistle and Kozeki (1985) investigated study approaches among secondary school children and, among other things, related these to subject-disciplines. The sample was O/L or lower British and Hungarian students. The study inventory was a school version of the adult ASI. The relationships obtained between *preferred* subject disciplines (science and arts) and the study approaches deep and surface are presented in Table 3.3.

There are no significantly different deep mean scores for students following science courses and those following arts courses, even though the scores are different. Thus the results are inconclusive. Yet it is worth remembering that there was a significant difference at tertiary level. The surface mean scores show only one significant

| Table 3.3: Study approach mean scores: t-tests were performed subject pairs in each country by gender |
|---------------------------------------------------------------|-----|-------------------------------|------------------|------------------|
| Study approach     | British |                  | Hungarian        |
|                   | Boys    | Girls          | Boys      | Girls |
| Deep              | Arts    | Science        | Arts      | Science |
|                   | (n=78)  | (n=128)        | (n=87)    | (n=111) |
|                  | 15.5    | 16.5           | 15.7      | 16.5   |
| Surface           | Arts    | Science        | Arts      | Science |
|                   | (n=78)  | (n=145)        | (n=111)  | (n=30) |
|                  | 12.6    | 12.5           | 9.2*      | 11.1   |

*p < .05 (After Entwistle and Kozeki, 1985)
Factors affecting Study Approaches and their effects

difference with respect to this study approach. These arts preferring male students have a significantly lower Surface mean score than the corresponding science preferring students.

A noteworthy feature of this study is that the deep study approach was measured without the sub-scales, Relating Ideas and Use of Evidence. This procedure effectively removes the process components of this dimension and has left, in this instance, deep intention only as a measurement of the deep study approach. The investigators for this omission give no reason. However, as these learning processes are related to a deep intention, the latter in isolation would be an adequate substitute for the deep study approach. But the findings with respect to the deep study approach may have been weakened because of this omission, both Use of Evidence and Relating Ideas being important in studying science. However, the relationship between the Deep study approach and the subject-discipline science does not appear to have been tested adequately in this investigation.

The examination for associations between study approaches and subject-disciplines, attempted above, failed to show firm evidence in this regard. But on the other hand, Operation and Comprehension Learning appear to be associated with subject disciplines in higher education. However, this relationship is not useful to guide the present investigation.

3.80 Relationships between other Learning Styles and subject disciplines

Associations of a firmer nature are suggested between 'conventional' learning styles and subject-disciplines. By learning styles here are meant those that followed the development of cognitive styles. As such their source is largely North American in origin. They are generally contrasted with study approaches and referred to as stable and enduring dispositions.

Among the more known American researchers in this area are Kolb and Schmeck. Kolb (1976; 1984) has developed a learning style classification based on the Experiential Learning Cycle. Schmeck et al. (1977) has developed the Learning Style Inventory. In this country Honey and Mumford (1982) have developed the Learning Style Questionnaire, based on Kolb’s theory.
Factors affecting Study Approaches and their effects

In probing relationships between Learning Styles and subject disciplines, the latter are usually made into disciplinary groupings based on epistemological considerations. Nulty and Barrett (1996) reports disciplinary groupings, summarised in Figure 3.7.

<table>
<thead>
<tr>
<th>Soft/Applied or Soft/Pure or</th>
<th>Concrete/Active Cluster</th>
<th>Concrete/Reflective Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commerce</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>Demography</td>
<td>History</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Linguistics</td>
<td></td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>Philosophy</td>
<td></td>
</tr>
<tr>
<td>Geography</td>
<td>Sociology</td>
<td></td>
</tr>
<tr>
<td>Political Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public policy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Transitional Cluster**

Biological Sciences

---

<table>
<thead>
<tr>
<th>Hard/Applied or Hard/Pure or</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract/Active Cluster</td>
</tr>
<tr>
<td>Applied Economics</td>
</tr>
<tr>
<td>Applied Physics</td>
</tr>
<tr>
<td>Art History</td>
</tr>
<tr>
<td>Computing</td>
</tr>
<tr>
<td>Demography</td>
</tr>
<tr>
<td>Engineering</td>
</tr>
<tr>
<td>Forestry</td>
</tr>
<tr>
<td>Law</td>
</tr>
<tr>
<td>Medical Research</td>
</tr>
</tbody>
</table>

Figure 3.7: Five disciplinary groupings (After Nulty and Barrett, 1996).
Factors affecting Study Approaches and their effects

This grouping is exhaustive, but loses potential from being unable to classify the Biological Sciences. What is more important for the present purpose is the possible relationship of Kolb's four learning styles (Diverger, Assimilator, Converger, and Accomodator) to subject disciplines. In this respect, Arts students as Divergers, Basic Sciences and Mathematics students as Assimilators, Engineering students as Convergers, and Business Administration students as Accommodators is usually found (the most productive Learning Style being the Accommodative Learning Style). Thus this classification of Learning Styles seems to add to the two styles Hudson (1966) presented, convergent and divergent modes of thinking. The addition, one may note, that of accommodation and assimilation, is reminiscent of Piagetian concepts. Though there are differences attributable to subject disciplines, these specific findings are not helpful to guide the present investigation.

Section summary and conclusions
The secondary school study referred to (Entwistle and Kozeki, 1985), did not find significant associations between preference for the discipline science and deep study approach. In the higher education sector there was significant difference for deep approach but the results at both secondary school level and higher education sector with respect to the relationship between the surface study approach and subject disciplines were inconclusive.

Initially it was proposed in the theoretical considerations that we might expect differences across subject disciplines. In other words, as long as the Deep study approach scale of measurement has in it items similar (in processes) to that in a conception of science, science students would obtain enhanced scores on it (the operation of context specificity). Hence for science, one could expect higher scores in Deep study approach than arts. No such prediction is made for the Surface study approach based on examination of the constituent items.

The absence of consistent relationships between study approaches and subject disciplines of Arts and Science need not deter the present investigation. This is because, unlike in most other investigation, what is hypothesised is intensification or reduction from a common start point, whatever the nature this would be. The motivation or choice of specialisation when given or when not given could also be
expected to bring about enhancement or reduction as the case may be in the level of study approaches. In fact motivation or intention is a component of a study approach the other being the process component. However, what should be assured is that study approaches are educable or capable of changing their application. This is assured as they are described as 'shallow', which is the reason these rather than learning styles elect themselves as candidates for the present investigation.
CHAPTER FOUR
Cultural Factors and the Choice of Instrument

4.00 Introduction

The research question contained reference to the Sri Lanka context, not only because of the 'physical' nature of its secondary education system (specialisation being preceded by extended general education) permitting answering this question, but also because the findings may have to be qualified taking into consideration its cultural milieu.

With respect to the latter, this is in connection with the main constructs and instruments envisaged to be used in the investigation. These, if classified broadly, relate to the categories of deep and surface learning.

In contrast to other accounts of human learning, these categories are cultural phenomena which are socially constructed (Richardson, 1994). As Richardson (1994, p. 450) points out, the progenitors, the Marton Group, were aware of this. A cultural influence can arise, as Richardson (1994) argues, by differential conceptualisation:

All industrial countries and many developing countries possess systems of higher education, yet they vary a good deal in their conceptualisation of the nature and purpose of higher education (Richardson, 1981). Thus, it would not be surprising if they vary also in the different cultural meanings attached to different types of study activities (p. 450).

This is likely to be reflected in the responses of the students to the instrument of measurement or at interviews. If these responses have a different meaning in the non-western setting from what was intended in the Western setting, then the obtained data would not be a true reflection of the constructs supposedly investigated. Hence this chapter will examine any peculiarity in the responses that has been obtained in both interview and test data in non-western countries from past research and apply the results to the Sri Lanka situation (as this aspect relates to the research question). To facilitate the latter, the Sri Lanka situation will be comparatively described. The aim
Cultural factors and choice of the instrument

is that the comparison will provide some evidence to judge the applicability of the constructs and instruments in the Sri Lanka situation. Depending on this examination, the protocol for the research strategies of the present investigation will be set-up. Thus this chapter expects to deal with the following three aspects, and in the order indicated below.

- the replicability of findings regarding learning and study approaches across non-western settings
- a comparative examination of Western and Non-western secondary education systems (the latter in terms of Sri Lanka)
- protocol for the present investigation

4.10 Replicability of findings regarding learning and study approaches across non-western settings

In the final analysis this appears to mean the validity and reliability of the constructs and instruments across non-western countries, although it is not always expressed in such terms. Also, of the two concepts validity and reliability, the former appears to be the one more relevant to the issue (as it is more of a question of dimensions). It would be possible to come to know this in two ways, by in-depth interviews and by student reports to questionnaires/inventories used.

In Western countries, interview data and responses to questionnaires differentiate between surface and deep approaches as well as between memorising and understanding (Marton et al, 1996), where memorising means mechanical (rote) memorising. However, in the Asian culture, the difference appears to be between mechanical memorising and memorising with the intention to understand. Thus the Asian learner, more particularly the Chinese learner, while adopting a deep approach to learning, also tries to memorise and understand at the same time. This was evident in Marton et al’s (1996) interview study with a group of Chinese teacher educators. Whilst a distinction between memorisation and understanding (in terms of conceptions of learning) was found in this sample, a more prevalent distinction was within memorisation, made between mechanical memorisation and memorisation with understanding (see Figure 4.1):
Cultural factors and choice of the instrument

Figure 4.1 The two forms of memorisation found in the Chinese sample of Marton et al., (1996).

There is no quarrel with mechanical memorisation as it is also present in samples in the West. However, memorisation with understanding was a new finding and in it two further forms of memorisation were found in the Chinese sample (Figure 4.2).

Figure 4.2: The two forms of memorisation with understanding found in the Chinese sample of Marton et al., (1996).
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The first form of memorisation with understanding involved the notion that we readily memorise or remember what we understand. The second type: understanding could be developed through memorisation.

It has been possible to link two forms of understanding to these forms of memorisation, i.e., subject-object (S-O) and temporal (t-t) to memorising what is understood and understanding through memorisation, respectively. Since the S-O understanding has been observed earlier with Swedish samples, the current observed link of it with memorising what is understood could be regarded found in the interview study. However, the linkage suggested of temporal understanding with understanding through memorisation is finding relating particular to the Chinese learner. It suggests development of understanding, for example, understanding increases with each additional reading of a text (hence temporal), an aspect not recorded as being present in the Western culture. Repeated memorising has been mistaken for rote learning when in fact repetitions were seen by the Chinese sample as enhancing understanding. The Paradox of the Chinese Learner (Marton et al., 1996) which will be referred to in a later section also appears to have roots in this apparent misconception. However, it appears sufficient to note here the linkage of memorising and understanding shown in this study: with respect to the Chinese learner in particular.

Other researchers (Dahlin and Watkins, 2000; p. 67; Sadler-Smith and Tsang, 1998; p. 83) have reinforced Marton et al.’s (1996) findings by stating that these students are not conforming to the Western conception of the Surface approach but are employing memorising as a strategy to enhance understanding: the Western concept of it being largely mechanical rote learning. By this explanation, the dimensionality of the constructs (deep and surface) is at issue here, the attributes of one merging with those of another. This leads to a question of construct validity of the dimensions in a non-western setting. This has lead, in a subsequent occasion for Kember (Kember et al., 1999) to propose a separate sub-scale (Understanding + Memorising) as an adjunct to the Meaning Orientation in the SPQ. It would be appropriate to note here that, now the belief among certain researchers (e.g., Kember, 1966, p.342) is that there are only two consistent orientations (that of achievement not being included), that of the meaning and reproducing. It is on this basis that the model
in Figure 4.3 has been constructed, attempting to take into account previously shown ambiguities with the usage of SPQ and LPQ instruments among Asian learners.

In this model applied to Asian students, one would see that memorising is not a part of the Reproducing approach, rather it has become a part of the Meaning approach with its link with understanding. Other aspects of the model are not at issue here.

---

**Figure 4.3** A model proposed for the SPQ structure (from Kember et al., 1999)

Note. ME = Meaning approach
RP = Reproducing approach
Cultural factors and choice of the instrument

This model of learning appears to be reinforced by the observation of (Marton et al., 1996) that memorising and understanding are not seen as mutually exclusive processes leading to high and low quality outcomes in countries such as Japan, China and Hong Kong, but are often seen as working together to produce high quality outcomes. The implication of this observation for separate constructs is apparent: instead of separation, a combination is suggested.

The above mentioned is one form of inference, based as it were mainly from observation and deduction. Statistical analyses of students’ responses to questionnaires could test assertions contained in them. It is to this aspect we turn next. This takes the form of looking at results of recent factor analyses.

Factor Analyses
The assertions such as those made in the previous section could be tested by examining whether or not the original factors are obtainable in a non-western setting, since stated like this it is too global. What appears to be of greater importance is to examine a range of possibilities: from a merging of the surface and deep approach (in the extreme case), through a dispersion of some of the sub-scales of the surface approach in the deep approach, to a creation of an entirely new surface approach (in addition to the current one). The last mentioned two being more in line of potential solutions that have been the subject of a specific inquiry in a recent research by Sadler-Smith and Tasang (1998). This has employed both Western (British) and non-western (Hong Kong) samples to which the Revised Approaches to Studying Inventory (RASI) have been administered. They say:

...if the Asian conception of learning assumes that memorisation and a deep approach are not mutually exclusive, one might expect memorisation to emerge as a construct distinct from other, less desirable, aspects of the surface approach such as ‘difficulty in making sense’ (p. 83).

The above analysis requires working at the sub-scale level in the factor analysis, knowing the different sub-scales of the Surface approach and the relative significance
of each in the total surface approach. The RASI has four sub-scales for the Surface approach. These are,

- Relying on memorisation
- Difficulty in making sense
- Unrelatedness
- Concern about coping.

Of these, difficulty in making sense and unrelatedness represent the ‘genuine’ surface approach. On the other hand, ‘relying on memorisation’ could form a part of understanding. However, the sub-scale ‘concern about coping’ appears related to the anxiety aspect of the Surface approach and is of no significance to the above debate. Sadler-Smith and Tsang (1998) expected two possible solutions. One was, as stated above, the separation of memorisation as a distinct construct (p. 83) and alternatively, memorisation combining with the deep approach (p. 87).

The results of the factor analysis supported the second mentioned. Regarding this they say:

It was anticipated that memorisation may have loaded on the deep approach for the Hong Kong sample; in fact it loaded (albeit weekly) on the deep (0.38) and surface (0.34) approaches (p. 87).

The above comment is made on the ‘relying on memorisation’ sub-scale. Thus in the Hong Kong sample it appears that memorisation combined with understanding, or as Sadler-Smith and Tsang (1998) say:

...the relying on memorising sub-scale of the surface approach ... loaded ambiguously on... the deep approach for the Hong Kong sample (Sadler-Smith and Tsang, 1998; p. 88).

In the Sadler-Smith and Tsang (1998) study the instrument of measurement was one of the Entwistle group, the Revised Approaches to Studying Inventory (RASI). The results of this study do seem to suggest that with Hong Kong students, memorisation
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could fall in both deep and surface. Thus the RASI is also potentially culturally linked, like the SPQ and LPQ instruments. However, in the Sadler-Smith and Tang (1998) study, no significantly different scores were found in the overall surface approach taken by the UK and Hong Kong students. Hong Kong students at both tertiary and secondary school level have consistently obtained lower surface approach scores (Watkins and Biggs, 1996), in the SPQ and LPQ respectively. This, in part, has led to support the concept 'Paradox of the Chinese learner' (Marton et al. 1996).

A comparison of the two instruments for cross-cultural use can now be made. With respect to the SPQ and LPQ instruments, two shortcomings are stated: dimensionality (no absolute distinction between deep and surface thinking) and 'inappropriate' mean score differences in surface and deep approaches (linked to the paradox of the Chinese learner). Thus of the two types of instruments the ASI or an analogue of it appears more suitable for cross-cultural use. The Sadler-Smith and Tang (1998) study addressed only Chinese students and not Asian students in general. Hence a potential advantage still exists for using the ASI with other tertiary Asian students. The present interest, however, is with a secondary school student population (in Sri Lanka) which is pursued in the next section.

Secondary School Studies

In contrast to the findings with respect to the tertiary sector presented above, the school version of the ASI do not appear to have had difficulty in its cross-cultural use (compared with that of the LPQ instrument discussed above). Thus Entwistle and Kozeki (1985) were able to replicate the adult factor structure across UK and Hungarian nationality secondary school student samples, other than that of the 'strategic or achieving' orientation which appeared to be associated more with an organised and conscientious approach to studying than competitiveness. However, the meaning and reproducing orientations have remained distinct. Kember and Gow (1990) reports data of a study by Lai (1989) in which the ASI had been administered to a sample of secondary school students in Hong Kong, in comparison to the data obtained in the Kember and Gow (1990) study that used the same instrument but with a tertiary education sector students. Inspection of the results of the two factor analyses indicates that the deep and surface orientations have emerged in factor position orders similar to that in the West (1st or 2nd), in the secondary school sample. With the short
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version of adult ASI (ASI-S), the factor structure expected of the instrument by Entwistle was found among secondary school Filipino students (Watkin et al., 1986). Considering these findings, it appears that at the school level the ASI instruments are less given to cultural specificity and hence would be better in the present investigation in comparison to other instruments frequently used, e.g., LPQ.

4.20 Cultural factors in non-western settings: identification

In the previous section some data were presented regarding the applicability of the constructs of approaches to learning and study to non-western settings. In this section cultural factors that have to be considered to determine the applicability of the constructs (deep and surface) will be identified with the aim of examining in the next section (4.30) to what extent the Sri Lanka education system includes these.

The link between memorisation and understanding found in non-western countries appears to be limited to Chinese student samples, hence it is of no concern to the present investigation. Besides this reason, the instrument contemplated to be used (an analogue of ASI), appears better able to separate deep and surface learning, cross-culturally at the secondary school level.

Repetition with effort in memorisation (Dahlin and Watkins; 2000) appears to be another feature in the Chinese setting. Thus they showed that whereas German students tended to play down the role of repetition in the process of understanding, the Hong Kong Chinese students “sometimes emphasised repetition combined with ‘attentive effort’. By such efforts they tried to discover new meanings in the materials they studied, in order to deepen their understanding” (p. 64). These findings appear to indicate the method by which memorising and understanding becomes linked. However, this link between memorising and understanding appears to apply in particular to the Chinese learner and as such is not evidence against the applicability of these constructs in other Asian countries.

A problem that appears associated with the ASI in its cross-cultural application at the tertiary level, is the greater significance a different factor attained over the usual Surface orientation factor. It has been labelled as ‘narrow orientation’
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(due to Pask’s operation learning and improvidence scale loadings) factor. This factor has emerged as the first factor in a Hong Kong tertiary institution (Kember and Gow, 1990), displacing the Surface orientation to which it was related to a position of less importance, i.e., as the fifth factor. By conducting semi-structured interviews distinguishing features of this orientation are given (Kember and Gow, 1990):

(a) learning tasks were defined by the lecturer
(b) understanding was sought in a narrow but systematic, step-by-step approach and
(c) as each part of the task was understood, an attempt was made to memorise the pertinent details

Kember and Gow (1990) speculated that the ‘narrow’ surface study approach adopted by Chinese students in Hong Kong was due either to their limited command of the language of instruction, i.e., English, or to the nature of their schooling and upbringing as children. This suggestion leads one to note the language of instruction of a country as well as its culture and to evaluate their relative influence (probable) upon learning and study approaches. Language is not a consideration in this study since the instrument was translated into the language that the students use in school and the medium of instruction in Sri Lanka is the student’s mother tongue. However, other factors such as obedience to authority (Kember and Gow; 1990) arising by the nature of schooling and upbringing as children which would be prevalent in non-western countries may result in adopting this narrow surface orientation. But Kember and Gow’s (1990) findings and comments are much more in relation to the tertiary education sector, and are as such not of concern to the present investigation.

Different relations of the motivational components with learning approaches are suggested in the model of learning constructed by Kember et al.,(1999), presented in Figure 4.3. Their proposal that deep approach may be linked to extrinsic motivation (career motive) as well the normal relation being with intrinsic motivation in all countries appears worth noting. Hence motivational components of the deep approach are regarded as universal in either the SPQ or ASI instruments.

Of the two main study orientations deep and surface, it has been repeatedly observed that the deep study orientation in both the ASI and SPQ instruments is less
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given to cultural specificity, this being attributed to the acknowledged common goals in higher education in different countries (Richardson, 1994).

Other suggested cultural differences appear to relate to age, gender and academic performance. Regarding the first two mentioned there appear to be a combined effect of gender and age upon study approaches (deep, surface and strategic) in their sample of Hong Kong students (Sadler-Smith and Tsang, 1998) but not for a UK sample (Sadler-Smith, 1996). However Sadler-Smith and Tsang (1998) recommends further investigation and clarification in this regard. It would be interesting to suggest that academic performance may influence study approaches depending perhaps on the success or otherwise of the former mentioned rather than the other way around. However, it is more probable that study approaches are antecedent to the nature of academic performance, hence this aspect would not be of concern to the present investigation.

The above mentioned are some of the cultural factors identified in non-western settings that may have a bearing on learning and study approaches. The examination ensures relative greater cross-cultural applicability of the chosen instrument, i.e. the ASI, *School Version*. In the next section (section 4.30) the extent of the prevalence of these aspects discussed in this section in Sri Lanka will be examined.

