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**Influences of Student Interest and Perceptions of Teaching on the
Quality of Learning in First Year Accounting**

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Abstract:

This study evolves from the broader educational research that indicates that the characteristics of the student and the perceptions of the teaching/learning environment influence the quality of student learning. The theoretical model of learning developed in the paper is based on Biggs' (1987) model of student learning and the congruence model of vocational interests and work environments proposed by Holland (1985, 1992). The theoretical model was tested using a sample of 826 first year accounting students utilising structural equation modelling as a tool of analysis.

The findings provide substantive information about the learning approaches of students with vocational interests congruent with the task demands of a first year accounting course. Additionally there is strong support for the association between student perceptions of teaching quality and learning approaches.

Overall the findings of the research project provide practical implications for course selection processes, evaluating and improving the teaching quality of accounting in higher education.

Key words:

Model testing using SEM; Teaching Quality; First year accounting; Student Learning.

1. Introduction

It is widely recognised in the educational literature that there are differences in the way students go about learning. Candy (1991, p.281) observed that “ to some extent the approach adopted by a learner is a function of his or her preferred learning style; to some extent it is influenced by the subject matter and the situation; and finally it is related to the learner’s repertoire of learning skills.” Each of these learning concepts has developed from a range of research and theory development. For example, studies of learning approach (Biggs 1987a; Entwistle & Ramsden, 1983; Marton & Säljö, 1984); learning style (Lawrence, 1984; Myers & Myers, 1980, McAulley & Natter, 1974) and learning skills (Candy, 1986; Frederick, Hancock, James Bowden & Macmillan 1981) represent a relatively new area of educational research.

In the educational literature students’ approach to learning has been viewed as one of the most influential concepts in the research into teaching and learning in higher education in recent times. Marton and Säljö (1976, 1984) identified two distinct types of learning. Firstly, learning that involves a deep approach where the learner internalises the content, relates the parts to each other and derives a wider picture for understanding how knowledge fits together and represents reality. In contrast, surface learning exists where the student orientates their learning approach towards memorisation and reproduction of factual material.

Research related to learning approaches has developed independently by a number of researchers in different countries since the 1970’s. In particular the work of Marton (1975) and others (Fransson, 1977; Säljö 1975; Svensson, 1976) from a research group based in Göteborg, Sweden have contributed to the research on learning approaches. These studies have identified that students select an approach to studying in response to both a particular task and the context of the learning situation. The work of Biggs (1978, 1987a) in Australia, Pask (1976) in the United States and Entwistle and Ramsden (1983) United Kingdom have contributed to the further refinement of the development of the theory on learning approaches.

These studies have used what has been termed by Entwistle (1998) as contrasting perspectives on the development of the concept of learning approach. The early qualitative research conducted by Marton (1975) investigated the way students tackled the task of reading an academic article using observation and interview techniques in an attempt to describe the learning situation as experienced by the individual student. In a deep approach, students demonstrated the intention to extract personal meaning from the text and this led to an active process of learning in which the student challenged the ideas, evidence and arguments presented in the task. In this situation the student reconstructed the knowledge within a personal framework. In contrast, a surface approach to reading an academic article was identified by the student’s focus on recalling the text or the facts and ideas presented. The adoption of a surface approach meant that the reader

did not engage in the act of learning and the reading was not seen to have any personal significance. As a result, rote memorisation was not uncommon in this approach and students failed to distinguish between essential points and incidental data. Further use of qualitative analysis have been employed by Säljö (1975), Marton and Säljö (1979), Entwistle and Ramsden (1983), Prosser (1993), demonstrating the differences in learning approaches adopted by students.

In contrast, inventories of study processes have developed as a quantitative approach to determining learning approaches (Biggs, 1987b; Entwistle & Ramsden, 1983; Schmeck, 1983). Inventories focus on comments of students about their experiences, but expressed as the extent to which the student agrees or disagrees with a set of statements about motives and strategies in learning. Inventories of learning approaches have assumed stability and consistency of behaviour, as they represent an individual's reaction to a set of statements (Entwistle 1998).

Despite the differences in the measurement techniques, overall the research has demonstrated that a student's learning approach is related not only to personal characteristics brought to the learning situation but also responses to specific learning environment. The situational influences include aspects of the teaching context, such as the forms of assessment, the attitude and enthusiasm of the lecturer, as well as the student's perception of the relevance of the learning task. Consequently Entwistle and Ramsden (1983) have described learning in higher education as a three-way transaction between the student, teaching context and the material being studied.

The following section gives an overview of the role of these three components in the development of learning approaches.

2. Background to the Development of a Model of Student Learning

2.1 Student Characteristics

Although it is acknowledged that students' approaches to learning depend on various background characteristics, such as intelligence, home background and personality (Biggs 1987b) learning by the individual has also been described as the result of the student's interaction with an object or task (Ramsden, 1992). Additionally, Marton (1976) stressed that the approach to learning should not be seen as uniquely a characteristic of the student, but as a response to a situation. Student interest in an academic task has generally been found to be associated with a deep approach to the task.

Several studies have shown an association between level of interest and deep approaches to learning (Biggs, 1979; Entwistle & Ramsden, 1983; Fransson, 1977; Hughes-Jones 1979; Nolen, 1988; Schiefele 1992, 1996). The early work of Fransson (1977) showed that a crucial aspect in the adoption of a deep approach to learning was more likely when interest and perceived relevance serve to increase intrinsic motivation. Similarly, Entwistle and Ramsden (1983) found that a

student's interest in the subject matter of the task was a crucial component of a deep approach. Their research indicated that students who had a high level of interest in a subject area tended to use superior learning strategies. That is, students with high content specific interests were able to recognise and solve problems at a more complex level and overall developed a long lasting knowledge of a subject.

Further evidence of the relationship between interest and learning strategies is provided by Nolen (1988) who studied the relationship among individual differences in motivation and study strategies of eighth grade students' reading. Individual differences were identified by motivational or goal orientations. The results of the study indicated that task orientation where the goal was learning for understanding, was positively correlated with both perceived value and use of strategies requiring deep processing of information.

Forms of intrinsic motivation have been linked with the broader concept of interest in interest research. Renninger, Hidi & Krapp, (1992) suggested that interest can be conceptualized in many ways but a common characteristic is that interest is a phenomenon that emerges from an individual's interaction with their environment. There have been various interpretations of the emphasis to be given to the two components in interest in terms of the person-environment interaction. Some researchers have concentrated on the characteristics of the learning environment that captures the interest of the individual, some times referred to as situational interest being related to the 'interestingness' of the task. Another body of research has emphasised the individual or person component in the person-environment interaction. Individual interest has found wide application in the area of vocational counselling and in the theory and measurements of vocational interest (Holland 1973, 1985). It is from the literature on vocational interests that further refinement and classification of types of individual interest has evolved.

Elsworth, Harvey-Beavis, Ainley and Fabris (1999) conceptualised interest within a three tiered structure based on the research on vocational and educational choice, school achievement and classroom learning. For example, task-specific interest is described as the most fine-grained level of interest in that it is a response to an environmental situation. This type of interest is related to a specific situation. When applied to an educational setting the interest would relate a task where there is a cognitive response from the individual, such as doing an experiment in science. At another level, domain specific level of interest has been identified. This is not only seen as part of the individual's interests, but is more general because at this level, interest is seen as an interaction of the person with a specific class of objects or events. In an educational setting, this level of interest can be related to preference for or choice of a particular educational study, such as a subject or group of subjects. Extending the previous example, interest in studying physics or chemistry would be viewed as a more general extension of the interest in doing a science experiment.

A third level of individual interest is termed generic interest, which can be viewed as incorporating a broad range of individual dispositions resulting from a combination of many

domain specific interests. Therefore an individual interested in studying physics and chemistry, at the generic level of interests, is likely to have more broadly based interests labelled as Investigative interests i.e. preference for activities that entail the observational, symbolic, systematic, and creative investigation of physical, biological, and cultural phenomena. (Holland, 1985, p.19.)

