TERTIARY LEARNING

A SYMPOSIUM1

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This Symposium reports on some of the outcomes of the Study of Tertiary Learning Project 1991, a research project funded by the Faculty of Education, Queensland University of Technology. It reports specifically on the following aspects of the project:

A comparison of students' and their lecturers' perceptions of the cognitive and affective aspects of their learning environments.

The relationship between students' learning processes and their perceptions of the cognitive and affective aspects of their learning environments.

The validity, reliability and factorial structure of Stevenson's "Cognitive Holding Power Questionnaire" for preservice teacher education students.

Towards a comprehensive quantitative measure of classroom learning environments.

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INTRODUCTION

This symposium focuses on small group learning at the tertiary level where "small group" is defined here as up to 30 students. It deals specifically with the learning behaviour of teacher education students and the learning environments which they and their lecturers create. The research reported has been developed within the framework provided by a model of factors influencing learning which has been reported elsewhere (Clarke and Dart; 1991).

The model assumes an interactionist view of learning where learning, being a specific form of behaviour, can be interpreted within Lewin's (1951) Field Theory framework. Lewin, in his classical equation $B=f(P,E)$, defines Behaviour (B) as a function of the interdependent components P, the person, and E, the psychosocial environment as interpreted by the person. The model synthesizes a number of comprehensive and well-accepted models of influences on student learning at the tertiary level (Biggs, 1989, 1990a; Entwistle, 1987; McKeachie et al, 1986) into the Lewinian equation producing a model which indicates that learning is a complex interactive product of student individual characteristics and the cognitive and affective press of a specific learning environment. The outcome of this synthesis is that the learning behaviour B of a given student is influenced by:

P variables:
- cognitive variables:
        prior knowledge
        intellectual skills and abilities
        learning approaches and style
- affective variables:
        personality
        motivation

E variables:
- cognitive press arising from the
teacher's and other students' characteristics and behaviour; and
curriculum and specific tasks
- affective press arising from the
        teacher's and other students' characteristics and behaviour
curriculum and specific tasks

The specific aspects addressed in the symposium are:

A: ECOLOGICAL MAP OF THE LEARNING ENVIRONMENT

B: SUBSTANTIVE QUESTIONS

1. A comparison of student and lecturer perceptions of their learning environments; and
2. The relationship between student study processes and their perceptions of the learning environment.

C: SOME PSYCHOMETRIC CONSIDERATIONS

3. An evaluation of the Cognitive Holding Power Questionnaire (CHPQ) (Stevenson; 1990) with regard to teacher education students;
4. Initial steps toward the development of a comprehensive learning environment inventory incorporating both cognitive and affective press;

RELATED LITERATURE

A brief review of relevant literature based on selected aspects of the model follows.

With respect to "P" variables:

There has been considerable research on learning or study processes (e.g. Biggs, 1987; Entwistle & Ramsden, 1983; Watkins, 1982). Recent research and theorizing (Biggs, 1990a; Dart & Clarke, 1991) indicate that students choose their approach to a particular learning task based on the value they place on the outcome and the expectation they have about their own ability to succeed with the task. A major outcome of the Dart and Clarke (1991) study was that "...if the students perceive that the (task)... requires understanding and provides opportunities to apply... knowledge and skills (which) ...enhance their personal competencies, they will choose to use a deep approach" (p. 11).

Research on motivational processes indicates that when students feel responsible for their own learning, they tend to adopt a Deep Approach (Biggs, 1985; Dart & Clarke, 1991; Ramsden, 1985).

With respect to "E" variables:

Research on post-secondary learning environments is small compared to the elementary and secondary level (Fraser, 1989). Based on the model, learning environments can be considered as having cognitive and affective elements. Fraser and Tregaust (1986) provide a review of the affective area while Stevenson (1986a, 1986b) deals with the cognitive area.

With respect to the interaction of "P" and "E":

Researchers have investigated the interactive influence of personal and contextual variables on learning processes (e.g. Ramsden & Entwistle, 1981; Watkins & Hattie, 1985) and the influence of environment on approaches to

learning (e.g. Ramsden, 1985; Ramsden et al, 1989).

METHODOLOGY

Sample

The sample included 470 first and second year students in 32 classes with their 17 lecturers in the B.Ed. (Sec) course at QUT in Brisbane. The major characteristics of the student sample are shown in Table 1.