4.30 A comparative view of the Sri Lanka educational context (some comparative points with that of United Kingdom)

To facilitate this examination a comparative approach will be adopted-comparing the Sri Lanka education system with that of the United Kingdom. But it will be necessarily brief, as it is based mainly on self-selected items. The aim is to probe the educational context in Sri Lanka, in particular, whether it guards against excessive memorisation and a lack of independent learning that would confound the main constructs of the investigation, surface and deep study approaches, respectively. Given this, the relative balance between using surface or the deep study approaches by the students would reflect, in part, the nature of the learning environment in the schools in Sri Lanka. The school system is described in greater detail in Appendix C.
Cultural factors and choice of the instrument

Since there appeared to be factors among learners in the Asia region that were different to those in the West with respect the study approaches, it is desirable to find out whether other factors different from that in the West may operate in the Sri Lanka context as well. Here we are searching for potential sources that are likely to confound findings regarding deep and surface approaches in Sri Lanka, which would, as mentioned earlier, relate to the validity of the constructs. This could be indicated by excessiveness memorisation or an inordinate lack of independence for the two constructs surface and deep, respectively. It may be also possible to identify, comparatively, a direction in education in Sri Lanka, that is directing students towards one or the other approach to learning and study. This involves a description of the learning context but with an evaluative approach.

Commencement of Primary and Secondary education

Primary school child starts at age 5 years in both countries. Secondary tends to start after 7 years in UK, but after 6 years in Sri Lanka.

Curriculum

In UK it is mostly process based in the primary school, but a shift towards content is observable in the secondary schools. In Sri Lanka, in most schools at all levels, the curriculum is mainly content based, providing grounds for potential memorisation.

Teachers

All teachers are academically and professionally qualified for their vocation in the UK. This cannot be said in the case with Sri Lanka teachers and when they do, there appear to be a gap in the standards as a consequence of their prior education and training. This is likely to affect promoting independence in learning among students in Sri Lanka.

Examinations

There are fewer levels of the same examination in Sri Lanka. Thus there are AS and A-levels at 18+ in the UK, after the GCSE at 16. In Sri Lanka, this aspect of the examination system has remained relatively static, having O-levels and A-levels only, like the old UK system. Quite recently, Sri Lanka reduced the number of A-L subjects required for university entry, making it three from that of earlier four to fall in line
Cultural factors and choice of the instrument

with UK. However, since then, UK has actually increased the number of subjects to 5 through the AS scheme. Selecting from a number of options would be an active matter and it would be possible to expect such circumstances to promote such an aspect as independence learning.

Time
The duration of the school time is noticeably short in Sri Lanka when compared to that in the UK. Therefore, school work is concentrated in to fewer class hours. Whereas in the UK the school hours, on the average, are from 8.45a.m. to 3.30p.m., in Sri Lanka these times are from 7.30 a.m. to 2.00p.m.

This examination tends to show that there is more potential to memorise in the Sri Lanka education system and relatively less opportunity for independent learning. But neither could be described as excessive that would confound the constructs investigated.

Ethos in classroom
In the UK, well provided teaching rooms are allocated to each teacher, and pupils move from room to room at the end of each period in secondary schools. In Sri Lanka, on the other hand, classrooms are allocated to the students, and teachers move from class to class. This difference may go a long way preventing teachers from building up resources for their teaching in Sri Lanka. This shortcoming may apply particularly to the Arts based teachers, as they would not have bases to operate from such as laboratories.

From personal experiences, having taught in both countries, it has been observed that in the UK, most teachers are approachable by students. They try to understand individual students. On the other hand, teachers in Sri Lanka are more dedicated to work, not to individual students.
Cultural factors and choice of the instrument

The following aspects in Sri Lanka classrooms are in sharp contrast to those in the United Kingdom. These are,

- teachers consider the class as an homogenous group
- teachers try very hard to improve examination results
- teach concepts well even without audio-visual aids
- examination preparation taken very seriously.

In contrast, in the United Kingdom, teachers more than in Sri Lanka, are concerned with engaging the pupils in activity, in addition to getting examination results. The relative lack of activity in learning is likely to result, in Sri Lanka, by a greater amount of learning by memorising. This would be the natural thing to do in such circumstances.

Examination preparation in Sri Lanka is taken very seriously as stated above. In the research literature an often mentioned influence upon study approach is examinations (Entwistle, 1991). By this is normally meant an increase in the number and frequency of examinations driving students towards a surface approach to learning and studying. This does not appear to be the condition in Sri Lanka as in the UK. Rather, examinations are fewer in number and far in-between. Hence a similar examination pressure may not build-up in Sri Lanka. Hence resorting to memorisation may more be due to a lack of activity-approach methods of teaching.

In the Chinese and Japanese contexts it was shown earlier (in Section 4.20) that students resort to memorising to improve understanding rather than as an aspect with diminished value. In the Sri Lanka context memorisation may have many uses for the student. One of these may be not to allow the material learned just to slip away as the material was learned with difficulty and without learning enhancing activity-approach methods. Whether this learned material was understood in the first place is, it appears another matter entirely.

In Sri Lanka the medium of instruction, even at the level of universities, is the mother tongue. Hence a ‘narrow’ surface study approach in the sense that Kember and Gow (1990) is likely to be absent in Sri Lanka students. Teachers in Sri Lanka are more respected than in the United Kingdom and this submission to authority, like in
Cultural factors and choice of the instrument

the Hong Kong situation, may lead to memorisation but with different motives. For example, to please the teacher rather than to understand the material.

But what must be also mentioned is that relatively more free time is at the disposal of Sri Lanka students. How this is utilised for studying would be interesting to find out since the observation has been made is that it is used in an unsophisticated way. Often, time is spent mostly re-reading previously studied learning material. This may also tend to encourage mechanical memorisation in Sri Lanka, rather than memorising combining with understanding. If this is the case, it would be the western concept of memorisation that is operating in Sri Lanka and hence the applicability of the construct in this context.

Therefore, above discussion does indicate the possibility of cultural and contextual influence in Sri Lanka upon study approaches that would be substantially different from that in UK (and by extension from that in any other western country) in terms of mean scores in the constructs. However, it does not seem likely that their construct validity is affected.

Ethos at home and society

In relation to academic work in Sri Lanka, the classroom ethos could be considered extending to the home and its surroundings. The homework set in Sri Lanka, unlike in the United Kingdom, does not appear to be of the problem solving type. Thus in this sphere also, the school ethos is reinforced at home. The prolific private ‘tutories’ emphasising memorisation that have mushroomed in Sri Lanka as of late in which every school pupil appear to be a member, may also be considered an extension of the school ethos through the home to the outer society.

4.40 Empirical evidence

The observations reported in previous section are mostly personal ones, but in the Sri Lanka situation these appear to be supported by the following references. Wanasinghe (1991) writing about science education points out that the teaching of the process components in the learning of science leaves a lot to be desired for. Thus he says:
Cultural factors and choice of the instrument

...'scientific literacy' is made up of seven distinct components:

1. Processes of science
2. Concepts underlying science
3. Nature of science
4. Science and society
5. Manipulative skills.
6. Attitudes towards science
7. Values of science.

The Sri Lankan school curricula do not lay sufficient emphasis of component numbers 1, 5, and 6 and appear to be unaware of component number 7 (1991, p.58).

- the above statement echoes the finding of Helen (1987) that the engagement of the process component at the junior secondary school level in Sri Lanka leaves much to be desired. Gunawardena (1990) also, in the main, shares this view.

- Wanasinghe (1982) also notes that too much is demanded from the teachers who are poorly supported with training and materials.

- The examination fever is so great in the country that they had thought of systematic assessment at General Education even of Pre-vocational studies introduced for a different reason. Jayaweera (1986) maintains even Pre-Vocational Studies had to be included in the examination scheme to give it legitimacy.

- Sri Lanka was one of the countries or perhaps was the only country that a change in the examination system preceded curriculum (science) change in the 1960s. Thus Lewin (1992) says:

  ...often the localisation of the examining system followed rather than preceded the institutionalisation of curriculum development activity (p. 14)

Sri Lanka was unique in this respect. However, the adequacy of the quality of the examination items to assess concepts were questioned (Lewin 1992):
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...though the content of examination items changed, their style and quality often fell a long way short of comprehensively assessing key aspects of new science curricula (p.14).

Such observations suggest a fairly homogenous teaching style across all subjects, which may influence student approaches to learning.

4.50 Section summary and conclusions: selecting an instrument.
Differences in Sri Lanka and Western systems may seem mainly be due to economic and cultural factors. In Sri Lanka pupils are driven by examination results more and more. Competition increases each year, hence teaching is geared to getting good grades rather than improving the individual's ability. Less University places are available than students who qualify (UGC, Sri Lanka, 2000), hence private tuition is resorted to by most.

The discussion of classroom ethos above pointed out differences between Sri Lanka and the United Kingdom. The same ethos appeared to be reinforced at home and in the wider social setting in Sri Lanka. It was argued that this ethos might reinforce relatively greater memorisation as a consequence of the teaching methods adopted. Memorisation may also be seen as an attempt to selfishly hang on to material learned with great difficulty. Thus memorising in this context may be different to that seen in the Chinese and the Japanese contexts. Memorisation in the Sri Lanka context may not arise as a consequence of less proficiency in the English Language, as education in Sri Lanka is mostly in the mother tongue in recent times.

It was also suggested that availability of greater free time for students is likely to lead students to memorise to fill in the free time rather than make an attempt to understand. However note must be taken that 'obedience to authority' now appears to be being eroded in Sri Lanka with social changes that have been ushered in, by an open economy. This may mitigate against a memorisation with difficulty. However memorisation may still prevail.
Cultural factors and choice of the instrument

Conclusions

Two conclusions could be derived from the presentation in this chapter. These relate to:

- rationale for choice of instrument
- raised issues relating to emphasis in schools on memorisation across all subjects and possible links to surface approach.

With reference to possible instruments one might reasonably say there was support for the use of RASI or an analogy of that for measuring study approaches in the Sri Lanka context as its construct validity held firm in non-Western settings even among Chinese students with whom the question of cultural specificity first arose. Secondly, it appeared from personal observations and empirical evidence presented that it would not be unreasonable to expect enhanced surface study approach scores across all subjects in Sri Lanka.
CHAPTER FIVE
Methodology, Research Design and Instruments

5.00 Methodology

In preceding chapters and especially in Chapter Two, it was pointed out that the seeds for the approach to learning and study tradition were set in Gothenburg by the Marton Group (Marton and Saljo, 1976a; 1976b), and in their endeavour to understand learning in higher education students were individually interviewed, a qualitative approach. Chapter Three described the rationale for using Entwistle’s Approaches to Learning and Studying Inventory (ASI) which has had as its methodology interviews similar to that conducted by the Marton Group (Entwistle et al., 1979). However, the current methods of the Entwistle Group takes the form of administering this inventory to large samples and generating quantitative data, which is what the present investigation will do to answer this study’s research questions.

Recent research in the social sciences and education has been in the midst of this methodological issue and which has been sometimes described as amounting to ‘paradigm wars’. However, some writers, e.g., Black (1999; p. 48) are of the view that the two modes are in fact complementary to each other. Though there are differences between the two modes of research, e.g., one being based on small samples and the other on representative ones (Black, 1999; p 48), it is the nature of the present research question, comparing groups, that necessitates the adoption of a quantitative methodology. Also, this methodology requires a reasonably sized sample of students at the beginning to allow for experimental mortality, for such a longitudinal study. However, as Black (1999) warns, this method also has its pitfalls, requiring rigour in the design of instruments and their administration.

The design process in quantitative studies

One finds many recent texts helpful regarding this research approach, e.g., Black (1999), McMillian and Schumacher (1989), Nachmias and Nachmias (1996). Black (1999) divides the approach in such a study into two stages, planning and execution, with each of the stages constituted of a number of steps (p.27). The present
investigation adopts the skeleton procedure which is set out in Figure 5.1 (without the probable iterations between the stages being indicated). This presentation is an integrated one as it binds together the threads in such research: research design, measurement and statistics.

The planning stage in this presentation begins with statement of the research question(s) and hypotheses, followed by identification of the variables. The design structure is next determined. Sampling and instrumentation then follow, though not without occasional steps back to refine previous decisions in light of developments. The iterations between the steps indicate the extent to which any design is tentative, with repeated revision and refinement Black (1999). The present investigation emulates these characteristics though it is the finished product that is most clearly observable. The presentation that follows in the subsequent sections adopts the order of the above mentioned steps (Figure 5.1).

5.10 The Research Questions
Previously it was established study approach as conceived of by the Entwistle Group constitutes a person-dependent part and a context-dependent part. The former implies a permanent nature and persistency, the latter, change and development. However that these two components may interact with 'unusual' consequences was pointed out in Chapter One. To reiterate, the situation may be complicated, however, if these two

![Figure 5.1 Stages of designing and carrying out a study (After Black, 1999)](image-url)
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aspects interact: a student's habitual response to the task of study may influence academic performance in, and motivation towards, certain subject disciplines. A context of exposure to a specialised subject discipline may arguably confirm or modify the student's personal approach. This argument led to the statement of the overall question of the investigation:

Would there be stability of intensity of study approaches over time with certain subject disciplines?

This overall question suggests two stages for its investigation: one for determining expressed choice of subsequent specialisation and its relationship to study approach; the second, investigating the possibility of change in level of study approach with specialisation. The former leads, it was pointed out in Chapter One, to a cross-sectional study, and the latter to a longitudinal one. For easier understanding, the assumptions and deductions underlying these are first stated, after concepts used in the investigation are presented.

5.20 Definition of terms and concepts used in the investigation
In the discussions presented in the preceding sections certain terms were used which also have common usage. Hence their particular usage in the present investigation appear to need definition which is provided below:

- **preference:** refers to a personal affective selection of a subject (s) made in the context of several available *common* subjects studied as in the case of the OL wide-curriculum provision in Sri Lanka
- **choice:** refers to a personal affective selection of an AL subject stream made whilst *still* at OL
- **selection:** refers to the AL subject specialisation stream the student is subjected to. This may or may not be congruent with the above choice (of the student)
- **congruent:** when choice of Arts or Science courses at age 16 is the same as final selection as A-level courses
- **incongruent:** when choice is not the same as selection (two possible outcomes)
- **wide-curriculum:** when all students study a wide-range of subjects, with only minor differences as in the case of General Education in Sri Lanka.
- **specialisation:** when studying is restricted to a group of subjects which make similar demands on students e.g. Arts specialisation, Science specialisation
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Assumptions and deductions leading to specific research questions

This research takes place at a time when students' studying characteristics can be assumed to be to some extent labile or plastic (16-17 years age range). It covers a period during which students move from a general curriculum to a specialised one.

It is assumed,

(a) in general, education study approach is being formed under the influence of wide-range of subjects
(b) these tentative study approaches reflect interest/preference for certain subjects (in the O-level general education curriculum)
(c) these tentative study approaches are associated with choice of subsequent specialisation
(d) the actual specialisation may, or may not, be congruent with the expressed choice of the student

If there is an observable effect (b) which is consistent, then it may be hypothesised that this correlation/association becomes

(e) intensified where (d) is congruent but
(f) reduced where (d) is not congruent

in both circumstances because (a) is still continuing.

The commencement of the investigation was prompted by observations of the juxtaposition of an undifferentiated general education curriculum on the one hand and subject specialisation on the other. One of the questions that arose in the mind in this situation was: how could the entry to and progress in specialisation be described in terms of student development? One that suggested itself was, as argued in Chapter One, students’ approach to learning and study.

In the present investigation, two sets of specific research questions result, each of which should be related to:

- the entry of students to specialisation
- the progress of students during specialisation
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in relation to the now chosen students' approach to learning and study.

The entry to specialisation and progress in specialisation mentioned above constitute two stages in the present investigation, cross-sectional and longitudinal. The linkage between the two stages and the basic variables within these in relationship to Study Approach are represented visually in Figure 5.2. Preference (attitude) potentially influences the choice at 16+, but is ameliorated by more pragmatic issues, such as employability. This in turn is combined with other factors, such as O-level grades, resulting in the ultimate selection of either Arts or Science at A-level. The events taking at selection (3) can be traced back to preference (1) in terms of Arts or Science curricula: the arrow pointing in the reverse direction is used to indicate this.

![Diagram of the linkage between the basic variables in relation to the stages in the investigation (SA: Study Approach)](image)

Fig. 5.2: The linkage between the basic variables in relation to the stages in the investigation (SA: Study Approach)
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5.20 The Specific Research Questions

For the cross-sectional study

(1) Will there be a relationship between study approach and preference for O-level subject areas (arts and science) among students in Sri Lanka?

This question attempts to establish a relationship between study approach and the OL curriculum (Arts/Science components) and thereby imply a relationship of study approach with the 'similar' AL curriculum.

(2) Will there be a relationship between study approach and choice of A-level specialisation (arts and science) among students in Sri Lanka?

This question attempts to determine whether there is consistency in choice of specialisation in relationship to study approach, across the different congruency groups.

For the longitudinal study

(3) Will intensity of study approaches change between student choice for a learning context, and subsequent subject specialisation?

Having possibly established a relationship between study approach and curricula (OL and AL), this question attempts to determine whether congruency of specialisation and choice makes a difference to study approach.

The next step in the design process, according to Figure 5.1 presented earlier, is to state the hypotheses. Leading to this, the research questions are classified, variables defined, and potential relationships stated (Black, 1999). Following the hypotheses, the design structure to resolve each one together with a variable map will be presented. Sections B and C that follow this section will deal with the sampling and instruments of the study.
SECTION A

Classification of research questions, hypotheses and design structure

The specific research questions classified

While the research questions lead the way in the research, they can be classified based on the nature and purpose of the resulting study (Black, 1999; Hedrick et al., 1993; Polit and Hungler, 1991).

The main research question (which being the one of the longitudinal study) was classified as one belonging to the *predictive* category. The key feature of this category, as Black (1999) states: “What will happen if one variable changes?” (p. 32). In these circumstances, the nature of any prediction is described as (Black, 1999):

> We do not always have control over variables: things happen and we are observers. There is not necessarily the intent to determine causality, but to identify the existence and strength of relationships between variables (p. 32).

In the research question, manipulation of variables is not attempted. Rather, we observe changes that occur by themselves.

Further it may be noted from the foregoing, the research question *suggests* the research design. For example, inclusion in the research the term “change” suggests that the same student should be tested twice with respect to Study Approach to determine change (which may be an enhancement or a reduction) in student study approach. Stated briefly, for a *direct* test of this, a within-subjects design is suggested.

Like wise, the two specific research questions of the cross-sectional study were classified as belonging to the *exploratory* category (Black, 1999) distinguished by: “Which characteristics or details relate to observed events, phenomena or reasoning.” (p. 31).
There is no presumption of causality in this instance either.

### 5.30 Variables and Causality

(a) Specifying and Describing Variables

The research questions presented in the previous two sections are stated as usually should be, in terms of concepts (Black 1999; p. 42). However, for questions to be satisfactorily resolved, the variables implied need to be more restrictively defined and the measuring instruments or category systems carefully developed. This would also appear to be ultimately linked to what would be considered as acceptable evidence for which aspect establishing, in the first instance, construct validity, established along the following lines (Black, 1999, p.36):

\[
\text{abstract concepts} \rightarrow \text{constructs} \rightarrow \text{operational definitions}
\]

Consequently, the set of items in a questionnaire represents the operational definition of the construct under investigation (Black, 1993; p.64-68). The shortcomings of such instruments often are not so much as their lack of reliability as validity, i.e., poor operational definitions of the constructs. In the present investigation the constructs of student learning and study are measured using an existing instrument that has demonstrated reasonable reliability and validity.

When considering how a construct is to be defined operationally it is necessary, as Black (1999) says 'to decide how it will be quantified and how it will used in a study' (p. 38). There are a number of ways of describing these but the most common place to start, he says, ‘is to consider them to be variables, which implies that they are not constant and have more than one value, level or aspect’ (p. 38). Thus in the present study, the measured constructs of deep and surface study approaches quantify level of use of each. They are observed rather than manipulated variables according to Black’s (1999; p.37) description which replaces the corresponding description of them by Kerlinger (1986) as measured and experimental, respectively.
(b) Variables and causality
Perhaps the single most sought after characteristic of the quantitative research tradition in the social sciences is that of causality, an inheritance from the physical science model. The adoption of the labels independent and dependent with respect to variables in the social sciences by itself does not necessarily confer these attributes, particularly in an ex post facto study such as this one. In the complex milieu of the education and learning context, multivariate conditions are more probable to reign, making causal inference difficult to make, as in the present study. Rather, non-causal relationships are probably the most likely to be attributed, but this does not deter the investigator to ensure control over extraneous variables.

(c) Threats to validity of results
Without adequate control over extraneous variable, the internal validity of a study is threatened, i.e., the validity of answers to the questions, since these other variables may have influenced the outcomes. However, internal validity is only one component of the validity of a study, the other components being the validities external, construct and statistical. External validity relates, in the main, to generalisability of obtained results to populations and, statistical validity, to the appropriate choice of statistical test to resolve hypotheses.

5.40 Research Questions and Hypotheses
Several authors, e.g., Black (1999), Nachmias and Nachmias (1996), mention that it is possible to have more than one research question for an investigation, and that a single research question can also generate more than one hypothesis. With these possibilities in mind the earlier stated (sec.5.20) specific research questions are restated and explained below. These are in turn turned into hypotheses in this chapter, this being the next step in the chain of events depicted in Figure 5.1. For the convenience of identification of the specific research questions these are numbered as 1, 2, and 3. The first two relate to the cross-sectional study numbered according to the order presented, in section 5.20. Number 3 will be used to identify the third research question relating to the longitudinal study. The numbers used for the hypotheses will follow the numbering of these research questions for the convenience of relating to each other.
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It is well to remember that hypotheses are more specific than research questions. This is one of the differences. Black (1999) further describes the differences:

First, it will be more specific and indicate the variables involved. Second, it is not unusual to find one question generates a number of hypotheses. Third, it would indicate the population and situation to which the study’s results could be extended (p. 49).