Generic interests have been viewed as representing a general disposition analogous to a personality trait. The main concern at the generic level has been with vocational interests in which there is an established history of psychometric and applied research (Walsh & Osipow, 1986). In particular, much of the research in the area of generic interests has been associated with vocational interests (Holland, 1973, 1985; Kuder, 1948; Strong, 1943).

In the development of his Vocational Preference Inventory (VPI) Holland viewed vocational preferences as consisting of a six-category typology of persons and their work environments. He categorised interests into six groups: Realistic, Investigative, Artistic, Social, Enterprising and Conventional. Although these may be described as personality types, the extent to which a person resembles each of the types constitutes an interest theme. An individual is not exclusively assigned one of the six types but is described as having a pattern of vocational interest consisting of a predominance of two or three of the six types.

Holland's (1973,1985) typology of person-environment interaction relates to the notion that particular work environments attract persons with similar vocational interests. The matching of persons and environments leads to job satisfaction and supposedly higher standards of work performance. Where there is a match between an individual's vocational interest and particular occupation environment a congruent environment prevails that results in job satisfaction.

The similarities between vocational and educational interests have led to an extension of Holland's work in educational research. In particular educational choice, school subject choice (Ainley, Jones & Navarantnam, 1990) classroom learning and education choices for tertiary courses (Elsworth, Harvey-Beavis, Gilding and Briant, 1986; Kidd and Naylor, 1991; Kidd, 1991). The indication is that generic interests explain significant differences in subject choice, independent of the confounding effect of other background variables such as sex, socioeconomic status and ability. This research on subject preferences and educational choices using Holland's model of vocational interests has provided strong support for Naylor's (1993) view of the "generality of interest themes", at least to educational settings.

Studies in the area educational research using Holland's typology of interests, however, have not gone beyond preferences for tertiary course selection. Although Schiefele (1992, 1996) and Nolen (1988) provide evidence of the relationship between topic interest (interest at the task-specific level in the hierarchy outlined above) and quality of learning experiences, there have not been studies that have expressly tested Holland's congruence model in an educational setting. From the findings of Entwistle & Ramsden (1983); Nolen (1988) and Schiefele (1989) however, there is evidence that interest-oriented learning results in deep learning. In these studies there is an

implied congruence between domain specific or task-specific interest of the person, expressed through the domain specific subject setting i.e. the educational environment, that evokes intrinsic motivation leading to higher quality learning.

It is proposed that once generic interest is matched with an educational environment, this provides the setting for deep learning to occur. Applying this to an accounting educational environment, it is proposed that the congruence between, interest in a subject such as accounting or an accounting task, together with the selection of a commerce degree will activate the intrinsic motivation that results in deep learning.

Interests as an expression of intrinsic motivation associated with the individual learner may have an important role to play in determining learning approaches. It is also recognised however, in the educational literature that the way students interact with the teaching /learning environment also influences learning approaches. The teaching context as the second link in the three – way interaction in higher education learning, as described by Entwistle and Ramsden (1983) is outlined in the following section.

2.2 Teaching Quality

There is a growing body of literature which describes the various ways in which teaching and the learning environment affect the quality of student learning (Biggs, 1989, 1993; Entwistle, 1992; Gibbs, 1992; Hounsell, 1997; Laurillard, 1993; Ramsden, 1992; Trigwell, Prosser & Taylor, 1994). The main focus in many of these studies has been on examining ways of improving teaching so that a deep approach to learning results in greater conceptual understanding. Additionally much of the literature has been based on students' perceptions of the teaching and learning environment, in an attempt to understand the experience of higher education from a student's perspective.

The task of setting a teaching environment that will enhance a deep approach to learning has been influenced by the curriculum, the teaching methods employed and the assessment procedures (Ramsden 1992). Good teaching which has components of explanation together with certain human qualities which Ramsden (1992) labels as “respect for students’ and “student-centredness” represent qualities in teaching that are claimed to encourage a deep approach to learning. Hodgson (1985) showed how good lecturing, as perceived by students, assists in bridging the gap between an extrinsic (or surface) experience of a lecture” relevance and an intrinsic (or deep) experience. Bliss and Ogborn (1977) provide further evidence of qualities related to the teacher-student relationship, which encourage students to relate to the subject with greater commitment.

More recent studies have focused on the academic teachers' conceptions of teaching and learning (Dart & Boulton-Lewis, 1998; Kember & Gow, 1994; Prosser, Trigwell & Taylor, 1994; Samuelowicz & Bain, 1992). Results of these studies have shown that the quality of learning

approaches and learning outcomes may be improved through the provision of learning environments characterised by learning activities and teaching strategies that promote student independence in learning.

Assessment is believed to have one of the most profound effects upon the learning approaches adopted by students. Assessment processes provide crucial messages to students about what is expected from them in the learning situation. Students subsequently select learning approaches that will enable them to maximise success (Ramsden 1985). Becker, Geer and Hughes (1968) described the powerful influence of assessment methods where students learned strategies that enabled them to earn high grades at the cost of understanding the material. The most revealing aspect being students' awareness of using inappropriate learning approaches in order to achieve the goal of high grades. For instance, studies have shown that some assessment methods emphasise passing examinations rather than understanding of course content. Watkins & Hattie (1985) found that surface demands, particularly in assessment affect students' approach to study.

The study which has provided the most compelling evidence of the different approaches student take to learning is influenced by their experiences of teaching assessment was conducted by Entwistle and Ramsden at Lancaster University from 1978 to 1981. The research involved both intensive interviews and a large-scale questionnaire survey. The interviews in particular, demonstrated the strong influence assessment requirements had on the approach to learning adopted by students when tackling academic tasks. Students often explained surface approaches or negative attitudes in terms of their experiences when inappropriate forms of assessment were used. The following extract from the interviews illustrates the influence of the assessment on the student's attitude towards studying:

I hate to say it, but what you've got to do is have a list of the "facts"; you write down ten important points and memorise those, then you'll do all right in the test... if you can give a bit of factual information – so and so did that, and concluded that – for two sides of writing, then you'll get a good mark. (Ramsden, 1997, p. 198)

Although not all students will respond to the assessment pressures in the same way, Entwistle (1998) suggested that students adopting a strategic (achieving) approach to study are particularly aware of the forms of assessment. Consequently students with high achieving strategies are likely to vary their approach to study to meet the perceived requirements of the assessment tasks. Miller and Parlett (1974) and Ramsden (1979) have provided further evidence of the adverse effects on learning approaches of inappropriate assessment methods.

Closely linked to assessment methods are student perceptions of workload. There is evidence that excessive workloads measured by the volume of material taught and assessed in a course can impact on the learning approach. Numerous studies have identified the problems related to

excessive curriculum material and the pace of a course. Overloading syllabuses with content leads to poor learning, resulting in surface orientation to learning (Dahlgren 1978, 1984; Entwistle & Ramsden, 1983; Ramsden & Entwistle, 1981). Interviews conducted with students from various discipline areas has shown that students tend to adopt surface approaches to learning when they perceive that the workload is excessive (Ramsden, 1992).

The literature demonstrates that students' perceptions of the quality of teaching is influenced by the quality of instruction, the perception of the assessment tasks and perceptions of the appropriateness of the workload required by the course of study.

3. Application of the Research to Accounting Education

The evidence advanced in the preceding section provides a base for the study of learning approaches in the accounting discipline. There have been few studies in the accounting literature that have adopted an integrated approach to investigating learning approaches. Although Gow, Kember & Cooper (1994) investigated learning approaches of students studying Accountancy at the Hong Kong Polytechnic, they did not investigate rigorously the role of teaching context and student characteristics in shaping learning approaches. Conclusions about the importance of contextual variables were derived from semi structured interviews with a small number of volunteer students.

Studies in accounting education have concentrated on course content and the impact teaching methods and assessment have on student performance as measured by exam scores (Rebele, Stout & Hassell, 1991; Smith and Usry, 1989). There have been few studies that have directly investigated the impact the teaching may have on student learning.

