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## The relationship between values and learning

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*Values are seen as antecedents of behaviour. The study reported has assumed that values have a direct influence on learning behaviour. Values that guide students' lives in their home countries are argued to influence the ways in which learning takes place in other countries. Ethnically Chinese students in Australia are the subjects of the study. Values have been measured on five occasions using the Chinese Value Survey (CVS) (Chinese Culture Connection, 1987). Approaches to study have also been measured on five occasions using the Study Process Questionnaire (SPQ) (Biggs, 1987). This paper considers the results of canonical correlation analysis using the four value scales of the CVS and the six SPQ scales. A strong first canonical factor is found in which a weighted combination of values is related to a weighted combination of learning motivations and strategies. The second pair of canonical factors relates low integrity values with a surface learning strategy. The third pair of canonical factors involves low Confucian values and a high deep learning strategy. The second and third canonical factors suggest that for some students their values and approaches to learning are changing during their period of study in Australia. This possible change in values and learning approaches warrants further investigation.*

canonical analysis, life values, learning strategies, Chinese Value Survey (CVS),  
Study Process Questionnaire (SPQ)

### INTRODUCTION

Values are seen as mediators of behaviour. The study reported here assumes that values have a direct influence on learning behaviour. Values that guide students' lives in their home countries will be considered to influence the way in which learning takes place. Feather (1986) points to evidence that value patterns have characterised nations and cultures within nations in history and Biggs (2001) has examined differences in learning approaches of different ethnic groups of students.

Ethnically Chinese students are the subjects of this study. Values have been measured on five occasions using the *Chinese Value Survey* (CVS) (Chinese Culture Connection, 1987) Approaches to study have also been measured on the same five occasions using the *Study Process Questionnaire* (SPQ) (Biggs, 1987). The question that arises is do students with different values have different approaches and styles of learning?

This paper considers the results of canonical correlation analysis using the four value scales of the CVS. They are Integrity, Confucian Ethos, Loyalty and Wisdom. The study examines the relationships between the four CVS scales and the six SPQ scales. The SPQ scales are Surface Motivation, Deep Motivation, Achieving Motivation, Surface Strategy, Deep Strategy and Achieving Strategy.

### **THE CHINESE VALUE SURVEY (CVS)**

The CVS was developed by Bond and his colleagues (Chinese Culture Connection, 1987) to measure life values that are peculiarly Chinese or Asian. It uses statements of values; for example, filial piety, the obedience and respect for parents and their financial support and honour and respect for ancestors. Other values measured are loyalty to superiors, knowledge/education and respect for tradition.

The CVS has been claimed by Bond and his colleagues (CCC, 1987) to measure Asian values more accurately than other values questionnaires such as that devised by Schwartz (1992). None of these other values questionnaires has sought to measure accurately values that are distinctly Chinese or Asian in nature. Even measurements taken of Chinese samples by Schwartz (1992) did not 'fit' well with assessments of values of people following a Westernised pattern of thinking.

Table 1 shows the value items of the four CVS scales that have been identified (Matthews, 2000). All the items have adequate positive loadings as estimated using confirmatory factor analysis using LISREL. These loadings are recorded for each item in Table 1.

The Integrity scale measures values such as industry, persistence, kindness and knowledge. The Confucian scale measures tolerance, loyalty to superiors, thrift and respect for tradition. The Loyalty scale measures filial piety, observation of rites and rituals and patriotism. The Wisdom scale measures humbleness, moderation or following the middle way and prudence.

### **The Study Process Questionnaire (SPQ)**

Biggs (1999) describes two distinct groups of learners: those who learn for the sake of knowledge acquisition and those who learn to gain a qualification. The first group learns using a deep approach. They study to learn and are motivated to go beyond the basic requirements for passing. Their learning involves a problem-solving approach and their interest carries them beyond a superficial understanding of what they are studying. These students are actively involved in the learning process and the process involves metacognitive activities that narrow any gaps in knowledge acquisition (Biggs, 1999). Learning in this manner is described by Marton & Säljö (1976a, 1976b, and 1996) in terms of phenomenographic understanding. It is a deep process and precipitates a broad involvement in the learning process itself.