Another characteristic of hypotheses is that they are ‘statements of expected outcome which can be subsequently tested’ (Black, 1999). Thus there follows an increasing specificity of the research problem along the following lines:

Research question → Research hypotheses → Statistical (null) hypotheses

The last mentioned will be considered later. These could be considered a state of further revision and refinement of the research question.

5.50 Turning research questions into hypotheses and research designs, in the Cross-Sectional Study

Specific Research Question No. 1

Is there a relationship across subject preference of O-level final year students in Sri Lanka and their level in a particular component of Study Approach?

Students in schools are on the whole studying what have come to be called ‘school subjects’. The educational psychology research literature, since behaviourism, mentions individual differences in preference in relation to subjects studied at school. These subjects are broadly categorised here into two: arts and science subjects. Thus some students appear to prefer science subjects in the common curriculum in the schools at O-level and others prefer arts subjects. Prefer and preference are terms that refer to ‘over something else’. Hence by preference for the subject science by a
student here is meant that this student prefers this subject to arts subjects. The label 'science subject' itself could be shared by other ones in the curriculum, e.g., mathematics.

The term 'preference' is an evaluative term. To find out about what subject a student prefers he may be asked individually or he may be given a questionnaire that is also given to other students.

How students were categorised as preferring Arts or Science subjects will be described later in this chapter under Instruments (in section C). The other variable relating to this research question is that of students study approach. This phrase may be used in a generic sense or in a specific sense. There were occasions in the earlier chapters that it was used in the former mentioned sense. But in this chapter it will be used in its specific sense, that being the one given to it by its progenitors, i.e., the Entwistle Group. This was described and examined in Chapter Two of this thesis. It appears sufficient to say here that it refers to level of deep and surface study approaches (Entwistle and Ramsden, 1983) only, in the present investigation.

Now the expectation of the forthcoming two hypotheses maybe stated first in general terms. Thus they expect a relationship between preference for arts or science subjects in the curriculum and study approach (deep and surface). It is hypothesised that arts/science preference, i.e., arts or science subjects preference will be related to level of each study approach. These two preferences are not those towards single subjects but, as mentioned above, towards the two broad categories of arts and science subjects. Of the two hypotheses that arise from this research question, one relates to how preference for arts subjects or science subjects relate to level of deep study approach, and the other how preference for arts subjects or science subjects would relate to level of surface study approach. These may be stated formally as done below.

But prior to that a word of clarification for the use of the phrase "level of" study approach in the research question may be indicated. This is to emphasise that second variable has two components: deep and surface, each of which is measured separately. Confusion is expected to be thereby avoided, as more than one component
of the study approach is investigated in this study (deep and surface) for both arts and science subject areas. Otherwise the possibility exists for misunderstanding, that one study approach is associated with only one subject area, which is not intended.

As stated earlier, hypotheses express potential relationships between and among variables. They are also statements of expected outcome which can be subsequently tested. They also refer to the population to which the findings regarding the sample could be generalised. These elements are contained in the hypotheses of the present study noted below.

**Hypotheses**

Alternative hypotheses are used to describe the two components of study approach (deep and surface study approaches), but the rest of the contents are the same (being the same independent variables arts and science preference). A *directional difference* is not hypothesised as theory and past research reviewed in Chapter Two did not lend *firm* evidence to justify such an expectation.

1.1 In a sample of final year O-level students the mean Deep study approach score of students preferring arts subjects will be different from that of students preferring science subjects.

1.2 In a sample of final year O-level students the mean Surface study approach score of students preferring arts subjects will be different from that of students preferring science subjects.

**Transforming Hypotheses into Research Designs**

Basic models of design of quantitative research for translating hypotheses into an action plan endeavours to control extraneous variables, otherwise the results of an investigation could be attributed to these rather than the independent variable of interest. To control such variables, they have to be identified in the first place, though there may be some unanticipated ones. While some of the latter may be adequately controlled by random sampling, drawing a *variable map* that includes the former has many uses one of which is the provision of a platform for a discussion of the validity
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of the results. Hence variable maps are presented below in relation to each of the hypotheses. The research designs themselves will be explained in detail in the discussion that follows.

Translating hypothesis 1.1 into a research design

To test the assertion of a hypothesis, research design will be described using diagrams, the components of which are represented by a common key (Figure 5.3). In this figure the independent variable is shown in a short rectangular box, the extraneous variable in an elongated rectangle with rounded corners. The dependent variable, Y, is shown in a rectangular box with rounded edges and thick lining. This pattern of representation will be followed in the rest of the design presentations.

The research design to resolve Hypothesis 1.1 together with a variable map is presented in Figure 5.4. In it, two rectangular boxes show the independent variable of two levels of subject preference.

![Diagram of research design]

**Figure 5.3** Key adopted for variables in the research design diagrams

5-13
PS: Purposive Sampling

Figure 5.4 The *ex post facto* research design to resolve Hypotheses 1.1 and 1.2, but in chronological order: SA scores will differ across student subject preference. (SA scores = Study Approach scores, Deep for Hypothesis 1.1 and Surface for Hypothesis 1.2)
Hypothesis 1.1 expected a difference in deep study approach (DSA) scores between the Arts preferring and Science preferring two groups, which also means an association of DSA with subject preference. Here the independent variable was subject preference, and this variable was dichotomous being divided into two categories—preference for Arts subjects or for science subjects. They are denoted by their usual symbol, $X$, with $X_{\text{Arts}}$ and $X_{\text{Science}}$ denoting Arts and Science preferences respectively, underlined because here it is a life event rather than one that could be manipulated (Black, 1999; p. 71). The dependent variable is denoted by $Y$, which is operationally defined by $O_{\text{Arts}}$ and $O_{\text{Science}}$, the scores on the instrument.

The design contemplated was an *ex post facto design* since in the present investigation manipulation of the independent variables was not possible, the variables being life events, whose use was utilised. Many psychologists and educationalists have pointed out the shortcomings of this design (e.g. Kerlinger, 1986). But as Black (1999, 1993) repeatedly points out, educational research often lacks opportunities to manipulate important independent variables, and hence the use of the *ex post facto design*.

**Known Extraneous variables**

Considering "gender balance", its potential to be an extraneous variable would exist if it had been previously shown that deep study approach were sex linked. In that case an association found here between this study approach and subject preference would have been attributed primarily to a sex difference by virtue of a preponderance of one of the sexes being in one of the subject preference groups. The literature has only recently probed into this aspect (Sadler-Smith, 1996; Hayes and Richardson, 1995) and as such the situation is not resolved. The weight of the available evidence, on the other hand, shows no gender bias. Hence mixing sexes at this stage of the design does not appear to go against what is so far known. Perhaps when the descriptive statistics are presented in the next chapter if there are any differences, they will be apparent. Until then, it appears justifiable to consider "gender balance" as a
potential extraneous variable in Figure 5.4 adequately controlled by sampling all students as one group.

"Ability range" appears to be another potential extraneous variable. If students preferring science happen to be more able students than arts preferring students then a found difference in deep study approach between the two subject preference groups would be due to just to this ability difference than due to a subject preference difference. But earlier research (Entwistle and Ramsden, 1983) has not shown such tendencies. However, these findings are mainly with adult populations.

On the other hand, if "gender balance" and "ability range" were related to subject preference, it would be difficult to control the effects of these two variables upon subject preference as they would be part and parcel of the latter mentioned. However, even in this case two solutions are afforded. Kerlinger (1986) says, they could be included in the design as additional attribute variables (observed variables). Secondly, by random assignment into groups following random selection (Black, 1999; p. 63). This would distribute the variables evenly across the groups. As it is, neither appears necessary, at this stage of the research.

The measurement of subject preference as Arts or Science was expected to be a nominal measure. How it was achieved is described later, under Instruments, in section C. This categorisation should result in two non-overlapping categories making the two preference situations mutually exclusive.

Evaluation of the Design

A consideration of the weaknesses and strengths of the above research design from the viewpoint of confounding factors in research designs in general may now be discussed in terms of fifteen potential sources (Black, 1999).

The following aspects can be regarded as on the favourable or on the positive side. Comparing two groups before arriving at a conclusion is better than inferring
from findings with respect to a single group. The investigation is to be conducted in the natural settings. The sample was a representative one of the urban population of students, although random sampling was not attempted. There was no opportunity to learn from the instrument as this aspect of the study had only one measure of both instruments at this stage of the investigation. Independence of observations was achieved by the two sets of deep study approach measurements. Though taken by the same students, they were taken after a considerable passage of time. However lack of such independence of observation may prevail if students responded to the instruments with a sharing of ideas amongst them. How this could be minimised is discussed later under Instruments (discussed later in C).

In contrast to these positive attributes of the above mentioned study design, there are negative aspects, as is the case of ex post facto research designs. Thus there could be many intervening variables other than subject preference that contributes to any observed study approach difference. This is the impinging of time and other events upon the dependent variable. It maybe schematically be shown as follows:

\[ X_1 \rightarrow X_2 \rightarrow X_3 \rightarrow Y \]

where \( X_2 \) and \( X_3 \) are intervening variables.

There could be regression towards the mean in that that the subject preference groups were selected on the basis of ranked data. The direction of causation is a problem in this design. This is because the "independent variable" is not manipulated. Further the used "independent" variable appears, as pointed out earlier, to be associated with a weak classificatory system.

Overall, the present design as a basic design has a number of weaknesses, but they appear to be those typically contained in the ex post facto approach, rather than specific to the design adopted in the present investigation. What one learns from the above discussion is that in the interpretation of the results obtained, due regard must be given to these limitations. Thus the results will be described in terms of association between variables, rather than causal.
In the above discussion it was considered that subject preference is the independent variable, X. Then Study Approach becomes the dependent variable. However the possibility exists that their roles operate in the reverse direction. That is Study Approach is the independent variable and this is what might determine subject preference. In this case it is the latter that becomes the dependent variable. But a study approach must be with respect to studying something or learning something (Ramsden, 1992). Hence for this study, subject preference will come first, though a more ‘traditional’ view would place study approach first as with the case of placing intelligence as the independent variable affecting a dependent variable like academic achievement.

Research question No. 2

Is there a relationship across choice of A-level specialisation of students (while at O-level) in Sri Lanka, and their level in each component of study approach?

The question that is being asked now is would groups of students who differ in their choice of eventual A-level subject specialisation (expressed while still at O-level) also differ in each of the two components of study approach. To answer this question, the short questionnaire (to be described later) elicited which of the three streams of specialisation available at AL would each of the students choose. This was asked while they were in the final year OL class and just before sitting the OL examination. This threefold classification (Arts, Commerce, and Science) was later reduced to one of two categories, Arts and Science, with the Commerce specialisation treated as an arts specialisation. The Study Approach components of students, that is, deep and surface study approaches, were measured as described above by means of a school version of the adult Approaches to Studying Inventory (Entwistle and Ramsden, 1983), the School and School Work Inventory (KE3).

In the absence of firm evidence from past research or by deduction from theory that choice of subject specialisation would be related to study approach (or an association between just only subject area of specialisation and study approach), non-directional hypotheses were set-up as follows for the two components of Study approach.
Hypotheses

2.1 In a sample of final year OL students the mean deep study approach score of students whose choice for AL specialisation is science will be different from that of students whose choice of AL specialisation is Arts.

2.2 In a sample of final year OL students the mean surface study approach score of students whose choice for AL specialisation is science will be different from that of students whose choice of AL specialisation is Arts.

Research designs as action plans to resolve each of these hypotheses together with variable maps is presented in Figure 5.5.

Hypothesis 2.1 expected a difference in deep study approach (DSA) scores between the Arts choosing and Science choosing two groups, which also means an association of DSA with choice of subject specialisation. The independent variable is choice of subject specialisation. This variable is dichotomous being divided into two categories: choice for Arts subjects or for science specialisation. They are denoted by their usual symbol, X, with $X_{\text{Arts}}$ and $X_{\text{Science}}$ denoting Arts and Science specialisation choices (life events) respectively. The dependent variable is denoted by Y, which is operationally defined by $O_{\text{Arts}}$ and $O_{\text{Science}}$, the scores on the instrument, the SSWI (School and School Work Inventory). The design contemplated was, as with respect to previous hypotheses, is the ex post facto design.

The potential confounding affects of the extraneous variables shown in Figure 5.5 are similar to those discussed with respect to Research Question 1 and depicted in Figure 5.4. These are "gender balance", "ability range" and "ordinal measures of choice", as well as those arising from the validity and reliability of the ASI. The ways of overcoming or nullifying these were dealt at length under Hypothesis 1.1. As the answers are largely similar, they are not repeated here.
Figure 5.5: The *ex post facto* research design (together with variable map) to resolve Hypotheses 2.1 and 2.2 but in chronological order: SA scores will differ across student specialisation choice. (SA scores = Study Approach scores, Deep for Hypothesis 2.1 and Surface for Hypothesis 2.2)
Hypothesis 2.2 expected a difference in surface study approach (SSA) scores between the Arts choosing and Science choosing two groups, which also means an association of SSA with choice of subject specialisation. As this is the only difference, the above discussion applies and is no repeated.

5.60 THE LONGITUDINAL STUDY
Research questions, hypotheses and research designs in the longitudinal study

Introduction
The longitudinal part will address aspects of central interest in the investigation, persistence and change of Study Approach. The first part or the cross-sectional part described in the previous section mainly laid a foundation towards an investigation of these. This part differs from the previous one in another aspect. Whereas aspects discussed so far in the cross-sectional study have been based largely on deduction and assumptions, from time to time the question of consistency and variability of Study Approach has been discussed in the research literature. Chapter Three made a survey of these. Hence this makes it possible to refer to empirical findings regarding the setting up of research questions and hypotheses in this section. But first it appears appropriate to reiterate the terms used in this study, persistence and change, as intended to be used in it. Reference to Fig. 3.1 in Chapter Three indicates,

\[\text{persistence: no change in intensity of Study Approach in congruency or incongruency of specialisation}\]
\[\text{+ve change: increase in intensity of Study Approach in congruency of specialisation}\]
\[\text{-ve change: decrease in intensity of Study Approach in incongruency of specialisation}\]

The present study differs from many earlier ones that investigated persistence and change in relating these to certain conditions, i.e., choice of specialisation. Thus, for example, the studies of Eley (1992), Newble and Clarke (1987), examine similar relationships, without specified motivation components.
Research Question No 3

Theoretical background

Earlier it was noted that study approach as conceived of by the Entwistle Group, constitutes of a person-dependent part and a context-dependent part, the former implying a permanent nature and persistence, and the latter, change and ‘development’. However that these two components may interact with ‘unusual’ consequences was pointed out, for example when a student’s habitual response to the task of study possibly influences academic in, motivation towards, certain subject disciplines. Then a context of exposure to a specialised subject discipline may arguably confirm or modify the student’s personal approach. This argument led to the statement of the overall question of the investigation, which is reiterated:

Would there be persistence of intensity of application (use of) Study Approaches over time with certain subject disciplines?

The specific research question for the longitudinal study is:

How will study approaches change with student choice for a learning context, over time with subject specialisation?

The question asks whether there will be persistence of study approach or whether they change with certain subject disciplines, these disciplines being that of choice or not of choice. It is anticipated that a positive change (increase) would occur under the congruent condition and a negative change (decrease) under the incongruent condition. Change, therefore, has these meanings in the study. The association’s hypothesised in the next page form the base lines to infer change magnitude and direction.

The question suggests two stages for its investigation: one for determining expressed choice of subsequent specialisation and its relationship to Study Approach; second, the increase or otherwise of study approach with specialisation. The former leads to a cross-sectional study, and the latter to a longitudinal one. The specific research questions to be answered in the longitudinal study flow from, to reiterate, the following assumptions and deductions.
Methodology, Research Design and Instruments

Assumptions and deductions underlying the longitudinal study
If there were an observable effect that study approach is associated with choice of specialisation then it may be hypothesised that this association becomes

(a) intensified in congruency, but
(b) reduced in incongruency, or not intensified as much as in congruency.

in both circumstances, because formation of study approaches is still continuing.

The phrase association mentioned above is the object of the examination. This is examined to find out whether the strength of it would be intensified or reduced under the conditions of congruency and non-congruency, respectively.

Methodology for Specific Research Question No. 3

After O-level, a differentiated curriculum awaits students upon their arrival at A-level which would lead some pupils to specialise in Arts and others in Science. This entry to A-level is associated with certain choices of specialisation (made at O-level) being met (congruency) whilst others not being met (incongruency). The choice was two-fold, Arts or Science (the expressed Commerce choice was subsumed under that of Arts, as shown in Figure 5.6.

![Figure 5.6: Flow diagram of the study](image-url)
Methodology, Research Design and Instruments

As noted above, two deductions are possible from the specific research question of this section. One is, under congruent the condition there would be in increase in study approach, whereas under the incongruent condition there would be a decrease in it. This is based on the plausible argument that the congruent condition would enhance whereas the incongruent condition would interfere with the development of the study approach. The second one is both would increase, but there would be a greater enhancement under the congruent condition over and above that in the incongruent condition.

Both these two expectations could be derived from the research question as it is stated, but without any evidence, a non-directional test of any hypotheses is necessary. However, as a re-framing of the research question does not appear to make a great difference, more attention will be given to deriving the hypotheses from it.

Two further aspects need be considered and whether these should be taken into account at this stage of the study. These are:

- whether results obtained in the cross-sectional study should be carried over to the longitudinal part of the investigation. This relates to a possible differential association obtained with regard to study approach and subject areas of science and arts.
- whether the cultural properties of the surface study approach should be given consideration.

Regarding the first mention the answer is no, if comparisons are intended to be made with groups whose eventual specialisation (selection) is the same though they differ in congruency/incongruency with respect to choice of specialisation and actual specialisation. Otherwise, the answer is in the affirmative. The decision made will be guided by the research question(s) of this part of the study which is(are) presented later.

Regarding the second mentioned aspect, the answer should be in the affirmative, as a review of Sri Lanka education system in Chapter Four indicated potential memorisation could be anticipated leading to higher scores in surface studying. However, sufficient evidence does not appear to exist for an a priori hypothesis.
These considerations are taken into account in the questions and hypotheses presented below for this section of the study.

5.70 The Research Question No. 3 (re-stated)

Is the association between choice and study approach (deep and surface) reflected, over time, in the association between selection and intensity of study approach (deep and surface)?

To the extent the earlier mentioned association is maintained, it would (in general) amount to a case of persistence of study approach. If not, it would be a case of change in it.

The depiction in Figure 5.7 implies several possibilities, e.g., SS for deep study approach may lead to its intensification, and similar to this would be that of AA for surface study approach, with the SA and AS conditions being capable of conveying lesser degrees of outcomes. These possibilities arise from the findings in the cross-sectional study and are related to the Research Question stated above. They presume, in the first instance, an association of choice with study approach. The purpose of the present Research Question (No. 3) is to examine these findings further by means of the longitudinal study.

<table>
<thead>
<tr>
<th>Choice</th>
<th>Selection</th>
<th>Congruency of Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science (S)</td>
<td>Science (S)</td>
<td>Congruent (SS)</td>
</tr>
<tr>
<td>Science (S)</td>
<td>Arts (A)</td>
<td>Incongruent (SA)</td>
</tr>
<tr>
<td>Arts (A)</td>
<td>Science (S)</td>
<td>Incongruent (AS)</td>
</tr>
<tr>
<td>Arts (A)</td>
<td>Arts (A)</td>
<td>Congruent (AA)</td>
</tr>
</tbody>
</table>

Figure 5.7: Figure showing combinations of specialisation choice and actual specialisation (selection) leading to four congruency of selection outcomes
Methodology, Research Design and Instruments

5.80 Questions and Hypotheses
The cross-sectional study found that choice of Science (for specialisation) was associated with higher Deep Study Approach scores and the choice of Arts with lower Surface Study Approach scores. The converse prevailed with that respect to the other component of the Study Approach (Surface) investigated. These findings, as reminded above, are potentially extended to in the present part of the research. That is whether these relationships are reflected in the longitudinal part of the investigation, with selection. To examine this one may wish to know the following aspects.

(1) the relationship of the four groups at choice with study approach
(2) the relationship over time of specialisation with study approach
(3) the relationship of the four groups at after selection with study approach.

A measurement plan relating to these relationships is presented in Figure 5.8.

<table>
<thead>
<tr>
<th>Selection congruency</th>
<th>Beginning (at choice)</th>
<th>After (with selection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS (congruent)</td>
<td>0₁s</td>
<td>0₂s</td>
</tr>
<tr>
<td>SA (Incongruent)</td>
<td>0₁a</td>
<td>0₂a</td>
</tr>
<tr>
<td>AS (Incongruent)</td>
<td>0₁ₐ</td>
<td>0₂ₐ</td>
</tr>
<tr>
<td>AA (congruent)</td>
<td>0₁α</td>
<td>0₂α</td>
</tr>
</tbody>
</table>

Figure 5.8: A model to relate to hypotheses in the longitudinal study

Notes:
Before: measurement of Study Approach at end of General Education
After: measurement of Study Approach on to 9m in selection (specialisation)
SS, SA, AS and AA refer to as in Fig. 5.7, that is;
SS: (congruent Science selection)
SA: (incongruent Science selection)
AA: (congruent Arts selection)
AS: (incongruent Arts selection)
Across Groups at Beginning

At choice

Sub-questions could be posed in respect to the main question, Question No 3. These relate to differences across the groups of different congruency selections—SS, SA, AS and AA. Though the interest is really at selection, the situation at choice provides a baseline for comparison with that at selection. Hence the analysis.

