

**A COMPARATIVE STUDY OF THINKING STYLES AMONG MALAYSIAN AND
BRITISH STUDENTS IN HIGHER EDUCATION**

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Abstrak

Gaya pemikiran telah didefinisikan sebagai cara bagaimana individu menggunakan kebolehan memproses maklumat yang ada pada dirinya. Diandaikan bahawa gaya pemikiran dipelajari dan merupakan hasil interaksi antara individu dan persekitaran sosialnya. Kajian ini menggunakan Skala Thinking Styles Inventory (TSI) untuk mengukur 13 gaya pemikiran yang terkandung dalam teori pengurusan mental sendiri. Sampel kajian terdiri daripada 242 pelajar universiti dengan umur purata 21 tahun, dari dua buah universiti di Malaysia dan United Kingdom. Keputusan kajian menunjukkan bahawa pelajar tempatan lebih menggunakan gaya pemikiran berbentuk eksekutif, hierarki, lokal, luaran dan konservatif, sedangkan pelajar United Kingdom lebih menunjukkan gaya pemikiran legislatif, dalaman dan liberal. Perbezaan signifikan didapati antara pelajar United Kingdom yang lebih menggunakan gaya pemikiran dalaman dan pelajar tempatan yang lebih menggunakan gaya pemikiran eksekutif, monarki, hierarki dan oligarki. Perbezaan jantina juga diperhatikan apabila pelajar lelaki didapati lebih menggunakan gaya pemikiran liberal berbanding dengan pelajar wanita. Analisis faktor juga menunjukkan perbezaan antara pelajar tempatan dan pelajar British. Data tempatan menghasilkan tiga faktor sedangkan data United Kingdom menghasilkan empat faktor. Perbezaan tersebut diandaikan disebabkan oleh proses sosialisasi yang berbeza. Keputusan kajian dijangka membawa implikasi bagi para pendidik dan juga pelajar.

INTRODUCTION

The launching of the government initiative to develop a Knowledge-based Economy (Knowledge-based Economy Master Plan, 2002) has focused attention on the nation's ability to successfully utilize knowledge. The K-economy requires workers who are flexible, innovative, creative and independent learners (Akgun, Lynn & Byrne, 2003; Cusimano, 1995; Davenport, Thomas & Cantrell, 2002; Garrick & Clegg, 2000; Hayes & Allinson, 1998; Smith, 2000).

Knowledge acquisition and creation have been investigated by studying individual differences in thinking styles. As Malaysia prepares to enter the Knowledge Era it is

now appropriate to research and document thinking styles, in particular amongst students in higher education who are just one step away from entering the workforce. Accordingly, the objectives of this study are to assess the suitability of an instrument to measure thinking styles, construct a profile of preferred thinking styles within a group of Malaysian university students, and to compare the Malaysian profile with that of thinking styles among a group of British university students. The influence of demographic factors such as age and gender is also investigated.

Thinking styles refer to relatively stable ways of processing information (Riding & Rayner, 2002) and are closer in meaning to cognitive rather than learning styles. Cognitive style has been defined as a person's preferred way of gathering, processing and evaluating information, whereas learning style refers to the organizing and processing of information leading to changes in knowledge and skills (Hayes & Allinson, 1998). Learning styles are therefore linked to particular outcomes whereas cognitive styles indicate predispositions in information processing. Thinking styles refer to preferred ways of using the abilities one has (Sternberg, 1997). These styles are learnt through socialization when children observe adults or other role models and then internalize the attributes observed.

Generally an individual has a cluster or profile of thinking styles and not just one thinking style. The effectiveness of thinking styles is determined by the match between thinking styles and the cognitive demands of the task. The closer the fit between thinking styles and task demands, the more successful the individual is in accomplishing that task. Stylistic flexibility is also an important attribute, since the demand for particular thinking styles varies with different tasks. The person with the most effective performance is one who can successfully acquire a repertoire of various styles and then successfully match thinking styles with cognitive demands in a variety of situations. The implication for education is that styles that are learnt can also be taught such that individuals become versatile in using thinking styles.

Sternberg's theory of thinking styles is based on an analogy with ways of governing society (Sternberg, 1997). He proposed that just as societies wish to regulate activities, similarly there are many ways humans could govern their everyday activities. The theory of mental self-government consists of 13 thinking styles falling along five dimensions. These are (1) functions of mental self-government consisting of the legislative, executive and judicial thinking styles, (2) forms of mental self-government consisting of the monarchic, hierarchic, oligarchic and anarchic thinking styles, (3) levels of mental self-government consisting of the local and global thinking styles, (4) scope of mental self-government consisting of the internal and external thinking styles and (5) leanings of mental self-government where the individual would show a preference for either a liberal or conservative thinking style.

