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EXPLAINING ACADEMIC ACHIEVEMENT: THE ROLE OF INTELLECTUAL ABILITY

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Studies have been carried out to examine the physical growth of Malaysian children but none have studied growth along with family situation, nutrition, education and especially intellectual ability of children. In one study examining the cognitive and language development, socio-emotional development, physical growth and nutritional status of three to six year old preschool children in Klang Valley (Chiam 1991), it was found that stunting and underweight, but not wasting, were related to cognitive development (classification, seriation, conservation, reasoning, problem solving). Almost all the correlations between home factors and language development and its components (vocabulary recognition, vocabulary verbalisation and language fluency) were significant. Father's education had the highest correlation with the language variables and mother's occupation had the lowest. Although the study provided some insights into children's physical, cognitive, language and socio-emotional development and the factors which are related to them, the analyses used data on preschool children.

This paper analyses, using a sample of 1404 primary school children in Selangor, the effect of the intellectual ability, child factors such as learning styles, home factors such as influence of parents and school factors such as the school teaching and learning environment on academic performance in school. It is now understood that intelligence is complex, that there are different ways to be intelligent and different ways that exceptional talent can be demonstrated. So to the extent that success in academic achievement is seen as the qualification for success in life, society experiences a great loss when a child does not perform as well as his intellectual ability suggests he should. The findings of this study can shed light on possible intervention strategies to address underachievement in academic performance.

Learning and Academic Performance

Academic achievement, an important aspect of school performance, is a function of various factors. The discussion is based on the conceptual framework shown in Figure 1 which describes the possible factors affecting school performance. Nutrition is an important factor affecting child growth that in turn is directly associated with the child's mental development. Mental development, or intellectual ability, household and parental factors, child factors and the school situation then affect school performance. Household/home factors include socio-economic background, demographic characteristics and food availability/diet. Socioeconomic background is a characteristic of prime importance, particularly in view of the relationship between economic status and school achievement for rural as well as urban children. Also important are parents' education, income, parental attitudes towards child's education/development, and educating practices. Learning styles, attitudes and motivation in schooling form the group of child factors critical to child's development and school

performance. School factors, such as, class size, and the learning and teaching environment are equally relevant.

Asian students use predominantly rote-based, low level cognitive strategies, both in their own culture (Murphy, 1987) and overseas (Pearson & Beasley, 1996; Biggs, 1998). A Western consensus is that students from Asian countries are brought up in a restrictive teaching/learning environment, which commits them to a passive, uncritical, and reproductive mode of learning (Ballard & Clanchy, 1997). Western observers perceive fierce and overcrowded classrooms, filled with docile rote learners cramming for exams. Asian students use highly adaptive learning strategies and achieve better than most Western students in high level academic tasks (Biggs, 1998).

Channels of learning such as these must be realized while teaching. There are various learning styles. Auditory learners learn best by hearing the material to be learnt. They learn best via verbal lectures, discussions and the tone, pitch and speed of the person speaking plays an important role. A visual learner needs to see the materials to be learnt. Visual learners may need to see the teacher's body language and facial expression to follow a lesson. They think in pictures and learn best from visual displays, illustrations and hand-outs. They also prefer to take detailed notes. Kinesthetic learning refers to learning by doing. Kinesthetic learners learn faster when 'doing' something with the information received- be it words, pictures or a physical skill. The act of drawing or writing information, or just moving, while thinking assists their learning. Most learners have been found to use a combination of all three styles (Felder, 1996).

Goolamally (2000) in her study among Malaysian Form 4 students found a strong relationship between learning styles preferences influenced by emotion and school performance. In contrast, Asiah (1999) did not find any relationship between learning style and academic achievement among the form four students she investigated. Neither did she find any significant difference between male and female students' learning styles. However, she found that the students seemed to be most influenced by sociological stimuli such as whether students like to learn alone or in a group, that is, whether the presence of others is a positive or negative factor. Similar results were obtained by Robiah (1996). In addition, Robiah also found that the majority of students showed preference for kinesthetic or 'tactile' style of learning. Hence, it is clearly established by research (O'Conner, 1997; Felder, 1996; & Felder, 2002) that different students demonstrate various learning styles.