The four groups are expected to differ in mean Study Approach scores when the choice is made. But the SS and SA groups are expected to be more similar with respect to the Study Approach at choice. Also the AA and AS groups are expected to be more similar at choice. This is because they are categorised on a similar basis, the former pair for Science choice and the latter pair for Arts choice. The different choice groups are also expected to vary between them in a particular component of Study Approach, as their choices are different. These expectations follow from Figures 5.7 and 5.8. An overall expectation is possible, which is expressed by Hypothesis 3.1 below:

Hypothesis 3.1: In a sample of A-level students in Sri Lanka the mean deep study approach scores at choice \( O_1 \) of SS, SA, AS and AA would be significantly different from each other.

This hypothesis may be named with the suffixes a and b for the deep and surface study approaches respectively, i.e., as Hypothesis 3.1a and Hypothesis 3.1b. Depending on the findings, one could proceed to examine or not to examine the six separate comparisons (Black, 1999; pp. 99-100).

Over Time

Overtime (within-groups)

The Research Question No. 3 implies sub-questions relating to difference over time in study approaches, between choice expressed and with selection (could be called the beginning and after difference). The associations between choice and study approach should be reflected in the association between study approach and selection. Columns
two and three in Figure 5.8 represent the two situations. A difference in the two overall mean scores (at beginning and after) could be expected. However, the more important aspect would be an increase or decrease in the within-subjects at each level of the between-subjects factor. That is, *along* the rows in Figure 5.8. The predictions regarding these rows are based on the *main* relationships observed in the cross-sectional study and are:

- Study Approach would increase with congruent selection
- Study Approach would decrease with incongruent selection

The expectations could be stated in another way:

Does the strength of the association between choice of specialisation (Arts/Science) and Study Approach (deep/surface) increase/decrease over time, when selection is congruent/incongruent with the choice?

What is expressed is that there would be differences in study approach across time (in the different choice and selection situations) for the *same* group of students. This leads to state a single hypothesis for the overall situation.

With $O_1$ denoting Study Approach (Deep/Surface) scores before and $O_2$ afterwards (of any one group),

**Hypothesis 3.2**: In a sample of A-level students in Sri Lanka, the mean Study Approach scores $O_1$ at choice will be significantly different from that of the mean of scores $O_2$ with selection of each group of students (SS, SA, AS and AA).

Upon which finding one could proceed to examine or not to examine the four separate comparisons (Black, 1999; pp. 99-100). However, the procedure to follow may also depend on the model of analysis of variance adopted.

This hypothesis would be named with the suffixes a and b for deep and surface study approaches respectively, i.e., as Hypothesis 3.2a and Hypothesis 3.2b.
Methodology, Research Design and Instruments

The increase/decrease expected of study approach is dependent on the association found earlier between the study approach and the choice of specialisation (and hence a reflection of the former).

Across Groups at End of Investigation

With selection

The four groups with selection are also expected to differ in their mean Study approach scores. These differences are different from that at choice and are expected to be brought about by the association seen earlier (between choice and Study Approach in the sample as a whole seen in the cross-sectional study). Findings regarding Hypothesis 3.1 above could function as the baseline to draw inferences regarding the findings regarding this hypothesis (Hypothesis 3.3). To ask questions regarding the expectations in the selection situation Figures 5.7 and Figures 5.8 is helpful. The summaries presented in these Figures suggest the directions of the examination.

If in the cross-sectional study it was found that students who choose Science had a higher deep study approach mean (than those who choose Arts) and if they get this choice at selection (congruent selection, SS), it was argued that their mean score would further increase. However, if students with this same choice have as selection Arts (incongruent selection, SA), this groups mean score would decrease from what it was earlier. The first two Rows in Figure 5.8 depict these two situations. Working down the rows, further expectations could be expressed. These expectations are based on the assumption that, it would be recalled, choice of specialisation would be associated with congruency of selection (in terms of study approach).

These expectations express differences in mean deep study approach scores across the four selection situations of SS, SA, AS and AA in Figure 5.8. This make it possible to state a single hypothesis to represent these expectations in the selection situation (as was the case at choice, made earlier). Figure 5.8 illustrates the situations. This overall hypothesis at the selection stage may be stated formally:
Hypothesis 3.3: In a sample of A-level students in Sri Lanka the mean Study Approach scores at selection \( (O) \) of the groups SS, SA, AS and AA would be significantly different from each other.

Depending on the findings one could proceed to examine or not to examine the six separate pair-wise comparisons (Black, 1999; pp. 99-100). This hypothesis may be named with the suffixes a and b for the Deep and Surface study approaches respectively, i.e., as Hypothesis 3.3a and Hypothesis 3.3b.

Indices of reflection

The expectations expressed in the above mentioned hypotheses are in terms of mean scores. The magnitude of a study approach would reflect (in the terminology of the Research Question No. 3) a situation’s (choice) association with that study approach and a change in it in a corresponding situation (selection) a reflection of the change in this association. Hence the justification of the adoption of mean scores to ‘reflect associations’. They could also be called indices of intensity of association, if the latter phrase is preferable to that of to ‘reflect associations’. However, here, reflection in the general sense means an increase or decrease.

\( \alpha \)-level

Methodology demands that the level of significance (\( \alpha \)) for the hypotheses be set in advance. The present study sets \( \alpha = .10 \) because we are looking for possible (even weak) relationships. Hence in these circumstances its worth increasing probability of Type I Error.

The next step, as Black (1999, p. 27) says, is to determine research designs to resolve the hypotheses whilst identifying variables. This is begun next in section 5.90.

Section summary

For Research Question No. 3, many expectations could be expressed, these being formally presented as four hypotheses. It was found possible to combine the proposed analyses of three of the hypotheses in a single factorial design, a Mixed Factorial design. The hypotheses in the longitudinal study were related to the hypotheses of the cross-sectional study.
Methodology, Research Design and Instruments

5.90: Turning hypotheses into research designs

The above mentioned hypotheses imply different research designs for their resolution. Hence the implied design would be described at the level of each of the hypotheses.

The Research Design for Hypothesis 3.1 (3.1a and 3.1b for the two components deep and surface study approaches)

The research design appropriate to test Hypothesis 3.1, across groups at choice, appear to be that basic one described by Black (1999; p.77) as D3: Post-test/observation only, with a control group, but independent variable, life event, is observed not manipulated, hence an ex post facto design.

The Research Design for Hypothesis 3.2 (3.2a and 3.2b for the two components deep and surface study approaches).

The hypothesis 3.2 has the following characteristics:
1. more than two groups to compare each other with
2. there is pre- and post - tests
3. the independent variables are experiences (congruency of selection), while not entirely under the control of the researcher, the events are observed as they happen.

Of the basic research designs that Black (1999) makes the most appropriate comes under the general heading Quasi Experimental (C) and is the design C2: Non-equivalent control group design with pre-tests. This design meets the requirement (1) and (2) mentioned above but requires the last (3) to be considered equivalent to an experimental treatment as if independent variable were manipulated. In this design the independent variable were not manipulated. Figure 5.11 presents the research designs and variable maps for both deep and surface study approaches.

The Research Design for Hypothesis 3.3 (3.3a and 3.3b for the two components deep and surface study Approaches)

The design to solve this hypothesis which relates to mean differences across groups in the selection condition is also the one used for Hypothesis 3.1, D3. Hence further comment on this design appears not necessary.
Research Designs and Variable maps

Hypothesis 3.1 expected that the Study Approach scores at choice of the different SS, SA, AS and AA groups to be different. Figure 5.10 presents the research designs and the variable maps to resolve these (for deep and surface study approaches).

A potential weakness of the adopted research design is as follows:
- the intensity of study approach measures in comparable choice groups (e.g., SS and SA) are different. Thus the study approach scores of the two science choice groups may not be similar, nor those of the two Arts choice groups.

These shortcomings could weaken associational inferences with subject choice.

Hypothesis 3.2 stated that the mean study approach scores $O_1$ would be different from that of $O_2$ of the same group (in A, SA, AS and AA groups) over time. Some of the extraneous variables that may interfere with a potential relationship are shown in Figure 5.11.

Figure 5.10: Ex post facto research design to resolve Hypothesis 3.1: that the mean study approach scores at choice across the congruency groups SS, SA, AS and AA will be different. (SA scores = study approach scores, deep for Hypothesis 3.1a and surface for Hypothesis 3.1b)
These are:

- other events occurring during the passage of time between the two testing sessions would particularly have an effect on $O_2$ unless they are equally distributed all the groups.

However the possibility that the 2 groups of the same choice at $O_1$ may differ in the study approach (deep or surface) is of not much importance now, as it is the same students who are tested on both occasions. However, a potential extraneous variable could be cited that was not in the previously considered design. This is, A/L Arts/Science and O/L Arts/Science contexts are not entirely similar, hence the comparison of study approaches are not in 'like with like' contexts though an assumption in this direction was made at the commencement of the investigation: hence the reason for measuring preference for Arts/Science at O-level.

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**Figure 5.11:** The *ex post facto* research design together with variable to resolve hypothesis 3.2 but in chronological order: the mean study approach scores before and after will be different across time ($SA$ scores = study approach scores, deep for Hypothesis 3.2a and surface for Hypothesis 3.2b).
Hypothesis 3.3 expected the four groups SS, SA, AS and AA to differ with selection, in O₂ of study approach. Hypothesis 3.3a related to the deep study approach, whilst 3.3b to the surface study approach.

The strengths and weaknesses of the research design with respect to Hypothesis 3.3 are in the design of the selection stage (Figure 5.12). If students with similar choice were dissimilar with respect to a study approach this difference is likely to interfere with association inferences. This is besides others that may be present, such as Instrument unreliability.

**Figure 5.12:** The *ex post facto research design* together with variable map to resolve hypothesis 3.3 but in chronological order: the mean Study Approach scores across congruent conditions will be different. (SA scores = Study Approach scores, Deep for Hypothesis 3.3a and Surface for Hypothesis 3.3b)
Population, Sample, and the Experimental Groups

Population and sample
The sample was drawn from a population of final year O-level students in Sri Lanka in 1994. They were tested in the month of October (the first testing occasion) before the O-level examination which was due in December. The population was urban schooling children. Random cluster sampling was adopted in selecting 11 schools from the population of 18 leading urban schools. The population of schools was from two areas. One was the capital (Colombo) and the other the city regarded as the second capital (Kandy). Within each selected school, the aim was to obtain data from all the students in that school in the O-level final year classes. This comprised the origin of the sample. By the procedure adopted and described above, the sampling could be described as cluster sampling with a certain purpose in view, to select from the most able. Since urban schools on the whole have the best students in Sri Lanka these were used in the study as Entwistle (1988, p. 41) notes, the instruments tend to only work with above average students (when secondary sector students are under consideration). This observation is based on Biggs’s (1985) earlier finding that the factor structure disintegrates in generally less than able secondary school populations. In the present investigation a preponderance of such students can reasonably be expected to be in schools in the less developed rural areas. From this point of view, it could be said that the population to whom any inferences would extend, will be urban students only.

The second reason to choose the sample from urban based schools was the intended longitudinal nature of the study which necessitates by and large the retention of the population across the O-level / A-level divide. Statistics are available that says that this resides mainly with respect to urban based schools. The extent of this retention is more than 90% in such schools.

How they were divide into two groups, one group preferring Arts subjects in the O-level curriculum and the other group preferring Science is described below.
Methodology, Research Design and Instruments

Underlying the categorisation was the assumption that the diverse subjects in the O-level curriculum could be categorised either as Arts or as Science.

Subject Preference Groups
One of the items in this questionnaire (hereafter called the short questionnaire) asked the students to indicate the most liked three subjects, in rank order. Of the three most liked subjects indicated by students the one ranked first was considered the preferred subject, arts or science. Those who ranked as first in liking mathematics were also considered as preferring science (due to the rather close resemblance of the two subjects). This was done in the present investigation to obtain a group of students who preferred the subject science. In the case of students who ranked as first in the order of liking an arts subject, e.g. Social Studies, were considered as preferring arts subjects. The answer had to be science or arts as no other categorisations of subjects were attempted. All student responses were scored for these two preference categories.

It was mentioned in Chapter Four that all students at the OL in Sri Lanka study the same six subjects. Of the two remaining categories (called Aesthetic and Technological), students had to choose one option from each, thereby making up the eight OL subjects that constitute the whole examination. In a few instances students ranked as the most liked an option in the two categories, for example, Radio Technology (Technological). This liking was considered a preference for the subject science. When the option Commerce (Technological) was ranked first in terms of liking (to give another example) preference was decided upon as being for arts subjects. Further, when the option subjects Dancing or Music (Aesthetic) were ranked first in the order of liking, they were considered a preference for arts.

It would be noted here that though three preference responses were drawn from a student, only the first in order was given consideration in allocating preference. The strategy adopted was to make the students to first recollect the subjects in its entirety as far as possible, and then to rank order them. By this means it was considered that the reliability of preference expressed would be more than that would be expressed by a simple dichotomous arts/or science preference one.
Specialisation Choice Groups

Whilst still at O-level and at the same time they responded to subject preference described above, the students were asked what A-level subject stream would they wish to follow upon entry to the A-level class. The relevant question was also in the Short Questionnaire (described later). This was not an unreasonable question by Sri Lanka standards, as almost all urban students become successful in entering the A-level class from the O-level. The response to this question is that described as ‘choice’ in the investigation. To assist the students to respond, the three available choices were mentioned in the test item, the students having only to underline one of the mentioned options: Arts, Commerce and Science.

Like with respect to determining subject preference that was described above, an attempt to safe-guard the reliability of expressed choice was made by providing the option labels, ensuring somewhat that they are not responding entirely in the abstract. The need for this provision followed the fact that the test item asked an aspect the students have not as yet experienced.

The congruency groups

At the time the second administration of the School and School Work Questionnaire was performed which was one year on to specialisation (selection) at A-level, note was made of the actual A-level subject stream the students were following. For this purpose, the students were asked to write with their personal details the label of the class that they were studying, which was checked by the investigator. After this was known, the congruency groups were formed. Expressed choice of specialisation was two-fold: Arts or Science. Actual specialisation was also two-fold: Arts or Science. Those students whose choice and selection were the same constituted a congruent group. In students they were different (two paths available), constituted an incongruent group. On this basis, four congruency groups were formed:

(1) choice Arts, selection Arts (congruent Arts, AA)
(2) choice Science, selection Science (congruent Science, SS)
(3) choice Arts, selection Science (incongruent Science, AS)
(4) choice Science, selection Arts (incongruent Arts, SA)
SECTION C

Instruments

Two instruments comprised this aspect. These were:

- A short questionnaire to elicit student subject preference and choice of specialisation (Appendix A)
- Entwistle’s student version of the ASI called School and School Work Inventory (SSWI, Version KE3) (Appendix A).

The main instrument under consideration for the present investigation (Approaches to Studying Inventory) has a long history and appears to have undergone many revisions and refinements (Entwistle, 1988) and as such embraces a certain amount of confidence. The School Version of this Inventory is a subsequent development of this and is the one of main interest in the present investigation.

The School and School Work Inventories

The intention of developing a school version of the Approaches to Studying Inventory (for adults) appears to have been strengthened by the findings of individual consistency and intertask variability in approaches to studying among secondary school pupils by Selmes (1987). The result has been the development of the above-mentioned School and School Work Inventory. Entwistle (1988) has the following to say regarding the development of it.

Nine of the subscales of the student inventory were considered applicable to schoolwork. The intention was to retain, as far as possible, the main features of the Meaning, Reproducing, and Strategic Orientations. However as pupils have little opportunity for strategic studying, at least in the sense of cue seeking, strategic approach was defined, instead, as a highly organised way of tackling school work with an eye to good attainment (p. 39)
Thus the main features of the adult inventory appear to have been retained and this makes it possible for comparisons with adult samples to be meaningfully made, an aspect of importance as most of the findings in the literature in fact relate to the latter. In previous studies (Entwistle and Kozeki, 1985) a school version of the inventory appears to give satisfactory measures of reliability across different cultures. Thus with a British secondary school sample, the internal consistencies (Cronbach’s α) for deep and surface approaches have been in the above study, .66 and .53 respectively. In the same study, for the Hungarian secondary school sample, the corresponding measurements have been .64 and .61 (p. 129). The Test-Retest reliabilities in the Hungarian school sample for Deep and Surface approaches have been .72 and .73 respectively (Entwistle and Kozeki, 1985; p 129).

The School and School Work Instrument of the present investigation (KE3)
The version described in the previous section (Entwistle and Kozeki, 1985) does not give a particular identification number. There appears to be several parallel forms of the inventory (KE3, Secondary School Project etc.), differing slightly. In the Secondary School Project Version five items constitute each subscale, e.g., deep and surface subscales. In the version labelled as KE3 six items constitute each subscale. The version used in the Entwistle and Kozeki (1985) study is described as a six-item subscale version. But apparently it is not the same as the KE3 version as the latter has items concerning Relating Ideas (in the Deep domain) which were absent in the version used in the 1985 study of Entwistle and Kozeki (Entwistle, 1988, p.39). Thus, regarding the latter, Entwistle (1988) notes “The processes of subscales of Meaning Orientation were omitted…” (p. 39).

Relating Ideas constitute one of the aspects of the cognitive processes components in the adult version (see Appendix), the other being Use of Evidence. However, in the KE3 version used in the present study both are retained and was used as such. Retaining Relating Ideas Use of Evidence in the present investigation was not an accident. It was expected that in such an instance a demarcation between the disciplines Science and Arts is more likely to be seen, if this aspect gains in importance. It was the view that Science would entail more of these thinking strategies. The English medium inventory (KE3) was translated into Sinhalese twice,
Methodology, Research Design and Instruments

the second time after a back translation into English. A qualified teacher and translator did the translation. An effort was made by the translator to convey the intended message in a test item rather than to make a literal translation.

Reliability of Instrument (KE3)

This was measured in two ways:

- Internal consistency (Cronbach's $\alpha$)
- Consistency over time (Test- Rest Method)

Regarding internal consistency, Tables 5.1 and 5.2 report these, for the deep and surface study approaches respectively.

<table>
<thead>
<tr>
<th>Table 5.1 Internal Consistency of deep approach scale (SSWI, KE3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item Nos. of scale and item-total</strong></td>
</tr>
<tr>
<td><strong>inter-correlations</strong></td>
</tr>
<tr>
<td>Tol.</td>
</tr>
<tr>
<td>Boys</td>
</tr>
<tr>
<td>Girls</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5.2 Internal Consistency of surface approach scale (SSWI, KE3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item Nos. of scale and item-total</strong></td>
</tr>
<tr>
<td><strong>inter-correlations</strong></td>
</tr>
<tr>
<td>Tol.</td>
</tr>
<tr>
<td>Boys</td>
</tr>
<tr>
<td>Girls</td>
</tr>
</tbody>
</table>
The deep approach scale appears to have moderate internal consistency, but that of the surface approach appears to be on the lower side. This low internal consistency of the surface approach has been noticed in earlier studies. In the present investigation it appears to have been largely caused by one item, item number 26 (see Appendix A). The scores obtained on this item correlates with the total scale score only to the extent of .19 in the total sample (for boys and girls, .20 and .19 respectively). Thus the item no. 26 deserves special examination. It is presented below for scrutiny:

**Item No. 26:** "I like to be told precisely what to do in essays and other set-work"

In this item the phrase set-work may not have been understood in the same way by all students, since in Sri Lanka an equivalent phrase is not used. The translation was as 'projects', as this word is more familiar. However, 'projects' too are not frequently given to students. It is possible that this relative unfamiliarity of doing projects contributed to the low item-total correlation. However, this view is need of clarification.

The Test-Retest reliabilities of the deep and surface study approaches were calculated in a sample of boys (n=92) with a time separation of two weeks, and they were respectively, .41 and .40. These are also on the lower to moderate size. The interpretations of the findings would take these into consideration.

The worrying aspect of this is that lower reliability can lead to potentially lower power in subsequent statistical tests. This would result in a lower probability of finding a significant difference when a significant difference was actually there (Black, 1999; pp. 429-431).

*The short questionnaire*

Named as such refers to that which essentially related to the cross-sectional study. As such it was constructed to elicit from the students mainly their,

- preference for subjects in the General Education curriculum at O-level.
Methodology, Research Design and Instruments

- choice of A-level specialisation whilst the pupils were still at O-level.

A translated (from Sinhalese) copy of it is attached as Appendix B.

It was planned that the two questionnaires would be administered to the sample at one sitting. The first one administered was the short questionnaire one. Upon completion of this the above described School and School Works Inventory was administered.

Students took about 15 minutes to complete the former, and about on the average, about 30 minutes to complete the second.
CHAPTER SIX

RESULTS OF DATA ANALYSIS

6.00 Introduction

This chapter has as its main aim to present the results of the data analysis (the main sources of the data being that obtained by the administration of the two instruments—*The Short Questionnaire* and *The Inventory of School and School Work*).