Each thinking style reflects an inclination for particular types of tasks or ways of working (Sternberg, 1997; Sternberg & Zhang, 2001). The legislative style of thinking reflects a preference for tasks that challenge accepted views and favor creativity; the executive style is associated with an interest in implementation; and the judicial style

reflects the tendency to be evaluative. The four forms of mental self-government refer to preferences in work structuring: the monarchic style indicates a preference to concentrate fully on one task at a time, the hierarchic style is associated with distributing attention amongst several prioritized tasks, the oligarchic style indicates a preference for working towards several objectives at the same time and may be associated with difficulty setting priorities; and the anarchic thinking style indicates a desire for flexibility in structuring the task at hand. The local style indicates a preference for detailed work, whereas the global style indicates a preference for abstract ideas and broader perspectives. The internal style individual enjoys working independently and the external style individual prefers interaction with others. Finally the liberal style of thinking is best matched to tasks requiring novelty and ambiguity, while the conservative style indicates a tendency to adhere to existing rules and guidelines in performing tasks. As with effective government, effective thinking involves using a variety of thinking styles appropriate to the task and consistent with personal preference.

Research using the Thinking Styles Inventory (Sternberg & Wagner, 1997) has been carried out in Hong Kong (Zhang, 1999, 2001a, 2004; Zhang & Postiglione, 2001; Zhang & Sachs, 1997); mainland China (Zhang, 2001c, 2002b, 2005); the United States (Zhang, 2000, 2002a); Spain (Cano-Garcia & Hughes, 2000); Norway (Fjell & Walhovd, 2004); the Philippines (Bernardo, Zhang & Callueng, 2002); and India (Verma, 2001). The TSI has demonstrated satisfactory levels of reliability and validity in all these studies and can be considered a practical measure.

The results of empirical studies using the TSI have highlighted the traditional nature of educational institutions. The executive, conservative and internal thinking styles have been shown to contribute to academic achievement among Hong Kong, Filipino and Spanish university students (Bernardo et al, 2002; Cano-Garcia & Hughes, 2000; Zhang, 2002b). Conversely, negative relationships have been reported in these studies between the legislative, liberal and global thinking styles and academic achievement. Zhang (2001b) has shown that thinking styles contribute to academic achievement beyond self-rated abilities on analytic, creative and practical intelligence among Hong Kong secondary school students. It has been suggested that biases in the education system favor the tendency to follow guidelines (conservative), link learning directly to experience (executive) and work independently (internal).

Research has also shown that high school students tend to obtain better academic achievement scores when their thinking styles match the thinking styles of their teachers (Zhang, 2001b). Differences have also been found between thinking styles and domains or field of studies (Zhang, 1999; Zhang & Sachs, 1997) with natural science and technology students scoring significantly higher on the global and legislative thinking styles as compared to social science and humanities students. Support for thinking styles as partly socialized has come from the significant effect of travel and work experience on the hierarchic, external, global, legislative and liberal thinking styles as reported by Hong Kong university students (Zhang, 1999; Zhang & Postiglione, 2001).

Gender differences have been observed among students in Hong Kong, the US and

mainland China with males tending to score higher on legislative, liberal and judicial thinking styles (Zhang, 2001a, 2002a, 2002b). The early studies did not find any significant gender differences (Zhang, 1999; Zhang & Postiglione, 2001; Zhang & Sachs, 1997) but did however find a significant effect for age. Older students were found to be significantly more judicial, legislative, hierarchic and global while younger students were significantly more conservative.

A unique finding was the difference reported by Verma (2001) between professional, non-professional, rural and urban students. Non-professional students scored significantly higher on the oligarchic and anarchic thinking styles, while professional students scored significantly higher on the global thinking style. Rural students scored higher on the hierarchic and lower on the oligarchic style compared to urban students. The differing pattern of thinking styles may be a reflection of varying socioeconomic influences on socialization and development of preferred channels of information processing. The effect of differing social environment may also extend to culture. Sternberg (1997) has suggested that cultural differences in thinking styles may be evident such that cultures favoring individualism are thought to encourage the development of legislative, liberal and internal thinking styles, whereas collectivistic cultures would encourage development of the executive, conservative and external thinking styles. However, it must be noted that sociocultural influences may be moderated by the almost universal tendency of educational institutions to emphasize conformity and obedience.

The conceptual basis for thinking styles may be found in cognitive development theory. The move to form a bridge between the individual differences approach with the cognitive developmental approach began with the categorization of the 13 thinking styles into three Types (Zhang, 2001a, 2001b, 2002a). The legislative, judicial, global, hierarchic and liberal thinking styles were categorized as Type I thinking styles reflecting creativity and requiring complex cognitive processing. People who prefer these thinking styles are characterized as norm-challenging and risk-taking.

On the other hand, the Type II category of thinking style is thought to require more simplistic information processing with a tendency towards norm favoring and/or authority orientation. Thinking styles in this second category include the executive, local and conservative styles.

