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A Rasch analysis of the Academic Self-Concept Questionnaire

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This study used the Rasch model to assess the unidimensionality and item-person fit of an Academic Self-Concept Questionnaire (ASCQ) that is based on the Confucian Heritage Culture (CHC) perspective. Knowledge of the relationship between academic achievement and academic self-concept is particularly useful because academic achievement is overemphasized in the CHC. ASCQ largely satisfies the Rasch model for unidimensionality. However, four items had poor Infit statistics, suggesting that they do not contribute significantly to the scale hierarchy. Rasch model also confirmed the unidimensionality of the two subscales – Academic Confidence and Academic Effort. The academic self-concept scale, academic effort and academic confidence subscales were also been found to be valid with students with learning disabilities. Results from this study will extend the predominantly Western based literature regarding Academic Self-Concept by reaffirming the construct of a CHC measure of academic self-concept that incorporates the values of academic effort and academic confidence.

Academic self-concept, Confucian heritage culture, Rasch analysis, Singapore, learning disabilities

INTRODUCTION

Singapore was the top performing country in the 2003 *Trends in International Mathematics and Science Study* (TIMSS), having significantly higher average achievement in mathematics and science than the rest of the participating countries (Ministry of Education, 2004). The TIMSS study conducted of Grade 4 (Singapore Primary 4) and Grade 8 (Singapore Secondary 2) students in 49 countries by the International Association for the Evaluation of Educational Achievement (IEA) affirmed the high quality of Mathematics and Science education in Singapore. Previously, Singapore's Secondary 2 students consistently performed among the top in Mathematics and Science in three similar TIMSS studies. They finished first in both Mathematics and Science in TIMSS 1995 and 2003, first in Mathematics and second in Science in TIMSS 1999. Singapore's Primary 4 students finished first in Mathematics and seventh in Science in TIMSS 1995 and first in both Mathematics and Science in TIMSS 2003 (Ministry of Education, 2004).

Although Singapore was the top performing country, it scored below the international average in the Index of Students' Self-confidence in learning Mathematics as well as Science. Supporting this, an international investigation using the TIMSS data showed that Singapore ranked sixth from the bottom of 41 countries (M = 2.68, SD = 0.73, r = 0.25) (Wilkins, 2004). When using a large nationally representative sample (N = 14, 825 students, 1, 015 high schools), it was reported that

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there was a negative effect relating to schools: those students who have higher self-concept tended to have lower performance in terms of achievement and vice versa.

Self-concept is an important construct in psychology and education especially academic self-concept which is generally defined as a person's *perception of self with respect to achievement in school* (Reyes, 1984, pp. 558-560). Considering that the TIMSS study had identified an existing discrepancy between academic self-concept and high achievement schools in Singapore, it may be possible that there will be an even greater discrepancy between academic self-concept and students with learning disabilities who are studying in mainstream schools. Academic self-concept is extensively researched in the Western cultures (Marsh, 1990a, 1990b, 1990c, 1993 & 2005) but the view on academic self-concept from a Confucian Heritage Culture perspective is not as widely known. Thus, it is often difficult to generalize the findings from Western studies in an Asian context because of the differences in culture.

CONFUCIAN HERITAGE CULTURE

In Singapore, Confucianism is generally understood as a secular system of ethics rather than a religion. Confucianism has been held by some to lie at the heart of the value system of the local community. Chen, Lee and Stevenson (1996) found in their cross-cultural studies that intelligence was not a factor in explaining the superior performance of students from a Confucian Heritage Culture (CHC) background. One cultural factor proposed is the high value placed on education. A second factor is the value of hard work, with effort emphasized over ability. Family involvement also plays a great deal in the high academic achievement of students. Parents have high aspirations and standards for their children and spend a great deal of time supervising their children's school work. Children are aware of their parents' high standards, subsequently spending more time doing homework. Last of all, these students are realistic in their self-evaluation of their academic performance. They appear to have more accurate self-perception because frequent, explicit evaluations occur both at the levels of the classroom and the school (Chen, Lee & Stevenson, 1996). In short, parents who have higher expectations, greater dissatisfaction with their children's performance and greater involvement in their children's homework and who provide a more stable home environment tend to give a higher achievement level among their children.

The Confucian culture encourages hard work and effort in the pursuit of learning. 'No pain, no gain' is a motto that students work by. The importance of education and diligence is stressed by parents and their children, therefore the willingness to work hard especially in the academic area is extremely important to students. Students view academic achievement as a route which prepares them to earn money, acquire luxuries and eventually enter prestigious schools and thus establish an outstanding career (Lau, Nicholls, Thorkildsen & Patashnick, 2000).

Singapore, an Asian country with predominantly a Chinese origin and a Confucian Heritage Culture (Volet, 1996; Biggs & Watkins, 1996) has diligence, hard work and high achievement motivation inculcated into students from a very young age. The process of learning is described as "studying extensively, enquiring carefully, pondering thoroughly, sifting clearly and practicing earnestly" (cited in Lee, 1996, pp. 35). Singapore not only has a CHC but also a school system which is segregated on the basis of achievement. Face – one's reputation – is of great concern in the Chinese culture and admission to a mainstream school is highly valued in a family which has a child that has learning difficulties. The family does not want to accept that the child has a learning difficulty and will push the child to a mainstream school. There is a paramount desire for the child to be placed into a mainstream school. It is possible that a brighter sibling enters a prestigious school first followed by a sibling who has a learning difficulty. Any social comparison with normal-achieving classmates leads to a negative contrast and results in a loss of academic self-concept. The gain in status and face for the individual and his family due to attending a prestigious mainstream school may possibly overshadow the denial that 'my child has a learning difficulty' and any negative academic self-concept.