The first aim here is to provide enlightenment on the characteristics of the group(s) considered in the investigation. This aspect is now given added impetus in research since the publication of Tukey’s (1977) work in which he has argued the need to pay greater attention to the data before subjecting them to analysis. Secondly, inferential statistics is used to resolve hypotheses in order to make inferences about larger groups (populations) based upon the data collected on the sample. Each section, therefore, will include both descriptive and inferential statistics.

6.10 Analysis of data in the cross-sectional Study

*Analysis of data relating to null hypotheses 1.1a and 1.2b*

These two hypotheses were derived from Question 1, stated in Chapter 5. To test them, they have to be first transformed into their respective null hypotheses (for example, Black, 1999: Howell, 1997). These null hypotheses, correspondingly labelled (with suffixes a and b for deep and surface study approaches, respectively) are:

- **1.1a** In a sample of final year O-level students the mean deep study approach score of Arts subjects preferring students will not be different from that of the Science subjects preferring students.
- **1.2b** In a sample of final year O-level students the mean surface study approach score of Arts subjects preferring students will not be different from that of Science subjects preferring students.
Data Analysis

Beginning with student characteristics, the frequency distribution regarding subject preference data in the whole sample (n=1685) is presented in Figure 6.1 and the chart in Figure 6.2 presents a visual illustration. These figures show that a preponderance of these students prefer science subjects, a feature discussed in relation to the cultural setting in Sri Lanka.

<table>
<thead>
<tr>
<th>O-level Subject Preference</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>602</td>
</tr>
<tr>
<td>Science</td>
<td>1083</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1685</strong></td>
</tr>
</tbody>
</table>

**Figure 6.1** Frequency Distribution of O-level Subject Preference

**Figure 6.2** Bar chart for data in Figure 6.1
Data Analysis

The distribution of the deep study approach scores in the whole sample

Figure 6.3 presents the distribution of the deep study approach scores, indicating the magnitude of intensity of use. The score range for this instrument was from 6 to 30, the higher the score the greater levels of use deep approach. The scale is sufficiently long to consider the data as continuous for purposes of analysis. Note the ceiling effect in the distribution of scores. This is a characteristic that merits further investigation and will be discussed later. As a result, the distribution appears slightly negatively skewed, but on the whole it has the potential to be a normal distribution with scores on either side. However the distributions of study approaches data in general appear to deserve independent study, as the past research is not very helpful in this matter.

Figure 6.3. Distribution of deep study approach scores in the whole sample (n=1685)
The distribution of the surface study approach scores in the whole sample

Figure 6.4 presents the distribution of the surface study approach for the total sample. This distribution clearly appears to take the form of a normal distribution. The scores indicate the magnitude of the intensity of use of the surface approach, the higher the score the greater the intensity use of this surface approach. The score range on this instrument also ranged from 6 to 30, with higher the score the greater the intensity use of surface approach.

Figure 6.4: Distribution of the surface study approach scores in the whole sample (n=1685)
Preference

6.20 Association of subject preference with study approach

This aspect of the investigation (i.e., of determining the association of O-level subject preference and study approach) is carried out to establish if there were any association between the O-level and A-level Arts and Science curricula and the study approaches investigated.

The Hypothesis 1.1 below examines this association with respect to the deep study approach.

Testing of the null hypothesis of hypothesis 1.1

Hypothesis 1.1 stated that the mean deep study approach score of students preferring Arts subjects will be different from that of those preferring Science subjects (the preference being in regard to the subjects in the O-level curriculum, divided broadly into two, as Arts and Sciences). This hypothesis was designed to answer the research question 1.1, which was, in brief,

Would subject preference be associated with Study Approach?

In hypothesis 1.1 the reference is to the deep study approach. Hypothesis 1.2 refers to the other component of study approach investigated, the surface study approach. Hence both hypotheses 1.1 and 1.2 come under the umbrella of the same Research Question 1 stated above. It is preferable to test each hypothesis by its null hypothesis (1.1a and 1.2b for deep and surface study approaches, respectively), that states there will no difference between the two mean scores.

Table 6.1 shows that the mean deep study approach score of the group of students who have a preference for Science subjects in the O-level curriculum is higher than that of the Arts subjects preferring groups. The appropriate statistical test that is applied to test the null hypothesis is a test that compares two groups, the parametric $t$-test, since the measurement is considered to be on a continuous scale.
Data Analysis

Table 6.1: Means and S.D. of the deep study approach of O-level Arts and Science subjects preferring groups

<table>
<thead>
<tr>
<th>Preference for subjects is Arts</th>
<th>Preference for subjects is Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean 23.60</td>
<td>Mean 24.57</td>
</tr>
<tr>
<td>S.D. 4.14</td>
<td>S.D. 3.79</td>
</tr>
<tr>
<td>n 602</td>
<td>n 1083</td>
</tr>
</tbody>
</table>

Additional conditions for its application given as follows. Have also been met: the samples are independent
- the variances are nearly equal
- the samples are large (> >)
- the samples are equal (here since they are large, being of the same order of magnitude is adequate)

The $t$-test being a parametric test, the data should have normal distributions, though the test is considered robust enough to allow for some skewness such as demonstrated by the distributions of the deep study approach data of the two groups presented in Figure 6.5.

Fig. 6.5: Distribution of the deep study approach data in the two O-level subject preference groups of Arts (n=602) & Science (n=1083).
Data Analysis

Again, note the ceiling effect of the individual distributions. The slightly negative skewed nature of both the distributions in Figure 6.5 was predictable from that observed with respect to the total sample in the deep study approach (Figure 6.3). As the t-test has been described as robust, it will tolerate some non-normality and even some difference in the variances (Black, 1999, p.419). The measurements made here are at least continuous. Hence the parametric t-test was applied to test the null hypothesis and the results thereby obtained are presented in Table 6.1A. As the two samples were not related, the independent-samples test applied.

The assumption of homogeneity of variance was violated as the $F_{obs}$ value (of 1.19) exceeded the $F_{crit \ 1-tail}$ value of 1.15. The application of the test took this heterogeneity of variances into account. This is shown in Table 6.1A by the reduced degrees of freedom ($df=1192$) in the calculation. The obtained $t$ value was 4.80. This was greater than the $t_{crit \ 1-tail}$ value of 1.96 required for significance (in a two tailed-test). This finding led to the rejection of the null hypothesis and the acceptance of a difference in mean deep study approach scores in the two groups. This also means that it is unlikely the two groups belong to the same population for this trait.

Table 6.1A: Results of t-test application to the deep study approach data relating to relating to Arts and Science subject preference, using Black's (1999) Excel Worksheet.

<table>
<thead>
<tr>
<th>Preference is Arts</th>
<th>Preference is Science</th>
<th>Test for Homogeneity of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>23.60</td>
<td>24.57</td>
</tr>
<tr>
<td>S.D.</td>
<td>4.14</td>
<td>3.79</td>
</tr>
<tr>
<td>n</td>
<td>619</td>
<td>1095</td>
</tr>
<tr>
<td>df</td>
<td>1192</td>
<td></td>
</tr>
<tr>
<td>Tails</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>alpha</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>0.998</td>
<td></td>
</tr>
<tr>
<td>$s_{diff}$</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>$t_{uncoled}$</td>
<td>4.80</td>
<td></td>
</tr>
<tr>
<td>$t_{crit \ 1-tail}$</td>
<td>1.96</td>
<td></td>
</tr>
</tbody>
</table>
Data Analysis

This could be interpreted as an association of subject preference in the O-level curriculum and the intensity of application of the deep study approach, with the Science subjects preferring students having a higher deep a study approach score (statistically higher) than the students preferring Arts subjects. However, the mean difference of the two groups is quite small, though the difference attained statistical significance. Hence the finding’s academic/practical significance is limited.

Testing of null hypothesis of hypothesis 1.2

Hypothesis 1.2 stated that there would be a difference between the mean surface study approach scores of the Arts and Science preferring student groups. Again these preferences relate to the broad classification of the O-level subjects in Sri Lanka to the Arts and Sciences. This hypothesis was formulated to answer the Research Question No1, would subject preference be associated with study approach? The subject preferences remain as with respect to hypothesis 1.1, they being Arts and Science of the O-level curriculum.

The means and standard deviations of the two samples to test the null hypothesis are presented in Table 6.2 which shows that the mean of the Arts subjects preferring students is 16.78 and this is higher than that of the Science subjects preferring students which is 16.01. As the samples are large, even this small difference (0.77) may amount to a significant one.

Table 6.2: Means and S.D. of the surface study approach of O-level Arts and Science subjects preferring groups.

<table>
<thead>
<tr>
<th>Preference for subjects is</th>
<th>Preference for subjects is</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>Sciences</td>
</tr>
<tr>
<td>Mean</td>
<td>16.78</td>
</tr>
<tr>
<td>S.D.</td>
<td>4.17</td>
</tr>
<tr>
<td>n</td>
<td>602</td>
</tr>
</tbody>
</table>

6-8
Data Analysis

Figure 6.6 presents distributions of the surface study approach scores of the Arts preferring and the Science preferring groups. Both the data distributions clearly appear to be normally distributed. Hence the application of the independent $t$-test is appropriate in these circumstances. The results of the application are presented in Table 6.2A.

Following the observation of homogeneity of variances of the two groups ($F=1.10$, where $F_{crit}=1.15$, $\alpha=0.05$) the independent $t$-test for pooled variances was applied (Black, 1999, p. 436) as the sample sizes were very different. The obtained $t$ value was 3.78, which exceeded the $t_{crit}$ value of 1.96 in a two-tailed test of significance with $\alpha=0.05$. This finding led to the rejection of the null hypothesis, and the acceptance of a difference in mean surface study approach scores in the two groups. Or, stated differently, the two groups belong to two different populations for this trait. The Power of the test was found to be 0.962, indicating a high probability of correctly rejecting the null hypothesis.

Figure 6.6: Distribution of the surface study approach data in the two O-level subject preference groups of Arts ($n=602$) & Science ($n=1083$).
Table 6.2A: Results of t-test application to the Surface Study Approach data relating to Arts and Science subject preference, using Black's (1999) Excel Worksheet.

|                  | Preference is Arts | Preference is Science | Test for Homogeneity of variance |
|------------------|--------------------|-----------------------|---------------------------------
| Mean             | 16.78              | 16.01                 | F 1.10                           |
| S.D.             | 4.17               | 3.98                  | P_{one-tailed} 0.05              |
| n                | 618                | 1100                  | F_{crit} 1-tail 1.15             |
| df               | 1716               |                       |                                  |
| Tails            | 2                  |                       |                                  |
| alpha            | 0.05               |                       |                                  |
| Beta             | 0.035              |                       |                                  |
| Power            | 0.965              |                       |                                  |
| s_{diff}         | 0.20               |                       |                                  |
| \hat{t}_{pooled}| 3.78               |                       |                                  |
| t_{crit}         | 1.96               |                       |                                  |

The finding, therefore, is that there is an association between preference for subjects in the O-level curriculum (in Sri Lanka) and the surface study approach, with the Arts subjects preferring students having a significantly higher surface study approach score than the Science subjects preferring students. However, the magnitude of the mean difference is small, though there was statistical significance. This questions the academic/practical significance of the finding.

Choice

6.30 Association of choice (of specialisation) and Study Approach

Analysis of data relating to null hypotheses of hypotheses 2.1 and 2.2

This section has as its interest choice of future specialisation in relationship to Study approach. Firstly, the frequency distribution of choice with respect to the Arts and
Data Analysis

Sciences specialisation (at A-level) is noted in Figure 6.7, visually illustrating it by a bar diagram in Figure 6.8.

There is a difference in the frequencies in the two Figures, Figures 6.1 and 6.7. That is, a few who preferred one subject were not consistent in their indication of Expected Specialisation (choice) on the same questionnaire, which may reflect such influences as employment prospects and family expectations.

<table>
<thead>
<tr>
<th>A-level Expected Specialisation (Choice)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>616</td>
</tr>
<tr>
<td>Science</td>
<td>1069</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1685</strong></td>
</tr>
</tbody>
</table>

**Figure 6.7:** Frequency Distribution of A-level Specialisation Choice

![Bar chart for data in Figure 6.7](chart)

**Figure 6.8:** Bar chart for data in Figure 6.7
We also note from the presentations in Figures 6.7 and 6.8 that still a greater number of students in the sample expect to specialise in the Sciences. That is, to a large majority their choice is Science, nearly twice that of the Arts. This difference may be explained by stating that in Sri Lanka that an education in the Sciences is presently highly valued.

**Association of choice and Study Approach**

**Analysis of data relating to null hypotheses of hypotheses 2.1 and 2.2**

Investigating the relationship of choice of specialisation to the Study Approaches were the object of these two hypotheses. To test them, like other hypotheses, they have to be first transformed into their respective null hypotheses (for example, Black, 1999: Howell, 1997). These null hypotheses, correspondingly labelled, would be,

- **2.1a** In a sample of final year O-level students the mean deep study approach score of students whose choice of AL specialisation is Arts will not be different from that of students whose choice of AL specialisation is Science.
- **2.2b** In a sample of final year O-level students the mean surface study approach score of students whose choice of AL specialisation is Arts will not be different from that of students whose choice of AL specialisation is Science.

The two hypotheses refer to the two components of the study approaches examined in the investigation. The hypotheses attempt to answer the research question (Research Question No. 2) which was, will choice of (expected) specialisation be associated with intensity of application of study approach? The term study approach refers, as previously, to both deep and surface study approaches.

The descriptive data to examine the null hypothesis of hypothesis 2.1 are presented in Table 6.3, which shows, as with respect to the earlier analysis with the deep study approach, choice of science specialisation has the higher mean group score. Prior to the application of a parametric statistical test to test the null hypothesis the data were examined for normality of distribution to determine appropriateness.
Data Analysis

Figure 6.9 presents the distribution of the deep study approach scores of the two groups.

Table 6.3: Means and S.D. of the deep study approach of A-level Arts choice and Science choice student groups

<table>
<thead>
<tr>
<th>A-level specialisation choice is Arts</th>
<th>A-level specialisation choice is Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>23.19</td>
</tr>
<tr>
<td>S.D.</td>
<td>4.15</td>
</tr>
<tr>
<td>n</td>
<td>616</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Choice is Arts</th>
<th>Choice is Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>24.83</td>
</tr>
<tr>
<td>S.D.</td>
<td>3.66</td>
</tr>
<tr>
<td>n</td>
<td>1069</td>
</tr>
</tbody>
</table>

Fig. 6.9: Distribution of the deep study approach data in the two groups whose choice of specialisation is Arts (n=616) or Science (n=1069).
Data Analysis

Figure 6.9 shows that for both groups the distribution of deep study approaches scores appear slightly negatively skewed and suffers from a ceiling effect. However, what would be accepted as normal is flexible for the t-test (Black, 1999). Hence, to test the null hypothesis, the t-test was decided upon, and the exploratory rather than definitive nature cross-sectional study appears not to hinder such adoption.

The results of the statistical analysis of the null hypothesis 2.1a are presented in Table 6.3A, using the independent-samples t-test, as the samples were not related.

Table 6.3A: Results of t-test application to the deep study approach data relating to choice of Arts or Science specialisation, using Black's (1999) Excel Worksheet.

<table>
<thead>
<tr>
<th></th>
<th>Choice is Arts</th>
<th>Choice is Science</th>
<th>Test for Homogeneity of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>23.19</td>
<td>24.84</td>
<td>F</td>
</tr>
<tr>
<td>S.D.</td>
<td>4.15</td>
<td>3.66</td>
<td>$P_{one-tailed}$ 0.05</td>
</tr>
<tr>
<td>n</td>
<td>631</td>
<td>1076</td>
<td>$F_{crit 1-tail}$ 1.15</td>
</tr>
<tr>
<td>df</td>
<td>1192</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tails</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>alpha</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$s_{df}$</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{unpooled}$</td>
<td>8.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{crit}$</td>
<td>1.96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Data Analysis

The t-test had to be modified to accommodate the heterogeneity of variances of the two groups since the obtained \( F = 1.29 \) was greater than \( F_{\text{crit}, t-\text{null}} = 1.15 \). The modification is indicated by the now lower degrees of freedom (\( df=1192 \)).

The Table 6.3A shows that the obtained t-value is 8.23 and this value thus surpassed the \( t_{\text{crit}} \) value of 1.96 with \( \alpha=0.05 \) in a two-tailed test of significance. Thus we reject the null hypothesis and state that the samples belong to different populations for this trait. This indicates that there is an association between choice of expected specialisation and the deep study approach. Whether there would be an association of these choices with the surface study approach is the subject of the next hypothesis (hypothesis 2.2).

Testing the null hypothesis relating to hypothesis 2.2

This hypothesis expected a difference in the mean surface study approach scores of students whose choice was either Arts or Science. This hypothesis was in expectation to answer the Research Question No2 (which is basically the same as that for hypothesis 2.1), the study approach in this instance being the surface study approach. As it is always the case, the null hypothesis of the hypothesis is what is tested. The null hypothesis says that there will be no difference between the two means and that any difference there is would be due to natural variation in the groups. The descriptive statistics are presented in Table 6.4, where the mean of the Arts choice group is higher this time.

<table>
<thead>
<tr>
<th>Table 6.4: Means and S.D. of the surface study approach of A-level Arts choice and Science choice student groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-level specialisation choice is Arts</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>S.D.</td>
</tr>
<tr>
<td>n</td>
</tr>
</tbody>
</table>
Data Analysis

The distributions of the surface study approach scores of the two groups were examined and these are presented in Figure 6.10, pose no additional problems as the distributions are normal in shape, so a parametric test may be applied. As the null hypothesis entails comparison only of two groups the independent t-test again could be applied to test the mean differences, as the two samples were not related samples. The results of this analysis are presented in Table 6.4A.

![Figure 6.10 Distribution of the surface study approach data in the two groups Whose choice of specialisation is Arts (n=616) or Science (n=1069)
Table 6.4A: Results of t-test application to the surface study approach data relating to choice of Arts or Science specialisation, using Black's (1999) Excel Worksheet.

<table>
<thead>
<tr>
<th></th>
<th>Choice is Arts</th>
<th>Choice is Science</th>
<th>Test for Homogeneity of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>16.84</td>
<td>15.96</td>
<td>F</td>
</tr>
<tr>
<td>S.D.</td>
<td>4.15</td>
<td>3.98</td>
<td>P one-tailed</td>
</tr>
<tr>
<td>n</td>
<td>629</td>
<td>1097</td>
<td>F crit 1-tail</td>
</tr>
<tr>
<td>df</td>
<td>1724</td>
<td></td>
<td>1.15</td>
</tr>
<tr>
<td>Tails</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>alpha</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>0.009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>0.991</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s_{dif}</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t_{crit}</td>
<td>1.96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.4A shows that the obtained F ratio of 1.09 is less than the F_{crit, 1-tail} value of 1.15, thus there is homogeneity of variances for the two samples. This makes it possible to proceed without modifying the t-test in this regard. The t-value of 4.35 obtained in the analysis that followed was greater than the t_{crit} value of 1.96 [\alpha=0.05, df =1724]. This lead to the rejection of the null hypothesis and to accept the hypothesis that there is a difference between the two surface study approach mean scores of those students whose choice is Arts and those whose choice is Science. This also implies that they are not from the same population and hence are from different populations.

**Summary of the finding regarding choice of (expected) specialisation**

Choice of specialisation was found to be associated with the deep study approach and surface study approaches. With respect to the deep study approach it was found that Science choice students had higher scores and the Arts choice students had lower scores. With respect to the surface study approach, Arts choice students had higher
Data Analysis

scores than Science choice ones. These associations, then, could be pursued in the longitudinal study results of data analysis of which are reported next.

6.40 DATA ANALYSIS IN THE LONGITUDINAL PART OF THE STUDY

Formation of the groups

The groups formed at the commencement of subject specialisation in the following year when the students were in A-level class are as presented in Fig. 6.11.

**Table 6.11: Choice and selection of A-level specialisation**

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>Arts</th>
<th>Science</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>345</td>
<td>103</td>
<td>448</td>
</tr>
<tr>
<td>Science</td>
<td>169</td>
<td>739</td>
<td>908</td>
</tr>
<tr>
<td>Total</td>
<td>514</td>
<td>842</td>
<td>1356</td>
</tr>
</tbody>
</table>

Figure 6.11: Choice and selection of A-level specialisation

The discrepancies between choice and selection in student numbers may be due to the nature of the O-level results that followed choice. If so, more Arts choice students have done better in this examination whilst less Science choice student have done well. This may be the major reason, however, other reasons may exist.

Reference to Figures 6.11 shows that out 448 students whose choice of specialisation was Arts, 345 were accepted for Arts specialisation (selection), whilst out of 908 whose choice was Science, 739 were accepted for Science specialisation. These two groups formed the congruent specialisation groups in the study AA and SS respectively. The other two groups of 103 and 169 formed the incongruent specialisation groups Arts-Science (AS) and Science-Arts (SA), respectively.
Data Analysis

To test the proportions changing in each direction (AS and SA) are equivalent, we use the McNemar change test (Black, 1999; p.596). One would assume an equal rate of change, i.e., AS+SA/2. Thus to test the likelihood, one uses the expression

$$\chi^2 = \frac{(AS-SA)^2}{AS+SA}$$

$$\chi^2 = \frac{(169-103)^2}{169+103} = 16.0$$

where \( \chi^2(1, 0.05) = 3.84 \) (critical value for \( \alpha = 0.05 \))

Thus, the magnitude of the change is found to be greater than what would expected if equal numbers were to change in each direction, allowing for natural variation. This simply suggests that there is likely to be some underlying reason, such as more Arts choice students have done better in this examination whilst less Science choice students have done well. This may be the major reason, however other reasons may exist which could be explored in subsequent research.