Learning behaviour that is conceptually opposite to deep learning is described as 'surface learning'. It involves only as much as is needed to pass an examination or acquire a qualification. Learners using this approach do not achieve the cognitive levels of deep learning. They tend to be passive and uninvolved in the learning process itself. This is described as extrinsic learning or learning that takes place external to the individual, requiring little personal involvement. It is the diametric opposite of intrinsic or deep learning where the student is actively involved in the actual learning process. Education through deep learning involves conceptual change that goes beyond the basic acquisition of information. Whatever approach is undertaken, it is what the student does that is important. The teacher is only a facilitator, a person who enables learning activities and assists students to achieve desired outcomes (Biggs, 1999). Biggs calls learning designed to achieve the desired teacher and student goals a type of entrapment in a 'web of consistency that optimises the likelihood that students will become engaged in appropriate learning activities' (Biggs, 1999, p.64). He calls this network constructive alignment.

Table 1 Cvs Factor Values And Description (N=573)

| <b>CVS I INTEGRITY AND TOLERANCE</b><br>(Development of Self) |  | <b>_x</b>    | <b>CVS II Confucian Ethos</b><br>(Relationships with Others)     |                                     | <b>_x</b>    |
|---|--|--------------|--|-------------------------------------|--------------|
| 2   | Industry                               | 0.50         | 3  | Tolerance                           | 0.19         |
| 4   | Harmony                                | 0.04         | 6  | Loyalty to superiors                | 0.45         |
| 9   | Kindness                               | 0.35         | 16   | Benevolent authority                | 0.32         |
| 10  | Knowledge                              | 0.34         | 17   | Non-competitiveness                 | 0.45         |
| 13  | Self-cultivation                       | 0.48         | 22   | Keeping oneself pure                | 0.44         |
| 15  | Sense of righteousness                 | 0.47         | 23   | Thrift                              | 0.30         |
| 18  | Personal steadiness                    | 0.07         | 33   | Contentedness                       | 0.41         |
| 19  | Resistance to corruption               | 0.18         | 34   | Being conservative                  | 0.63         |
| 21  | Sincerity                              | 0.33         | 35   | Protecting your 'face'              | 0.49         |
| 24  | Persistence                            | 0.27         | 37   | Chastity in women                   | 0.31         |
| 25  | Patience                               | 0.68         | 38   | Having few desires                  | 0.56         |
| 28  | Adaptability                           | 0.45         | 39   | Respect for tradition               | 0.41         |
| 30  | Trustworthiness                        | 0.44         |  |                                     |              |
| 32  | Courtesy                               | 0.36         |  |                                     |              |
| 36  | A close friend                         | 0.17         |  |                                     |              |
|   |  | <b>=0.89</b> |  |                                     | <b>=0.83</b> |
| <b>CVS III Loyalty to Ideals</b><br>(Social Responsibility)   |  | <b>_x</b>    | <b>CVS IV Tolerance and Moral Discipline</b><br>(Worldly Wisdom) |                                     | <b>_x</b>    |
| 1   | Filial piety                           | 0.34         | 5  | Humbleness                          | 0.26         |
| 7   | Observation of rites and rituals       | 0.78         | 12   | Moderation-following the middle way | 0.36         |
| 8   | Reciprocation of greetings and favours | 0.68         | 14   | Ordering of relationships           | 0.66         |
| 11  | Solidarity with others                 | 0.43         | 26   | Repayment of good and/or evil       | 0.52         |
| 20  | Patriotism                             | 0.50         | 27   | Sense of superiority                | 0.53         |
| 31  | Having a sense of shame                | 0.35         | 29   | Prudence                            | 0.25         |
|   |  |              | 40   | Wealth                              | 0.14         |
|   |  | <b>=0.77</b> |  |                                     | <b>=0.69</b> |

### Learning objectives

Learning is criterion-referenced when the learning objectives are clearly understood by both students and teacher. The objectives may be hierarchical or structural in nature as in the SOLO taxonomy (Biggs & Collis, 1982). Thus levels of the SOLO taxonomy provide a hierarchical framework for learning objectives and the associated teaching and learning activities that may be teacher or self-directed. If teaching and the assessment of learning are aligned at the higher levels of the SOLO taxonomy, students tend to adopt a deep approach both to learning and assessment. This leads to changes in the students that are identified by Biggs (1999) as positive learning outcomes.

