TESTING THE THREE-FOLD MODEL OF INTELLECTUAL STYLES ON ADOLESCENTS' SCHOOL PERFORMANCES: A LONGITUDINAL INVESTIGATION

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ABSTRACT

This survey project proposes to examine changes and malleability of intellectual styles employed by students during the transition from Secondary 3 to Secondary 4, in relation to their school performances (academic, extra-curriculum and social) and streaming (sciences, pure arts, technical and commerce). Specifically, the styles concept refers to an application of a threefold model of intellectual styles proposed by Zhang and Sternberg (2005). Six schools from both Malaysia and Hong Kong comprising students of the four streams will be selected. For measurement, back-translated revised Thinking Styles Inventories (TSI) and Iowa Managing Emotions Inventory (IMEI) will be used. Data analyses are primarily latent class analysis (LCA), aided with other complimentary analyses. Additionally, six(6) focus group discussions will be conducted in between two survey data collection using another sample. Based on the results, the relationship of intellectual styles, performances, school subjects and intelligence following Sternberg's triarchic intellectual components (analytical, creativity and practical) are further explored. The project's major academic novelty lies in being the first longitudinal study, and in relation to multiple performances. The results are expected to provide new evidences on several contested issues on styles such as values ascribed to styles, malleability, and styles as traits or states. (199 words).

INTRODUCTION

Intellectual styles (abbreviated as styles henceforth) can be broadly defined as one's preference in information processing or using one's abilities; styles are neither intelligence nor abilities. Various labels have been used, such as cognitive styles, conceptual tempo, decision making and problem-solving styles, learning styles, mind styles, perceptual style, and thinking styles (Zhang & Sternberg, 2005).

Coping, performance and survival are based not just on intelligence or abilities. Intellectual styles provide the qualitative dimensions to coping and adaptations. The *qualitative* dimensions here include both personality and preferred activities; style is to varying degrees, cognitive, psychological, sociological, affective and physiological in nature (see summary of styles by Zhang & Sternberg, 2005). Exploring on style malleability on academic stylistic demands can shed insights on both one's inherent uniqueness and interaction with one's environments.

Styles can explain academic achievement differences over and above students' self-rated abilities based on Sternberg's triarchic theory of human intelligence (1985) (the three components are analytical, creativity and practical); and performance tests (Grigorenko & Sternberg, 1997; Sternberg & Grigorenko, 1995; Zhang, 2001b, 2002a, Zhang & Sternberg, 1998). The findings are also supported indirectly by Bernardo, Zhang and Callueng (2002), Grigorenko and Sternberg (1997). However, these studies are all cross-sectional in nature. This project proposal is about examining students' thinking styles, and style malleability as a response to changing learning environment, vis-à-vis performances in schools, over a span of two years, to fill the literature gap of style changes as a response of changing academic demand.

Schooling transitions and performances

Styles are found to be related to learning experiences. Satterly (1976) showed that field independence and reading achievements are related. Atkinson (1998) found that students' technology project work to be affected by their thinking styles. Both Zhang (2001b), Grigorenko and Sternberg (1997) found that styles contribute towards academic achievements beyond ability tests. Importantly, Zhang (2002b) found that higher (more advanced) cognitive development to be related with using a wider range of styles. In this sense, diversity or malleability of styles, than superiority of any single style is related with higher intelligence.

Schooling experience provides the first significant life challenge before one venture out to the society and adulthood. In most Asian countries, one-set-fits-all central curriculum instead of student-centered approach that emphasizes individual academic interests is the norm. Under such curriculum, students are expected to perform well on all subjects. Good results thus call for diverse skills (writings, remembered facts, analytical reasoning), using different notation systems (mathematical and verbal), and subject areas (social and natural sciences), such demands are the heaviest, and the most dramatic during Secondary 3 to Secondary 4 transition, and culminating in Sixth forms (equivalent to A-level). While this experience is frustrating for many differently gifted students and learning needs, this project's focus is not on the area of instructional designs, or school reforms. By tapping into how students cope with their school demands, this project is expected to shed lights on intellectual styles from a developmental approach, especially that of more all-rounded students.

The concept of Intellectual styles (and integration of styles)

Various concepts of styles have been proposed. In order to better organize various labels, and dichotomous styles under one meaningful framework, researchers proposed comprehensive, integrative, multidimensional models. These models include Curry's (1983) three-layer "onion" model, and Miller's model (1987).