SELF-CONCEPT

Self-concept is an important construct in psychology and education. Byrne (1984) concluded that 'self-concept' is a multidimensional construct, having one general facet and several specific facets, one of which is 'academic self-concept'. The term 'academic self-concept' can be characterized by two elements consistent with the Shavelson model (Strein, 1993). First, academic self-concept reflects descriptive (e.g., *I like math*) as well as evaluative (e.g. *I am good at math*) aspects of self-perception. Second, self-perceptions associated with academic self-concept tend to focus on scholastic competence, rather than attitudes. It is referred to as a person's *perception of self with respect to achievement in school* (Reyes, 1984). A student's self-perception of academic ability or achievement will affect their school performance (Marsh, 1990a).

There is a general consensus that children with special educational needs or learning difficulties tend to have lower self-concept than those without difficulties (Gurney, 1988; Elbaum & Vaughn, 2001). They are vulnerable to low self-concepts because of a tendency to academic failure, the stigmatizing nature of their learning problems and the segregation from mainstream schooling that many learning disabled students experience.

Learning disability is defined as *a condition in which a student has dysfunction in processing information typically found in language-based activities, resulting in interference with learning. Students with learning disabilities have average or above average intelligence but experience significant problems in learning how to read, write and use a computer* (Friend & Bursuck, 2006).

Elbaum and Vaughn (2001) in a meta-analysis review of 64 studies from 1975 to 1997 showed the effects of intervention of student's academic self-concept in students with learning disabilities. In line with this comparison, Chapman (1988) reviewed 21 studies addressing the general self-concept of students with and without learning disabilities and 20 studies addressing their academic self-concept. He found that students with learning disabilities tended to have general self-concepts that were lower than those of their peers without learning disabilities but within the normal range. By contrast, on a measure of academic self-concept, the average difference between students with and without learning disabilities was large, as indicated by mean effect size (ES) of -0.81. Thus, learning disability has a significant impact on academic self-concept, but not general self-concept.

Three major points in understanding the self-concept of Chinese people are found in studies relating to self-concept from the CHC viewpoint. The first point relates to the discrepancies between one's actual self, ideal self and ought self. Despite the higher academic performance of Chinese students than American students, they tended to have a low ability self-concept (Sue & Okazaki, 1990). Chinese parents usually place high expectations on their children such that the actual self of the child might not measure up to the high expectations of the parents. The second point is based on the looking-glass self tradition (Cooley, 1902; Shrauger & Schoeneman, 1979) – how we see ourselves depends to a great extent on how we imagine others see us. Chinese people tend to place a significantly high importance on how they appear in others' eyes or how they are being judged (Cheung & Lau, 2001). The last point comes from the multifaceted and hierarchical nature of self-concept developed by Marsh, Byrne and Shavelson (1988). Research has shown that Chinese people's self-concept has adopted the multidimensional approach to self-concept (Lau & Leung, 1992; Leung & Lau, 1989).

Psychologists have recognized the important role of self-concept in an individual's personal adjustment while educators are becoming increasingly aware that a students' perception of him/herself may have a significant influence on his/her academic performance in school. Studies done over the years have substantiated the positive relationship between these two variables and the volume of growing evidence that the two influence each other cannot be overlooked. This study may have significance for educators in that it could provide useful information pertaining to

the relationship between academic self-concept and academic achievement among primary school children with learning disabilities in Singapore.

PURPOSE OF STUDY

The purpose of the study was to assess whether the items in the *Academic Self-Concept Questionnaire* (ASCQ) (Liu & Wang, 2005) fitted the Rasch model. A previous longitudinal academic self-concept study (Liu & Wang, 2005) relating to the measurement properties of the *ASCQ* including variability, reliability and the relationship between academic self-concept and academic achievement using a sample of secondary school students was done in Singapore but there is no published study that supports the unidimensionality of the instrument especially with mainstream primary school students with learning disabilities in Singapore. Unidimensionality means that only a single construct is measured by items in a scale. If the 20 items in the ASCQ produces a valid unidimensional scale, then they all should contribute to the measurement of academic self-concept, the underlying construct that the instrument purports to measure. Furthermore, separate analyses can be undertaken to establish whether academic confidence and academic effort form separate subscales in their own light. Rasch analysis addresses unidimensionality by assessing the contribution that the items take to make the scale hierarchy. The technique provides an estimate of item difficulty based on the frequency with which students respond to an item, which can be used to assess the position of items along the scale and to consider any possible redundancy or gaps in the scale hierarchy.

Research Questions

Bearing in mind that Singapore has a mainly Confucian Culture heritage, this research study attempts to answer two research questions.

Will the items in the ASCQ fit the Rasch model?

Can academic self-concept be formed by two subscales: academic confidence and academic effort?

Hypotheses

Based on the research questions the following hypotheses were tested:

H1: The items will fit the Rasch model, confirming the undimensionality of the instrument.

H2: Academic self-concept is formed by academic confidence and academic effort.

METHOD

The Sample

The sample consisted of 120 students from three private Student Care Centres that cater to students with learning disabilities outside school hours. These 120 students came from thirteen government schools. The sample presented in Table 1 included 48 Primary 4 pupils, 41 Primary 5 pupils and 31 Primary 6 pupils. Thus, participants were drawn from 30 different primary school classes in 13 different schools. All students had been identified as having a learning disability based on their verbal IQ, pictorial IQ and full-scale IQ obtained in the WISC testing done by educational psychologists from the Ministry of Education, Singapore.