Table 2 summarises the approaches to learning in terms of a motivation and a complementary strategy for each approach. The characteristics associated with each approach are also listed. Each approach is divided into affective and cognitive groups that form congruent motive-strategy combinations. The essentials of the three approaches are described as follows: if the goal is to avoid failure, learn key facts and principles verbatim, a

surface approach is involved. If the goal is to satisfy curiosity, a need to understand what was going is required, a deep approach is involved. If the goal is to maximise grades, the student needs to make best use of time; an achieving approach is involved. The SPQ is designed to assess students' intentions and perceptions of learning. (Biggs, 2001).

### BACKGROUND TO THE ANALYSIS

Canonical analysis is able to analyse two sets of data simultaneously to see if there are strong and meaningful links between the data. The analysis undertaken in this study has been carried out to investigate the relationships between values and approaches to study.

*Table 2 Motive and Strategy in Approaches to Learning*

| Approach             | Motive  | Strategy   |
|----------------------|---|--|
| <b>SA: Surface</b>   | <b>Surface Motivation (SM)</b> is instrumental: to meet requirements minimally; a balance between working too hard and failing.                 | <b>Surface Strategy (SS)</b> is reproductive: to limit target to bare essentials and reproduce through rote learning.                |
| <b>DA: Deep</b>      | <b>Deep Motivation (DM)</b> is intrinsic: study to actualise interest in what is being learned; to develop competence in academic subjects.     | <b>Deep Strategy (DS)</b> is meaningful: read widely, inter-relating with previous relevant knowledge.                               |
| <b>AA: Achieving</b> | <b>Achieving Motivation (AM)</b> is based on competition and ego-enhancement: to obtain highest grades, whether or not material is interesting. | <b>Achieving Strategy (AS)</b> is based on organising time and working space; to follow up suggestions; behave as a 'model' student. |

Following Biggs, J. B. (1987a). and Murray-Harvey (1994).

Canonical correlation analysis has been selected as the statistical procedure for the analysis in this paper because it permits the analysis of two sets of variates simultaneously. It allows the examination and testing of the significance of the relationships between the sets of data. The purpose of the analysis is to investigate whether life values and learning are related to one another. Canonical correlations analysis using the SAS (1985) computer program is the preferred analytical tool as it is able to demonstrate clearly whether significant correlations exist between the two sets of measures.

Canonical variate analysis is a multivariate analytical procedure that was first developed about 1935 by Hotelling but remained largely unused because of the complexity of the computations involved in the analysis. With the advent of electronic calculators and computers, canonical variate analysis emerged as the procedure that has become the general analytic method from which parametric statistical procedures such as analysis of variance, principal components factor analysis and regression have been derived. The term 'variate', first used by Bartlett (1941), refers to observed measures and the term 'variable' to latent constructs that are formed from measured observations (Keeves & Thompson, 1997).

Canonical variate analysis is particularly useful in the study of the relationship between sets of variates. The procedure is able to analyse not only the relationships within a set, but also the relationships between the sets as well as the degree of overlap or redundancy between the sets of variates. One set of variates may also act as a predictor for the other set of variates. Moreover, canonical variate analysis may be used when either or both sets contains variates that are continuous, categorical or mixed (Keeves & Thompson, 1997).