The remaining anarchic, oligarchic, internal and external thinking styles were categorized as Type III. This last category of styles is thought to be value neutral and could be used at both higher and lower level of cognitive complexity (Zhang, 2005).

Support for this classification of thinking styles has come from studies reporting positive significant correlations between Type I thinking styles and self-esteem and a significant negative correlation between the conservative thinking style (Type II) and self-esteem (Zhang, 2001a; Zhang & Postiglione, 2001) among Hong Kong university students. Higher self-esteem is thought to boost confidence such that students would be encouraged to use their abilities in more creative and norm-challenging ways (Type I thinking styles) while lower self-esteem would be associated with the tendency to avoid making mistakes by staying close to established guidelines (Type II thinking styles). A

study of the relationship between thinking styles and the dimension of holistic-analytic thinking among a sample of 212 US university students found significant associations. Styles requiring greater cognitive complexity such as the legislative, judicial, global and liberal thinking styles tended to cluster together with holistic thinking. The more conservative analytic style of thinking factored together with the executive, local and conservative thinking styles (Zhang, 2002a).

A stronger association between thinking styles and cognitive development has been found in a study using Perry's theory of intellectual and ethical development. In studying the epistemological development of a group comprising Harvard University undergraduate men, the Perry scheme postulates an increasingly complex conception of knowledge develops as the student progresses from dualism to multiplicity and to relativism before stabilizing beliefs at the commitment stage (West, 2004). Zhang (2004) found significant correlations between dualism and the executive and conservative (Type II) thinking styles whereas students at the relativistic level of cognitive development reported significant correlations between a wider range of thinking styles from Type I, II and III categories. Thus it was concluded that students at the early stage of cognitive development tended to employ a narrower range of thinking styles that are norm-favoring and require more simplistic information processing, whereas students at the next higher stage of cognitive development tended to employ a wider range of thinking styles. The commitment level of cognitive development was not included in this study as it was thought that very few university students would reach this level.

This pattern of relationship between cognitive development and complex thinking styles was also found in a cross-cultural comparison of the relationship between thinking styles and analytic, creative and practical abilities among university students in Hong Kong, mainland China and the United States (Zhang, 2005). Both Hong Kong and mainland Chinese university students indicated that Type I thinking styles were predicted by analytic and practical abilities, whereas Type II thinking styles were only predicted by practical ability. Among US university students it was found that creativity predicted the legislative thinking style, while analytic ability predicted the judicial and hierarchic thinking styles. Cultural differences were also observed with the global and liberal thinking styles being predicted by creative and analytic ability among US students, whereas reverse results were indicated by both Hong Kong and mainland China students. Thus it appears that there are some empirical grounds for categorizing thinking styles into Types that are more cognitively complex. However, the results are not consistent across cultures and require further investigation.

The objective of this study is to measure thinking styles in two cultures previously unexplored. The reliability and validity of the Thinking Styles Inventory in two samples of university students in Malaysia and Britain are assessed first before comparisons are made between the two groups of participants. Factor analysis of the data would indicate the extent to which categorization of thinking styles into Types is consistent across cultures. Age and gender influences are also investigated.

METHODOLOGY

Participants

Students from two universities in Malaysia (Kuala Lumpur) and the United Kingdom (London) participated in this study. Among the 242 participants, 196 were female students and 42 were male, with 4 students who did not indicate gender. The age of participants ranged from 17 to 42 years, with a mean age of 21 years. Participants were all undergraduate students in their first year of study in the social sciences.

Measures

All participants responded to the Thinking Styles Inventory (TSI) (Sternberg, 1997). The short version of the TSI is a self-report test consisting of 65 statements with each set of five statements assessing one of the 13 thinking styles. Participants were required to rate themselves on a 7-point scale with 1 indicating that the statement does not characterize them at all and 7 indicating that the statement represents them extremely well. In the present study all five dimensions of mental self-government were measured as this is the first time the inventory has been used in both countries. To cater for language differences, the TSI was translated and back translated to create a version in Bahasa Melayu, the language of instruction in Malaysia. Questionnaire items for Malaysian students were presented in both Bahasa Melayu and English, while British participants were presented with the English version.

RESULTS

Scale Reliabilities

The alpha coefficients for the Malaysian sample were all above .50, ranging from .55 to .85, indicating reasonable internal consistency. Examination of the item-total correlations on three sub-scales of thinking styles indicated that reliability could be further increased by deleting one item in each sub-scale. In the monarchic sub-scale, removal of item 30 (When trying to make a decision, I tend to see only one major factor) raised the alpha reliability coefficient from .57 to .62. Similarly in the oligarchic sub-scale, removing item 32 (When I have many things to do, I split my time equally among them) increased the alpha value from .55 to .60. Removal of item 63 (I like to memorize facts and bits of information without any particular context) in the local sub-scale increased alpha from .61 to .73. Reliability coefficients for the British sample were more varied, ranging from .27 to .81. Alpha coefficients for both samples are presented in Table 1A of the Appendix. In the British sample, three scales reporting low reliabilities were the oligarchic (.27), anarchic (.48) and local (.48) sub-scales. For the anarchic and local sub-scales, removal of

item 20 (I like to tackle all kinds of problems, even seemingly trivial ones.) and item 24 (I like to deal with specific problems rather than general questions.) respectively, raised reliability coefficients to .53 and .56 respectively. The low validity item in the oligarchic sub-scale was item 32 which was also the item that indicated low validity in the Malaysian sample. In the British data, removal of item 63 improved reliability from .27 to .41. These items were removed from subsequent analyses.