The total sample comprise of 88 male and 32 female students. Their age ranged from 9 years 5 months to 12 years 7 months with a mean age of 11 years 1 month. For ethnicity, there were 81 Chinese students, 24 Malay students, 8 Indian students and 7 Eurasians. A pupil was classified in school records an ethnic Eurasian if both his/her parents were not Chinese, Malay or Indian (e.g. Arabian) or if the father was a Caucasian.

Table 1: The Sample

	Centre 1			Centre 2			Centre 3			All Schools		
	M	F	T	M	F	T	M	F	T	M	F	T
Pri 4	10	2	12	12	1	13	9	14	23	25	8	48
Pri 5	10	2	12	13	2	15	11	3	14	34	7	41
Pri 6	8	4	12	8	1	9	7	3	10	23	8	31

M = Male; F = Female; T = Total

Instrumentation

The study made use of the *Academic Self-Concept Questionnaire* as a measure of students' self-concept. Students' scores in the Primary Three Examination taken by all participants at the end of their 3rd year of primary schooling were used as the academic variable. Obtaining a mark on the Primary Three final examination of between 85-100 per cent was allocated to Band 1, while the mark range of 75-84 per cent was allocated to Band 2, Band 3 had the mark range of 50-74 per cent and the mark range of Band 4 was below 50 per cent.

The Academic Self-Concept Questionnaire

The *Academic Self-Concept Questionnaire* (ASCQ) was developed by Liu & Wang (2005) which was designed with reference to the *Academic Self-Esteem* subscale (Battle, 1981), the *School Subjects Self-Concept* (Marsh, Relich & Smith, 1983) and the *General and Academic Status* scale (Piers & Harris, 1964), and was also designed specifically for a CHC value system. Sixteen items were selected from the established instruments and four additional items were constructed, guided by a general understanding of the students and the cultural context in Singapore. Several items were reworded so that the questionnaire contained both positive and negative items. Negatively worded items are included in questionnaires to disrupt a response set where subjects respond favourably or unfavourably to all items (Marsh, Barnes, Cairnes & Tidman, 1984).

The original ASCQ consisted of two 10-item subscales: students' academic confidence (10 items) and students' academic effort (10 items). The academic confidence (AC) subscale assessed students' feelings and perceptions about their academic competence. Example items included 'I am good in most of my school subjects' and 'Most of my classmates are smarter than I am' (negatively worded). The academic effort (AE) subscale assessed students' commitment to and involvement and interest in schoolwork. An example of an item would be 'I am interested in my school work' and 'I study hard for my tests'. Odd numbered items (items 1, 3, 5, 7, 9, 11, 13, 15, 17 and 19) were items that measured students' confidence subscale. Even numbered items (items 2, 4, 6, 8, 10, 12, 14, 16, 18 and 20) were items that measured students' effort. Item 13 that was deleted from the original questionnaire was included in this current study because the questionnaire had not been tested on students with learning disabilities. Items 2, 4, 7, 9, 11, 13, 14, 16, 17 and 20 were negatively worded items. The questionnaire items are presented in Appendix A.

PROCEDURE

These procedures were adopted in this study:

Permission was obtained from the Principals / Centre Director of the three Student Care Centres to conduct the study.

The researcher along with some assistants visited each centre and met the principals in June 2006 to discuss the study and plan the strategy for the administration of the questionnaire.

Written consent was obtained from all parents or guardians of students participating in the study, with verbal consent gain from the student again at the time of administration.

The questionnaires were administered orally in English by the researcher and her assistants to each student individually from the beginning of July 2006 until 21st of July 2006. The

administration was conducted in an unobtrusive location in the centre grounds to ensure that responses from other students were not heard. Administration time was about 10-15 minutes. The administration procedures outlined by Marsh, Craven & Debus (1991, 1998) were followed. Using a double binary response format, students were initially asked to respond 'yes' or 'no' to each question (the first binary response). This binary response was followed by a second binary response ('no always', 'no sometimes', 'yes sometimes' and 'yes always'). Special care was taken to ensure that pupils understood the instructions before they answered the questions and that it was not a test, that there were no right or wrong answers and that everyone would have different answers. All students' responses were recorded on a prepared response sheet by the administrator.

Information pertaining to the students' demographics, results, type of learning disability and the WISC-III IQ scores were obtained from data files which were made available to the researcher by the centre's Principal. The individual band for each of the three examination subjects, English Language, Chinese Language, Mathematics and Science in the Primary Three Examinations were also made available to the researcher

The completed questionnaires were coded and data entered into the Statistical Package for Social Science (SPSS). Negatively worded items were reversed for analysis.

DATA ANALYSIS

The data were analysed using Rasch (1980) measurement techniques, which allowed both students' performance and item difficulties to be measured using the same metric and placed on the same scale. Rasch calibration was used to evaluate the fit of data to the unidimensionality of the Rasch model and for the construction of the academic self-concept questionnaire. The 20 items were analyzed using the partial credit model (Masters, 1982). Items were calibrated in terms of the degree to which students agreed with the items (this corresponds to item difficulty for the questionnaire) and the three category/step thresholds were estimated for each item. A high item difficulty means low levels of agreement with the item. *Quest* (Adams & Khoo, 1996) test analysis computer software was used to perform the partial credit analysis. The item difficulties and step thresholds as well as indicators of the extent to which each item fitted the model were examined. The Rasch model requires that data fit the model and it follows three main requirements. 1) Equal differences have to be found between two sets of item difficulties on the scale and between the two corresponding sets of measures on the scale, 2) An individual's measure on the scale should not be affected by any omissions of any items, 3) the construct of the final scale cannot be affected by any opinions/answers of students.