In canonical analysis, the variates on each set are weighted to form the first pair of variables. The canonical correlation between this pair of variables is the highest. The second canonical correlation is the highest that can be found between the *X* and *Y* weighted composites that are uncorrelated or orthogonal with the first pair of variables. The significance of each pair of

correlations may be tested using Wilks' lambda and an  $F$  ratio. Likewise, a third or more pairs of canonical variables may be identified and tested to assess whether they are significantly related.

The canonical correlation coefficient between each pair of canonical variables describes the strength of the relationship between the pairs of latent variables. The square ( $R^2$ ) of this relationship estimates the amount of variance of one latent variable that is predictable from the other latent variable in the pair. The relationship between the two latent variables that form a pair may be viewed as causal and therefore unidirectional, whereby the latent  $X$  variable forms a causal link with its paired  $Y$  latent variable. Measures of redundancy are used to examine commonality between blocks of variates in an analysis (Cooley & Lohnes, 1971, 1976; Keeves, 1975, 1986; Keeves & Thompson, 1997; Pedhazur, 1997).

### Transformation weights and structure coefficients

There are two types of coefficients that help in the interpretation of canonical variate analysis. These are the transformation weights and structure coefficients. The transformation weights are assigned to the variates that form the latent variable in the linear combination of variates. Structure coefficients are the correlations between the derived variables and the original variates. The structure coefficients are loadings that enable the pairs of variables to be identified and related to their respective variates. The sum of the squared structure coefficients enables the proportion of variance estimated by each factor to be calculated (Keeves & Thompson, 1997).

Transformation weights and structure coefficients assist in attaching meaning to canonical variates. The transformation weights are assigned to the original variates that make up the predictor and criterion sets of variables. The coefficients help to identify the related variables in the predictor and criterion sets and are particularly useful in seeking relationships between the original variables and the derived canonical variables (Tatsuoka, 1973).

### Variance

Redundancy measures the proportion of variance of a set of variates that is predictable from its paired canonical latent variable.

## RESULTS

### Relationships between the latent variables

Table 3. Canonical Analysis: Tests Of Successive Latent Roots

| Number of roots        | Canonical R | $R^2$ | Approx $F$ | df     | p <  |
|------------------------|-------------|-------|------------|--------|------|
| 1                      | 0.40        | 0.16  | 8.99       | 24     | 0.01 |
| 2                      | 0.35        | 0.11  | 7.23       | 15     | 0.01 |
| 3                      | 0.24        | 0.06  | 4.78       | 8      | 0.01 |
| 4                      | 0.10        | 0.01  | 1.77       | 3      | N.S. |
| Overall analysis       |             |       |            |        |      |
| Statistics             | Value       | F     | Num df     | Den df | p <  |
| Wilks' Lambda          | 0.695       | 8.99  | 24         | 1965   | 0.01 |
| Pillai's Trace         | 0.340       | 8.77  | 24         | 2264   | 0.01 |
| Hotelling-Lawley Trace | 0.389       | 9.11  | 24         | 2246   | 0.01 |

N.S = not significant

The statistical analysis was undertaken using SAS (1985). Table 3 shows the results of the tests of successive latent roots for statistical significance. Three of the four possible roots are found to be significant when  $p$  is  $<0.01$ . The fourth root is not significant at the 0.05 level. The table also gives values for Wilks' Lambda, Pillai's Trace and the Hotelling-Lawley Trace. These are all measures of overall statistical significance of the canonical analysis.

In the testing of the successive latent roots, the first pair shows a significant relationship and a moderate degree of correlation (0.40). The second pair of variables is significantly correlated (0.35) and is set orthogonal to the first pair. The third pair is also orthogonal to the other two pairs and the two latent variables are significantly correlated (0.24). The canonical correlation ( $R$ ) describes the strength of the relationship between the latent variables. The square of this relationship ( $R^2$ ) describes the proportion of variance of one latent variable predictable from the other latent variables in the same set (Keeves & Thompson, 1997)

### Relationships between the latent variables and the observed variables

Table 4 records the transformation weights, the structure coefficients and the variance extracted for the canonical variables. The transformation weights are the predictor variables and are marked with the letter 'U'. The transformation weights are the numerical paths that link the predictor variates to the predictor latent variables. The structure coefficients are listed under the criterion variables and are marked with the letter 'V'. The structure coefficients are the path between the latent criterion variables and the criterion measures. The predictor variates have paths connected to the latent predictor variables.