Inter-scale Correlations

Pearson inter-scale correlations are shown for both samples in Tables 2A and 3A in the Appendix. The Malaysian sample indicated significant correlations between many of the sub-scales with strong associations observed in the expected direction. The monarchic style correlated more highly with the hierarchic (.62) thinking style as compared to its correlations with the oligarchic (.23) and anarchic (.37) thinking styles. Similarly an inverse significant correlation was observed between the internal and external thinking styles sub-scales. The inter-scale correlations observed for the British sample showed fewer significant correlations. Those correlations that were significant indicated patterns of associations in expected directions as predicted by the theory of mental self-government. For example, the legislative sub-scale was significantly positively correlated with the judicial (.40) but not the executive (.01) sub-scale. Further support was evident in the significant negative correlations between the global and local (-.47) sub-scales, the internal and external (-.33) sub-scales and the liberal and conservative (-.57) sub-scales. As a whole, both sets of data have indicated associations in support of the theory of mental self-government (Sternberg, 1997), thus indicating that the TSI is a reliable and valid measure for use in both groups of participants. The differences observed between both groups in the pattern of associations in inter-scale correlations suggest that British students have clearer preferences in their use of thinking styles. The less distinct preferences shown by the Malaysian sample indicate the tendency to use a greater variety of thinking styles or the unwillingness to commit to any particular set of thinking styles.

Inter-group Comparison

Table 1 indicates means and standard deviations for each of the 13 sub-scales of thinking styles for both groups of participants. Analysis of variance between the groups indicated significant differences in three of the five dimensions of the TSI.

Table 1
Sample Means and Standard Deviations of the TSI

| Sub-scales | Malaysian sample (n=154) | | British sample (n=88) | |
|--------------|-----------------------------|------|--------------------------|------|
| | Mean | SD | Mean | SD |
| Legislative | 24.22 | 4.99 | 24.27 | 3.39 |
| Executive | 26.17 | 4.54 | 24.15 | 4.43 |
| Judicial | 22.44 | 4.95 | 23.21 | 3.93 |
| Monarchic | 23.16 | 4.30 | 21.95 | 3.81 |
| Hierarchic | 25.88 | 4.85 | 24.41 | 4.44 |
| Oligarchic | 21.59 | 4.34 | 20.39 | 3.48 |
| Anarchic | 21.46 | 4.77 | 20.64 | 3.78 |
| Global | 18.79 | 4.39 | 18.68 | 3.89 |
| Local | 21.43 | 4.59 | 22.03 | 3.70 |
| Internal | 20.72 | 6.02 | 23.39 | 4.30 |
| External | 24.23 | 4.79 | 23.27 | 3.86 |
| Liberal | 21.17 | 5.44 | 21.57 | 4.74 |
| Conservative | 21.21 | 4.15 | 20.50 | 4.71 |

The strongest difference was observed in the use of the internal thinking style ($F_{1229}=13.04, p<.01$) with British students being significantly more internal than Malaysian students. A significant difference was also observed on the executive thinking style ($F_{1234}=11.13, p<.01$) where Malaysian students showed a significant preference for the executive thinking style compared to British students. The greatest number of significant differences were observed in the form dimension of mental self-government where Malaysian students showed a significantly higher preference for the monarchic ($F_{233}=4.65, p<.05$), hierarchic ($F_{1232}=5.41, p<.05$) and oligarchic ($F_{1230}=4.71, p<.05$) thinking styles. There were no significant differences on any of the remaining thinking styles. Based on these significant differences observed it was decided to perform independent factor analysis on the two samples.

Factor Analysis

Sub-scales in both samples were independently subjected to principal components factor analysis with varimax rotation. Factors with eigenvalues greater than 1 were retained. The results are shown in Tables 2 and 3. By this criterion it was possible to identify 3 factors from the Malaysian data. Factor 1 showed high loadings on the executive, judicial, hierarchic, local and liberal thinking styles.