6.50 Null Hypotheses In The Longitudinal Study

Testing Null Hypotheses of Hypothesis 3.1 (at choice, across groups)

Emanating from the Hypothesis 3.1 the null hypothesis is that the mean study approach (deep or surface) scores at choice of the groups SS, SA, AS and AA would not be different.

This hypothesis was formulated to function as a baseline to compare with the findings with respect to Hypothesis 3.3, rather than to answer a particular research question. The statistical testing of this hypothesis (3.1) suggests the adoption of a one-way analysis of variance. However as Black (1999; p.487) says, factorial designs are desirable than a number of separate one-way analyses of variance, what the testing of the other null hypotheses would entail as well is first scrutinised.
Data Analysis

Testing Null Hypothesis to Hypothesis 3.2 (the over time condition)

The hypothesis was:

**Hypothesis 3.2:** In a sample of A-level students in Sri Lanka, the mean of Study Approach scores $O_1$ at choice will be significantly different from that of the mean of scores $O_2$ with selection of the four congruency selection groups (SS, SA, AS and AA) over time.

Where $O_1$ and $O_2$ denote the Study Approach (deep and surface) scores at choice and selection, respectively.

Each group constituted of the same students in the two conditions over time. Hypothesis 3.2 suggested a repeated measures one-way analysis of variance model to test its null hypothesis. To reiterate, Figure 6.12 presents a model depicting the measurements involved.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>congruency</td>
<td>(1 year)</td>
<td></td>
</tr>
<tr>
<td>SS</td>
<td>$O_{1ss}$</td>
<td>$O_{2ss}$</td>
</tr>
<tr>
<td>SA</td>
<td>$O_{1sa}$</td>
<td>$O_{2sa}$</td>
</tr>
<tr>
<td>AS</td>
<td>$O_{1as}$</td>
<td>$O_{2as}$</td>
</tr>
<tr>
<td>AA</td>
<td>$O_{1aa}$</td>
<td>$O_{2aa}$</td>
</tr>
<tr>
<td></td>
<td>$\Sigma O_1$</td>
<td>$\Sigma O_1$</td>
</tr>
</tbody>
</table>

Fig.: 6.12: Model to illustrate measurements related to longitudinal study.

**Note:** SS (congruent science selection)  AA (congruent arts selection)
SA (incongruent science selection)  AS (incongruent Arts selection)

**Before:** measurement of Study Approach at end of General Education

**After:** measurement of study approach 1 year after 1st measurement (9m of course)
Data Analysis

Testing Null Hypothesis to Hypothesis 3.3 (with selection, across groups)
Following from the hypothesis 3.3 the null hypothesis is that the mean Study Approach (deep and surface) scores with selection of the groups SS, SA, AS and AA would not be different.

This hypothesis is based on the assumption that, to reiterate, choice of specialisation would be associated with congruency of selection (both in terms of study approach). That is, the first mentioned association intensifies/reduces, as the case may be, the second mentioned association. The hypothesis relates to the anticipated differences in mean study approach scores across the four groups SS, SA, AS and AA.

Differences between a number of means that the null hypothesis addresses itself suggests that the statistical procedure of variance analysis (ANOVA) be involved in the testing of it. Further, as only a single classification is involved (that of selection congruency), a One-way Analysis of Variance is indicated. This is the second one-way analysis of variance suggested thus far.

An analysis of variance model for testing null hypotheses for hypotheses 3.1, 3.2 and 3.3
The analysis of the two null hypotheses to hypotheses 3.1 and 3.3 entails two one-way analyses of variance. On the other hand, the analysis of null hypothesis to hypothesis 3.2 entails a form of repeated measures model.

The Mixed Model, combining repeated measure with groups enables the analyses of the null hypotheses 3.2 which may be denoted by A x (B), whereby it means repeated measures on factor B and A represents the between-groups factor. In the present investigation, B represents the measurements of study approach over time with two levels and A the different congruency selection student groups SS, SA, AS and AA with four levels. Therefore, if there were a significant main effects across (B) the two measures and a significant interaction with A (groups) then post hoc tests on individual groups over time would tell whether changes are significant. A feature in this model should be noted. In mixed experiments, it is within-subject factors that are generally of principal interest (here change over time).
Deep Study Approach

The data to test the null hypotheses of three hypotheses 3.1, 3.2 and 3.3 are presented in Table 6.5 where

- The data to test the null hypothesis to hypothesis 3.1 is contained in Columns 2
- The data to test the null hypotheses to hypotheses 3.2 is contained in Columns 2 and 3
- The data to test the null hypothesis to hypothesis 3.3 is contained in Column 3

With respect to null hypothesis of Hypothesis 3.1, Table 6.5 shows that the means are different across the 4 congruency selection groups SS, SA, AS and AA. The two Science choice groups (SS and SA) both have higher Deep Study Approach scores than the two Arts choice groups (AS and AA). Thus the association between choice of specialisation and deep study approach initially observed in the general sample appears to be still observable at this stage, with respect to these (choice) groups to undergo selection (specialisation).

Table 6.5: Means and S.D. of deep study approach scores.

<table>
<thead>
<tr>
<th>Congruency of Selection</th>
<th>$O_1$ (at choice)</th>
<th>$O_2$ (with selection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congruent Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS (n=739)</td>
<td>25.13 (3.56)</td>
<td>25.07 (3.44)</td>
</tr>
<tr>
<td>Incongruent Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA (n=169)</td>
<td>24.70 (3.51)</td>
<td>24.88 (4.46)</td>
</tr>
<tr>
<td>Incongruent Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS (n=103)</td>
<td>23.53 (3.82)</td>
<td>23.62 (4.33)</td>
</tr>
<tr>
<td>Congruent Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA (n=345)</td>
<td>23.48 (4.15)</td>
<td>23.29 (4.05)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=1356)</td>
<td>24.53 (3.80)</td>
<td>24.49 (3.76)</td>
</tr>
</tbody>
</table>
Data Analysis

The over time mean difference is slight (Hypothesis 3.2 data), being 24.53 and 24.49, registering a decline with respect to this study approach. Data presented in Column 3 of Table 6.5 (to test hypothesis 3.3) show that the means are different from each other.

To know the significance of data one must examine the results of the Mixed Design Model variance analysis. The results of the application of this model are reported separately as between-subjects effects and within-subjects effects. The former is of theoretical interest only. The latter relates to null hypothesis of hypothesis 3.2. Regarding analyses relevant to null hypotheses to Hypotheses 3.1 and 3.3, separate one-way analyses have to be performed.

6.60 Statistical Analysis of Null Hypotheses

Results of this analysis are presented first for deep study approach.

Statistical analysis relating to null hypothesis of Hypothesis 3.1 (deep study approach): One-way analysis of variance at choice

One way analysis of variance with deep study approach (at choice) as the dependent variable and congruency selection as the independent variable gave the following result: that there was an overall difference between the groups SS, SA, AS and AA in deep study approach at choice. The results of the analysis are summarised in Table 6.6.

Table 6.6. Summary of the one-way analysis of variance results on the data in column 2 (at choice) of Table 6.5 (Deep study Approach)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>751.285</td>
<td>3</td>
<td>250.428</td>
<td>17.979</td>
<td>p&lt;.0001</td>
</tr>
<tr>
<td>Within groups</td>
<td>18832.221</td>
<td>1352</td>
<td>13.929</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19583.506</td>
<td>1355</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Data Analysis

Following the finding of a significant F-ratio there are a number of possible post hoc tests.

For the present investigation, the moderately liberal Newman-Keuls procedure has been chosen for the comparison of the means, as this is an exploratory study. In this computation the means are arranged in descending order. Thus:

<table>
<thead>
<tr>
<th>SS</th>
<th>SA</th>
<th>AS</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.13</td>
<td>24.70</td>
<td>23.53</td>
<td>23.48</td>
</tr>
</tbody>
</table>

Application of the Student-Newman-Keuls procedure showed the following significant differences (p < .05).
- between SS and AA
- between SS and AS
- between SA and AA

These differences between the means are better appraised when they means are displayed in a Venn diagram (Black, 1999, p.472) with those that belong to the same population enclosed in the same boxes and vice versa:

Thus there is no difference between SS and SA (same population), AS and AA is also in the same population, but there is a difference in SS and AA. SA and AS belong to same population for this trait. What this means is these difference across groups that was apparent as in whole sample is less.

Statistical analysis of data relating to the null hypothesis of Hypothesis 3.2 (Within-subjects analysis).

This null hypothesis states that the mean of deep study approach scores O1 will not be different from that of the mean of deep study approach scores O2 over time, at each level of the between-subjects factors.
Data Analysis

The descriptive statistics relating to the null hypothesis were presented earlier in Table 6.5 from which we see that the overall deep study approach mean scores across time ($O_1 = 24.53$ and $O_2 = 24.49$) are not very different from each other, a slight reduction of this study approach over time. Application of this model (Mixed Design Model) provides, with respect to the null hypothesis to Hypothesis 3.2, an analysis of variance of the Within-subjects Effects. The results of this statistical analysis are summarised in Table 6.7.

The non significant F-ratio of .002 ($p < .967$, $\alpha = .05$) leads to the acceptance of the null hypothesis and state that there is no overall difference in deep study approach over the time factor relating to General Education and A-level specialisation. Hence the analysis ends at this stage.

Statistical analysis relating to null hypothesis of Hypothesis 3.3 (deep study approach): One-way analysis of variance at selection

The results of the one way analysis of variance at within-subjects level $O_2$ (at selection) are summarised in Table 6.8.

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over time-Context (B)</td>
<td>.01</td>
<td>1</td>
<td>.01</td>
<td>.002</td>
<td>p&lt;.967</td>
</tr>
<tr>
<td>Over time (B) x Congruency selection (A)</td>
<td>8.65</td>
<td>3</td>
<td>2.88</td>
<td>.350</td>
<td>p&lt;.792</td>
</tr>
<tr>
<td>Error (Over time)</td>
<td>11254.29</td>
<td>1352</td>
<td>8.32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.7: Tests of Within-Subject Effects (deep study approach)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>851.770</td>
<td>3</td>
<td>283.923</td>
<td>20.998</td>
<td>p&lt;.0001</td>
</tr>
<tr>
<td>Within groups</td>
<td>18280.935</td>
<td>1352</td>
<td>13.521</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19132.705</td>
<td>1355</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.8: Summary of the one-way analysis of variance results on the data in Column 3 (with selection) of Table 6.7 (deep study approach)
Data Analysis

As the F-ratio is significant, as post hoc tests for detecting differences between the four means (as previously) the Student-Newman-Keuls procedure was adopted. First the means were arranged in descending order:

<table>
<thead>
<tr>
<th>SS</th>
<th>SA</th>
<th>AS</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.07</td>
<td>24.88</td>
<td>23.62</td>
<td>23.29</td>
</tr>
</tbody>
</table>

Again, application of the Student-Newman-Keuls procedure showed the following significant differences (p < .05).

- between SS and AA
- between SS and AS
- between SA and AA

The Venn diagram (Black, 1999, p.472) with those that belong to the same population enclosed in the same boxes and vice versa is as follows:

Thus there is no difference between SS and SA (same population), AS and AA are also in the same population. SA and AS are also coming from the same population. This was the same pattern before selection as reported in the previous Venn diagram. What this means is that from what was at choice this has not changed with selection over time with respect to the deep study approach. This comparison, however crude, is between choice and selection as tested by the null hypotheses to Hypotheses 3.1 and 3.3 respectively. What of the findings with selection itself? The Venn diagram shows that the SS and SA groups are not different in their use of deep study approach.

The same conclusion should be arrived at with respect to the two groups AS and AA. They are also coming from a common population, differential selection has not brought a difference. For both these situations one could argue for persistence of the deep study Approach. The coming together of SA and AS in the Venn diagram to be considered to be in the same population is interesting. These two groups differ in both choice and selection, which might be the reason for the commonalities. However
these two groups were not different at choice either, as shown in the earlier analysis. On the one hand selection may seems to had no effect on the use of deep study approach. On the other hand, selection itself may have been ineffective in offering the students their choices. What the results show is that the relevant research question was not answered in the affirmative.

Surface Study Approach
Next, the null hypotheses to the Hypotheses were probed with respect to the surface study approach.

The descriptive statistics relevant to the testing of these three null hypotheses (3.1, 3.2 and 3.3) are presented in Table 6.9.

The relevant mean surface study approach scores across the groups SS, SA, AS and AA to test the null hypothesis 3.1 is contained in Column 2 of Table 6.9. That is, at choice. The data relevant to test the null hypothesis to Hypothesis 3.2 is contained in the Columns 2 and 3. The data relevant to test null hypothesis to Hypothesis 3.3 is contained in Column 3.

Table 6.9: Means and S.D. surface study approach raw scores

<table>
<thead>
<tr>
<th>Congruency of Selection</th>
<th>( O_1 ) (at choice)</th>
<th>( O_2 ) (with selection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congruent Science</td>
<td>15.65 (3.79)</td>
<td>16.41 (3.84)</td>
</tr>
<tr>
<td>SS (n=739)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incongruent Science</td>
<td>16.13 (3.82)</td>
<td>16.58 (3.79)</td>
</tr>
<tr>
<td>SA (n=169)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incongruent Arts</td>
<td>16.62 (4.11)</td>
<td>17.30 (3.46)</td>
</tr>
<tr>
<td>AS (n=103)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congruent Arts</td>
<td>16.53 (3.99)</td>
<td>16.81 (4.01)</td>
</tr>
<tr>
<td>AA (n=345)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16.01 (3.89)</td>
<td>16.60 (3.85)</td>
</tr>
<tr>
<td>(n=1356)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Data Analysis

One-way analysis of variance to test hypothesis (3.1): Mean differences at choice (surface study approach)

Figure 6.10 provides a summary of the analysis of variance. The significant F-ratio was followed by the application of the in the post hoc analysis of the mean differences. When the means were placed in descending order with the associated group the result was:

<table>
<thead>
<tr>
<th></th>
<th>AS</th>
<th>AA</th>
<th>SA</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>16.62</td>
<td>16.53</td>
<td>16.13</td>
<td>15.65</td>
</tr>
</tbody>
</table>

The application of the Student-Newman-Keuls procedure resulted in only one pair of means being significantly different (α=.05) from each other out of the six pair-wise comparisons made. The pair of means AA and SS was the only significantly different one:

For easier appraisal a Venn diagram can represent this situation:

```
AA   AS   SA
    SS
```

AA, AS and SA belong to the same population, SS, SA and AS belong to the same population. The only difference is between AA and SS, the congruent selection groups, for the surface study approach at choice. Here, congruency is associated with identifiable differences. Thus on the whole the groups are similar, and consistency of difference across groups was not as apparent as it was in whole sample and still less when compared to the deep study approach.

Table 6.10: Summary of the one-way analysis of variance results on the data in column 2 (at choice) of Table 6.9 (surface study approach)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>231.448</td>
<td>3</td>
<td>77.149</td>
<td>5.147</td>
<td>p&lt;.002</td>
</tr>
<tr>
<td>Within groups</td>
<td>20265.463</td>
<td>1352</td>
<td>14.898</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20496.911</td>
<td>1355</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Data Analysis

Within-subjects analysis (Hypothesis 3.2): Surface Study Approach

The summary of this analysis is presented in Table 6.11. The main effect of over time factor is, in this case, significant. The $F$-value is 11.50 ($p<.001$, $\alpha = .05$). But as the interaction is non-significant ($F=.98$, $p<.403$, $\alpha = .05$), the Mixed Design Model does not permit simple main effects tests at the various levels of the between subject factors. The overall within-subjects difference over time that was significant tells us that there was an overall change across time in the use of surface approach, one that did not differ across the four groups.

One-way analysis of variance to test hypothesis (3.3): Mean differences at selection (Surface Study Approach)

The descriptive statistics relevant to test the null hypothesis is contained in Column 3 of Table 6.9. The results of this one-way analysis of variance are summarised in Table 6.12. The obtained non-significant $F$-ratio indicates that there is no overall difference between the means of the four groups SS, SA, AS and AA in the Surface Study Approach. Hence further examination, pair-wise examination of the means, is not appropriate.

Table 6.11: Tests of Within-Subject Effects (Surface Study Approach)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over time-Context (B)</td>
<td>118.07</td>
<td>1</td>
<td>8.07</td>
<td>11.50</td>
<td>$p&lt;.001$</td>
</tr>
<tr>
<td>Over time (B) x Congruency selection</td>
<td>30.06</td>
<td>3</td>
<td>0.02</td>
<td>0.98</td>
<td>$p&lt;.403$</td>
</tr>
<tr>
<td>Error (Over time)</td>
<td>11254.29</td>
<td>1352</td>
<td>8.32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.12: Summary of the one-way analysis of variance results on the data in column 3 (with selection) of Table 6.9 (surface study approach)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>91.999</td>
<td>3</td>
<td>30.666</td>
<td>2.071</td>
<td>$p&lt;.102$</td>
</tr>
<tr>
<td>Within groups</td>
<td>20015.160</td>
<td>1352</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20107.159</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comparing the two situations of choice and (with) selection, what this appears to mean is that selection has been unable to bring about a change from what was there even at choice. The difference with selection is even less than what was at choice. Perhaps a change or changes in an unexpected direction took place. If so it would be observable in a within-subjects analysis. Consistent with other results, this is shown as all four groups in one box.
CHAPTER SEVEN
Interpretation of Results

7.00 Introduction

Studies have shown that preference for specific teaching environments are associated with certain study approach orientations (Entwistle and Tait, 1990), giving support for the influence of person on use of study approach. The overall aim of this study was to explore the possible contribution of context to the use of different study approaches by students, as opposed to the impact of the person. Consequently, the original research question asked whether there would be change in intensity of use of study approach by students over time depending on whether their A-level specialisation (Arts or Science) was the same as their choice at O-level (congruent) or not the same (incongruent), the context. It was hypothesised that, over time, study approaches would be

- intensified with congruent specialisation and,
- weakened with incongruent specialisation.

In essence, these two conditions provided contrasting natural contexts for the students. Before resolving these hypotheses, it was seen as necessary to consider other conditions at the initial O-level stage. The students were divided into two groups according to expressed choice of A-levels. Associations were found between choice of subsequent specialisation and study approach (Entwistle’s), as follows:

- students whose choice was Science had higher deep study approach scores than students whose choice was Arts and,
- students whose choice was Arts had higher surface study approach scores than students whose choice was Science.

Since the question aimed to explore the possible impact of context on use of study approach, this use was tested not only at the end of O-levels, but also after they had been in their specialisation subject for 9 months. Based on the above associations, it was expected that students whose choice was Science would increase their deep study
approach scores when the selected subject at A-level was congruent (i.e., Science specialisation). It was also expected that the students whose choice was Science would have their deep study approach scores reduced by incongruent specialisation (i.e., Arts subjects). Similarly students whose choice was Arts were expected to intensify their surface study approach scores when their specialisation was Arts (congruent) and to be reduced if specialisation was in Science (incongruent).

7.10 Summary of findings
Initially, characteristics of students were investigated before addressing the main research questions.

Preliminary findings
The investigation found that choice for Arts/Science subject disciplines was associated with surface and deep study approaches respectively, with Arts choosing students having a higher surface mean study score and a lower deep study approach score, and Science choosing students having a higher deep study approach score a lower surface study approach score. These findings are not consistent with studies which tend to show associations between specific subjects or subject areas and use of deep or surface study approaches (e.g., Entwistle and Kozeki, 1985).

Main Findings
These findings may be presented under the headings indicated below. Contrary to the above mentioned expectations:

(1) Across Time
There was an overall significant difference across time (9 months) for the surface study approach (but not for the deep study approach), though no one group could be found to have a significant change over time as there was no significant interaction between subject groups and time.

This means that the congruent selection groups are not associated with change in intensity of study approaches from what they had at choice, whereas intensification had been expected. Like-wise, the incongruent selection situations have not resulted in reductions in the study approaches.
Interpretation of Results

The results obtained here were found through a within-subjects analysis. In this repeated measures design, it should be noted that it is the difference in each pair of related means that is of interest, not the overall difference over time. The access to the analysis of the difference in a pair of related means is provided only by a significant interaction between the various levels of subject groups and time. This interaction was not present with respect to both study approach analyses.

Two further analyses were made, two one-way analyses of variance: one with the scores of study approach at choice at O-level and the other after 9 months at selection. Choice of subjects Arts or Science specialisation at O-level were associated with intensity of a study approach as mentioned earlier. What happened at selection, is more related to the overall change discussed in the previous section, since it relates to the impact of the context on study approach these being Arts or Science (actual) specialisation courses. Therefore, the results of the analysis of the study approach scores at selection are discussed in detail.

(2) Differences at Selection

After 9 months (of selection) there were still differences between the pair of groups:

SS-AA,

i.e., between the two congruent selection situations, for the deep study approach but not for the surface study approach.