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Table 1 somewhere here

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At the end of semester 1 1991, the students completed questionnaires which dealt with their learning and motivational processes and their perceptions of the cognitive and affective press of their learning environments. Lecturers completed questionnaires on their perceptions of the cognitive and affective press in their learning environments.

Instruments

Student Learning Processes

The Study Processes Questionnaire (SPQ) (Biggs; 1987) is a comprehensive 42 item instrument, measuring combinations of students' Surface, Deep and Achieving approaches to study. For definitions of these concepts, see Biggs (1987). There are six subscales: Surface Motive, Surface Strategy, Deep Motive, Deep Strategy, Achieving Motive and Achieving Strategy. Pairs of conceptually related subscales can be added to give a measure of an approach. For example, Surface Motive plus Surface Strategy provides a measure of Surface Approach and so on.

Student Motivational Processes

Students completed the Academic Locus of Control Scale (ALC), a 28-item measure of beliefs in personal control in academic settings for college students developed by Trice (1985). The items

...reflect Rotter's (1966) internal/external distinction where internal attributions (low scores) index belief that personal effort is required to achieve success in academic settings, while external attributions (high scores) suggest that powerful others or situational factors largely determine success or failure" (Trice, Ogden, Stevens and Booth; 1987: 483). (Parentheses are Trice et al's).

Student Perceptions of Cognitive Press

Stevenson (1986a, 1986b) by synthesizing ideas derived from theories on

cognitive processing and cognitive structure (Anderson, 1980, 1982; Fischer, 1980; Scadura, 1980, 1981) has conceptualized the cognitive demands of a learning environment as Cognitive Holding Power (CHP). This he defines as "...a characteristic of a learning setting which presses students into different kinds of cognitive activity" (Stevenson; 1990, 1) and measures at the post-secondary level with a 30 item instrument the CHPQ (Stevenson; 1990). The CHPQ has 2 major subscales which measure first and second order cognitive holding power. See Stevenson (1990) for definitions and examples.

Student Perceptions of Affective Press

The affective characteristics of the learning environments were measured using the College and University Classroom Environment Inventory (CUCEI) developed by Fraser and Tregaust (1986). The CUCEI is a 49 item instrument designed to gather perceptions of the psychosocial characteristics of learning environments and consists of 7 scales: Personalization, Involvement, Student Cohesiveness, Satisfaction, Task Orientation, Innovation and Individualization. See Fraser and Tregaust (1986) for definitions. Clarke (1990) reports additional reliability data based on a QUT sample.

The CUCEI is available in actual and preferred forms for both students and lecturers. The Student Actual form was used here.

Lecturer Perceptions of Cognitive Press

The CHPQ (Stevenson; 1990) was modified into a Lecturer Form by changing the original questions in an appropriate way. For example

"I copy what the lecturer does" became
"Students copy what I do"

"I feel I have to copy what the lecturer does" became
"Students feel that they have to copy what I do" and

"The lecturer encourages students to copy what he/she does" became
"I encourage students to copy what I do".

Lecturer Perceptions of Affective Press

The Lecturer Actual Form of the CUCEI was used here.

Analysis

The data was analysed using the SPSSX package (SPSS Inc; 1988). The particular procedures used are discussed under each section. There has been considerable debate with regard to the appropriate unit of analysis in

classroom-based research of the type reported here (Ames and Archer, 1988; Fraser, 1985). Because the interest here is in each student's perception of the classroom context and how these perceptions related to personal variables and lecturers' perceptions, the individual score was used as the unit of analysis rather than the mean score of the students at the classroom level. Ryan and Grolnick (1986) suggest that it is necessary to determine the "...functional significance of the environment for the individual when concerned with the effects of the environment on self-related variables" (p. 557).

RESULTS AND DISCUSSION

A: ECOLOGICAL MAP OF THE LEARNING ENVIRONMENT

Consistent with the "ecological map" concept used in the development of the model directing this research (Clarke and Dart; 1991), an evaluation of the relationships which existed among the significant P and E variables was made prior to any analysis of the substantive questions being addressed in the project.

The REGRESSION procedure was used to carry out multiple regression analyses with Satisfaction, Locus of Control, First and Second Order Cognitive Holding Power and Approaches to Learning (Surface, Deep, and Achieving) as dependent variables. Because of the high correlation between the Involvement and Satisfaction subscales of the CUCEI ($r = 0.69$) it was decided to omit the Involvement scores from these analyses. Results showing the significant predictor variables and the percentage increment in explained variance are reported in Table 2.