Table 2
Rotation Component Matrix for the Malaysian Sample

| Sub-scales | Factor 1 | Factor 2 | Factor 3 |
|-------------|----------|----------|----------|
| Legislative | .67 | .31 | .41 |
| Executive | .88 | | |
| Judicial | .82 | | |
| Monarchic | .70 | | |
| Hierarchic | .86 | | |
| Oligarchic | .22 | .81 | |
| Anarchic | .56 | .59 | |
| Global | | .85 | |
| Local | .82 | | |
| Internal | .34 | .33 | .79 |
| External | .42 | .34 | -.74 |
| Liberal | .73 | .27 | |

Table 3
Rotation Component Matrix for the British Sample

| Sub-scales | Factor 1 | Factor 2 .76 | Factor 3 | Factor 4 |
|---------------------|----------|--------------|----------|----------|
| Legislative | .29 | | | |
| Executive | .86 | | | .22 |
| Judicial | | .68 | | .24 |
| Monarchic | .80 | | | -.21 |
| Hierarchic | .86 | .20 | | |
| Oligarchic | | | .76 | .37 |
| Anarchic | | .33 | .76 | |
| Global | .58 | .45 | .00 | |
| Local | | | -.36 | |
| Internal | | .50 | | -.77 |
| External | | .32 | .21 | .79 |
| Liberal | -.43 | .77 | | |
| Conservative | .89 | -.31 | | |
| % Variance | 29.92 | 18.90 | 16.69 | 9.29 |
| Cumulative variance | 29.92 | 48.82 | 65.51 | 74.80 |
| Eigenvalues | 3.89 | 2.46 | 2.17 | 1.21 |

The highest loadings in Factor 2 were for the oligarchic and global sub-scales, while Factor 3 was dominated by loadings on the internal and external sub-scales. These 3 factors together accounted for 68.51% of variance. The British sample yielded a four factor solution explaining 74.80% of variance.

Factor 1 showed highest loading for the executive, monarchic, hierarchic and conservative sub-scales. Factor 2 showed high loadings on the legislative, judicial and liberal sub-scales. Factors 3 and 4 were similar to Factors 2 and 3 observed for the Malaysian sample, in that they were dominated by the oligarchic and global sub-scales and the internal and external sub-scales respectively. The factors found in both samples indicate some commonalities and differences. One similarity is the clustering of the executive, hierarchic and local thinking styles in Factor 1 of both samples. A significant difference of preferences observed was in the second factor of the British sample. The clustering in Factor 2 of the British data consisting of the legislative, judicial and liberal thinking styles is unique in that this particular combination is not observed in the Malaysian data. A comparison between these results and the Type classification of previous studies will be undertaken in the following discussion.

Gender and Age Effects

Female students were predominant in both groups of students. The Malaysian sample consisted of 82% female students and 18% male students, whereas the British sample consisted of 83% female students and 17% male students. Taking into consideration the probable impact of culture on gender roles, it was decided to analyze gender effects independently for the two samples. In the Malaysian sample the most significant gender difference was observed on the liberal sub-scale, where male students reported significantly more use of the liberal thinking style as compared to female students ($F_{j\ 144}=8.42, /K.01$). Other significant differences between female and male students were observed for the judicial thinking style ($F_{j\ 142}=4.86, /K.05$), internal ($F_{j\ 141}=4.65, /K.05$), anarchic ($F_{j\ 145}=4.03, /K.05$) and legislative thinking style ($F_{j\ 144}=3.79, p<.05$). Female students tended to report more use of the judicial thinking styles and male students reported greater use of the internal, anarchic and legislative thinking styles.

In the British sample, again the strongest gender difference was observed on the liberal thinking style with male students indicating a greater preference for this thinking style as compared to female students ($F_{j\ 85}=1.051, /K.01$). Other significant gender differences were observed for the executive ($F_{185}=9.22, /K.01$), conservative ($F_{186}=7.74, /K.01$), monarchic ($F_{j\ 85}=5.23, p<.05$) and hierarchic ($F_{j\ 86}=4.10, /K.05$) thinking styles. In the British sample, female students reported higher preferences for executive, conservative, monarchic and hierarchic thinking styles compared to male students. Thus the pattern of gender differences has varied between the Malaysian and British samples with only one similarity, that is the stronger preference expressed by male students for the liberal thinking style.

In examining the correlation between age and thinking styles, there were no significant correlations observed in the Malaysian sample. The British students however indicated a tendency towards lesser use of the monarchic thinking style as age increases ($r = -.33, K.OI$). Another trend observed was an increasing use of the liberal thinking style as age increases ($r = .23, p < .05$) and lesser use of the conservative thinking style ($r = -.23, p < .05$). Thus both samples indicated significant gender differences and only the British sample indicated significant age trends.

DISCUSSION

One of the objectives of this study was to assess the suitability of the TSI for use in Malaysia. Psychometric analysis with the Malaysian data indicated alpha coefficients ranging from .55 to .85 indicating acceptable levels of reliability. The removal of one item from each of the monarchic, oligarchic and local sub-scales further improved reliability. It is interesting to note that item 63 showed low validity in both the Malaysian and British samples, whereas the other items removed were unique to each sample. Another indicator of validity was the inter-scale correlation matrix. The results of the inter-scale correlation matrix for the Malaysian sample showed relationships in the expected direction although the abundance of significant correlations observed suggested a preference for using multiple thinking styles rather than a narrow set of thinking styles.