Thus for the deep study approach, the difference between this pair of groups remained unchanged. The results of the one-way analysis of variance here helps to explain that the non-observance of an overall difference across time for the deep study approach is not due to one group’s increase (SS) being counterbalanced by the other’s decrease (AA) in which case there would not have been a difference between SS and AA which was not, but rather by the deep study approach, as said earlier, remaining the same. Put another way, we see a significant difference (SS-AA) with no increase in magnitude for the deep study approach. The same argument, i.e., of no change in study approach, is applicable to the pair of incongruent groups (SA and AS) as there was no difference between the two groups at selection as was the case also at choice. Thus neither congruent nor incongruent context has made an impact with respect to deep study approach for all the groups.
Interpretation of Results

However, when considering the size of the surface study approach across the four groups after nine months, there is now no difference. What is seen is that the differences that were observed at choice no longer exist. Hence the only change to be inferred is an increase in surface study approach for all groups, congruent and incongruent. In previous studies (e.g., Watkins et al., 1986) deep study approach had not changed over time, but there has been a reduction in surface study approach.

If explained in terms of previous associations (at O-level) then the former mentioned finding indicates that the association between subjects and study approach has been maintained for the deep study approach whilst it has weakened for the surface study approach. The latter was not what was expected in the circumstances (surface study approach in congruent selection conditions). What was expected was an increase in this surface study for AA but a reduction for SS (for the association to hold). What has really happened is no discernible change of this study approach at SS, that is, a reduction of surface study approach (see Table 6.9).

7.20 Conclusions

Subject Disciplines and Study Approaches

In the present investigation it was found that Science choice students had higher deep study approach scores than Arts choice students did. The inverse relationship prevailed with respect to the surface study approach. In a study (Entwistle and Kozeki, 1985) directly comparable (using a similar instrument) to the present one employing British and Hungarian pupils, attainment in both Arts and Science was positively correlated with deep study approach while being negatively correlated with surface study approach. As these would be the expected relationships of the study approaches with subject attainment in Arts or Science the present study’s relationships of study approaches and choice of subjects vis-à-vis the attainment in subjects could be explained by the composition of the subjects groups (Arts/Science) in Sri Lanka. As indicated above high subject attainment is connected with deep study approach. In Sri Lanka, however, high attainers tend more to be Science students and more Arts students tend to be low attainers. Therefore Science students should have high deep study approach scores and low surface study scores whereas Arts students should have high surface and low deep study approach scores. The validity of this explanation rests on the levels of attainments of these two groups and is supported by
the analyses presented in Table 2 of Appendix B where it could be seen that Science choice students in the present sample have a significantly greater subject attainment level than the Arts choice students.

**Study approaches across groups**
There are several possible reasons for finding no difference across the four groups in the surface study approach mean scores after 9 months at A-level while there was an overall increase in surface approach over time. One might be that there was no difference in teaching style in any of these specialisations that might differentially influence the students. Thus in both Arts and Science at A-level, learning of facts and memorisation may have been equally stressed. Thus the classroom context could have influenced student use of study skills.

**Intensification and reduction of surface study approach across time**
There could be many explanations for finding no intensification (in congruent conditions) or reduction (in incongruent conditions) for the study approaches over time. One would be the short length of time over which the operation of selection took place. On the other hand, maybe the contexts were not as different for the students as originally expected. Again, if A-level classrooms only emphasise memorisation regardless of subjects, then this might explain why the only increase was overall intensity of use of surface approach.

Alternatively, the significant overall increase over time in this study approach at A-level (whereas the deep study approach remained unchanged) could be explained by the students being anxious in the new learning situation of A-level specialisation. Therefore they adopted, as a safeguard to approach in response, an enhanced application of surface study approach as a 'coping strategy'. This may go towards explaining the significant increase in the mean score in this study approach at A-level and presupposes that the students had not adapted themselves after nearly one year into A-level specialisation. In earlier studies, such anxiety has been associated with the surface study approach (Fransson, 1977).

Other factors may have influenced the failure to show intensification or weakening of association with selection. One relates to the choice made by the students: was it an informed one or not? In the intense competition prevailing in the
education system in Sri Lanka, there is always the possibility of students making choices for ill-informed reasons. Perhaps this may be such an occasion. Thus, some students may have chosen science for potential employment reasons, for example, rather than because they liked the subjects.

Another explanation that may be advanced in respect of change is from the students' point of view: their expectations of the different subject streams were not being met. If this existed, it would lead to loss of motivation even within congruent groups.

Overall, there appears to be several possible known extraneous variables whose control would be difficult in the complex learning environment. There would need to be further investigations, predominantly qualitative, to determine the nature of their influence.

*Lack of change in deep study approach*

As there was no evidence of change within groups over time (as well as overall) for the deep study approach, this strongly suggests that context had no effect on this study approach. However, the failure for the deep study approach to show differences is possibly due to the ceiling-effect observed in the distribution of scores at the inception, thereby rendering it less likely increases in later measurements would be detectable.

Other investigations of persistence and change in study approach appear to be few. When present, the apparently parallel labels of consistency and variability are the ones often used. To be comparable to the present investigation these studies, strictly speaking, would need to be longitudinal in nature. The findings in such studies that studied variability of study approach are mixed. These have measured study approaches of the same students following different courses (e.g., Eley, 1992). The reasons adduced for when there is lack of change are much the same: too much similarity in the different courses and too short the period of time of contextual influence.

Other studies of a longitudinal nature appear to have observed changes in study approaches over time with respect to the same learning context, that is, for the same first year university courses. As such, these may better be regarded as
Interpretation of Results

developmental studies rather than those of variability (e.g., Vermetten et al., 1999b; Watkin and Hattie, 1985; Watkin et al. (1986).

However, the present investigation is different from all others in probing nature of change of study approaches. In this endeavour, use was made of the basic concept choice and subsequent selections (context), largely unused in similar circumstances in past research.

The present study investigated the consequences of a change in subject matter taught not just time in the same class. The study had a baseline from which to compare, at least theoretically, so that any increase or a decrease that could be identified.

Teaching methods, curricula and study approaches

Earlier studies appear to have related teaching methodology or curricula followed by students, to their study approaches (see for example, Eley, 1991). In these, the deep study approach has generally been found to be associated with ‘freedom’ in learning and the surface study approach to an absence of this. In the present investigation it was seen that the same learning environment at A/L had differences with respect to deep study approach in different groups. Thus for the following pairs of groups of congruency-selection there were differences in each row after 9 months.

<table>
<thead>
<tr>
<th>SS</th>
<th>AS ..................(1) Science A/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA</td>
<td>AA ..................(2) Arts A/L</td>
</tr>
</tbody>
</table>

In both the learning environment was the same for nine months: (1) science specialisation and (2) Arts specialisation. The darkened letters are intended to convey similarity of the environments. Yet in both situations each pair of groups differed significantly in deep study approach. These differences can possibly be explained by the fact they joined classes different from their initial choice (and hence with differing extant levels of deep study approach) alone, and not because of, as in the present case, on account of different learning environments. Research into student learning should take regard of this.
7.30. Critical analysis of methodology

A critical analysis of the methodology adopted can be considered from two aspects, its strengths and weaknesses.

Strengths

To ensure the validity of the final instrument the process of development involved the following steps. Many versions of the student questionnaire were made available by Professor Entwistle to the investigator who selected one that had not recently been given to schools in which he intended to conduct his research. This eliminated from consideration the questionnaire used in the Entwistle and Kozeki (1985) study. The version finally selected for use was the KE3. This contained items relating to the process skills components of the deep study approach, in an attempt to bring out any relationship of this study approach with either of the A-level Arts or Science subjects. Next, the inventory was translated into Sinhalese language by an experienced teacher and expert translator who on an earlier research occasion had successfully translated the version used in the last mentioned study. However the investigator checked the validity of the instrument by translating it back into English and where changes in the Sinhalese translation were considered necessary the translator attended these to.

To reduce any possible bias in the responses, the full questionnaire of 60-items was used in the investigation to hide the intent to focus on only two aspects. The scores of responses to only 12-items (six for each of the two study approaches deep and surface) were ultimately used in the investigation.

A purposive sample of students was used in this investigation because earlier research (Biggs, 1985) had indicated that this type of questionnaire was more suitable for students high in both memory and reasoning scores. Earlier experience with a close questionnaire had shown that less able students tended to leave the questionnaire incompletely finished. This was not a risk that was wanted in this longitudinal study. This led to the random selection of the sample of 11 schools from 18 relatively academically inclined schools in the easily accessible urban areas. Such schools in urban areas in Sri Lanka have a large proportion of O-level students entering the A-level classes (Perera, 1988). Hence the sampling method adopted served two functions, ensuring construct validity in the instrument and retention of the sample in the system for the second testing.
Interpretation of Results

To have adequate representation of student numbers in the four A-level groups, the decision was taken at the start of the investigation to select a sufficiently large to ensure each group was viable. As a consequence, the smallest group was more than adequate (109) for the investigation.

No problems were encountered during the administration of the translated questionnaire. On some occasions comments were encouraged from the students. Students appeared to have responded with understanding to the items as there were no complaints regarding these. A similar situation prevailed when a close version of the questionnaire (that used in the Entwistle and Kozeki (1985) study) was administered on an earlier occasion following a pilot study.

A potential problem was identified due to the length of the questionnaire. Answering it entailed continually using a common key, for each item. The student operation involved encircling a number corresponding to a level of response ranging from complete agreement to complete disagreement, through a no opinion stage, for each statement. As it was necessary to minimise rejection of answer scripts in a longitudinal study like this, an effort was made to ensure that the students understood the instructions relating to answering the questionnaire. This was achieved by the students and the administrator of the questionnaire jointly going through, step by step, the provided worked example. This procedure was associated with explanations that were kept uniform across the testing sessions and were carried out instead of leaving the students to go through the worked example and familiarise themselves with the instructions without assistance. The procedure had to be repeated in 11 schools and in each of the several classes in each school. This procedure was adopted at the first testing, that is towards the tail end of the final year O-level class. During the second testing, a repetition of the entire procedure was not attempted as the respondents were the same students. However, to assist recollection, they were reminded of the basic processes of responding to a questionnaire. Due to joining a new school, etc., a few students were in A-level classes that had not answered the questionnaire on the first occasion. Nevertheless they were required to answer the questionnaire to avoid isolation them in the classroom but their responses were not given regard in the analyses. One student was recognised as being in one school in the first testing.
Interpretation of Results

occasion but in another in the second. In the interest of consistency of learning environments this response was also not considered.

Perceived weaknesses and limitations of the study
First, there was the possibility that the administering of the instrument by the investigator would lead to experimenter effect because the students would want to please the outside investigator. The investigator administered the questionnaire in some of the classes in school, whilst a postgraduate education student trained by the investigator for this purpose administered the questionnaire in the rest of the classes of the same school. The number of classes tested in a school ranged from 5 to 9 in most of the schools. The same procedure was followed by the trained assistant. The possibility existed that because it was their study habits that were being investigated, student responses would indicate what they knew to be good approaches, but not necessarily what they did themselves. This could have been due to an outsider administering the test, while their own teacher (who was due to teaching them at the time of testing), might not have generated such a reaction.

Alternatively, the questionnaire could have been left in a neutral place like on a classroom desk for collection and later completion. The cultural features of Sri Lanka and the longitudinal nature of the study ruled out this option. Whilst some teachers in Sri Lanka like to give a questionnaire themselves, all teachers are not equally enthusiastic. Also, there would be a greater danger that they simply would not be collected and/or completed correctly. Hence the existing procedure of administering the questionnaire had the added advantage of the instructions being thoroughly understood and was adopted.

As the deep study approach at the first testing showed a ceiling effect in the distribution of its scores, the change of context does not allow for easy change in its measurement level. This would be for both directions, a potential increase or decrease. Hence the manifestation of a potential change was denied by the ceiling effect.

Another limitation of the study was the non-pursuance of possible gender effects. As the investigation was an exploratory study in a new cultural milieu, it was thought sufficient to restrict it to variables of utmost importance in the investigation.
Interpretation of Results

As the possibility existed that decisions that these students made may have been influenced by parental and social pressure in Sri Lanka, their ‘choice’ of A-level specialisation may also mean the result of operation of other influences as well and not choice alone. For example, prospects in the job market identified as suitable for them by the parents. Anticipating this, an item in the Short Questionnaire (Item No. 6) asked specifically whether it was their own decision, their parents or ideas of others. As more than 99% of the students stated that it was their own choice, further analysis relating to it was not taken-up. Hence contrary to expectations, this potential limitation did not seem to be present in the sample.

A factor that the researcher has to be guard in a longitudinal study like this is that of confounding of results by maturation. However maturation effects appear capable of being ruled out in the present investigation as all groups were of the same age, thereby any one group not being different in age to another to confound the obtained results by maturation. Anyhow, the raw scores did not increase over time with deep study approach and the increase in the surface study approach was in the opposite direction, increasing rather than decreasing with age. The latter cannot be justifiably defended in terms of greater maturity.

Another reason for the hypotheses not being supported is that choice was not functional as was intended, i.e., one that was expressed with freedom and without constraints. This would be the cultural factor, meriting research by itself, since both choice and ultimate selection could be influenced by such factors as employment prospects and family pressure.

Mentioning the nature and implementation of the curriculum of A-level Arts and Science is relevant. Two possibilities arise in this situation. One is that the Arts and Science A-level curricula are not ‘different’ in their delivery, i.e. classes were mostly lectures. The other is even when the subjects at A-level are different, how they are taught (i.e., what type of study approach is encouraged through homework) is not, leading to similar deep study approaches in both Arts and Science specialisation.

Sampling, statistics and instrument

There were some limitations in the investigation that were specially associated with the above mentioned.
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The sample sizes of the congruent and incongruent selection groups differed to a relatively large extent which was not anticipated.

The surface study approach scale of the Study Approach Instrument used (School and School Work Inventory, SSWI, KE3) had a low reliability. This would confer in turn lower power of the statistical tests used, in other words lowering the probability of finding significant differences when they existed. The KE3 version may have not being the most suitable instrument in the context of Sri Lanka due to the use of some activities as examples that were not common in schools.

If there was a question regarding the outcome of the present investigation, it was with respect to the surface study approach. In this investigation it may arise because of the relatively low reliability of the instrument observed. In the past research the question related to it appears to have mainly been one of consistency of the loading of the components in the Reproducing Orientation dimension on a single factor, and not on the surface approach itself. Alternatively, other instruments (e.g., Learning Process Questionnaire, LPQ) has encountered this problem in the norming sample itself (Biggs, 1987a).

High scores were obtained by students on the deep study approach instrument at choice that resulted in a ceiling effect. Thus any increases with congruent selection would have been difficult to detect. This may be attributed to experimenter presence or wording of questions.

The duration of specialised study at A-level may have been uneven in the schools given the localised disturbances in Sri Lanka. The study was limited to areas where the predominant use of language was Sinhalese rather than being fully representative of the different geographical areas of Sri Lanka.

The present study employed largely an urban population to safeguard theoretical pronouncements and sample mortality, but it did exclude rural students. As a consequence, if such a study were replicated, it is recommended that employing a wider population of students than the one used in the present investigation.
7.40 Improved practices

As the surface study approach scale had a low reliability as a result of an item, attention to its wording is necessary. The translation indicated the possibility of misconception since the word ‘project work’ when substituted for the word ‘set work’ did not have sufficient usage in the Sri Lanka context for unambiguous responses.

The observed ceiling effect of the deep study approach measures could also be traced to the inadequacy of the instrument. Perhaps removal of the presence of the outside experimenter discussed in the previous section would also contribute to more honest replies, particularly if there were an interaction between the presence of a visitor and tendency to choose deep study approaches. However this is not completely the case, since the results showed an increase in surface study approach at the same time. Alternatively, the wording of questions may have caused the ceiling effect. This might be reduced by having more questions and questions that are more provocative, to make the scale longer and to enhance the identification of negative cases. Nevertheless, elimination of experimenter effect should not only be the desired intention but also result also in action.

The influence of the context upon study approaches may possibly have been greater if the two contexts were differentiated, rather than as generally as just Arts and Science which have the possibility that the components subsumed under each overlap. History and Physics may have served as better contrasting environments, but unfortunately such a subject division was not present at that time in General Education curriculum. However, recent events in the country have added History as a specific part of the Social Studies subject in the General Education curriculum.

To overcome the potential insufficient time for students to adapt to new curricula and teaching, the second measure could have been administered in the second year of A-level instead of the end of the first year.
Interpretation of Results

7.50 Recommendations for future research/action

If students just entering A/L classes are subjected to stress leading to increased use of surface study approach as a coping strategy, the teaching styles at this juncture should be accordingly adjusted, with the aim of reducing this state of mind. This would need a more differentiated (rather than a general learning of teaching methodology embedded in teacher training programs) to suit a variety of situations. As a first step, interview data gathered from recent entrants to A-level could be collected to confirm or otherwise this state of mind.

As the alternate possibility existed that at A-level the teaching itself is memorisation directed, a different course for future research would be to investigate study approaches at O and A levels of the GCE to find a difference in practice as has been done in related studies (e.g., Eklund-Myrskog and Claes-Goran, 1999; Zeegers, 2001).

An over emphasis on individual differences in learning has been the subject of recent criticism (Lingbiao and Watkins, 2001). Even when individual differences are pursued, their scope of interactions with general conditions do not appear to be fully utilised (Riding and Rayner, 1998). On a practical note, does not the emphasis of individual differences in learning to the detriment of general laws of learning miss out information that the teacher can more easily put to use in the learning situation?

Returning to the present study, ‘composite’ individual differences in the process of learning constructs appear to have a short ‘life-time’. Thus the literature review showed that in the Chinese culture the memorisation component of surface study approach separates from the rest of its components. This appears to suggest that a return to a study of discrete ‘skills’ is yet a viable option. For example, a surface approach may contain many discrete elements such as ‘not fully reading the instructions’ which may be meaningfully pursued independently of other components.

Though available evidence (Lai, 1989; in Kember and Gow, 1990) and personal experience of Sri Lanka schools justified the use of the ASI (school version) in the present investigation, a more thorough examination of the mutual exclusiveness of memorisation and understanding for a valid use of the instrument should be a concern for future research. This is because the Chinese cultural heritage of
combining memorisation with understanding in learning may have a general effect in the Asian region including that of Sri Lanka. Confucianism in Chinese culture is also linked with Buddhism which is the predominant religion in Sri Lanka. In truth, however, whereas Chinese culture escaped Western domination, that of Sri Lanka witnessed several waves of Western influence and its school system is still mainly an inheritance of the West (Jayaweera, 1986).

Whilst this argument also lent support to the usage of the instrument in the present investigation, additional support for the present context being important came from a study by Biggs (1991) that found Chinese students were higher on rote and lower on meaningful, learning approaches. The Chinese students were in a highly traditional medical school in Hong Kong in which rote learning of technical terms was emphasised, while Western students were in the most learner-friendly of environments, problem-based learning, in Australia. Whilst this study gives other comparisons some validity, i.e., understanding is combined with memorisation in China (as previous studies have tested Chinese students either in China or Australia in learning situations associated with promoting understanding), direct information relating to the mutual exclusiveness or otherwise of understanding and memorisation in the Sri Lanka educational context still appears desirable as it affects the transferability of this dichotomy to this country.

The starting point in such situations as undertaken once by Marton et al., (1996) appears to be to examine the conceptions of learning in Sri Lanka. In this endeavour, repetitive behaviour should not be mistaken for rote learning as Confucianism advocate withholding criticism until one fully understands the other’s point, or as On (1996) quotes Chu (1990) in Zhu (1992):

‘Generally speaking, in reading, we must first become intimately familiar with the text so that its words seem to come out of our mouth. We should then continue to reflect on it so that its ideas seem to come from our own minds...(Chu, 1990, p.135).
Interpretation of Results

While the present study of this thesis resolves the stated hypotheses, it also raises a number of issues that could lead to additional research:

- A new study that includes comparison with a western sample using the same concepts (deep and surface study approaches and choice) as these may differ in the meaning attached to from culture to culture. In which case, especially with respect choice, the research design may require modification to examine whether study approaches are subject to change, i.e., alternate concepts to choice. However, the researcher must be on guard against possible 'macro' nature of this kind of variable.

- A question that could be asked, based on the investigation’s finding but however seeking verification is: Does A-level teaching and learning for all subjects only encourage surface approach, in Sri Lanka? And if so, why?

The answer to these questions would be of considerable interest to educational planners and curriculum developers in Sri Lanka, and would have a direct bearing on both curriculum development and teacher education.

Inference of causality

Strong association of study approach with subject preference was observable in the present investigation. Choice of specialisation was also strongly associated with level of study approach. Could causality be inferred in these circumstances? Could it be said that study approaches affect preference and choice? Probably the consistent nature of the relationships between two similar affective concepts ‘like’ preference and choice with study approach moves us in this direction. In which case study approach may be conceived of, in the first part of the study, as independent variable, affecting preference and choice. It also follows, then, preference and choice are dependent variables. If this interpretation is acceptable it becomes one of the many roles that study approach could take. However the variables are too big to provide any basis for causality, limiting conclusions to associations. If there had been significant differences then it would have been worthwhile looking for components (e.g., what part of being in Science, or what aspect of congruency), that might be a basis for investigating causality in future research.
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However, in the longitudinal study, study approach was investigated as a dependent variable to the now independent variable of subject specialisation (‘treatment’). But, to reiterate, from the results obtained it does not appear warranted to describe it in terms of dependent variable as very little change was brought about. In other studies it is the latter role that is mainly ascribed to it. Expected results have also thereby been obtained. Study approach in this study did not appear to take the role of dependent variable easily, not increasing even when the context was the chosen one (congruent selection), nor decreasing even when it was not (incongruent selection). Hence even without association one cannot think of causality and hence discuss study approaches in this study in terms of possible independent and dependent variables.