Table 2 somewhere here

The major outcomes are:

(a) Student Satisfaction was related to:

. high Innovation - the extent to which a range of different learning experiences, teaching approaches and assignments occur.
. high Task Orientation - the extent to which classroom activities are well organised;
. high Cohesiveness - the amount of friendliness between students;
. high Deep Motive - the degree to which students are interested in their learning; and
. high Individualization - the extent to which individual needs are taken into account by the lecturer.

(b) Student Locus of Control (feeling of being able to control the outcomes

of their learning) was related to:
. high Achieving Strategy - a highly organised approach to study;
. low Surface Motive - little concern with avoiding failure; and
. high Deep Motive - a lot of interest in the learning task;

(c) First Order Cognitive Holding Power (a learning environment where
students feel pressured into using specific procedures, which either they
are familiar with or are available from the lecturer, to reproduce
information) was related to:
. high Surface Strategy - the use of rote learning techniques; and
. low Individualisation - where little attention is paid to individual
differences.

(d) Second Order Cognitive Holding Power (an environment promoting
generation of ideas, linking of new information with prior knowledge,
development of appropriate strategies, and metacognitive thinking) was
related to:
. high Deep Strategy - learning strategies which aim at understanding;
. high Satisfaction - the degree to which students enjoy class activities;
and
. low Surface Strategy - little use of reproductive learning strategies.

(e) Surface Approach to Learning (the students reduces what is to be learnt
to the status of unconnected facts to be memorized and reproduced at a
later time) was related to:
. high First Order Cognitive Holding Power - a learning environment
characterized by a press to reproduce knowledge;
. high Achieving Approach - an organized approach taken to learning;
. external Locus of Control - a belief that one has little control over the
outcomes of their learning; and
. low Second Order Cognitive Holding Power - a learning environment
perceived as requiring little generation of ideas or personal construction
of meaning.

(f) Deep Approach to Learning (the student attempts to make sense of what
is to be learnt - ideas and concepts - and engages in thinking, integration
of ideas etc.) was related to:
. high Second Order Cognitive Holding Power - a learning environment
perceived as requiring students to engage in metacognitive thinking and to
be actively involved in constructing their own understandings; and
. high Achieving Approach - an approach to learning characterised by the
organization of study processes.

(g) Achieving Approach to Learning was related to:
. an Internal Locus of Control orientation - the feeling of being able to
control learning outcomes;
. Surface Approach to Learning; and
. Deep Approach to Learning.

The relationship between Achieving Approach and both the Surface and Deep

Approaches is consistent with Biggs' (1987) conceptualization of Achieving
Approach as one that can align with both Surface and Deep Approaches
because Surface and Deep relate to how the learner engages content of
learning and Achieving refers to how the learner organizes the context of
learning.

For information only and not discussed here, the reliability of all the
scales used in the study are reported in Table 3. In that Table, the
results are also compared with previously published Australian and overseas
results.
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Table 3 somewhere here
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B: SUBSTANTIVE QUESTIONS

1. Comparison of Student and Lecturer Perceptions of the Learning
Environment

Lecturer and student perceptions of the affective and cognitive dimensions
of their classroom environment were compared using the MANOVA procedure. A
one-way two-group MANOVA in which the group of 9 environment scales
constituted the dependent variables was performed. Wilks' lambda criterion
was significant (p<0.000) and consequently the univariate ANOVA results
were examined for the 9 scales individually. Means and standard deviations
are reported in Table 4 . Effect sizes are also given. These have been
calculated according to the method used by Biggs (1990b), whereby the
students' means are subtracted from the lecturers' means and divided by the
larger of the two standard deviations to yield a conservative estimate of
effect size.
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Table 4 somewhere here
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The major outcomes are:

(a) Lecturers perceived significantly more Personalisation, Cohesiveness,
Satisfaction, Task Orientation, and Second Order Cognitive Holding Power
than did their students; and

(b) Students perceived significantly more First Order Cognitive Holding
Power than did their lecturers.

In sum, lecturers believe more so than their students that in their
classrooms
. a significant amount of personal interaction occurs between lecturer and
students,

. students are helpful towards each other,
. students enjoy their classes,
. class activities are clear and well organised, and
. students are required to be actively involved in constructing their own
understandings and engage in metacognitive thinking.