Table 4 Transformation Weights and Factor Structure Coefficients of Canonical Variates

| Predictor measures        | Transformation weights (U)• |                |                | Structure coefficients (V)† |                |                |
|---------------------------|-----------------------------|----------------|----------------|-----------------------------|----------------|----------------|
|                           | U <sub>1</sub>              | U <sub>2</sub> | U <sub>3</sub> | V <sub>1</sub>              | V <sub>2</sub> | V <sub>3</sub> |
| INTEGRSC                  | 0.22                        | -1.29          | 0.22           | 0.76                        | -0.64          | 0.09           |
| CONFURSC                  | 0.18                        | 0.05           | -1.25          | 0.71                        | 0.01           | -0.70          |
| LOYALRSC                  | 0.35                        | 0.50           | 0.32           | 0.82                        | 0.03           | 0.19           |
| WISDOMRS                  | 0.48                        | 0.61           | 0.52           | 0.87                        | 0.27           | 0.08           |
| <b>Variance extracted</b> | 0.63                        | 0.12           | 0.14           |                             |                |                |
| Criterion measures        | U <sub>1</sub>              | U <sub>2</sub> | U <sub>3</sub> | V <sub>1</sub>              | V <sub>2</sub> | V <sub>3</sub> |
| SURMOTRS                  | 0.42                        | -0.01          | 0.47           | 0.61                        | 0.37           | 0.18           |
| DEEPMOTR                  | 0.20                        | -0.68          | -0.04          | 0.54                        | -0.50          | 0.25           |
| ACHMOTRS                  | -0.12                       | 0.57           | 0.61           | 0.45                        | 0.50           | 0.42           |
| SURSTRRS                  | 0.30                        | 0.51           | -0.73          | 0.61                        | 0.62           | -0.27          |
| DEEPSTRR                  | 0.08                        | 0.09           | 0.75           | 0.41                        | -0.25          | 0.59           |
| ACHSTRRS                  | 0.62                        | -0.30          | -0.52          | 0.77                        | -0.26          | -0.07          |
| <b>Variance extracted</b> | 0.33                        | 0.19           | 0.12           |                             |                |                |
| Canonical R               | 0.40                        | 0.34           | 0.24           |                             |                |                |
| Canonical R <sup>2</sup>  | 0.16                        | 0.11           | 0.06           |                             |                |                |
| ‡Redundancy               | 0.05                        | 0.02           | 0.01           |                             |                |                |

Transformation weights  $f > 0.10$ ; †structure coefficients  $f > 0.40$  underlined; ‡Redundancy of criteria given predictor/latent variable

The first predictor latent variable is a general values factor. The second predictor latent variable involves the contrasting relationship between wisdom and loyalty with integrity and the third predictor latent variable involves the Confucian factor contrasted with the loyalty and wisdom.

The first criterion latent variable is concerned with general learning style. The second criterion canonical factor involves achieving motivation and surface strategy contrasted with deep motivation. The third latent variable involves achieving motivation and deep strategy.

**Path Diagram**

Figure 1 shows a path diagram of the canonical correlation analysis following an approach suggested by Keeves, (1975, 1986). Four sets of predictors that comprise the four groups of values from the *Chinese Values Survey* (CVS) give rise to a single latent variable that is labelled 'Values'. This relates to the criterion latent variable called 'Learn'. Learn involves the six criterion variates that are concerned with the learning styles proposed by Biggs, (1987b) for the *Study Process Questionnaire* (SPQ). The path coefficients for Values are the transformation weights for the first predictor factor and are shown in Figure 1. The path coefficients associated with Learn are given by the structure coefficients from the latent variable Learn, with a residual effect that is due to exogenous disturbance (Keeves, 1975).