7.60 Features to note in the study

Aspects of this study that differentiates this one from others include,

- emphasis on context (congruency of choice and selection) as opposed to person or only the learning environment

- the A-level curriculum (Arts/Sc) was responded to (via study approaches) in the abstract (while in the O-level, in terms of choice), but this was capable of being ratified by reference back to preference shown to O-level subjects (Arts/Science)

- adopted a research design that could give direct evidence of change of study approach.

- the research design had different groups for different combinations of ‘traits’, making possible controlled comparisons

- post hoc tests were other than multiple t-tests thereby potentially reducing Type I Error in the interpretation of the results.
7.70 Summary

Most of the expectations stated in the research question and hypotheses were not found, though a relationship between choice for Arts or Science subjects in the two curricula of O-level and A-level and study approach (deep and surface) was established. Therefore, it could be said that the context as defined here (congruent and not congruent) made no difference. The only significant context effect was an overall slight increase surface approach for everyone. Preference for Arts/Science subjects at O-level was measured only to find out at the outset whether the intended investigation was a viable one as the study approaches were to be later measured at A-level in relationship to similar subject areas.

The study approaches were generally found to be stable and persistent within the context of the present investigation. The nature of change of the surface approach (in the direction of greater surface approach) should be a concern for educators in Sri Lanka, as it may be the result of teaching approaches at A-level or may be due to surface approach employed as a coping device by students in the early stage of the A/L situation.
Bibliography


Bibliography


Bibliography


Bibliography


Bibliography


Bibliography


Bibliography


APPENDIX A: Instruments

1. School and SchoolWork Inventory (SSWI) Version KE3
2. Deep Study Approach test items in the KE3
3. Surface Study Approach test items in the KE3
4. The Short Questionnaire
SCHOOL AND SCHOOL WORK

Please read these instructions carefully.

This questionnaire, in two sections, contains comments made by pupils about their school and school work. To what extent do you agree or disagree with their comments? As the comments are feelings based on personal experience, there can be no right or wrong answers. We are interested in your opinion or experience.

Read each comment carefully and then immediately show how closely you agree or disagree with that comment by circling one of the letters at the right-hand side. For example:

11 2 X XX

I enjoy the practical work at school a b c d e

Choose the letters according to the answer you want to give.

<table>
<thead>
<tr>
<th>Column Heading</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>close to my own feeling</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>agreement with the</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>comment on the whole</td>
<td></td>
<td></td>
<td>?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>not sure or not</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>understood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>XX</td>
</tr>
<tr>
<td>disagreement on the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>whole</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel rather the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>opposite of this</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Try to avoid the ? answer if you possibly can. It is important that you give an answer to EVERY question.

Please fill in the details below and then TURN OVER

<table>
<thead>
<tr>
<th>School .........................</th>
<th>Class ...........</th>
<th>Column Heading</th>
</tr>
</thead>
<tbody>
<tr>
<td>School ..........................</td>
<td>Class ...........</td>
<td>Column Heading</td>
</tr>
<tr>
<td>Sex Male/Female Date of Birth</td>
<td>Sex Male/Female Date of Birth</td>
<td>Column Heading</td>
</tr>
<tr>
<td>(circle number) 1 2</td>
<td>Date of Birth</td>
<td>Column Heading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>71</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
</tr>
</tbody>
</table>

Version KE3
1. I enjoy talking to my parents about what happens in school.
2. Most teachers are fair to all their pupils.
3. Being friendly with other pupils is more important to me than competing with them.
4. When I'm absorbed in something, my parents don't interrupt me.
5. I get so involved in some topics at school that I try to follow them up on my own.
6. School is a boring place.
7. When I don't do well at school, I feel ashamed of myself.
8. I want teachers to know that they can depend on me.
9. Punishment in schools is always unfair.
10. Adults demand too much from young people and give little help in return.
11. My parents are really happy when I do well at school, and that makes me feel good, too.
12. It would make me feel bad if I disappointed the teacher.
13. I enjoy helping other pupils with their school work.
14. I don't feel happy having to work on my own.
15. I generally leave my homework until the last minute.
16. Many school lessons are dull and uninteresting.
17. I would rather admit something I have done wrong than try to cover it up.
18. If teachers would let pupils do whatever they want to do, I would enjoy school much more.
19. I would rather be corrected, than left to do something wrong.
20. My teachers never seem to be satisfied with what I've done, even when I've tried hard.
<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>21.</td>
<td>My parents don't seem to be all that interested in what I've done at school.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>22.</td>
<td>There are very few teachers that I can really admire.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>23.</td>
<td>I feel really good when my friends can see that I've done well.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>24.</td>
<td>You can't expect pupils to come up with good ideas of their own.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>25.</td>
<td>School provides a great deal of useful knowledge about life.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>26.</td>
<td>I spend a lot of my spare time finding out about things on my own.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>27.</td>
<td>If I'm given something to do, I always try to do it as well as possible.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>28.</td>
<td>School rules are sensible: I always try to follow them.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>29.</td>
<td>If I have done something wrong, I'm always ready to take the consequences.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>30.</td>
<td>I rather resent the amount of pressure the teachers put us under.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>31.</td>
<td>My parents are always helpful and encouraging about my school work.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>32.</td>
<td>Most teachers never bother to explain things well enough.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>33.</td>
<td>I don't really care what other people think about me.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>34.</td>
<td>My parents always value my opinion.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>35.</td>
<td>The things we learn at school are not of any real use to me.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>36.</td>
<td>I feel happy and excited when a new topic is introduced.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>37.</td>
<td>I always find a good excuse if I haven't done my homework.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>38.</td>
<td>When school work is hard I usually give up.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>39.</td>
<td>I find I am often having to make excuses.</td>
<td>a b c d e</td>
</tr>
<tr>
<td>40.</td>
<td>My parents demand too much of me and put me under a lot of pressure.</td>
<td>a b c d e</td>
</tr>
</tbody>
</table>
41. Adults are not really interested in trying to understand young people's feelings.
42. It is often the teacher's fault when you get into trouble at school.
43. People seem to find it difficult to get on well with me.
44. I always prefer to work things out for myself.
45. I quickly lose interest if new topics are difficult.
46. There are a lot of lessons which I find exciting and challenging.
47. If I am expected to do something, I do it.
48. I always put a lot of effort into what we're asked to do in school.
49. I am ready to take responsibility for all my actions, no matter what.
50. My parents seem to be totally unrealistic in what they expect me to achieve at school.
51. If I do well at school, my parents always show that they are pleased with me.
52. Most teachers try hard to help all the pupils.
53. There's a really good feeling among the pupils in this school.
54. I'm expected to work out too many things on my own.
55. I don't mind working hard if I learn something in the process.
56. I find school work really very interesting.
57. I always try to live up to my parents' trust.
58. Only weak people like rules and need order.
59. A feeling of guilt is worse even than severe punishment.
60. Adults always seem to be expecting too much of young people.
SECTION B

1. I try to relate ideas in one subject to those in others, whenever possible.  
2. When I'm reading, the ideas sometimes produce vivid images in my mind.  
3. I find some subjects so interesting that I would like to go on with them after I leave here.  
4. I find I have to rely on memorizing a good deal of what we have to learn.  
5. I prefer to tackle each part of a topic or problem in order, working through it one step at a time.  
6. I suppose I'm more interested in the qualifications I'll get, than in the subjects I'm taking.  
7. In exams I tend to panic.  
8. I'm very good at organizing my study time effectively.  
9. I hate admitting defeat, even in trivial matters.  
10. If I have something to do, I feel it's worthwhile only if I do it well.  
11. I generally try to understand things even when they initially seem rather difficult.  
12. I like to play around with ideas of my own, even if they don't get me very far.  
13. Some of the work here is really exciting and gripping.  
14. I don't usually have time to think about the implications of what I have read.  
15. I'm more ready to follow well-tried approaches to problems than unfamiliar ones.  
16. My main reason for studying is so that I'll be able to get a good job.  
17. I worry a lot when teachers criticize my work.  
18. I very rarely require extra time to complete written work.  
19. I enjoy competing with other pupils in school work.  
20. I feel it's my duty to work hard at school.
21. Often I ask myself questions about the things I hear in lessons or read in books. 
22. I enjoy doing things where I can use my imagination or my own ideas. 
23. My main reason for studying is so that I can learn more about the subjects which really interest me.
24. The best way for me to understand what technical terms mean is to remember just the text-book definition.
25. I think it's important to look at problems cautiously and logically without relying on intuition.
26. When I work hard, it's only so that I can continue my education.
27. I am always worrying that I will get behind with my work.
28. I always organize my work very carefully.
29. It's important to me to do things better than other pupils, if I possibly can.
30. I don't mind working long hours to complete my work satisfactorily.
31. I try to relate what I read to previous work.
32. I prefer teachers who use lots of examples, or their own experiences, to help us understand things.
33. I spend a good deal of my spare time finding out about interesting topics which have been discussed.
34. I like to be told precisely what to do in essays or other set work.
35. I prefer to stick to one approach to a problem until I'm absolutely sure it won't work.
36. When I work hard it's only because I don't want to let my parents down.
37. I never seem to be able to do things as well as I feel I could.
38. If I do something badly, I try to work out why, so that I can do better next time.
39. If I want something badly, I don't mind really pushing to get it.
40. When I've started a piece of work, I stick at it even if I'm finding it really hard.
41. I prefer to make my own notes when I can.  
42. I suppose I'm a bit too ready to jump to conclusions.  
43. I am fascinated by some of the topics we meet in school work.  
44. I make my own notes only when the teacher tells me to.  
45. I prefer teachers who stick to the point and don't go off at a tangent.  
46. I suppose I'm at school only because I don't seem to have any real choice about it.  
47. Other people always seem to be able to do things better than I can.  
48. If conditions aren't right for me to study, I always try to do something to change them.  
49. I feel tense before an exam, but that seems to make me work better during it.  
50. I take my work seriously, no matter what.  
51. In trying to understand new ideas, I often try to relate them to real-life situations.  
52. In written work I try to put over my own view whenever possible.  
53. I get very enthusiastic about some of my school work.  
54. Generally I read only what we are specifically told to read.  
55. When I'm explaining something, I generally try to give a lot of detail.  
56. I work well only when the teacher puts me under a good deal of pressure.  
57. Worrying about school work often prevents me from sleeping.  
58. I plan my working time carefully to make the most of it.  
59. I play any game to win, not just for the fun of it.  
60. Even when I'm tired, I try to finish everything I have to do.  

CHECK BACK TO MAKE SURE YOU HAVE PUT A CIRCLE AGAINST EVERY QUESTION.

Then answer the remaining questions on the back.
Which type of subject do you enjoy most? (Circle number)

Arts  Science  Both equally  Neither equally  Not sure
    1       2       3       4       5

Please indicate below how well you have been doing in your school work. Against the subjects you have been studying enter in the box either your 'O' grade or, if you haven't taken these exams yet, estimate your performance as follows: 5 = in top quarter of class; 4 = above average; 3 = average; 2 = below average; 1 = bottom quarter of class.

Arts-Type Subjects

English  Mathematics
History  Physics
Geography  Chemistry
French  Biology
German (or other language)  Technical Subjects
Art

Add any subjects below on either the Arts or Science side.

..................  ..................

..................  ..................

..................  ..................

Thank you for helping us with this research project: we are very grateful.
Appendix A

Table 1: Items selected from the School and School Work Inventory (KE3): Meanings Orientation

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Deep Approach (Cronbach Alpha = 0.66)</th>
<th>Item-scale total correlation</th>
<th>My item number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I try to relate ideas in one subject to those in others, whenever possible.</td>
<td>0.62</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>I generally try to understand new topics by working on the ideas out for myself.</td>
<td>0.63</td>
<td>10</td>
</tr>
<tr>
<td>21</td>
<td>Often I ask myself questions about the things I hear in lessons or read in books.</td>
<td>0.61</td>
<td>20</td>
</tr>
<tr>
<td>31</td>
<td>I try to relate what I read to previous work.</td>
<td>0.60</td>
<td>35</td>
</tr>
<tr>
<td>41</td>
<td>I prefer to make my own notes when I can.</td>
<td>0.53</td>
<td>7</td>
</tr>
<tr>
<td>51</td>
<td>In trying to understand new ideas, I often try to relate them to real-life situations.</td>
<td>0.56</td>
<td>44</td>
</tr>
</tbody>
</table>

(n=200)*

* a sub-sample
Appendix A

Table 2: Items selected from the School and School Work Inventory (KE3):
Reproducing Orientation

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Reproducing Orientation (Cronbach Alpha = 0.40)</th>
<th>Item-scale total correlation</th>
<th>My item no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>I find I have to rely on memorising a good deal of what we have to learn.</td>
<td>0.44</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>I don't usually have time to think about the implications of what I have read.</td>
<td>0.53</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>The best way for me to understand what technical terms mean is to remember just the text-book definition.</td>
<td>0.44</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>I like to be told precisely what to do in essays or other set work.</td>
<td>0.11</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>I make my known notes only when my teacher tells me to.</td>
<td>0.50</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Generally I read only what we are specifically told to read.</td>
<td>0.48</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

(n=200)*

* a sub-sample
THE SHORT QUESTIONNAIRE

Name:- Year:- School:-

1. What are the three subjects that you like most out of the subjects taught at O-level?

State these three in the order of preference.

1. 2. 3.

2. State the optional subjects offered by you.

1. 2.

3. Do you expect to enter the A-level class? Yes/No (underline your answer)

4. The reason that you want to enter the A-level class is (if expecting to enter):

1. In order to enter the University
2. In order to obtain qualifications to enter other institutions of higher education other than the University
3. In order to obtain qualifications to sit for various examinations
4. In order to obtain qualifications for a job

5. State the subject stream that you expect to follow at A-level (choose one of the following by underlining)


6. Which one of the following that had the greatest influence in your selection (the subject stream)?

1. Your ideas 2. Parents ideas 3. Ideas of others
Table 1: The matrix of intercorrelations of the variables deep study approach, surface study approach and academic achievement (OL Grades) in the entire sample of the longitudinal study (all the groups)

<table>
<thead>
<tr>
<th></th>
<th>Deep</th>
<th>Surface</th>
<th>Deep12</th>
<th>Surface12</th>
<th>OL Exam. Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep</td>
<td>1.0000</td>
<td>-0.2000**</td>
<td>0.4182**</td>
<td>-0.1943**</td>
<td>0.2157**</td>
</tr>
<tr>
<td>Surface</td>
<td>-0.2000**</td>
<td>1.0000</td>
<td>-0.1269**</td>
<td>0.3149**</td>
<td>-0.1416**</td>
</tr>
<tr>
<td>Deep12</td>
<td>0.4182**</td>
<td>-0.1269**</td>
<td>1.0000</td>
<td>-0.2371**</td>
<td>0.2215**</td>
</tr>
<tr>
<td>Surface12</td>
<td>-0.1943**</td>
<td>0.3149**</td>
<td>-0.2371**</td>
<td>1.0000</td>
<td>-0.0355, n.s.</td>
</tr>
<tr>
<td>OL Grades</td>
<td>0.2157**</td>
<td>-0.1416**</td>
<td>0.2215**</td>
<td>-0.0355, n.s.</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

(n=1356, except for OL Exam. Grades where n=1322 as results of 34 students could not be known)

**p<.001
n.s.: non-significant

Deep: First measurement of deep study approach (at OL)
Deep12: Second measurement of deep study approach (at AL)
Surface: First measurement of surface study approach (at OL)
Surface12: Second measurement of deep study approach (at AL)
OL Exam. Grades: OL Exam. Grades of the eight subjects converted to marks and totalled. A (Distinction)=4 marks, B (Credit pass)=3 marks, C (Pass)=2 marks and D(fail)=1 mark. In this sample, students had passed in all the eight subjects in the General Education curriculum.
Table 2: $t$-test for independent samples of A-L choice and O-L attainment

<table>
<thead>
<tr>
<th></th>
<th>Choice is Arts</th>
<th>Choice is Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{x}$</td>
<td>25.72</td>
<td>28.45</td>
</tr>
<tr>
<td>SD</td>
<td>3.41</td>
<td>3.11</td>
</tr>
<tr>
<td>$n$</td>
<td>438</td>
<td>884</td>
</tr>
</tbody>
</table>

$t=14.55$ ($df=1320$), $p<.001$

OL Exam. attainment: OL Grades of the eight subjects converted to marks and totalled. The following marks were awarded for the Grades:

- A=4 marks,
- B=3 marks,
- C=2 marks,
- D(fail)=1 mark.

The grades are explained in the page containing Table 1 in this Appendix (B).
APPENDIX C

Sri Lanka Education System

Introduction
The modern education system in Sri Lanka (as opposed to the indigenous one which is described as the ancient one) is an heritage of the British rule, and reflected the British education system (Jayaweera, 1993).

Of particular interest to the present study, is the departure from early specialisation that prevailed from British colonial times, to one of general education in the junior secondary school sector. Subject specialisation as a result was postponed until arrival of pupils at Sixth Form or what is now called Advanced Level class.

The present structure of the education system is noted below. In it greater attention is given to the aspects relevant to the present investigation.

The present system of education
The present system of education, i.e., after the 1977 proposals, consists of three distinct segments:

1. The school system
2. The university system
3. The tertiary education system

Of these, it is the school system that is relevant to the present investigation and it is this that is mainly taken for consideration in the pages that follow. However, a brief note is taken below of the other systems.

The School System
It covers a period of General Education, followed by subject specialisation in the Advanced level classes.

The span of General Education, which is open to all students, consists of:
- years of Primary schooling in Grades 1 to 5 (School Years 1 to 5)
- years Junior Secondary schooling in Grades 6 to 8 (School Years 6 to 8)
- 3 years of Senior Secondary schooling ((School Years 9 to 11)
The span of General Education terminates with the General Certificate of Education Examination which is held at the end of School Year 11 (earlier called Grade 10). The present arrangement is much the same as the 1972 educational reforms, and hence Sri Lanka counts an unbroken period of General Education of 28 years to date.

**Subject specialisation**
The last two grades in the school system, Grades 11 and 12 (School Years 12 and 13) are accessible only to those with a strong academic aptitude and prepares students to enter the Universities and other tertiary institutions. It is in these two grades that specialisation takes place. This takes the form of Science or Arts or Commerce, the three subject specialisation streams that presently exits.

**The Universities**
There are seven in number at present, with the number continuously increasing due to the expansion of the school sector. The universities, however, still follow the British model with work intensive three and four year undergraduate degrees. However, the majority of the undergraduates and who in recent times have been women, offer Arts degrees. Increase in postgraduate studentship is a recent occurrence.
Entry to the Universities for undergraduates is gained by success at GCE A/L Examination. As the number of pupils who are successful at this examination is far in excess of the available University places, tremendous competition prevails to enter the Universities. The proliferation of tutories is attributed to this condition, such that even primary school children resort to tuition on a mass scale. Thus all along the ladder of school education there is competitiveness, a condition forced upon by more than a narrow sized educational apex i.e. the Universities.

**The Tertiary sector**
In leaving out Universities from this category, this label appears a misnomer. This sector caters for non-University Higher Education and Technical and Vocational Education. Entry to this sector is by success at GCE O/L or GCE A/L.
The disciplines brought together in General Education

All pupils study the following subjects:

1. First Language (usually Sinhalese or Tamil)
2. Religion (Buddhism, Christianity, Hinduism or Muslim)
3. Mathematics
4. English
5. Science
6. Social Studies
7. Aesthetic Studies (Traditional and Western: singing and Dancing etc.)
8. Life Skills (Home Economics etc.)
9. Health and Physical Education

The first six subjects provide the academic core. As this education takes place without a change from Grade 5 to Grade 11 for all pupils, a wide curriculum is offered to pupils and thus ‘early specialisation’, is absent. If there is in fact variations, they are minor ones: many different subjects constitute Aesthetic Studies and Life Skills. Students can differ in what they offer for each of these two disciplines. But in practice, a variety of subjects for each category are not simply available in all the schools. In general then, all pupils study the same subjects at the junior secondary level, with minor differences.

School Years 12 and 13 (Grades 11 and 12)

Consists of three streams of specialisation. These are:

- Arts
- Science
- Commerce

Entering an AL stream of specialisation

This aspect is important to the present research as much as it forms the bridge between the OL and AL, which together have a bearing in the present investigation.

To enter the AL class a pupil must have passed the OL examination with credit passes in the two subjects Mathematics and mother tongue (Sinhalese or Tamil). This is the general rule of entry to the AL. Besides this requirement, there are special
requirements for the different streams of entry. To enter the science stream, a pupil must also possess a credit pass in Science at the GCE OL Examination. Likewise, to enter the Arts stream one must have a credit pass in an arts subject e.g. Social Studies. A credit pass in Commerce is a must for those aspiring to enter the third stream, Commerce (a stream introduced to the education system relatively recently). Whilst the entry requirements are as indicated above, they do not appear difficult to surmount. This is borne out by the fact that over sixty percent of the pupils succeed to gain entrance to the AL from those that studied at the OL. In the Urban sector, this percentage is much higher. It is nearly ninety-nine percent (Perera, 1990). A large number of pupils both in the rural and urban areas actually obtain very high grades (distinctions) in the subjects at the Examination (OL), and hence their results are far in excess to the minimum required for AL entry.

After the minimum entry qualifications are fulfilled, gaining entry to one or other stream of specialisation appears to depend on the following factors.

- Strength of the overall results (relates to the Grades obtained in the subjects)
- Preference of students
- Institutional constraints such as availability of Science teachers in the rural areas. In such instances the pupil enters an alternate subject stream in the same school or enters a new school, which is not subjected to this particular constraint.