On the other hand, students believe more so than their lecturers that in
their classrooms there is more emphasis on
. listening to the lecturer and
. copying down what the lecturer says and feels is important.

2. The Relationship between Student Learning Processes and their
Perceptions of the Learning Environment

The relationships between perceived classroom environment and study
approaches were analysed by canonical correlation analysis using the MANOVA
procedure. Three interpretable canonical correlations (Rc.) were found
between these sets of variables using Thorndike (1978, p.183) criterion
that only squared canonical correlations greater than 0.10 should be
considered meaningful. The decision rule used to identify the important
variables for each significant canonical correlation was based on Stevens
(1986) and is a conservative approach which decreases the chance of making
a Type 1 error. The rule is:
(i) all correlations between dependent and canonical variables greater than
0.4 were considered; and then
(ii) the standardized canonical coefficients were examined in a relative
way to each of the others in that particular item set and only those
greater than 0.4 were accepted. These relationships are shown in Table 5.

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Table 5 somewhere here

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The results, in order of greatest significance were:

Rc= 0.61. The first canonical correlation linked classrooms perceived as
providing high press for metacognitive thinking and linking new information
with old with strategies that lead students to generate meaning and to
integrate ideas and concepts.

Rc = 0.45. The second canonical correlation linked classrooms perceived as
exerting high press on students to engage a task through listening to the
lecturer and copying what the lecturer says or does in relation to the task
with an approach to learning in which many reproductive or rote learning
strategies were evident.

Rc = 0.33. The third canonical correlation linked classrooms perceived as
not fostering friendly interpersonal relationships but as giving high
satisfaction with low anxiety and high interest in learning in students.

C: SOME PSYCHOMETRIC CONSIDERATIONS

3. Evaluation of the CHPQ

The CHPQ was developed in a TAFE environment. This project provided the opportunity to evaluate its factor structure, validity and reliability in a different setting.

(a) Factor Structure

Stevenson (1990) extracted 8 factors accounting for 41% of variance. Using the Stevenson criteria of factor scores >0.3 and any number of items per factor, analysis of the QUT data yielded 6 factors accounting for 35.5% of variance. These are compared in Table 6 using the Stevenson factors as a reference point. Items 10, 14 and 25 were not included in the analysis on Stevenson's advice (1990, p.13).

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Table 6 somewhere here

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The factors have a number of similarities but some differences. For convenience, henceforth Stevenson's factors will be labelled SF and the QUT factors labelled CF. The major points of similarity and difference are:

1. Stevenson's largest factor SF1, Listening and Watching, occurs essentially as two factors in the QUT data - CF1, Lecturer as Expert, and CF2, Copying and Modelling. The "tradesman-apprentice" nature of the TAFE environment is not so prevalent in the teacher education situation and, although the two elements of "expert" and "copying" still emerge, they are not integrated as they would be in the practical trade settings.

2. Notions of "discovering" and "checking and linking" emerge in both sets of data. However, the more verbal, abstract teacher education settings integrate these aspects in CF4, Encouraged to Check, Link and Try Ideas, compared to the practical settings where the activities can be discrete as in SF2, Encouraged to Check and Link, and SF3, Discovering.

3. The concept of "validating" is common to both settings (SF5 and CF5).

4. There has been a deliberate policy in recent years in the teacher education courses on Kelvin Grove Campus of promoting "autonomous learning". This could well account for the emergence of factors CF3, Checking and Trying Out Ideas, and CF6, Autonomous Learning. In the TAFE settings, the items in these factors are split into small disparate factors SF4, Autonomous Action, SF6, Finding Out for Oneself, SF7, Teacher Showing, and SF8, Seeking Help.

Based on the assumption of two underlying theoretical constructs - first

and second order cognitive holding power - Stevenson carried out a forced 2 factor solution producing groupings of items which indeed did reflect the two constructs. A forced 2 factor analysis of the QUT data produced identical results in terms of grouping of items.

(b) Reliability

Stevenson (1990) reports Cronbach 's ranging from 0.82 to 0.86 for the First Order Cognitive Holding Power scale and 0.77 to 0.87 for the Second Order Cognitive Holding Power scale. The QUT data had Cronbach 's of 0.87 for the First Order Cognitive Holding Power scale and 0.85 for the Second Order Cognitive Holding Power scale.