Research in the area of interests, and more particularly vocational interests as personality traits, has introduced the concept of person-object congruence. Congruent interests matched with the study of accounting are expected to be associated with deep approaches to learning. In the context of this study the generic interests related to Conventional interests would be expected to be associated with a deep approach to learning. Holland describes the conventional personality type person as one who engages in activities that entail the explicit, ordered, systematic manipulation of data, such as keeping records, filing materials, organizing written and numerical data according to a prescribed plan. It is proposed that Conventional interests and the study of accounting provide a form of person-environment fit, which conforms with the model of congruence resulting in deep learning.

The primary objective of this paper is to investigate the learning approaches adopted by accounting students in the first year of an undergraduate business degree course. It is anticipated that the student's vocational interests will influence learning approaches, in particular the congruence between interests and the domain specific choice of a tertiary business course will be investigated. Additionally it is expected that the teaching context as measured by student

perceptions of workload, assessment and quality of teaching will have a direct effect on learning approach.

Research Questions

The literature review has provided an overview of the development of the theory of learning approaches with an emphasis on the importance of motivational interest of students and their perceptions of components of the teaching/learning environment. The application of this theoretical base results in the formulation of the following research questions.

Research Question 1:

Do students with vocational interests congruent with accounting studies, adopt a deep approach to learning accounting?

Research Question 2

Do vocational interests congruent with the study of accounting, influence student perceptions of teaching in accounting?

Research Question 3

Is there a relationship between perceptions of the teaching/learning environment and the learning approaches adopted by accounting students?

4. Using Structural Equation Modelling to Test a Model of Student Learning.

4.1 The Theoretical Model

In this study, Structural Equation Modelling (SEM) is used as it provides a means of comprehensive and rigorous testing of the hypothesised model of student learning. The SEM design used in this study is a factor analytic measurement model that is superimposed on a simultaneous equation model describing the relations between latent variables, known as a FASEM model, (Bentler, 1989). The measurement part of the model describes how the measured variables are generated by the latent variables. These can be viewed as measurement equations that relate V-variables to F-factors, with E-error residuals. The more interpretative part of a FASEM model is the simultaneous equation model representing the causal effects of the constructs (latent variables) on each other. Relationships were examined for three learning approaches – deep, surface and achieving, each representing latent variables in the model. Each approach to learning had two indicator measurement variables motive and strategy.

Using EQS, the model of student learning was developed to test the associations between sets of variables and the learning approaches. The sets of variables in the model were constituted by:

- a) The six RIASEC interest variables being Realistic, Investigative, Artistic, Social, Enterprising and Conventional interests.
- b) A measure of overall Teaching Quality, a latent variable with five indicators (Good Teaching, Clear Goals, Workload, Assessment and Independence).

Figure 1 shows diagrammatically the model. Following the usual conventions, the rectangles in the model represent single measured variables while the ellipses identify latent variables defined by more than one indicator. Arrows that lead from an ellipse to a rectangular box identifies an observed variable that measures the respective latent variable. For example in Figure 1 Deep strategy and Deep motive are observed variables that define the latent dependent variable Deep Approach to learning. Each of the observed variables has a corresponding measurement error term represented by an arrow leading to the rectangular box.

In this model when an arrow leads from one latent variable (e.g. Teaching Quality) to predict another (e.g. Deep Approach), Teaching Quality is a dependent latent variable and Deep Approach to learning is also a dependent latent variable, with an error-of-prediction or disturbance term. This represents the structural component of the model that establishes the relationship between dependent latent variables. The arrows between the dependent latent variables represent paths and the arrows from factors to observed variables represent loadings.

In summary, Figure 1 shows the complete structural equation model that incorporates both the measurement model and the structural model. The model shows five observed dependent variables that define the latent variable Teaching Quality and six observed variables that define the learning approach variables (Deep, Surface and Achieving). In addition there are six observed independent RIASEC variables.

It is proposed that Interests have a direct effect and an indirect effect on learning approach. The direct effect of interests on learning relates to the congruence model shown in Figure 1, where it was hypothesised that a match between Interests and learning tasks of accounting results in deep learning. The indirect effect arises from the influence interests may have on perceptions of Teaching Quality and subsequently learning approach. For example, where there is congruence between the interests of the learner and the learning task, it is hypothesised that there is also likely to be a perception that the teaching is good, which subsequently assists in the development of a deep approach to learning. Each of the six RIASEC variables represent independent variables to be tested for association with each of the latent variables i.e. the three learning approaches and Teaching Quality. For purposes of clarity the paths represented by arrows from only one interest category (Realistic Interests) to the latent variables are shown in Figure 1.

The measures of teaching perceptions outlined in Figure 1 are specified in the model as having a direct effect on learning approaches. For example, it is hypothesised that perceptions of the teaching as appropriate, is likely to encourage students to adopt a deep approach to learning when they perceive the teaching as appropriate. In contrast where students perceive that the workload is heavy and/or the assessment tasks too demanding, that is, perceive the teaching as inappropriate, they are likely to adopt a surface approach to their learning.

4.2 Sources of Data: Survey Instruments

The survey consisted of three measurement instruments. Student vocational interests were measured using the Interests Inventory developed by Ainley, Robinson, Harvey-Beavis, Elsworth and Fleming (1994). This instrument consisted of descriptions of 24 activities which students could have already undertaken (such as going to the theatre) or which they might reasonably have thought about doing (such as working with machines and tools, keeping accounts for a small business). The 24 items in the instrument had four items hypothesised for each of Holland's interest types of Realistic, Investigative, Artistic, Social, Enterprising and Conventional interests. Students were asked to describe the extent to which they liked or did not like each of the 24 activities in the item bank. A four-point scale of liking was used, ranging from 'like very much' through 'like somewhat' and 'dislike somewhat' to 'dislike very much'.

Elsworth et al. (1999) conducted the reliability testing of the RIASEC scales, using students who were studying at the Year 12 level in secondary school in 1993. The Cronbach standardised item alpha scores for each of the six RIASEC scales was as follows: Realistic Interests 0.82; Investigative Interests 0.67; Artistic Interests 0.68; Social Interests 0.65; Enterprising Interests 0.60; Conventional Interests 0.74.

The second instrument used in the survey was a measure of student learning approach, using Biggs Study Process Questionnaire (SPQ). The SPQ is a 42-item questionnaire that provides scores on three motives for learning and three learning strategies scales. Scores on each of the deep, surface and achieving motive and strategy scales are determined using a scale 1 to 5 for each of seven items. Each item is a self-report statement of a motive or a strategy. The student rates himself or herself on the statement using a 5-point scale from 5 ('This item is *always* or *almost always* true of me') to 1 ('This item is *never* or *only rarely* true of me'). To determine students' motive and strategy in learning the 42 SPQ responses are summed in six sets of the seven questions used to derive motive and strategy sub-scale scores (range 7 to 35). Scores on motive and strategy are summed to give an overall approach to learning, (range 14-70).

The reliability of the SPQ has been tested by Biggs (1987b) using alpha coefficients as measures of internal consistency. The Cronbach's alpha scores for each of the 6 measures was: Surface motive 0.55; Surface strategy 0.56; Deep motive 0.64; Deep strategy 0.65; Achieving motive 0.72; and Achieving strategy 0.73 (Biggs 1987b, page 22). The Surface motive shows the

least satisfactory result, (0.55) although Biggs reports that the internal consistency overall is satisfactory.

The third instrument brings together components of perceptions of teaching and learning in the Course Experience Questionnaire, (CEQ) which evolved from the CPQ designed to measure students' experiences in British higher education institutions developed by Ramsden and Entwistle (1981). The CEQ was designed to measure differences between academic organisational units and allowed ordinal ranking of units in different institutions, within comparable subject areas, in terms of perceived teaching quality. The CEQ consists of 30 items which measure students' perception of the quality of their learning in higher education along five dimensions: Good teaching, Clear Goals, Appropriate Workload, Appropriate Assessment and Emphasis on Independence. Each item in the scale consists of a statement about the teaching or learning related to the student's unit of study with ratings from 1 (definitely disagree) to 5 (definitely agree).