The Rasch person-item map presented in Figure 1 displays a ruler created from the measurements of students' academic self-concept in response to the questionnaire. The Rasch person-item map in Figure 1 orders the level of self-reported answers of the students in the study (left hand side) and the difficulty of the items (right hand side). Items at the top of the scale are harder to perform. Items become easier to answer further down the scale. Students with higher academic self-concept (at the top of the scale) have no difficulty with the questionnaire; students with lower academic self-concept (at the bottom of the scale) have difficulty even with the easiest questions.

The vertical scale is an interval level iterative scale: the spaces between items, between persons and between items and persons have substantive meaning in terms of the underlying variable (Callingham & Bond, 2006). The academic self-concept of each student to answer the questions is referred to as the person measure and the level of self-concept to perform each item with a criterion level of difficulty is called item measure. The map of students and items to compare the range and position of the item measure distribution (left side of the Figure 1) to the range and position of the student measure distribution (right side of the Figure 1). Items should be located at each point on the scale to measure meaningful differences. The items must cover all the areas on the ruler to measure the academic self-concept of all students. On the academic self-concept scale,

the distance of the item from the top of the ruler correlates to its difficulty relative to the other items. Items closer to the top are harder to answer; moving down the scale, the items become easier to answer – that is, they require a lower level of academic self-confidence to answer it.

Two mean square fit statistics are used to determine how well individual items fit the Rasch model. These statistics assess the extent to which unpredicted responses to an item are given by students whose position in the hierarchy, as determined by their academic self-concept is either close to the item's position (Infit statistic) or far from the item's position (Outfit statistic) in the hierarchy of items. For the data to fit the model adequately, it is generally recommended that the two fit statistics range from 0.6 to 1.4 (Bond & Fox, 2001, p. 179). Fit statistics higher than 1.4 and below 0.6, respectively, indicate too much and too little variation in response patterns. Items with poor fit statistics should be considered for removal from the instrument.

RESULTS

Rasch analysis was used to assess the ASCQ for unidimensionality and person-item fit. The items in the ASCQ appear to form a unidimensional scale presented in Figure 1, with academic confidence and academic effort forming the separate subscales of the academic self-concept scale presented in Figures 3 and 5 respectively. The majority of items fitted the model adequately, supporting the first hypothesis. Three of the items (items 4, 13 and 18) had poor Infit statistics and were deleted from the questionnaire. Item 7 ("Most of my classmates are smarter than I am") and item 15 ("I am good in most of my school subjects") are items on the confidence subscale. There was an absent in "yes always" answers in both items. An examination on students' background did not reveal any significant differences between the students. A person-case estimate was conducted and it was found that there was an erratic student whose second binary answer was contradicting his first response (i.e. a "Yes" was followed by a "No Sometimes" or "No Always") and a low response student with a score of 3. A decision was made to omit these two cases from the sample size and items 4, 13 and 18 from the questionnaire.

Academic Self-Concept Scale

A new Rasch scaling was used to assess the revised questionnaire with a new sample size of 118 students. The Quest programme (Adams & Khoo, 1996) was used on the 118 students to obtain a variable map. Figure 1 shows this variable map which is the thresholds of the items of the overall academic self-concept scale. X's which are located on the left-hand side of the diagram represent 1 student. The range of item difficulties approximately matches the range of students' scores, implying that the test is appropriate for this group of students (i.e. students with learning disabilities with a CHC background). From Figure 2, items 17 and 3 are seen as the most difficult items in the questionnaire while items 20 and 8 are the easiest items. There are some students at the higher end of the scale who do not have any corresponding items, implying that they have a high level of academic self-concept. Likewise, two students at the lower end of the scale who do have any corresponding items from the questionnaire have low level of academic self-concept.

Table 2 shows the INFIT statistics scores of items in the questionnaire before (INFIT 1) and after (INFIT 2) deletion of items. It was found that the revised questionnaire fitted the Rasch model with items falling within the expected values of 0.60 – 1.40 except for Item 20. Item 20 had an Infit of 1.61 that lies outside the acceptable range of 1.40. However item 20 was retained as it was within the acceptance range prior to the deletion of items 4, 13 and 18. The Infit for boys (n=86) is 1.34, is marginally smaller than 1.40 and value of this index for girls (n=32) is 1.71. Figure 2 provides a visual diagram showing item fits.