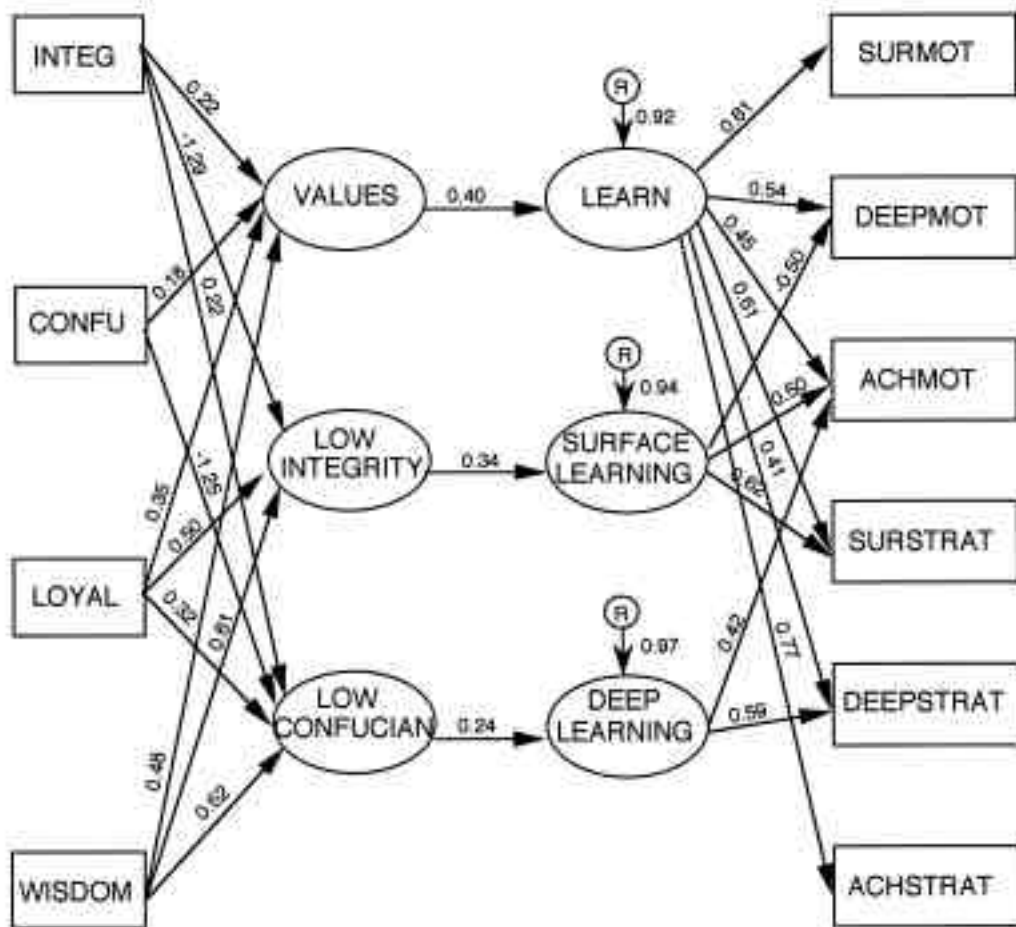


Figure 1 Path diagram showing the correlation between values and learning

The second latent variable, Low Integrity involves three predictor variates, integrity, loyalty and wisdom. The path coefficients for Low Integrity are the transformation weights involved in forming the second predictor variable and are shown in Figure 1. The path coefficients associated with the second criterion factor are given by the structure coefficients that come from the latent variable Surface Learning. Surface Learning involves three variates associated with learning styles, achieving motivation and surface strategy with positive correlations and deep motivation with a negative correlation.