Scale psychometrics for the British sample showed mixed results. The oligarchic, anarchic and local sub-scales showed low reliability that improved with the elimination of one item for each sub-scale. Inter-scale correlations for the British sample also showed associations in the expected directions, for example significant negative correlations were observed between the global and local sub-scales, as well as between the internal and external sub-scales. Thus the TSI appears to be a fairly robust measure suitable for use with student samples in both Malaysia and the United Kingdom. The results of this study extend the scope of this measure that has previously been proven to be both reliable and valid with samples of university students in Hong Kong, mainland China, the US, Philippines, Spain and Norway.

A comparison of the profile of thinking styles generated by both groups of participants, indicated that the Malaysian profile showed a preference for the executive, hierarchic, local, external and conservative thinking styles. The profile generated by the British participants showed some similarities and dissimilarities. In common for both groups of participants was the preference for the hierarchic and local thinking styles. This may be indicative of students' tendencies for prioritizing work and the need for attention to detail when acquiring new knowledge. Significant differences were observed between Malaysian and British participants' preference for the legislative, internal and liberal thinking styles.

The strongest difference between both these groups of university students was in the use of the internal thinking style, such that British university students showed a clear

preference for working independently while Malaysian students indicated preference for group work. This result may be viewed as supporting Sternberg's (1997) contention that thinking styles would differ with culture. Malaysia has been categorized as a collectivistic country with high power distance, while the United Kingdom is said to be individualistic with low power distance (Hofstede, 1981). Thus it is not surprising that Malaysian students would prefer thinking styles that support working together and are norm-favoring (executive, external and conservative thinking styles) rather than the more norm-challenging (legislative, internal and liberal) thinking styles favored by British university students. Differences in expectations within the respective education systems could also be an influence on thinking style preferences. It is possible that university students in the United Kingdom are encouraged and familiar with working independently and critically analyzing knowledge whereas local university students would continue the tradition learnt in schools of working cooperatively and accepting rather than evaluating knowledge.

The results of factor analysis partially supported Sternberg's original conception of the 5 dimensional theory of mental self-government. The five factor structure has been previously corroborated only by Zhang (1999) using a sample of 151 Hong Kong university students and Fjell and Walhovd (2004) who used two samples of 107 American university students and 114 Norwegian volunteers. In both the above two studies, similarities were observed in 3 factors; that is, Factor 1 contained the hierarchic, judicial and liberal sub-scales, while two other factors contained the external-internal thinking styles and the local-global thinking styles. Subsequently, factor analyses in other studies have reported either three factors (Zhang, 2001a; Zhang & Sachs, 1997) or four factors (Cano-Garcia & Hughes, 2000). The results of this study which found a three factor solution in the Malaysian data and a four factor solution in the British data offer only partial support for Zhang's attempt to categorize the 13 thinking styles into 3 Types. A commonality between both the Malaysian and British group of participants in this study is the clustering of the executive, hierarchic and local thinking styles in the first factor for both samples; which may be viewed as partial support for Zhang's Type II category. Factor 2 of the British sample contained the grouping of the legislative, judicial and liberal thinking styles which overlaps with the Type I category proposed by Zhang to indicate the use of thinking styles with higher cognitive complexity. This particular combination of complex thinking styles has also been reported in the Norwegian and Texan samples used by Fjell and Walhovd (2004). However, samples using Hong Kong university students (Zhang, 1999; Zhang & Sachs, 1997), mainland China university students (Zhang, 2001c, 2002b) and Spanish university students (Cano-Garcia & Hughes, 2000) have not reported this particular grouping of thinking styles. This pattern of similarities and differences supports Sternberg's contention that thinking styles develop through socialization, indicating that culture has a significant influence on the development of thinking styles.

Additional support for the influence of social environment on thinking styles comes from the gender differences indicating that male students preferred the liberal thinking style for both samples, whereas gender patterns were inconsistent for the executive,

conservative, monarchic, hierarchic, judicial, internal, anarchic and legislative thinking styles. The results of this study supported earlier findings on the liberal thinking style (Zhang, 2001a, 2001c, 2002a, 2002b) but differed on the other thinking styles.

Overall, the results of this study have shown some commonalities and differences in the use of thinking styles among university students in Malaysia and the United Kingdom. Both groups of students had in common the preference for using the executive, hierarchic and local thinking styles. Differences emerged in the preference of British students for the internal thinking style. This pattern along with the significant gender differences observed in the executive, conservative, monarchic, hierarchic, judicial, internal, anarchic and legislative sub-scales show the strong and clear influence of socialization and culture on the development of thinking styles. Additional support for the significant influence of culture has been found in the inability to reproduce Zhang's suggested Typology of three categories of thinking styles. Again the pattern emerged of a mixture of overlap and distinctiveness, as evidenced in the presence of the co-occurrence of the executive, hierarchic and local thinking styles and the absence of the Type I clustering (legislative, judicial and liberal thinking styles) among university students in non-Western countries. It may be erroneous to conclude that this absence is linked to the lack of cognitive complexity in these countries; instead it may be that cognitive complexity is indicated by different combinations of thinking styles in dissimilar cultures.