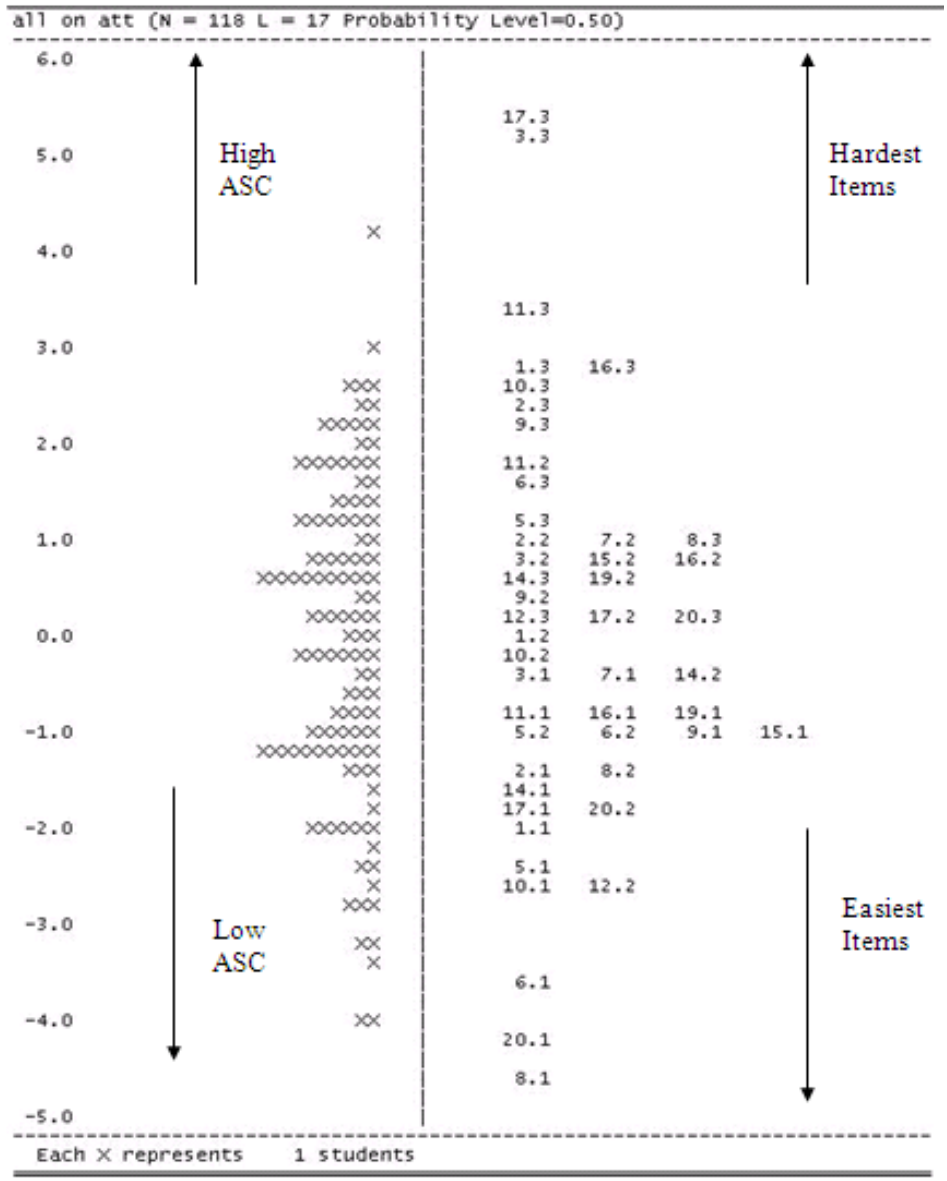

Figure 1: Item estimates (thresholds) of all items in Academic Self-Concept Scale

Table 2: INFIT Mean Square Statistics of items in the ASCQ

Item No.	INFIT 1	INFIT 2
1	0.97	1.12
2	0.82	0.96
3	0.87	1.00
4	2.41	-
5	0.64	0.73
6	1.01	1.24
7	0.84	0.96
8	0.94	1.17
9	0.71	0.80
10	0.74	0.84
11	1.00	1.19
12	0.93	1.11
13	1.48	-
14	0.78	0.93
15	0.72	0.82
16	0.76	0.81
17	0.64	0.74
18	1.52	-
19	0.92	1.02
20	1.27	1.61