This project is based on the most recent work from Zhang and Sternberg's (2005) threefold model of intellectual styles. Basing on empirical results and systematic review, the model is proposed to address a number of issues or controversies pertaining to styles researches. These issues include: styles as value laden versus value-free, styles as traits versus states, and styles as different constructs versus similar constructs with different labels. The model is a revision of Sternberg's theory of mental self-government (TSI) (Grigorenko & Sternberg, 1995). The model to a larger extent covers most grounds of styles constructs proposed by previous studies. In a nutshell, the main two levels of this model are best represented by first, a critical, creative worker (Type 1, or level 1), and second, a docile worker in execution (Type II, or level 2).

The threefold model consists of 13 styles, grouped under 5 dimensions: functions (legislative, executive, and judicial), forms (hierarchical, oligarchic, monarchic, and anarchic), levels (global and local), scope (internal and external) and leanings (liberal and conservative). The model is advantageous compared with other models in yielding a style profile for each individual that falls along five dimensions (Ibid). These 13 styles fall under one of three levels summarized as follows:

Table 1: Summary of the threefold model of intellectual styles

Type I: preferences for unstructured tasks, complex information processing, values freedom and originality	
Legislative (functions)	Enjoys creative strategies.
Judicial (functions)	Focusing on evaluating products or other's activities.
Global (level)	Sees the overall pictures, and abstraction.
Hierarchical (forms)	Prioritizing tasks according to one's evaluation.
Liberal (leaning)	Enjoys tasks that involve novelty and ambiguity.
Type II: preferences for structured tasks, simplistic information processing, marked by conformity to traditions and high levels of respect for authority	
Executive (functions)	Concerned with implementing guided and structured task.
Local (level)	Enjoys working with concrete details.
Monarchic (forms)	Focusing on one thing at a time.
Conservative (leaning)	Tend to adhere to existing rules.
Type III: manifests the characteristics of both Type I and II, depending on the stylistic demands of a specific task and on individual's interest in the task	
Internal (scope)	Prefers working independently
Oligarchic (forms)	Working on multiple tasks to serve multiple objectives, without setting priorities.
Anarchic (forms)	Working on tasks that would allow flexibility as to what, where, when, and how one works.
External (scope)	Prefers working in collaboration.

Note: reproduced from Table V: Intellectual styles (Zhang & Sternberg, 2005)

Intellectual styles and correlates

Existing literature from the United States, mainland China, Hong Kong and the Philippines discussed relationships of style with the following correlates: context and socio-economic status, student-teacher relationships, and styles with academic achievements.

To the broadest sense and without referring to a specific stylistic dimension, previous studies associated lower grades and new teachers with type I teaching styles; conversely, higher grades, experienced teachers and the sciences subject are associated with type II teaching styles (Sternberg & Grigorenko, 1995; Grigorenko & Sternberg, 1997; Zhang & Sachs, 1997). Natural science and technological disciplines are linked with global style whilst social sciences and humanities with local style (Zhang & Sachs, 1997). Type I is also associated with higher socioeconomic status (SES), later-born; whilst Type II with lower SES and first born (Sternberg & Grigorenko, 1995; Grigorenko & Sternberg, 1997). For student teacher samples in Hong Kong, Type I is related to higher age, travel experiences (Zhang, 1999; Zhang & Sachs, 1997, Zhang & Sternberg, 1998). Additionally, not all studies using TSI yielded five factor solutions (Zhang & Sach, 1997).

In terms of student-teacher relationships, teaching approaches and teachers thinking styles are by and large overlapping (Zhang & Sternberg, 2002; Zhang, 2001a). Teachers also inadvertently favored students of similar styles, giving more positive evaluations and higher grades (Sternberg & Grigorenko, 1995). In general, and without referring to any particular culture, Type I styles (creative

and complex cognition) is ascribed more favorable values than Type II (norm favoring execution), Internal and external styles seem to be relatively neutral (Zhang & Sternberg, 2005).

Type I is related to deep learning approach; and Type II with surface approach (Zhang, 2000; Zhang & Sternberg, 2000). Undergraduates preferring Type I also found to have higher self-esteem (Zhang, 2001c). Undergraduate academic achievements were found to be related to a mixture of Type I and II styles; such as conservative (confirming to norms), hierarchic and internal (working independently) (Zhang & Sternberg, 1998); judicial (evaluative of work or activities) and legislative style (preferring generating creative strategies) (Grigorenko & Sternberg, 1997); executive styles is contributory to academic achievements in Filipino and Hong Kong's samples from comprehensive universities, but negatively correlated with a sample from an elite, gifted student population sample (Bernado, Zhang & Callueng, 2002; Grigorenko & Sternberg, 1997; Zhang & Sternberg, 1998). It can be inferred that different learning cultures reward different styles, and learning culture is in turn shaped by students' profile, suggesting issues such as misfit of styles and cultures of differently-abled students.