The results of this study must be interpreted with some caution due to the disparity in sample size and also the disproportionate number of female and male students is needed further research using more balanced samples. Previous studies have indicated differences in thinking styles among students in different disciplines. In light of the current government emphasis on science education, it would be interesting to compare the thinking styles of science students against those of arts and humanities students to identify respective thinking style profiles and implications for knowledge work and contribution to the knowledge economy. While keeping in mind the limitations of this Study and the need for future research, it is also noted that some consistent patterns have emerged in Malaysian students' use of thinking styles. These results have implications for both research and application.

IMPLICATIONS AND APPLICATIONS

One of the outcomes of this study is support for the viability of the TSI as a measure of thinking styles among Malaysian university students. Previous studies have found significant associations between thinking styles and academic achievement that are distinct from the association between intelligence and academic achievement (Bernardo et al., 2002; Cano-Garcia & Hughes, 2000; Zhang, 2001a, 2002a). The positive correlation of thinking styles with academic performance needs to be researched locally. The urgency for this research is signalled by the results of inter-scale correlations for Malaysian participants which showed an over abundance of positive correlations. This lack of clear

preferences of thinking styles may indicate a lack of awareness about thinking styles. Further research would serve the dual objectives of creating awareness as well as assessing the impact of thinking styles on academic performance. It would also be beneficial to assess the relationship between thinking styles and other measures of thinking such as critical thinking skills and tests of everyday mental reasoning.

Considering the immediate need for knowledge workers, it is also most urgent that similar research is undertaken with samples of working adults to determine if these thinking styles are relevant in the work context and then to assess the profile of thinking styles currently prevailing among employees. An examination of the association of thinking styles with performance indicators could give some indication of the contribution of thinking styles to national productivity and the push towards becoming a knowledge economy.

The second major implication of this study is the clear influence of social environment on thinking styles. The differences emerging in thinking styles between both Malaysian and British university students, in addition to only partial support of Zhang's typology of styles, all support the view that thinking styles develop in interaction with the social environment. As thinking styles are learnt it is then possible to encourage their development by creating the proper social environment that would foster flexibility, creativity and innovation among both university students and employees. The results of this study suggest three ways in which a beginning can be made in education.

Create an Awareness of Thinking Styles

First it is necessary to encourage development of a variety of thinking styles. The results of this study indicate a lesser discrimination among thinking styles by Malaysian students as compared to their British counterparts. This suggests that learning may still be viewed in an ad-hoc manner with students either repeating tried and tested methods or perhaps approaching learning in a trial-and-error manner. Along with the focus on content it is also necessary to be explicit about effective approaches to information processing. Thus it is important that educators first of all encourage students to assess their thinking styles and facilitate deliberate matching of thinking styles to task demands. The TSI is offered as a reliable instrument for that purpose among Malaysian students.

Facilitate the Use of a Variety of Thinking Styles

Secondly it is suggested that familiarity with a variety of thinking styles will provide a sound foundation for their confident use. In the context of teaching and learning, educators could create an environment that allows the use of different thinking styles such that students can discover their strengths and weaknesses and also develop ways of thinking to compensate for their weaknesses. Using various methods of delivery and assessment of learning that encourage both individual and group work, the inclusion of tasks that necessitate careful analysis but also contain opportunity for brainstorming,

the encouragement to evaluate information at both the local and global levels as well as developing a balance between acquisition, evaluation and application of knowledge would all foster development of variety in thinking styles.

Incorporate Values and Models that Encourage Higher Level Cognitive Processing

One of the key findings of research on knowledge workers is the need to create work environments that allow mastery and autonomy (Bourner, 1997; Chawla & Renesch, 1995). This will be possible only if employees are given the scope to experiment, improvise and explore. Both Smith (2000) and Cusimano (1995) have demonstrated how it is possible to foster these values and approaches in the workplace without losing productivity. Their experiences have in common allowing employees to create their own best ways of working, providing opportunities for sharing those self-created methods among peers and working together to evaluate performance. In this way it has been possible to develop operators and technicians who are comfortable with applying both inductive and deductive thinking on the shop floor. Similar value changes may be possible in education so as to encourage the use of thinking styles associated with greater cognitive complexity such as the legislative, judicial and liberal thinking styles. Educators could encourage this development through greater utilization of project work that suits legislative and liberal thinkers with less emphasis on examinations that suit executive thinkers. Thus by using learning and assessment strategies that incorporate values of mastery and autonomy it would be possible for educators to facilitate the development of thinking styles associated with greater cognitive complexity.