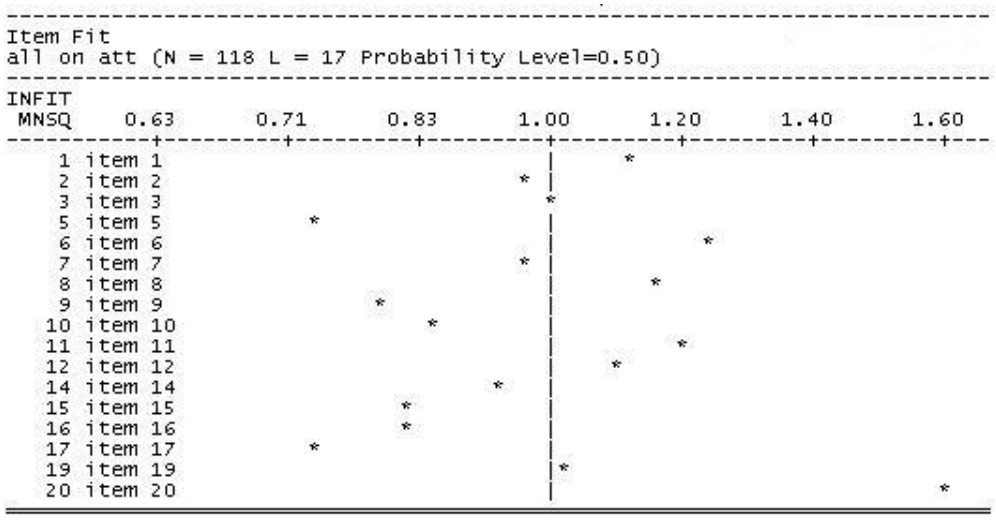

Figure 2: Item fit of all items in the Academic Self-Concept scale

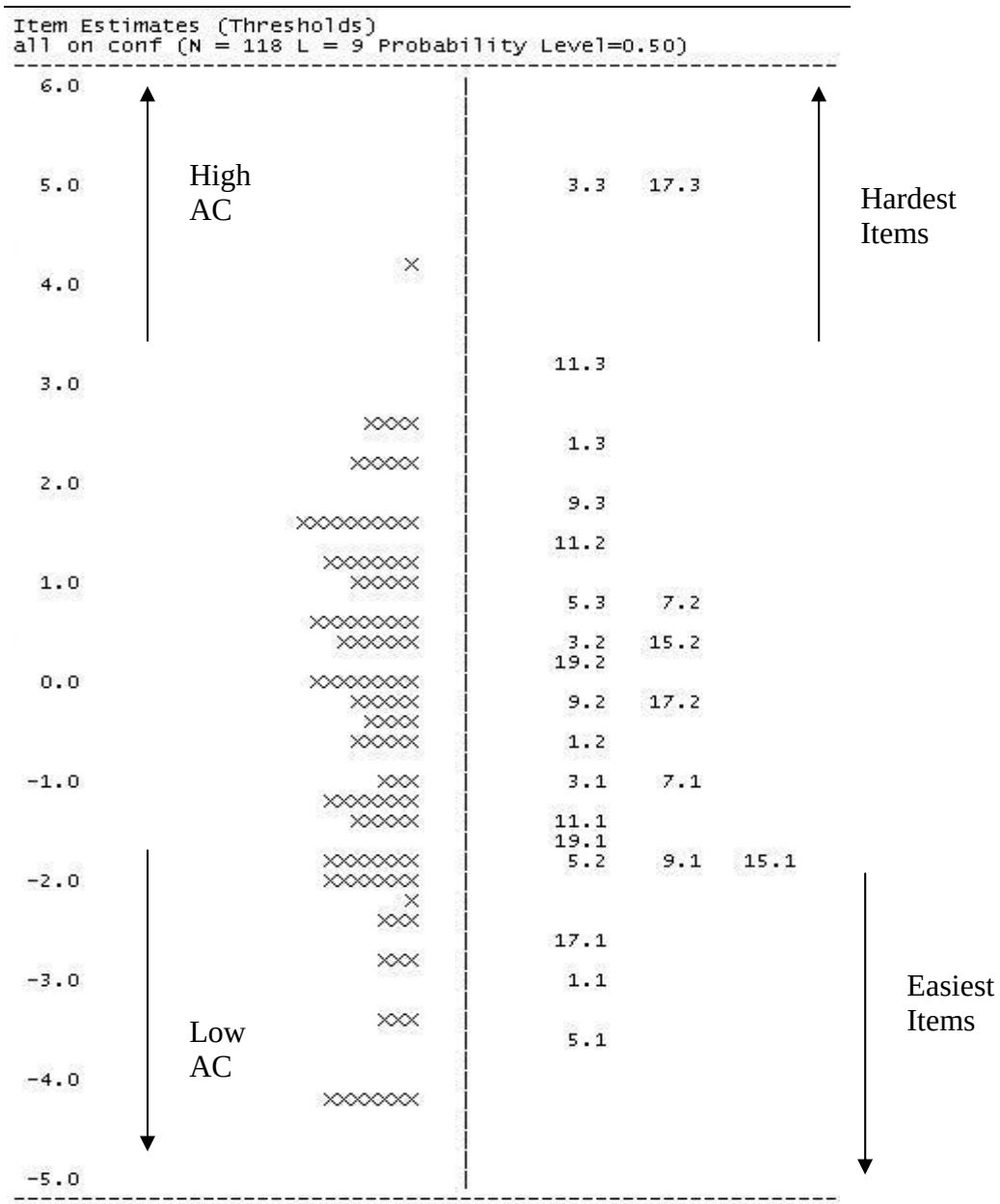

Figure 3: Item estimates (thresholds) of items in the academic confidence subscale

Table 3 shows the INFIT statistics scores of items in the questionnaire before and after deletion of items. Figure 4 show that the final items fit the unidimensionality of the academic confidence subscale. All the INFIT values of the items fall within the expected values of 0.60-1.40.

Table 3: INFIT Mean Square Statistics of items in the AC subscale

Item No.	INFIT 1	INFIT 2
1	1.12	1.27
3	1.01	1.03
5	0.79	0.94
7	0.76	0.81
9	0.75	0.83
11	1.27	1.32
13	1.91	-
15	0.71	0.85
17	0.80	0.90
19	0.89	0.97

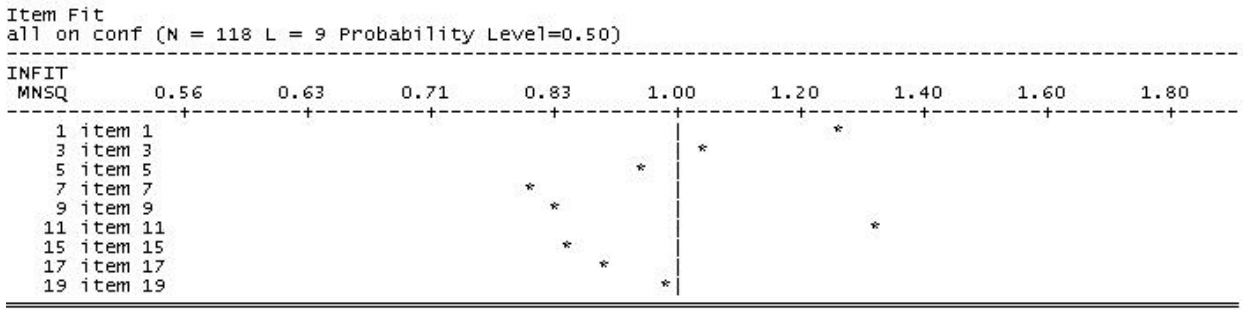

Figure 4: Item fit of the items in the academic confidence subscale

Academic Effort Subscale

For the academic effort subscale, the range of items show a linear distribution with respect to the students, implying that the academic effort subscale is appropriate for primary school students with learning disabilities from a CHC background. Items 10 and 16 are the most difficult items, while item 8 is viewed as the easiest item in the academic effort subscale. Two students show a high level of academic effort but the exact level of their academic effort could not be estimated accurately because of the paucity of items at the higher end of the scale (see Figure 5).

As shown in Figure 6, only item 20 had a poor Infit statistic of 1.60. Table 4 presents shows the INFIT statistics scores of items in the questionnaire before and after deletion of items. Majority of the items fit the unidimensionality of the subscale, with expected values falling in between the range of 0.60-1.40 range (Table 4).