Work by the author of the scales (Ramsden, 1991) provided strong support for their sensitivity, reliability and validity in evaluating various disciplines in higher education. The scales and their defining items (based on the national trial sample (Linke, 1990) are shown in Table 1.

INSERT TABLE 1 HERE

The reliability and validity tests conducted in the national trial of the CEQ were replicated in the Review of the Accounting Discipline in Higher Education (Mathews et al., 1990). In this study the only modification to the instrument has been to make the statements subject specific. Instead of the instrument being used as an assessment of teaching and learning for the student's total course in any one year, the survey refers to studies of accounting relevant to the year of the survey,

4.4 Administration of the Survey

The survey consisting of the three instruments outlined above was conducted using students studying first year accounting at Deakin University in 1995. The survey was administered to students studying 'on campus' during week eight tutorials of a twelve week semester unit. To minimise non-response bias, one follow up session was conducted in lectures in the ninth week of the semester. Surveys were distributed to 'off campus' students by mail in the eighth week of the semester. Respondents were asked to place their completed survey in the stamped envelopes provided and return them to the researcher. A reminder letter was sent to these students three to four weeks after the initial mailing.

A small pilot study was conducted using the survey instrument, prior to distribution. Some formatting and display changes were made to the survey as a result of this pilot study.

4.4 Response Rate

In Table 2 the number of students responses is shown together with the response rate for on and off campus students. The response rate used is based on the number of students who completed the unit, (i.e. attended the final examination in the unit) rather than the number of students enrolled at the time of the survey. In some instances students had discontinued their studies by week eight, but were still on the official enrolment lists provided by university administrative services at this time.

INSERT TABLE 2 HERE

5. Data Reduction Techniques

Traditionally numerous indicators of a latent variable has been treated as equally accurate indicators of a latent variable and the errors of measurement are assumed to have the same variance. A one-factor congeneric measurement model enables each variable to contribute in varying degrees to an overall latent variable as well as allowing the error variances and the regression coefficients to differ. A one-factor congeneric model used in this study represents the regression of a set of observed indicator variables on a single latent variable.

Holmes-Smith and Rowe (1994) indicate that there are three main reasons for fitting congeneric (not the same) measurement models to large data sets. Firstly a fitted congeneric model allows large numbers of like observed variables to be reduced to a single composite scale, therefore reducing the number of variables in the subsequent structural equation model. Secondly a one-factor congeneric measurement model allows for differences in the degree to which each individual measure contributes to the overall composite scale, thus providing a more realistic representation of the data. Thirdly the fit statistic for the congeneric model is a quasi test of validity.

This type of preliminary analysis was conducted as a form of data reduction and to maximise the reliability as well as account for measurement error in the development of the structural equation model. Each of the measured variables in the model shown in Figure 1, were subject to preliminary analyses using a two-stage estimation procedure incorporating PRELIS 2 and LISREL VIII (Jöreskog & Sörbom, 1993). The data from the survey were first analysed in PRELIS to generate a correlation matrix of polychoric correlations and a weight matrix of asymptotic covariances of the estimated correlations for use in the asymptotically distribution-free Weighted Least Squares fit function. These two matrices were then used in a LISREL run to estimate and test the one-factor congeneric model. The following sections outline the results of the

preliminary analysis of the measures of learning approach, Interests, and teaching/learning perceptions, using these statistical techniques.

5.1 Measures of Learning Approach

Learning motives and strategies that were measured using a five-point scale were regarded as ordinal variables. Given the categorical nature of the responses, the raw data were first analysed in PRELIS and then the two matrices generated from PRELIS were used in LISREL to estimate and test the one-factor congeneric model. Factor score weights, for Deep motive in measuring learning approaches, are shown in Table 3.

Jöreskog and Sörbom (1989) have shown that having fitted a one-factor congeneric model it is possible then to compute an estimated composite score for each subject. These weight factors are also used in determining the composite scale reliability.

The results of this preliminary analysis for each of the six measured variables related to learning approaches, is also shown in Tables 3. The goodness-of-fit statistics are shown in Table 4. Additionally the unweighted and weighted reliability scores are shown for each composite variable in Table 4. The results of the analysis shown in Table 3 for the congeneric models for motive and strategy measuring learning approach scales show that item factor score weights vary from 0.05 (Achieving motive, item 4) to 0.28 (Deep strategy, item 1 and Surface strategy item 6). The models for the composite scales fit the data well, with the Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI) and Root Mean Square Residual (RMR) within acceptable limits, with two exceptions:- Surface motive and Surface strategy. The acceptable level for goodness-of-fit for a model using the RMR is <0.05 , however the RMR for surface motive is 0.08 and surface strategy 0.11. Additionally the AGFI index is below the acceptable level of 0.95 for both these composite scales.

The composite scale reliabilities estimated from the 'total coefficient of determination' (Jöreskog & Sörbom, 1989) shows the proportional weighting of items in each scale. The unweighted measure of reliability, Cronbach's alpha, shows the extent to which the unweighted items in the scale 'agree' with each other and also the extent to which they are measuring the same thing. Biggs (1987a) reported that the surface motive has recorded the lowest unweighted reliability score (0.60). This is also reflected in this study where the weighted scores for Surface motive are shown to be the least reliable of the six composite scales. Biggs (1987a) has attributed the lack of internal consistency in the unweighted scores to the fact that the motive comprises both positive aspects of extrinsic motivation (just doing enough work to pass) and negative aspects of extrinsic motivation (fear of failure). In other studies the surface motive has also been shown to have the lowest Cronbach alpha coefficient (Balla, Stokes & Stafford, 1991; Biggs, 1993b; Kember & Gow, 1990).

5.2 Interest Scales

The results of the one factor congeneric model estimates for the Interest scales are shown in Table 5. The recalibrated factor score weights for items show the diversity in weighting attached to items within each scale. For example the Realistic scale is heavily weighted on the fourth item (Question 18, working with machines and tools) while the investigative scale is weighted (0.50) towards the fourth item (question 21, solving problems and puzzles). These weights are similar to the one-factor congeneric models developed by Elsworth et al, (1999). The model fit indices for each of the interest scales indicate that each of the models fit the data well (see Table 6). All indices are within the acceptable range for each of the interest scales. Additionally all items have very good item reliabilities. The unweighted measures of reliability are at least comparable, and some times superior, to the reliability scales reported by Elsworth et al. (1999).

5.3 Perceptions of Teaching/Learning Environment – the CEQ

Prior to the entry of the CEQ data in PRELIS however, some items in each of the scales needed to be re scaled as the CEQ consisted of a mixture of positively and negatively scored items. Once all CEQ items were scored on a positive scaling, they were subject to preliminary analysis using the two-stage estimation procedure incorporating PRELIS 2 and LISREL VIII, as previously outlined for learning approaches and interests.

The development of the five CEQ scales is shown in Table 7. In this instance each of the five scales was derived from item scales varying from 5 items (Workload and Clear Goals,) to 8 items, (Good Teaching). The goodness-of-fit indices were all within acceptable ranges for the measures reported, indicating that each of the models fitted the data relevant to the scale very well (see Table 8).

The reliability scales overall, are consistent with those reported in a study by Ramsden, the author of the scales, shown in Table 1. The results reported in Table 8 however, do show lower levels of unweighted reliability scores for two scales: appropriate Assessment (0.63) and emphasis on Independence (0.56).

5.4 Development of Composite Scores

The re calibrated weighted factor scores for learning motive and strategy, interests and CEQ having fitted and been accepted, an estimated composite score for each subject in each year of the study, was computed by applying the formula below. Each associated item related to the composite score as follows:

$$\zeta = (FS_1 \times X_1) + (FS_2 \times X_2) + \dots (FS_n \times X_n)$$

Where ζ is the estimated composite score for the single latent variable

FS is the factor score regression, and

X is the subject's observed indicator variable

Once the composite variables had been computed using the weighted factor loadings it was then possible to build the structural equation models to examine the relationships among the latent variables underlying these composite scales. The factor score weights were applied to each of the 17 variables to be analysed in the model representing the first year of studies in accounting. The weight factors were also used to determine the composite scale reliability scores. As shown in each of the composite scales, the reliability of each measure using factor score regression weighting was superior to the unweighted reliability scales.