In reviewing both school copings and styles, it is clear that styles are related to age and cognitive development, subject matters and learning approach. In sum, I would like to propose the following *statement of problem*: Styles, or the preferred way of processing information is linked with the nature of task assigned and disciplines studied. Therefore, it can be inferred that learning difficulties can be in part explained by mal-adjustment in learning styles. However, our society ascribes higher or more positive values on Type I styles (Zhang & Huang, 2001; Zhang & Postiglione, 2001), which may not conform to the nature of a school subjects. For example, learning natural sciences and technological subjects, at its initial stage calls for not creativity but conformity with existing procedures (Type 1 styles). Notwithstanding, excellence at higher learning level (such as innovative invention and momentous scientific breakthrough) invariably must be based on both originality and tireless learning on existing body of knowledge (Type II styles). In short a balance of multiple styles according to situational needs. Disentangling the intersection of styles and learning task therefore provides answers to a number of critical educational questions/issues: (a) asynchronous development over life span for many differently gifted individuals, due to style misfit (b) the relationships between style flexibility and adaptations, (c) best ways to nurture and meet the learning needs of our precocious scientists and creative workers that do not conform or/ adapt well to their learning environments. From a cross-cultural perspective, styles are partially socialized and shaped by culture; different cultures probably encourage or reward different styles (Bernado, Zhang & Callueng, 2002; Sternberg, 1997; Zhang & Sachs' 1997). For this reason, cross cultural samples are sought to present the contrast in trends, or structure among factors (if any) to better understand the issues of adaptations. Utility of TSI has not been explored on Malaysia samples before.

Styles are partially socialized and trainable (Ibid). Learning environments are postulated to shape individuals' predominant thinking styles. That is, the nature of an academic discipline and learning environments modify our thinking styles (Zhang & Sternberg, 2002). In view of the importance of formative years spent in schools. Studying the changes and malleability of styles as a result of school adaptations will shed light on the following intriguing *research questions*: (a) Can the model (revised TSI scale) reliably applied on adolescents? (b) What are the styles employed by Secondary 3 and 4 students at the end of school year? (c) Which styles are best predictors of school performances at Secondary 3 and 4? (d) Can changes in styles predict changes in performances? (e) Can malleability of styles predicts performances? These research questions can be represented by the following *conceptual framework*:

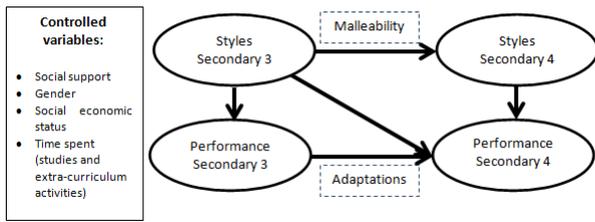**Figure 1: Conceptual framework**

METHODS

Procedures: This project is a mixed method study using both qualitative and quantitative methods using two independent samples. The project is mainly a two years longitudinal survey project administered at the end of school years after final examinations. In year one, data from respondents are analyzed to establish acceptable reliability and validity. In year two, changes of response will be analyzed. *Participants*: Six Malaysia and Hong Kong schools (three schools from each contry) of varying degrees of selectivity will be selected, summing up to an estimated sample size of at least 1200. The two locations are selected to compare the difference of a developed region and a developing country. Stratified and purposive sampling will be used. Data collections will be conducted after final examinations to make sure school operations will not be interrupted. On respondents' age group, Secondary 3 and 4 students are selected based on the following considerations: (a) curriculum transitions, (b) ease of tracking students over the two-year period to ensure participant retention, (c) adequate cognitive skills to respond in self-rated questionnaires, (d) adequate cognitive and meta-cognitive awareness to regulate one's learning styles parallel to the theoretical underpinning of research instrument used (theory of mental self-government), (e) controlled setting (schools) that ease operationalizing research constructs.

For the *qualitative* line of inquiry, six(6) focus groups discussion (FGD) with both teachers and students separately (3 FGD each) consisted of 8-12 participants in each section will be conducted after first data collection to aid in interpretation of data analyses, and clarifying on unexpected issues. It is expected to source additional sample for the sole purpose of FGD, to make sure the year two results are not influenced by heightened sensitivity or Hawthorn effect induced from FGD. Follow-up emails will be sent out after each section to further elicit thoughts not delivered during face-to-face discussions. Examples of questions are listed under Appendix A.