Table 4: INFIT Mean Square Statistics of items in the AE subscale

Item No.	INFIT 1	INFIT 2
2	0.78	0.96
4	1.96	-
6	0.84	1.00
8	0.79	0.95
10	0.79	0.89
12	0.79	0.94
14	0.67	0.80
16	0.70	0.89
18	1.46	-
20	1.28	1.60

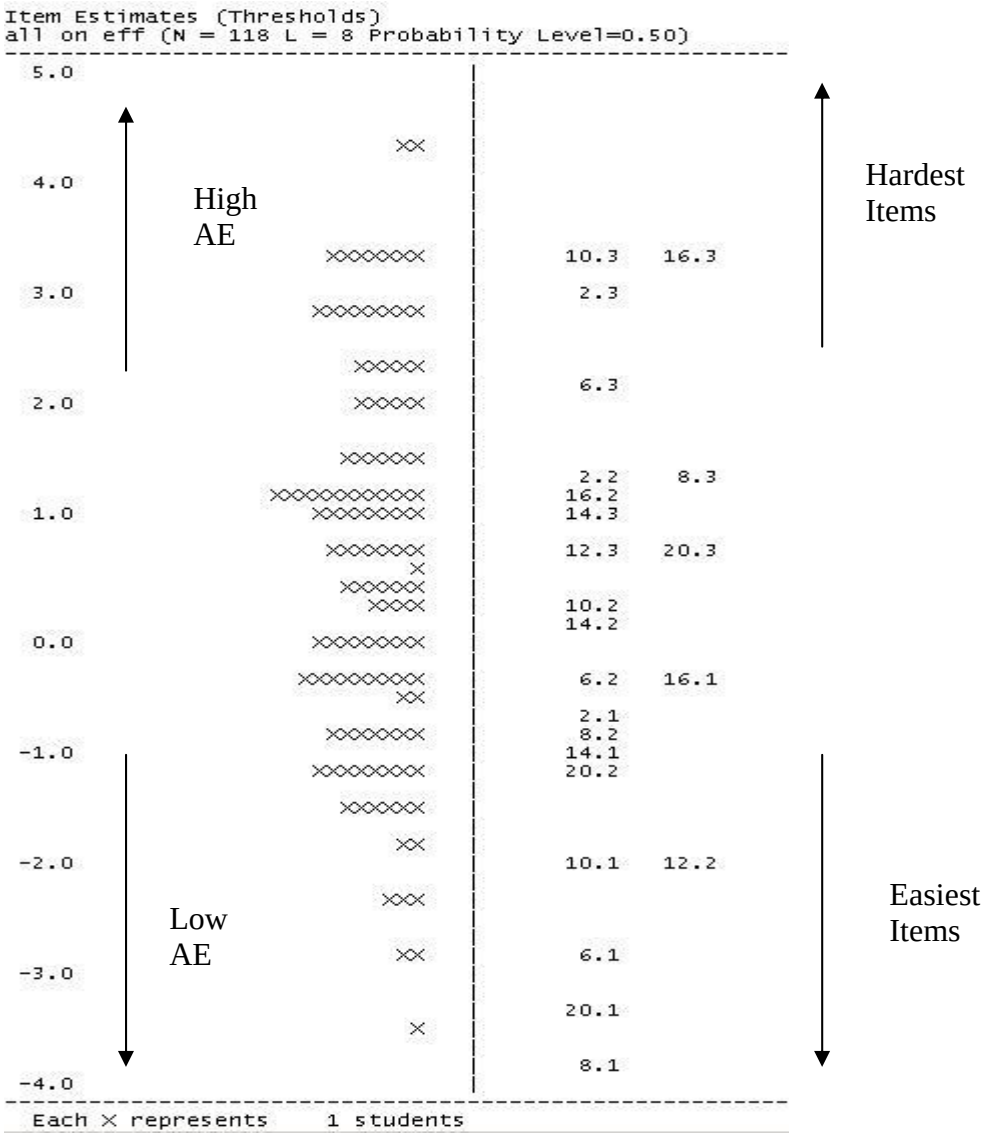

Figure 5: Item estimates (thresholds) of Academic Effort subscale items

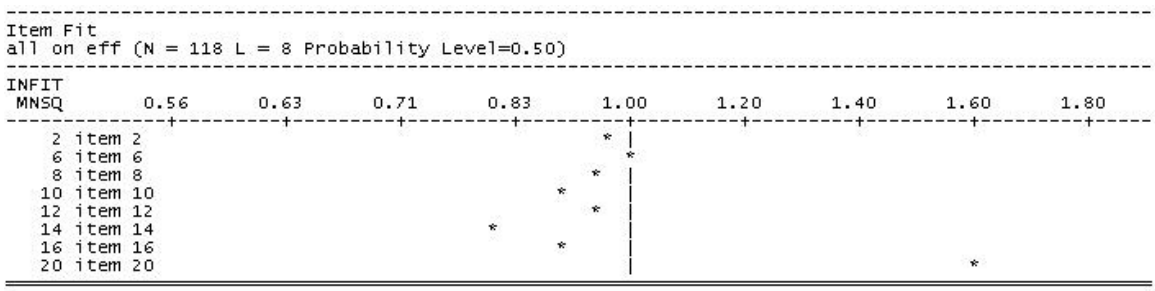

Figure 6: Item fit of Academic Effort subscale items

DISCUSSION

A Rasch analysis using case estimate scores based on the second binary answer of the ASCQ, the AE and the AC subscales had been conducted. The findings from this Rasch analysis confirm the study done by Liu & Wang (2005) that academic self-concept in a CHC perspective is formed by 2 factors – academic confidence and academic effort and further extends the findings to show that these 2 factors form separate scales which fit the Rasch model. The academic self-concept scale has also been found to be valid with students with learning disabilities.