Holmes-Smith and Rowe (1994) indicate that a major limitation of structural equation modelling is that in research applications where there are a large number of latent variables, and hence, an even larger number of observed indicators, the number of parameters to be estimated is also large. Consequently there is a risk that the structural equation models developed may lack robustness due to the confounding of measurement and structural parameter estimation problems, which may also be aggravated by small sample sizes and data lacking multi normal distribution. In this study 96 observed variables were reduced to 17 composite variables using one-factor congeneric measurement models. This data reduction technique therefore enabled the development of a more robust model for analysis using SEM.

5.5 Treatment of Missing Values

Prior to the commencement of the SEM analysis the data were screened for missing values. Cases were omitted from the study if there were missing values for every item in any one scale. For example, a case was omitted if there were missing values for all of the SPQ measure, despite all values present for the Interests and CEQ. Missing values on a whole scale inventory was in some instances attributed to respondents turning over two pages at once when completing the survey. All other missing values for items within scales were adjusted by replacing the missing value with the variable (series) mean. Bentler (1995 p. 63) describes this approach as a useful and reasonable way to impute data.

The following section provides the discussion of the results of the SEM analysis following the preliminary data analysis.

6. Results

Because a theoretically driven model was proposed about the learning approaches adopted by accounting students, the first interest is in the assessment of the fit of the hypothesised model to the data. After the fit of the model was determined to be at least adequate, then the importance of the parameter estimates was assessed.

6.1 Assessment of Model Goodness -of-fit

Several statistical indices are provided within EQS to describe the fit of the model to the data. The goodness-of-fit indices were based on maximum likelihood (ML) estimation technique. The goodness of fit indices incorporating the CFI (robust) estimation technique are presented in Table 9 .The SEM model was estimated from an ‘all present’ sample of 826 respondents to the first year survey instrument. The results shown in Table 9 indicate that overall the model appeared to have an acceptable fit to the data. While the chi-square goodness-of-fit index was statistically significant, the CFI value of 0.92 and the GFI 0.94 suggest that the model fit was within an acceptable range. In addition the RMSEA of 0.07, is within the accepted range, outlined by Browne and Cudeck (1993).

INSERT TABLE 9 HERE

6.2 Parameter Estimates in the Model

The measurement model specifies how latent variables are measured in terms of the observed variables. Table 10 shows the standardized solution from the EQS analysis using the weighted scores for each of the measured variables, derived from the preliminary analysis The Table shows the measurement model. In this study the latent variable Teaching Quality (F1) is determined by the five measured variables, Good Teaching, (V7) Clear Goals, (V8) Workload, (V9) Assessment, (V10) and Independence (V11). The three latent variables for learning approach are each measured by two indicator (measured) variables, motive and strategy. Deep Approach to learning (F2), is measured by Deep strategy (V12) and Deep motive (V13). Surface Approach (F3) is measured by Surface strategy (V14) and Surface motive (V15) while Achieving Approach, (F4) is measured by Achieving strategy (V16) and Achieving motive (V17).

INSERT TABLE 10 HERE

Table 10 shows firstly the five indicators of Teaching Quality from the measurement section of the analysis. The results indicate that the best loadings for Teaching Quality came from Clear Goals (0.730) and Good Teaching (0.721). For the learning approach indicators, the loadings are generally high, with deep motive (V13) having the highest loading (0.828). The measurement equations showed that the loadings on all variables related to motive and strategy were significant

at the 0.05 level. Note where the variable was set to 1 there is no detail shown in the measurement equations with standard errors and test statistics i.e. goodtw, deepmow, achievsw, surfstw as it is a requirement within the program specification to set some variables to 1. Setting these variables is a requirements of the statistical process, because all the measurement variables are exogeneous variables.

Table 11 shows the results of the analysis for the structural part of the model. The first equation shows the direct relationships between the six RIASEC variables and the latent variable Teaching Quality. The results show that Investigative Interests ($V2=0.224$) and Conventional Interests ($V6=0.270$) were significant and positively related to Teaching Quality. The results indicate that first year students who have high Investigative and Conventional Interests have positive perceptions of the Teaching Quality, more so than students who score highly on other interest categories.

INSERT TABLE 11 HERE

In terms of a **deep approach** to learning, several variables were found to have statistically significant positive relationships with this latent variable. Table 11 shows that the highest standardized score relates the latent variable ‘Teaching Quality’ (F1 to a Deep approach to learning). This finding suggests that students, who view of the overall teaching/learning environment favourably, utilise a deep approach in their learning.

Of the RIASEC interest measures, Investigative, Conventional, Enterprising and Artistic interests all have positive and statistically significant relationships with a deep approach to learning. Investigative interests having the highest direct positive relationship with a deep approach to learning. Holland (1985) describes an Investigative interest type as inquiring and preferring environments which encourage them to see themselves as scholarly. Therefore it would be anticipated that Investigative interest type would be a predictor of a deep approach to learning. The significantly positive relationships for Conventional and Enterprising interest and a Deep learning approach however, offers some support to the notion of congruence between the learner’s domain specific interest as measured by conventional/enterprising interests and the context of the learning task, being the study of accounting.

The third equation for **surface learning** shows a number of negative relationships for predictor variables. Although Social and Conventional Interests show a statistically significant positive relationship with Surface learning. As anticipated, the latent variable Teaching Quality was negatively associated with Surface learning. This finding suggests that students who perceived the quality of the teaching to be poor, tended to use surface approaches in their learning. Alternatively this finding can be interpreted as showing that students who perceived the quality of the teaching as appropriate, did not use Surface approaches in their learning.

The Investigative interests were negatively and statistically significantly associated with Surface learning. The statistically significant result for Conventional interests lends some support to the view that there is a relationship between students with high Conventional interests including repetitive recording type tasks, and the use of Surface approaches in learning.

The fourth equation in Table 11 shows a strong positive and statistically significant relationship between Teaching Quality ($F1= 0.351$) and an **Achieving approach** to learning. Additionally Conventional interests ($V6= 0.303$) were also shown to be significantly related to an Achieving approach to learning. Investigative interests ($V2=0.132$) and Enterprising interests ($V5=0.165$) were also positively related to an achieving approach to learning in first year accounting.

Summary of results

The congruence model developed in this paper and supported more generally by the literature on intrinsic motivation, suggests that Conventional interests would form part of the congruence model leading to a Deep approach to learning accounting. More generally the literature supports the view that there is a link between intrinsic motivation and a Deep approach to learning (Entwistle & Ramsden, 1983; Nolen 1988; Schiefele, 1992).

The analysis of the SEM model incorporating paths from the six RIASEC interests to the latent variables Deep, Surface and Achieving learning approaches provides some support for the first research question on the relationships between Conventional interests and Deep learning approach. For instance the SEM analysis showed that Conventional interests were significantly and positively related to a Deep Approach to learning. The path coefficient of 0.22 indicates that independent of other predictors, such as other RIASEC variables and measures of Teaching Quality Conventional interests were positively associated with a Deep approach to learning. Although Conventional interests are positively and significantly related to each of the three learning approaches, the direct effect of 0.303 for Conventional interests as a predictor of an Achieving approach to learning is marginally higher than in the other two learning approaches. (Direct effect on a Deep approach 0.218 and direct effect on Surface approach, 0.261). Results suggest that students with high Conventional interests have an interest in the content, typical of a deep approach, but are also mindful of the assessment requirements that are typically associated with an Achieving approach to learning.

6.3 Variance Accounted for in the Model.

The R^2 statistic for each of the four structural equations of the Models gives an estimate of the account of variance in the dependent variable which is provided by the independent variables. The proportions of variance in the three learning approaches accounted for by the 'full' model

(Interests and Teaching Quality) varied from 15 per cent for Teaching Quality to 45 per cent, for Deep approach to learning.