CONCLUSION

The current study has shown that the TSI is a reasonably reliable and valid instrument for identifying and creating awareness of thinking styles among Malaysian students. Further research could improve the credibility of this instrument by modifying low validity items and using more balanced and varied samples. The Malaysian student profile in this study has indicated a preference for the executive, hierarchic, external and local thinking styles. The British sample indicated a similar pattern in the preference for the hierarchic and local thinking styles, but differs in the reported greater preference for the internal, liberal and legislative thinking styles.

Factor analysis has not supported all five of the dimensions of mental self-government and the distinct differences in factors between the Malaysian and British participants may be interpreted as indicating the influence of socialization and culture on development of thinking styles. Therefore it is important that further research on thinking styles is undertaken to discover its impact on academic achievement, its relation to other forms of thinking such as reasoning and its probable impact on workplace productivity. At the same time educators are urged to create an awareness of the importance of thinking styles in learning and to encourage the use of a variety of thinking styles towards developing the flexibility, creativity and innovation required of participants in the knowledge economy.

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Appendix

Table 1A
Alpha Coefficients for TSI

| Sub-Scales | Aloha Reliability | |
|--------------|-----------------------------|--------------------------|
| | Malaysian sample (n=154) | British sample (n=88) |
| Legislative | .78 | .50 |
| Executive | .82 | .76 |
| Judicial | .80 | .65 |
| Monarchic | .57 | .56 |
| Hierarchic | .85 | .73 |
| Oligarchic | .55 | .27 |
| Anarchic | .65 | .48 |
| Global | .56 | .65 |
| Local | .61 | .48 |
| Internal | .76 | .70 |
| External | .75 | .59 |
| Liberal | .81 | .81 |
| Conservative | .56 | .80 |

Table 2A
Scale Inter-correlations for the Malaysian Sample

| | Leg. | Exe. | Jud. | Mon | Hier. | Olig. | Anar. | Glob. | Local | Int. | Ext. | Lib. |
|--------------|-------|-------|-------|------|-------|-------|-------|-------|-------|--------|-------|-------|
| Exe. | .60** | | | | | | | | | | | |
| Jud. | .54** | .61** | | | | | | | | | | |
| Mon. | .43** | .61** | .49** | | | | | | | | | |
| Hier. | .56** | .78** | .58** | .62* | | | | | | | | |
| Olig. | .47** | .30** | .26** | .23* | .28** | | | | | | | |
| Anar. | .56** | .47** | .49** | .37* | .48** | .59** | | | | | | |
| Glob. | .16 | .05 | .16 | .24* | .03 | .44** | .29** | | | | | |
| Local | .51** | .58** | .71** | .48* | .59** | .29** | .52** | .05 | | | | |
| Int. | .64** | .26** | .34** | .31* | .25** | .35** | .41** | .24** | .33** | | | |
| Ext. | .15 | .39** | .42** | .24* | .34** | .27** | .30** | .26** | .31** | -.25** | | |
| Lib. | .54** | .46** | .71** | .34* | .50** | .35** | .61** | .16 | .64** | .43** | .32** | |
| Cons. | .32** | .47** | .25** | .51* | .41** | .33** | .31** | .28** | .44** | .19** | .31* | .23** |

Table 3A
Scale Inter-correlations for the British Sample

| | Leg. | Exe. | Jud. | Mon. | Hier. | Olig. | Anar. | Global | Local | Int. | Ext. | Lib. |
|----------------|-------------|-------------|-------------|-------------|--------------|--------------|--------------|---------------|--------------|-------------|-------------|-------------|
| Exe. | .01 | | | | | | | | | | | |
| Jud. | .40** | .07 | | | | | | | | | | |
| Mon. | .04 | .52** | -.01 | | | | | | | | | |
| Hier. | .25* | .72** | .22* | .67** | | | | | | | | |
| Olig. | .12 | -.06 | .13 | -.24* | -.15 | | | | | | | |
| Anar. | .24* | -.29** | .30** | -.12 | -.08 | .58** | | | | | | |
| Global. | -.01 | -.20 | .09 | -.16 | -.21 | .52** | .49** | | | | | |
| Local. | .16 | .45** | .28* | .40** | .52** | -.15 | -.13 | -.47** | | | | |
| Int. | .40** | -.20 | .09 | .16 | .08 | -.15 | .13 | -.07 | .16 | | | |
| Ext. | .14 | .16 | .27* | -.07 | .13 | .40** | .22* | .10 | .10 | -.33** | | |
| Lib. | .53** | -.43** | .42** | -.22 | -.13 | .19 | .35** | .07 | -.04 | .35** | .19 | |
| Cons. | -.12 | .79** | -.02 | .59** | .66** | .01 | -.13 | .07 | .36** | -.19 | .08 | -.57** |