(c) Validity

Logically, an environmental press typified by First Order Cognitive Holding Power is one that could be predicted as fostering the use of Surface Strategies and a Surface Approach while one typified by Second Order Cognitive Holding Power could well foster the use of Deep Strategies and a Deep Approach. Some of the relationships established in the regression analyses support these notions. Further evidence of the predictive validity of the First and Second Order Cognitive Holding Power scales can be obtained by measuring the correlation between these scales and the Surface and Deep Approach scales of the SPQ. These indicate highly significant relationships between First Order Cognitive Holding Power and Surface Strategy ($r = 0.45$, $p<0.001$) and Surface Approach ($r = 0.38$, $p<0.001$) and between Second Order Cognitive Holding Power and Deep Strategy ($r = 0.55$, $P<0.001$) and Deep Approach ($r = 0.55$, $p<0.001$).

The replication of the factor structure of the First Order Cognitive Holding Power and the Second Order Cognitive Holding Power scales confirms the construct validity of the questionnaire. Informal feedback from some students and lecturers indicated that the notion of "copying" was somewhat alien to teacher education settings and hence those items using that concept could be regarded as reducing the face validity of the CHPQ somewhat.

4. Production of a Comprehensive Measure of Learning Environment Press

The model of factors influencing tertiary learning mentioned earlier (Clarke and Dart; 1991) proposes that the variety of environmental influences on learning could be synthesized into cognitive press and affective press. As the first step in a long-term project of developing a single comprehensive and quantitative measure of the environmental press of learning environments, student responses to the items from the CUCEI and the CHPQ were pooled and analysed using a procedure developed by Burnett and reported in Fanshawe and Burnett (1991). In brief, the procedure has 6 steps:

Step 1

Submit all items to a principal components analysis with a varimax
rotation. Identify the number of factors which have five or more items with
a factor loading of 0.4 or greater.

Step 2

Submit all items to a principal components analysis with a varimax
rotation, stipulating the number of factors identified in Step 1.

Step 3

Compute Cronbach   reliability coefficients on all items with loadings of
0.4 or greater for each of the factors generated in Step 2.

Step 4

Subjectively select items to represent each subscale using three criteria:
        . equal number of items in each scale;
        . items should have face validity;
        . items should have high corrected item-total correlations.

Step 5

Submit the selected items to a principal components analysis with a varimax
rotation. The number of factors extracted should equal the number of
factors originally extracted in Step 1 and the items from the same subscale
should load on the one factor with loadings of 0.4 or greater.

Step 6

Compute the Cronbach   reliability coefficient for each of the subscales.

This procedure produced the factors summarized in Table 7. There are five 7
item factors accounting for 37.4% of variance with Cronbach   's ranging
from 0.84 to 0.86.

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Table 7 somewhere here

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The factors identify a press toward

- warmth and challenge (Factor 1) (17.2%) (= 0.86)
- positive interpersonal relationships (Factor 2) (6.9%) (= 0.86)
- enjoying classroom activities (Factor 3) (5.4%) (= 0.88)
- quantitative learning (Factor 4) (4.7%) (= 0.87)
- qualitative learning (Factor 5) (3.2%) (= 0.84)

The outcomes of this analysis are obviously delimited by the original items in the CHPQ and the CUCEI. However, the direction given by the interactive model of influences on student learning referred to earlier (Clarke and Dart; 1991) is that environmental press is an interactive product of both cognitive and affective elements. Factor 1, the strongest factor, reminiscent of concepts synthesized from theory and research by Campbell (1968) and Dunkin (1966), reflects such an interaction and provides the incentive to proceed with the notion of developing a comprehensive instrument. That work is now proceeding (Clarke; in process).

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Table 1   Profile of Student Sample

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        ------------------------------------------------
              Year 1                 Year 2         Total
        ------------------------------------------------
        A/H           S/T           A/H           S/T
        ----------------------------------------------------
Male          21            37            24            46
        126
        ----------------------------------------------------
Female  76            122           51            93                344
        ----------------------------------------------------
Totals: 97            159           75            139
        ----------------------------------------------------
                      256                         214
        470
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Table 2 Relationship between Selected Outcomes and other Variables

VARIABLE	BETA	INCREMENT in R2

(1) SATISFACTION

Innovation	0.24	25.6%
Task Orientation	0.32	11.9%
Cohesiveness	0.26	6.4%
Deep Motive	0.17	2.8%
Individualization	0.19	2.3