The Deep and Achieving approaches are the two learning approaches most strongly associated with the explanatory variables in the model. Forty-five per cent of the variance in Deep approach was accounted for by the proposed model and 44 per cent of the variance in Achieving approach to learning is explained by the model. The Surface approach with only 15 per cent of the variance accounted for by the 'full model' suggests that there are influences other than vocational interests and perceptions of the teaching/learning environment that account for the adoption of this approach to learning. The latent construct Teaching Quality, had 16 per cent of the variance in the model explained by the RIASEC interests

6.4 The Direct and Indirect Effects of Interests on Learning Approaches

A final examination of relationships was to examine the decomposition of direct and indirect effects in the model. The direct effects for each interest are calculated net of all other interests and the latent variable Teaching Quality. A direct effect is measured by a structure coefficient. An indirect effect exists between two latent variables and is measured by the product of the structure coefficients involved. For instance, in this study Figure 1 shows that Realistic interests have both a direct and an indirect effect on the latent variable Deep approach to learning. In the model proposed it is hypothesised that Realistic Interests also has an indirect effect on deep approach to learning through the latent variable Teaching Quality. The standardized values for direct effects and indirect effects are shown in Table 12.

INSERT TABLE 12 HERE

Overall the results shown in Table 12 indicate that the indirect effect of each variable on the learning approaches was relatively small. For example, with Investigative interests of the total effect, 85 per cent could be attributed to the direct effect with only 15 per cent related to the indirect effect. The results show that Interests and Teaching Quality each have a substantial direct effect on learning approaches, but there is little mediating effect of interests by perceptions of Teaching Quality.

7. Refinements to the Model

The preceding sections showed that the hypothesised model varied in the degree to which it fitted the data. Further post hoc statistical tests may be undertaken to examine whether the hypothesised model can be refined within the acceptable constraints of the theory supporting the formulation of the model. Making refinements to hypothesised models without due consideration of the dangers of nonsensical re-specification presents numerous problems. This issue has received

due attention by several authors (Bollen, 1989; Byrne, 1994; Cliff 1983; Cudeck & Browne, 1983 and Schumacker & Lomax, 1996). The model re-specification in this study followed substantive knowledge and parameter guideline provided by Bentler (1989).

The hypothesised model was re estimated with two additional parameters, resulting from the analysis of the LM tests. The Workload/Surface approach parameter and the Good teaching/Workload error term were specified to be freed. The measures of the improvement in the model resulting from freeing these parameters are shown in Table 13. The Satorra-Bentler scaled statistic is also shown as it corrects the chi-square for problems of multivariate kurtosis in the data.

INSERT TABLE 13 HERE

Table 13 indicates that by specifying the two additional parameters there was a highly significant reduction in the chi-square values between the initially hypothesised restricted and the modified (nested) model, indicating that the model fit had been improved substantially. Further evidence of the improvement in the model is provided by the goodness-of-fit indices. The results show that in each instance the goodness-of-fit was improved by the modifications. The CFI and the Robust CFI indices for the restricted model and the modified (nested) models are shown in Table 13.

Interpretation of Results

The structural equation for the three learning approaches incorporating the path from workload to surface learning, is shown in Table 14.

INSERT TABLE 14 HERE

The equation for Surface Approach to learning, indicates that the measured variable, Workload had a direct effect of -0.277 on a Surface approach to learning. This result can be interpreted as meaning that perception of Workload as inappropriate influenced the adoption of a surface approach to learning. In contrast, the latent variable Teaching Perceptions was positive, but not significantly related to a surface approach to learning. This result contrasts with the restricted model (see Table 11) where the latent variable Teaching Quality, was negative and significant.

The other predictors of surface learning remained relatively unchanged. In terms of Deep and Achieving approaches to learning, the introduction of the additional estimated parameter meant that the strength of the relationship between the latent variable Teaching Quality, and each of the learning approaches decreased slightly although the relationships were still significant. Surface

approaches to learning were more readily identifiable with negative perceptions of teaching, in particular the perception that the Workload was heavy was seen to be the most significant relationship with Surface learning approach. This supports previous study, for example Ramsden and Entwistle (1981) found a significant correlation between perception of workload and surface approach to learning. Similarly Gow and Kember (1990) have shown associations between workload and surface learning. In this study the difference highlighted in the re specification of the SEM analysis was that workload was the critical aspect in the adoption of a surface approach to learning, rather than the five measures of the latent variable of Teaching Quality

Overall the results shown in Table 14 highlight that once the refinements were made to the hypothesised model, the Surface approach to learning was influenced more specifically by students' perceptions of the workload than the overall latent variable Teaching Quality.

Summary and Conclusions

The hypothesised model shows that the data fits the model adequately, particularly given the large number of parameters in the model. Further refinement to the model, enabled an improvement in the fit indices together with a change in emphasis of the relationships between components of Teaching Quality and Surface learning approaches adopted by students.

In addressing the first research question the findings indicate that there is a significant relationship between Conventional interests and a Deep approach to learning accounting. However Conventional interests are more closely related to an Achieving approach to learning than a Deep approach to learning. This suggests that at first year level at least, students with predominant Conventional interests adopt an Achieving approach to their learning. Students with high Conventional interests tend to have motives related to achieving high grades that will possibly enhance career prospects as measured by responses to the SPQ. In addition these students utilise study tactics that involve keeping well organized lecture notes rereading lecture notes for understanding and generally behaving as a model student. This finding supports previous research indicating that tertiary students with conventional interests demonstrate achieving traits, (Kristjanson reported in Holland 1985). The predominance of an Achieving approach to learning among first year students has been highlighted in earlier studies. For example, Gow & Kember (1990) found that achieving strategies were highest in the first year of university studies and declined thereafter. Tentatively it could be argued that a congruent environment for this group of students initially requires an Achieving approach to learning. Students with high Conventional interests may need to integrate a range of learning strategies that produce high marks. In addition, the structure of the teaching context, given a large lecture format for teaching, together with a standard text, may give less opportunity for independent study involving levels of understanding typical of a deep approach to learning. Therefore the first research question is only partly answered by this analysis. Although there is a significant and positive relationship between Conventional

interests and a Deep approach to learning, it would appear that the relationship is not as strong as the relationship between Conventional interests and an Achieving approach to learning.

The structural equation model shows that Conventional interests are positively and significantly related to perceptions of Teaching Quality. This result suggests that students who have interests associated with the study of accounting are able to readily identify the goals of the course, view the workload and assessment as appropriate and perceive that the teaching is good, as measured by the CEQ. Investigative Interests were also significantly related to the latent variable Teaching Quality. These findings suggest that students with scholarly type interests as typified by Investigative interests and students with interests more closely allied with accounting studies view the teaching more favourably than other interest category students.

The results of SEM that related to the third research question examined perceptions of teaching and the learning approaches. The results suggest that Teaching Quality as measured by the CEQ have an important relationship with learning approach. For example, the findings show that high perceptions of teaching quality are positively related to Deep and Achieving approaches to learning. In addition the perceptions of teaching impact on a Surface approach to learning, as it relates to perceptions of high Workload.

The findings related to this research question potentially have important implications for accounting educators. The impact on learning approach arising from perceptions that the workload is heavy would appear to support previous findings by Dahlgren, 1978,1984, Entwistle and Ramsden 1983, Ramsden and Entwistle 1981. In this study, when students perceive that the course tries to cover too many topics, the work volume is high and not enough time is given for understanding, an inferior learning approach is adopted. Particularly in a first year course where many students are introduced to the study of accounting for the first time it is important to acknowledge that perceptions of a heavy workload have an impact on the quality of the learning. Inferior learning approaches have also been associated with poorer quality learning outcomes.