Measurement: The questionnaire consists of two parts; the first part solicits responses on demographic information and indicators of school performances (academic, extra-curriculum and social-emotional development). For assessing students' social development, I will use the Chinese version of Iowa Managing Emotions Inventory or IMEI (Zhang, 2008; Hood & Jackson, 1997) which measures Chickering's (1969) five emotion management dimensions. This inventory pertains to five types of emotions: happiness, attraction, anger, depression, and frustration using a 5-point response scale. Sample of items are such as "*I try to understand my own anger,*" "*I rarely look beyond my feelings of anger for causes.*"

The present study employs a Chinese version of the inventory. The second instrument is about the threefold model operationalized using revised Thinking Styles Inventory (TSI) (Sternberg et al. 2003). The scale contains 65 self-rating items on Likert scale (ranging from 1 [*low*] to 7 [*high*]). Examples of items from the inventory are: (1) "*I like tasks that allow me to do things my own way*" (legislative), (2) "*I like situations in which it is clear what role I must play or in what way I should participate*" (executive). With the exception of the anarchic subscale, the instrument consistently provides satisfying reliability (Sternberg & Wagner, 1992; Sternberg 1997; Sternberg et al., 2003). It is expected that both instruments will be back-translated in Malay Language mainly based on the Chinese version and aided by the original version for the Malaysian samples. Additionally, 10-points self-rated abilities according to Triarchic components (Analytical, Creativity and Practical) scale (Zhang, 2001) will be appended to the instrument too. All these

scales have been reliably used by others, across samples from China, Hong Kong and the United States (Ibid).

Operational definitions of major constructs are as follows: (a) styles: preferred ways of information processing as measured by revised TSI. Based on previous studies (Zhang & Sternberg, 2005), either a two or three level/factor solutions are possible. (b) Adaptability: changes in performances grouped under 4 types, *improvement*, *decline*, *remain high*, and *remain low*. (c) Academic performances: standardized school subject marks to account for dispersion of marks to make sure scores are absolute and not relative between subjects. (d) Social emotional development: management of the following five emotions, happiness, attraction, anger, depression, and frustration as captured by IMEI. (e) Extra curriculum performance: a composite index to gauge level of activeness in extra-curriculum activities, formed by multiplying time spent, level of enjoyment, and leadership roles. (f) Social support: quantity and quality of friendships in school.

For *data analyses*: reliability and validity will be established first by using exploratory factor analysis. Relationships between all variables will be tested using correlation and regression methods. Repeated measure ANOVA will be conducted to track changes over the two years. Cluster analysis and SEM are used to collapse sub-scales into factors and other multivariate analyses. Using SPSS and MPLUS. The following two (2) diagrams summarize data analyses to be performed for both cross-sectional and (two year) longitudinal data (note: dotted lines indicate grouped factors by collapsing subscales, while arrows indicate predictions, i.e. dependent variables on the right regressing on independent variables on the left column):
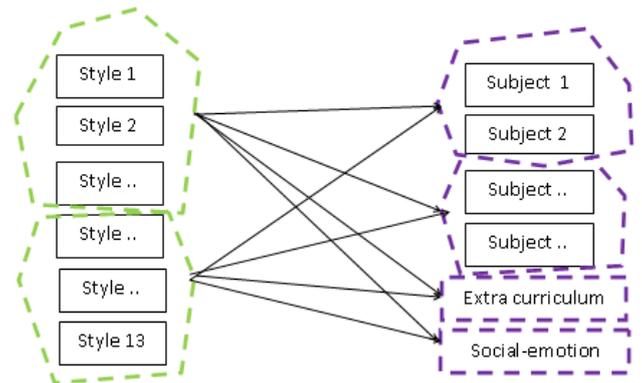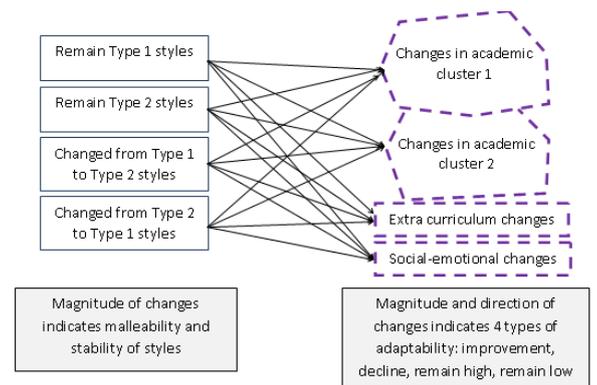