Hypothesis 1 states that the items will fit the Rasch model, confirming the undimensionality of the instrument. Rasch analysis of the ASCQ largely confirms the unidimensionality of the instrument. This means that the ASCQ shows considerable promise in determining the academic self-concept of students with learning disabilities of a CHC background. Hypothesis 2 states that academic self-concept is formed by academic confidence and academic effort. It was found that the items in the ASCQ appear to form a unidimensional scale of academic self-concept measured from a CHC perspective which itself is formed by two unidimensional subscales of academic confidence and academic effort which are the essential elements of the CHC view.

Three of the items (items 4, 13 and 18) had poor Infit statistics and were removed from the questionnaire (Table 1, Figures 1 & 2). There are a number of possible reasons for the poor fit of the items. The word "often" in Item 4 ("I often do my homework without thinking") may have caused some confusion with the students' ability to process the sentence. It may also be that students with learning disabilities are not able to do their homework without thinking. Item 13 ("I get frightened when I am asked a question by the teachers") was previously found to have poor validity (Liu & Wang, 2005). Item 18 ("I do not give up easily when I am faced with a difficult question in my schoolwork.") is the longest question in the questionnaire. This question has 18 words which is considerably more than the seven items proposed for human short term memory (Miller, 1965). Peterson and Peterson (1959) tested the duration of short term memory and found that at least 50 per cent of information was forgotten after a time of six seconds. A long question may be particularly difficult for students with learning disabilities as the cognitive load imposed on their short term memory may interfere with their capability to understand the question or process the information. With a learning disability, it is possible that the amount of information retained after the question has been read would be less than 50 per cent.

When these items were removed from the questionnaire, item 20 ("I am not willing to put in more effort in my schoolwork") presented as a misfit problem in the questionnaire. For the information provided by the Rasch analysis for item 20, there would appear to be a small number of girls who responded inconsistently to this item. As a consequence, some doubt must be expressed about the strength of the item that is negatively worded at least with respect to female students with learning disabilities. Furthermore, this is the last item of the test and it only showed signs of lack of strength after three other items had been removed from the test. Item 20 that has been presented as a misfit problem after a further modification to the instrument could be considered for future removal from the ASCQ. A shortened version of the ASCQ can be considered after further modification.

Understanding the academic self-concept of students with learning disabilities in Singapore presents an interesting perspective because unlike the Western countries including Australia where academic self-concept is intensively researched (Marsh, 1990a, 1990b, 1990c, 1993 & 2005), little is known about the academic self-concept of students in Singapore and other Asian countries. Despite Singapore's acceptance of Western technologies and its cosmopolitan appearance, it is still at heart a traditional Chinese society in which Confucian Heritage Culture (CHC) values such as academic effort and academic confidence are predominant. Thus, it is often difficult to generalize the findings from Western studies in an Asian context because of the differences in culture. By using Rasch analysis to analyse a previously constructed Academic Self-Concept Questionnaire (ASCQ) based on CHC educational values and incorporating the values of academic effort and academic confidence, it was hoped to extend the predominantly Western based literature regarding academic self-concept to Singaporean students by examining the construct of a measure of academic self-concept that had been developed from a CHC viewpoint. Moreover, knowledge gained from this study will provide an insight to future policies that can be made to provide better support for students with learning disabilities studying in mainstream schools.

Rasch analysis of the ASCQ largely confirms the unidimensionality of the instrument. In addition, the original ASCQ developed by Liu & Wang (2005) has been improved through the removal of

three items with poor fit statistics. However, the addition of further items toward the extremes of the scale hierarchy could be considered in future studies to ensure valid estimates of academic self-concept can be obtained for all students. Subject specific self-concept questionnaires in reference to a CHC perspective should also be developed.

Although present findings are interesting and have important implications, it has to be acknowledged that this study has some limitations. There is a need for further studies using more representative samples of various school zones in Singapore, as well as a comparative study between students with learning disabilities and students without learning disabilities. Future research could also include a larger sample size and within-class effects can be considered. It would also be interesting to find out if these effects could be applied on students without learning disabilities. A replication of this study can also be done in countries with a CHC tradition such as Hong Kong or China.

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APPENDIX A

Y – Yes; N – No; NA – No Always; NS – No sometimes; YS – Yes sometimes; YA – Yes always

No	Questions	1st Response			2nd response		
1	I can follow the lessons easily	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
2	I day-dream a lot in class	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
3	I am able to help my classmates in their schoolwork	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
4	I often do my homework without thinking	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
5	If I work hard, I think I can go to the Polytechnic or University	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
6	I pay attention to the teachers during lessons	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
7	Most of my classmates are smarter than I am	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
8	I study hard for my tests	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
9	My teachers feel that I am poor in my work	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
10	I am usually interested in my schoolwork	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
11	I often forget what I have learnt	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
12	I am willing to do my best to pass all the subjects	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
13	I get frightened when I am asked a question by the teachers	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
14	I often feel like quitting school	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
15	I am good in most of my school subjects	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
16	I am always waiting for the lessons to end	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
17	I always do poorly in tests	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
18	I do not give up easily when I am faced with a difficult question in my schoolwork	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
19	I am able to do better than my friends in most subjects	**Y**	**N**	**NA**	**NS**	**YS**	**YA**
20	I am not willing to put in more effort in my schoolwork	**Y**	**N**	**NA**	**NS**	**YS**	**YA**