Implications for accounting educators

The research findings presented in this study are capable of being translated into broadly based policy recommendations. The results suggest that accounting educators can improve the quality of student learning in two distinct ways. Firstly through the structuring of teaching that encourages conceptual learning. For example, the evidence from this study indicates that inappropriate levels of workload encourage surface type learning. In contrast where students were more readily able to 'engage with the subject' by relating to real world situations, there was greater utilisation of deep approaches to learning. Secondly, accounting educators by providing students with appropriate expectations of course requirements have the opportunity to encourage more positive perceptions of the teaching/learning environment. In this study negative perceptions of the teaching/learning environment appeared to be related to inferences about the difficulty of content

and workload requirements conveyed by accounting educators. Therefore accounting educators by giving students appropriate course expectations represented by clear goals, appropriate assessment and workload, may be able to more readily encourage deep approaches to learning.

Overall the challenge for accounting educators is to undertake teaching that encourages students to use deep approaches to learning. The goal ultimately being to produce graduates equipped with qualities of critical thinking, flexibility and ability to engage in problem solving tasks adaptable to a rapidly changing work environment. The results of this study indicate that accounting educators can influence the adoption of deep approaches to learning by changing the teaching/learning environment. Given this capacity to influence learning approaches the educator needs to identify aspects of teaching and assessment methods that focus on requiring students to learn and think independently.

Criticisms of the poor quality of accounting graduates has related to their failure to display qualities identified with a deep approach to learning. For these qualities to develop, not only do students need to have teaching that encourages deep learning, but there is also evidence from this study that a deep approach relates to students' interests in the field of study. Entwistle and Ramsden (1983) noted that for a deep approach to occur, "students need to engage with the subject, to develop an intellectual passion to understand" (Entwistle & Ramsden, 1983, p. 215). The findings from this research support this view. Consequently career advisors at secondary schools and course advisors at tertiary level have a role to play in encouraging self-selection into courses that provide personal relevance for students. If students follow their interests in terms of secondary school subject choice and higher education courses, it is likely that they will approach their career in accounting with greater commitment and passion, resulting in greater job satisfaction. Ultimately this matching of vocational interest with domain specific content provides the opportunity to produce better quality graduates for the accounting profession.

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Table 1 Scale Characteristics of the National Trial CEQ

Scale	Defining item	Mean	SD	Cronbach's alpha
Good Teaching	Teaching staff here normally give helpful feedback on how you are going	3.20	0.86	0.87
Clear Goals	You usually have a clear idea of where you're going and what's expected you in this course	3.34	0.86	0.80
Appropriate Workload	The sheer volume of work to be got through in this course means you can't comprehend it all thoroughly (negative)	2.87	0.91	0.77
Appropriate Assessment	Staff here seem more interested in testing what we have memorised than what we have understood (negative)	3.34	0.81	0.71
Emphasis on Independence	Students here are given a lot of choice in the work they have to do	2.64	0.79	0.72

Source: Ramsden, P. (1991). A performance indicator of teaching quality in higher education: The course experience questionnaire. Studies in Higher Education Vol. 16, No.2 p.134

Table 2

Response Rates for the Survey

Respondents	Number	% Response
On campus:		
Campus 1	463	79
Campus 2	213	65
Campus 3	53	91
Off campus	97	54
Total	826	

Table 3 Fitted One-factor Congeneric Model for Motive and Strategy Scales:
Factor Score Regressions

Motive / Strategy	SPQ Item	Description	Factor Loading (λ)	Recalib. Weight for Comp.
Surface motive	Item 1	Course selection based on career	.32	.07
	Item 7	Discouraged by poor marks	.57	.17
	Item 13	Education leads to a well paid job	.55	.16
	Item 19	Worry about doing well in tests	.63	.21
	Item 25	Shouldn't study material not examined	.31	.07
	Item 31	Resisted study, but worthwhile	.42	.10
	Item 37	Studying provides better job opportunities	.65	.22
Deep motive	Item 2	Studying gives deep personal satisfaction	.71	.23
	Item 8	Compelled to discover truth	.47	.11
	Item 14	Any topic can be interesting	.55	.13
	Item 20	Academic topics can be exciting	.59	.20
	Item 26	Become absorbed in work	.59	.15
	Item 32	Aim in life to discover own philosophy	.43	.09
	Item 38	Studies have changed views on issues	.43	.09
Achieving motive	Item 3	Want top grades to enhance employment	.81	.25
	Item 9	Strong desire to excel in studies	.81	.25
	Item 15	View self as ambitious and want to get to the top	.70	.14
	Item 21	Prepared to sacrifice friendship for success	.40	.05
	Item 27	Course choice related to prospects of top marks	.41	.05
	Item 33	Achieving high grades a competitive game	.78	.21
	Item 39	Society based on competition	.43	.05
Surface strategy	Item 4	Only study course materials, browsing wasteful	.44	.13
	Item 10	Learn some things by rote	.30	.07
	Item 16	Choose factual rather than theoretical subjects	.27	.07
	Item 22	Restrict study to specific tasks, no extras	.36	.10
	Item 28	Learn when lecturers use prepared notes	.42	.12
	Item 34	Don't question statements/ideas of lecturers	.68	.28
	Item 40	Rely on lecturers statements rather than own judgement	.62	.23
Deep strategy	Item 5	Relate studying to real life situations	.72	.28
	Item 11	Reading new material reminded of prior material	.36	.08
	Item 17	Work on a topic to form own viewpoint	.51	.13
	Item 23	Try to relate what learned in one subject to another	.66	.22
	Item 29	Find new topics interesting	.56	.15
	Item 35	Use free time to pursue interesting class topics	.31	.06
	Item 41	Try to relate new material to what already know	.34	.08
Achieving strategy	Item 6	Summarise readings & include in notes	.60	.12
	Item 12	Try to work consistently and review for exams	.63	.13
	Item 18	Try to complete assignments as soon as given	.70	.17
	Item 24	After lecture reread notes for legibility & understanding	.74	.21
	Item 30	Self test on important topics until understand them	.60	.12
	Item 36	Look at most suggested readings for lectures	.68	.17
	Item 42	Keep neat, well organised notes	.46	.08

Table 4 Goodness-of-fit Measures and Item Reliabilities for Motives and Strategies

	Deep Motive	Deep Strategy	Surface Motive	Surface Strategy	Achieving Motive	Achieving Strategy
<u>Goodness-of-fit</u>						
Chi-square (χ^2)	50.96	63.24	148.37	89.16	107.09	60.29
Degrees of freedom (df)	14	14	14	14	14	14
Probability p	.00	.31	.00	.00	.00	.00
Goodness of fit index (GFI)	.98	.98	.97	.95	.97	.98
Adjusted goodness of fit index (AGFI)	.97	.96	.94	.91	.95	.97
Root mean square residual (RMR)	.05	.05	.08	.11	.07	.05
RMSEA *	.05	.07	.11	.08	.09	.07
<u>Scale Reliability:</u>						
Cronbach's alpha	.75	.70	.64	.70	.82	.82
Composite scale reliability	.78	.75	.69	.73	.87	.83

Note. * RMSEA = Root Mean Square Error of Approximation

Table 5 Fitted One-factor Congeneric Model for Interest Scales: Factor Score Regressions.