Figure 2a: Cross-sectional data analyses

Figure 2b: Longitudinal data analyses (for different streams)

CONCLUSION

This is a longitudinal mixed method project using both survey and focus group discussion to probe into the relationships between styles changes and multiple school performances. The **novelty** or contribution to existing knowledge of this project lies in its strengths in the following: (a) mixed method results (b) cross-cultural samples from Malaysia and Hong Kong, (c) multiple outcome or dependent

variables are compared for multivariate results, (d) changes in styles and outcomes are tracked over two years on multiple settings. At present, the exploratory nature of this new approach makes it difficult to make **predictions** on all the relationships between independent and dependent variables. The most I can say for the moment is Type 1 style to be related with humanities and Type II with other streams, but "contribution" of each style to different subject achievements can be difficult to predict, but styles do contribute uniquely to each particular subject (see Zhang, 2001b). Cross-cultural differences can be of varying degrees or in kind. Malaysian samples are expected to score higher on Type II. Based on previous studies, Hong Kong students of internal and hierarchical styles will perform better (Zhang & Sternberg, 1998). Lastly, by referring to the aforementioned results, the relationship of intellectual styles, performances, school subjects and intelligence following Sternberg's Triarchic intellectual components (analytical, creativity and practical) framework will be further explored. Subject to analyses results, possible corresponding benchmarks for the three components can be: verbal analytical, quantitative analytical (analytical component), visual creativity, writing creativity, hobbies (creativity components), life skills, social support, socio-emotional development and extra-curriculum involvements (practical component). Only analytical intelligence is expected to correlate positively with academic results, practical intelligence is predicted to correlate negatively with while creativity is independent of academic performance (Zhang, 2001b; Zhang & Sternberg, 1998). The following **variations** in research design are not impossible: change of locations and sample size; inclusion of expert in-depth interview (IDI) on top of FGD; tracking an additional year (Secondary 5) to better capture late-bloomers using diverse measurement of intelligence components, additional scales on creativity and practical scales can be added by referring to self-rated items pertaining to hobbies, imagination, inventive tendency, life skills, computing skills, being "street-smart", creative musical, visual or physical expression; and using Raven Progressive Matrices to measure intelligence. Over and above usual **limitations** of longitudinal survey methods, the major shortcoming of this project is its assessment limitations beyond school settings (such as community involvement) and other artistic achievements. By ignoring transition of styles from one activity to another, styles here referred to more of one's stabilized or conditioned traits than fleeting, temporary states, in congruence with the idea of adaptations. A number of **expected outcomes** can be assumed: (a) Exploring profiles of adolescent learning styles: Cross cultural evidence from Hong Kong and Malaysia, (b) Identifying subgroups of learning styles using cluster analysis, (c) Examining the nexus of school success, intelligence and intellectual styles, (d) Transition between Type 1 and Type 2 styles according to the threefold model of intellectual styles: A two year longitudinal approach.

Appendix A: Sample questions for FGD

For students:

1. What are your main motivations going to schools?
2. How do you cope with your time management?
3. Do you think your school learning is meaningful? Why?
4. Which are your favorite subjects? Why do you like them?
5. Please describe your teachers' thinking styles for these school subjects?
6. How do you cope with your school subjects?
7. Do you employ different learning strategies for different subjects?
8. What do you like about your extra-curriculum?
9. What are your goals in extra-curriculum participation? Do you enjoy them?
10. What kind of roles do you play in your school clubs?
11. What values are important for you? And your friends? (provide flashcards with values to elicit their responses)
12. Which of the following styles are considered important for success as a student? (ratings by respondents)

For teachers:

1. What are the values deemed important for success to you?
2. What are your teaching expectations on students?

3. Do you think it pays to go the extra mile in teaching?
4. What learning strategies are crucial for success at your subjects taught?
5. How successful were most students employ the strategies for your subjects taught?
6. What kind of extra-curriculum activities have you participated?
7. What do you like about your extra-curriculum activities in school?
8. What are your goals in extra-curriculum participation? Do you enjoy them?
9. What do you think of the importance of extra-curriculum activities?
10. Which of the following styles are related to good students? (ratings by respondents)
11. In your opinion, which of the following styles are related to good worker? (ratings by respondents)

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