Multiple R = 0.70   Adjusted R2 =   49.0%

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(2) LOCUS OF CONTROL

Achieving Strategy	-0.46	24.1%
Surface Motive	0.23	5.5%
Deep Motive	-0.20	3.5%

Multiple R = 0.58   Adjusted R2 = 33.1%

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(3) FIRST ORDER COGNITIVE HOLDING POWER (FOCHP)

Surface Strategy	0.41	18.9%
Individualization	-0.27	7.1%

Multiple R = 0.51   Adjusted R2 = 26.1%

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(4) SECOND ORDER COGNITIVE HOLDING POWER (SOCHP)
    Deep Strategy        0.49                31.2%
    Satisfaction         0.24                 6.5%
    Surface Strat.      -0.20                 3.6%
    Multiple R = 0.65       Adjusted R2 = 41.3%

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(5) SURFACE APPROACH
    FOCHP                0.24                13.4%
    Achieving Approach   0.42                 4.0%
    Locus of Control     0.35                10.5%
    SOCHP               -0.20                 3.4%
    Multiple R = 0.57       Adjusted R2 = 31.3%

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(6) DEEP APPROACH
    SOCHP                0.49                29.7%
    Achieving A.         0.30                 8.5%
    Multiple R = 0.62       Adjusted R2 = 38.2%

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(7) ACHIEVING APPROACH
    Locus of Control    -0.46                21.9%
    Surface Approach     0.37                12.9%
    Deep Approach        0.27                 6.2%
    Multiple R = 0.64       Adjusted R2 = 41.0%

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All Beta values are significant at p<0.001

Table 3 Cronbach 's for All Scales Used in the Project and a Comparison
with Existing Results

Study Processes Questionnaire

		B
Surface Motive	0.55	0.51
Surface Strategy	0.58	0.62
Surface Approach	0.68	0.68
Deep Motive	0.64	0.63
Deep Strategy	0.72	0.73
Deep Approach	0.79	0.79
Achieving Motive	0.67	0.71
Achieving Strategy	0.73	0.75
Achieving Approach	0.76	0.77
Surface Achieving Approach	0.77	0.74
Deep Achieving Approach	0.83	0.85

		T
Academic Locus of Control	0.7	not

reported

College and University Environment Inventory

				C		F&T
Cohesiveness		0.9	0.9		0.9	
Individualisation		0.7	0.8		0.8	
Innovation		0.7	0.8		0.8	
Involvement		0.7	0.7		0.7	
Personalisation	0.8	0.8		0.8		
Satisfaction		0.9	0.9		0.9	
Task Orientation		0.6	0.5		0.8	

Cognitive Holding Power Questionnaire

			S
First Order	0.9	0.9	
Second Order	0.9	0.8	

B: Biggs (1987) (CAE sample)

C: Clarke (1990)

F&T: Fraser and Tregaust (1986)

S: Stevenson (1990)

T: Trice (1985)

Table 4 Comparison of Lecturer and Student Perceptions of the Learning
Environment

Environment	Mean	SD	Effect Size
Personalization L	4.61	0.64	0.78
S	4.11	0.43	

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```
        Cohesiveness            L  3.71  0.57           0.41
                                S  3.34  0.91


        Satisfaction            L  4.13  0.45           0.52
                                S  3.70  0.82


        Task Orientation        L  3.97  0.54           0.71
                                S  3.53  0.62


        First Order             L  2.42  0.39          -0.53
        Cognitive Holding       S  2.70  0.54
        Power


        Second Order            L  3.88  0.43           0.87
        Cognitive Holding       S  3.46  0.49
        Power
_____


        L: Lecturers

        S: Students
```

Table 5 Relationships between Perceived Environment and Approaches to Learning

CLASSROOM ENVIRONMENT	1	2	3	4	5
Personaln Involvement					
Cohesive			-0.47(a) -0.48(b)		
Satisfactn					
Task Orientn			-0.68 -0.70		
Innovation	-0.60 -0.61				
Individualn			0.82		0.70
FOCHP		-0.88 -0.95			
SOCHP	-0.93				

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        -0.90

LEARNING
APPROACH

Surf Mot                      -0.52                      0.43
                    -0.80                      0.58
Surf Strat                -0.83
                          -0.88

Deep Mot
Deep Strat
        -0.90

        -0.62
Ach
Mot                                                           -0.
84
                                                              -0.
94
Ach Strat                     -0.73
                              -0.85
```

Values in Table:

    a = correlation between dependent and canonical variables;
    b = standardized canonical coefficients for dependent variables.