Interest Type	Questionnaire Item	Factor Loading (λ)	Recalibrated Weight for Composite	
Realistic	Item 4	Driving trucks	.53	.07
	Item 8	Building things	.83	.23
	Item 11	Repairing things	.82	.22
	Item 18	Working with machines and tools	.91	.48
Investigative	Item 3	Thinking your way through problems	.71	.27
	Item 12	Working with figures	.59	.17
	Item 19	Doing experiments in a laboratory	.32	.06
	Item 21	Solving problems and puzzles	.83	.50
Artistic	Item 5	Writing stories, poems, plays etc	.73	.33
	Item 16	Acting in plays	.73	.32
	Item 20	Going to the theatre	.49	.14
	Item 24	Painting or drawing pictures	.60	.21
Social	Item 6	Talking to friends	.60	.28
	Item 10	Going shopping	.55	.24
	Item 13	Helping other people	.54	.22
	Item 15	Helping cater for a party	.58	.26
Enterprising	Item 1	Managing other people	.90	.74
	Item 9	Organising or chairing meetings	.55	.12
	Item 17	Getting other people to do things your way - influencing others	.52	.10
	Item 23	Selling things	.26	.04
Conventional	Item 2	Doing the banking	.70	.26
	Item 7	Keeping the accounts for a small business	.77	.36
	Item 14	Doing office work	.71	.27
	Item 22	Typing or word processing	.48	.11

Table 6
Goodness-of-fit Measures and Scale Reliabilities for RIASEC Interests

	Realistic	Invest.	Artistic	Social	Enterpris	Conventl
<u>Goodness-of-fit</u>						
Chi-square χ^2	16.12	3.62	7.85	2.17	23.62	21.73
Degrees of freedom	2	2	2	2	2	2
Probability p	.00	.16	.02	.34	.00	.00
Goodness of fit index (GFI)	1.00	1.00	1.00	1.00	.99	.99
Adjusted goodness of fit (AGFI)	.98	.99	.98	.99	.94	.95
Root mean square residual (RMR)	.03	.02	.03	.01	.05	.04
RMSEA	.095	.032	.061	.01	.12	.11
<u>Scale Reliability:</u>						
Cronbach's Alpha	.86	.72	.73	.65	.66	.76
Composite scale Reliability	.90	.80	.76	.66	.85	.79

Table 7 Fitted One-factor Congeneric Model for CEQ Teaching Scales: Factor Loadings and Scale Recalibration Weights

CEQ Scale	Item No	Questionnaire Item**	Factor Loading (λ)	Recalib. Weight for Compos.
Good Teaching (8 items)	Item 3	Teaching staff motivate students in work	.67	.15
	Item 7	Staff put time into commenting on students work	.65	.14
	Item 15	Staff make effort to understand student work difficulties	.68	.15
	Item 17	Staff give helpful feedback on progress	.70	.16
	Item 18	Lecturers extremely good at explaining things	.65	.14
	Item 20	Staff work hard to make subjects interesting	.62	.12
	Item 27	Course tries to get best out of students	.53	.08
	* Item 25	Staff show no real interest in what students have to say	.43	.06
Clear Goals (5 items)	Item 1	Easy to know standard of work expected	.66	.22
	Item 6	Clear idea of direction and expectations	.74	.30
	* Item 13	Hard to know what is expected in course	.65	.21
	* Item 19	Aims and objectives are not made clear	.47	.11
	Item 29	Staff make known their expectations	.58	.16
Appropriate Workload (5 items)	* Item 4	Workload is too heavy	.72	.21
	* Item 10	Syllabus tries to cover too many topics	.75	.24
	Item 14	Enough time given for understanding	.63	.15
	* Item 22	There is a lot of pressure on students	.60	.13
	* Item 30	Volume of work prohibits comprehension	.78	.27
Appropriate Assessment (6 items)	* Item 5	Lecturers give impression can't learn from students	.50	.16
	* Item 8	Course really only requires a good memory	.50	.17
	* Item 12	Staff interested in testing memory	.68	.32
	* Item 21	Staff ask factual type questions	.53	.19
	* Item 23	Feedback usually in form of marks and grades	.26	.07
	* Item 26	Course time requires effort around exam	.31	.09
Emphasis on Student Independence (5 items)	* Item 2	Few opportunities for choice of areas to study	.22	.07
	Item 9	Course encourages development of academic interests	.52	.22
	Item 11	Students are given choice in ways of learning	.52	.22
	Item 16	Students are given choice in work requirements	.58	.26
	Item 24	Opportunities to discuss with staff ways of learning	.40	.15
	* Item 28	Little choice in ways assessed	.25	.08

Note. * = rescaled negative item

**=Abbreviated scale item description

Table 8

Goodness-of-fit Measures and Item Reliabilities for CEQ Measures

	Good Teaching	Clear Goals	Workload	Assess.	Indep.
<u>Goodness-of fit</u>					
Chi square χ^2	66.75	10.85	21.78	56.93	35.75
Degrees of freedom	20	5	5	9	9
Probability p	.00	.054	0.00	0.00	.00
Goodness of fit index (GFI)	.98	1.00	.99	.98	.99
Adjusted goodness of fit (AGFI)	.97	.99	.98	.95	.97
Root mean square residual (RMR)	.05	.03	.03	.06	.05
RMSEA	.06	.04	.07	.08	.06
<u>Scale Reliability:</u>					
Cronbach's Alpha	.83	.76	.82	.63	.56
Composite scale reliability	.84	.78	.84	.67	.61

Table 9

Goodness of Fit Indices for the Hypothesised Model

Index	Value
Chi-square	399.438
Based on 80 degrees of freedom $p < 0.001$	
Comparative Fit Index (CFI)	0.927
Lisrel GFI	0.942
Lisrel AGFI	0.888
Robust Comparative Fit Index	0.881
Root Mean Sq. Error of Approximation (RMSEA)	0.070
90% Confidence Interval of RMSEA	0.063, 0.076

Table 10: Measurement Model: Equations

Measurement variable	Factor loading
Goodtw = V7 =	0.721 F1 + 0.693 E7
Cleargls = V8 =	0.730*F1 + 0.684 E8
Workload = V9 =	0.549*F1 + 0.836 E9
Assess = V10 =	0.403*F1 + 0.915 E10
Indep = V11 =	0.455*F1 + 0.891 E11
Deepstr = V12 =	0.752*F2 + 0.659 E12
Deepmot = V13 =	0.828 F2 + 0.560 E13
Surfstr = V14 =	0.532 F3 + 0.847 E14
Surfmot = V15 =	0.718*F3 + 0.696 E15
Achievstr = V16 =	0.695 F4 + 0.719 E16
Achievmo = V17 =	0.571*F4 + 0.821 E17

Table 11

Structural Equations Standardized for Theoretical Model

Dependent Latent Variable	=	F1 Teach Qty	+	V1 Real	+	V2 Invest	+	V3 Artistic	+	V4 Social	+	V5 Enterp.	+	V6 Convnl
Teach Qty F1 =				-.02		.22*		.00		-.06		-.01		.27*
Deep App F2 =		.24*		-.01		.30*		.17*		-.08*		.22*		.22*
Surface App F3 =		-.16*		-.06		-.22*		-.07		.13*		-.05		.26*
Achiev App F4 =		.35*		-.03		.13*		-.01		.05		.17*		.30*

Note * = $p < .05$

Table 12 Total, Direct and Indirect Effects on Learning Approaches

Variable	Deep			Surface			Achieving		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Teaching Quality F1	.240*		.240	-.162*		-.162	.351*		.351
Realistic V1	-.007	-.004	-.011	-.056	.001	-.055	.038	-.005	-.033
Investigative V2	.294*	.053*	.347	-.232*	-.019	-.251	.132*	.079*	.211
Artistic V3	.171*	.000	.171	-.065	.000	-.065	-.010	.000	-.010
Social V4	.077*	-.013	-.090	.137*	.006	.143	.049	-.019	.030
Enterprising V5	.215*	-.001	.214	-.053	.001	-.052	.164*	-.002	.162
Conventional V6	.218*	.064*	.282	.241*	-.024	.217	.303*	.095*	.398

Note. * = $p < .05$

Table 13 Changes in Model Goodness-of-fit Resulting From Model Refinements

	Chi-square	df
Restricted model	433.93	80
Nested model	360.63	78
Change in chi square	73.30**	2
Satorra-Bentler		
Scaled chi-square		
Restricted model	401.00	80
Nested model	332.97	78
Change in chi square	68.03**	2

Note **= $p < .001$

Table 14. Re-Specification of Structural Equations for Learning Approaches:

First Year Coefficients

Dependent factor	W/load	Teaching Qlty	Realistic	Invest.	Artistic	Social	Enter-rising	Convent-ional
Deep Learning		.19*	-.01	.31*	.17*	-.08*	.22*	.24*
Surface Learning	-.28*	.04	-.06	-.20*	-.08	.12*	-.06	.25*
Achieving Learning		.26*	-.03	.15*	-.013	.05	.17*	.33*

Note * = p <.05