The second factor shows that students who have low integrity values tend to be surface learners. They are low in values such as persistence, industry and sincerity but relatively high in values associated with wisdom and loyalty such as moderation or following the middle way, filial piety, a sense of superiority, having a sense of shame and prudence. These students show a high level of achieving motivation and highly developed surface strategies in their learning. The same students show poorly developed deep learning motivations. They prefer to learn only what is needed to pass examinations or gain qualifications. They do not appear to have a deep commitment to study *per se*.

The third latent variable, Low Confucian, involves predictor variates Confucian ethos and loyalty. This latent variable is formed with the transformation weights given for these variates in Table 3 and the path coefficients for Low Confucian are the transformation weights for the third criterion factor that are shown in Figure 1. The path coefficients associated with the third criterion factor are given by the structure coefficients that come from the latent variable Deep Learning. Deep Learning involves two variates with strong coefficients (values > 0.40), deep strategy and achieving motivation. These are the learning styles associated with low Confucian values.

In contrast, students who are low in Confucian values such as tolerance, non-competitiveness and being conservative, are relatively high in loyalty values such as observation of rites and social rituals and solidarity with others, filial piety and having a sense of shame and on wisdom values such as humbleness, prudence and the ordering of relationships. They show high levels achieving motivation to learn as well as well developed deep learning strategies. These students find it easier to adjust to the ideas and constructs associated with problem-based learning prevalent in the Western university settings in Australia. Their commitment to knowledge and learning for the sake of inquiry into new and different areas of study is likely to enable these students to adapt quickly and easily to university life in Australia.

### ***Redundancy***

The results recorded in Table 4 show that the largest contribution to the explained variance for the predictor variables is 63 per cent for the first predictor variable or general values factor, 12 per cent for the second predictor variable and 14 per cent for the third predictor variable. The largest variance for the criterion variables is extracted by the general learning factor of 33 per cent. The second factor accounts for 19 per cent and the third for 12 per cent of the variance.

The redundancies of the criterion variables given the predictors are five, two and one per cent respectively. This indicates that the general values factor explains five percent of the variance of the six learning factors. The Low Integrity and Low Confucian factors only set of variates respectively.

## **DISCUSSION OF RESULTS**

### **What constitutes good learning**

In Australian universities the teacher's role is to engage students in meaningful learning activities that lead to the desired learning outcomes. The teacher should only facilitate the learning process; it is the student who must actively engage in this process for its successful completion. Therefore what the student does is more important than what the teacher does. By implication, there must be active involvement on the student's part for learning to occur. Learner involvement necessitates a problem-based or deep approach to learning rather than a surface approach to maximise optimal engagement by teachers and learners in order to ensure appropriate learning activities and positives outcomes (Biggs, 2001).

This view of learning refers to Biggs' (2001) concepts of what constitutes good learning and what are the optimal conditions for positive outcomes from a Western perspective. This view may require some modification where the Asian learner is concerned. Biggs (1996), Stevenson and Stigler (1992) and others have noted that success and failure in Confucian Heritage Cultures (CHC) is attributed primarily to effort and secondarily to ability. Ability helps but effort is thought to overcome most obstacles to learning. The Chinese proverb, 'failure is the mother of success' encapsulates and underscores CHC thinking. There is an importance of effort in the learning process.

The results obtained from canonical analysis show that lower Confucian values are associated with a deep learning strategy as well as high achieving motivation. In addition lower values associated with integrity and tolerance are related to a surface learning strategy with high achieving motivation but with lower deep motivation.

### CONCLUSION

Canonical correlation analysis has shown that two seemingly disparate areas of study, namely, values and approaches to learning, may be analysed and interrelated. The results of the analyses undertaken are statistically significant. Other analyses in this study show clearly that some life values and learning strategies of CHC students studying in Australian universities change over time. This study shows that in general, students with higher values have strong learning strategies. However, students who are low on Confucian values use a deep learning strategy and manifest a strong motivation to achieve and succeed in their studies. Moreover, students who are low in integrity values use a surface learning strategy. They are high in achieving motivation but low on deep motivation. The question awaiting further analysis is whether there is evidence of change in the values and learning strategies of particular groups of students during their periods of study in Australia.

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