Table 6   Comparison of Stevenson and Clarke Factors

```
_____

Stevenson Factors                       Clarke Factors
_____

F1 Listening &              F1 Lecturer as Expert
   Watching (14.4%)             (21.2%)

Item 5,6,8,9,16,17,             Item 5,6,8,9,18,20,28
18,20,22,23,24,28,30
                            F2 Copying and Modelling
                               (14.9%)

                            Item 16,17,24,26,30
_____
F2 Encouraged to            F4 Encouraged to Check,
   Check and Link (5.1%)        Link and Try Ideas(4.8%)
```

```
Item 3,13,21,29              Item 3,11,15,21

F3 Discovering (4.8%)

Item 2,3,4,15
-----------------------------------------------------------
F5 Validating (3.9%)         F5 Validating (4.7%)

Item 7,12,19                    Item 7,12,29
-----------------------------------------------------------
F4 Autonomous Action         F6 Autonomous Learning
   (4.5%)                                (4.2%)

Item 14,25                      Item 4,22,27

F6 Finding Out for           F3 Checking and Trying
   Oneself (3.4%)               Out Ideas (6.7%)

Item 27                         Item 1,2,13,19,(-)23

F7 Teacher Showing (2.7%)

Item 26

F8 Seeking Help (2.3%)

Item 1,10

-----------------------------------------------------------
```

Table 7   Factors of a Measure of a Comprehensive Learning Environment Press

Factor 1 Press toward warmth and challenge (17.2%) (= 0.86)

The lecturer/tutor helps each student who is having trouble with the work. (0.58)

The lecturer/tutor considers students' feelings. (0.55)

Teaching approaches in this class are characterized by innovation and variety. (0.53)

The lecturer/tutor often thinks of unusual class activities. (0.53)

Students have a say in how class time is spent. (0.48)

Teaching approaches allow students to proceed at their own pace. (0.41)

The lecturer/tutor encourages students to try out new ideas. (0.41)

Factor 2 Press toward Positive Interpersonal Relationships (6.9%) (= 0.86)

Students in this class get to know each other well. (0.74)

Students don't have much of a chance to get to know each other in this class. (-) (0.71)

Each student knows the other members of the class by their first names. (0.70)

The class is made up of individuals who don't know each other well. (-) (0.67)

Students in this class aren't very interested in getting to know other students. (-) (0.64)

It takes a long time to get to know everybody by his/her first name in this class. (-) (0.62)

Friendships are made among students in this class. (0.60)

Factor 3 Press toward Enjoying Classroom Activities (5.4%) (= 0.88)

Classes are boring. (-) (0.57)

Classes are a waste of time. (-) (0.56)

Students enjoy going to this class. (0.53)

Students "clockwatch" in this class. (-) (0.49)

Students are dissatisfied with what is done in the class. (-) (0.48)

Classes are interesting. (0.48)

The students look forward to coming to classes. (0.47)

Factor 4 Press toward Reproducing Expert Knowledge (Quantitative Learning) (4.7%) (= 0.87)

I feel I have to do what the lecturer/tutor tells me. (0.74)

I feel I have to work exactly as I am shown. (0.70)

I feel I have to copy what the lecturer/tutor does. (0.66)

I rely on the lecturer/tutor for new ideas. (0.59)

The lecturer/tutor encourages students to copy what he/she does. (0.58)

The lecturer/tutor encourages students to do what they are told. (0.57)

The lecturer/tutor encourages students to do their work exactly as they are shown. (0.57)

Factor 5 Press Toward Constructing Own Knowledge (Qualitative Learning) (3.2%) (= 0.84)

I feel I have to find links between the things I learn. (0.66)

I feel I have to try out new ideas. (0.65)

I feel I have to check my results against things I know. (0.58)

I feel I have to find out information for myself. (0.52)

The lecturer/tutor encourages students to find out things for themselves. (0.46)

The lecturer/tutor encourages students to check their results against things they know. (0.46)

The lecturer/tutor encourages students to find links between the things they learn. (0.41)

The lecturer/tutor encourages students to ask questions to check their results. (0.41)