Another related study conducted in the Philippines by Totica (1990) to establish the relationship between learning styles and science achievement revealed interesting results. Surprisingly, students who obtained high scores in science were only passive processors of information. The active ones performed poorly in tests. This implies that achievement tests may not actually reflect the true potential of a student. In relation to this, Abdul Hamid (1977)

found that not all students who did not perform well in examinations lacked hard work. In fact, many of these students were hardworking but were found to have ineffective learning styles.

The educational effect of class size in schools is an important variable associated with school performance. A main reason for disagreement is the conflict between, on the other hand, the common assumption among teachers, parents, and governors of schools (Bennett, 1996) that smaller classes provide a more productive educational environment than larger classes, and, on the other hand, the unwillingness of government agencies and other policy makers, as well as some researchers, to agree that class size in itself is a main determinant of educational progress. A main reason for caution is that any commitment to smaller classes necessarily involves more teachers, and this has considerable resource implications (Blatchford, Goldstein & Mortimore, 1998).

The STAR random control study (Pate-Bain et al., 1992) has shown a class size effect on children's achievement. Children in small classes (13-17 children) significantly and consistently outperformed those in either of the other two conditions (regular classes of 22-25 children or of 22-25 children with a teacher's aide) on the Stanford Achievement Tests in reading and mathematics from the kindergarten year through Grade 3. Furthermore, ethnic minority children benefited relatively more than the majority white children on the tests, whereas inner city, predominantly minority children in the small classes had significantly higher self-concept scores in grades 1 and 2, and higher motivation scores in grade 3 (Hargreaves, Galton & Pell, 1998). The project STAR team asserts that "small classes provide quality, equality, and equity" (Achilles, Finn & Bain, 1998). It shows that smaller classes appear overall to benefit children with special needs, children from minority groups, and younger children during the first years of school, by facilitating changes in aspects of instructional processes (Podmore, 1998).

Schools in the developed countries of the West normally have class size of about 20 to 30 students per class. Class size in China, Hong Kong, Singapore, Korea, Taiwan and Japan are typically larger. Elementary schools in Japan, China and Taiwan range from 38 to 50 (Stevenson & Stigler, 1992), while secondary school classes in China ranged around 45-50, but in "key" or elite schools may even exceed 60. Average classes size in Singapore and Hong Kong are roughly similar, at primary level ranging from 30 to 39, and at secondary, the average is just under 40, dropping to 20 pre-university. In Singapore and China in particular, elite classes tend to be larger than normal, and smaller in rural areas in China, so that overall there is a positive but coincidental association between academic performance and class size (Biggs, 1998).

Bosker (1998) in the Netherlands found an association between class size and primary pupil achievement. The most negative relationships show up in grade 2 classes. For

arithmetic achievement the effect size is in the area when classes are larger than 25 pupils. For language achievement in grade 2 the results become clear cut if classes contain more than 35 pupils, although a negative effect for classes of size 25-29 appears as well. As for the associations between class size and pupil achievement in grades 4, 6 and 8 are less pronounced, although there is some indications that pupils in classes with 35 or more pupils lag (slightly) behind other pupils. Interaction effects between, socio-ethnic status, sex, and IQ, on the one hand, and class size, on the other, appear to have inconsistent patterns. Quite surprisingly, in three of ten cases, achievement gaps appeared to be widening with decreasing class size.

A positive school environment can be fostered by establishing a school philosophy stressing that children come first and emphasizing love, pride, and the encouragement of pluralism. Parents, parent-teacher organizations, and community supporters can all become active in developing positive attitudes toward the school (Zepka, 1985). Teachers also play a very influential role in student's academic performance. Teaching approaches may be simplistically stated as being on a spectrum from traditional methods to more free and flexible methods. Wishard (1997) states that, "*Traditional methods are defined as heavily structured, disciplined, having a lecture format, and set in a competitive environment such that students are definitively preoccupied with the grade received rather than the process of learning. These reforms call for new and innovative ways of teaching, encompassing free and flexible environment, concerned with the interest of the students, and their participation in their acquisition of knowledge*"(p.3).

Teachers must be effective in the classroom and the characteristics of an effective instructor suggested by the Gwenna Moss Teaching and Learning Centre, University of Saskatchewan (2003), are knowledge of, and enthusiasm for, the subject matter and teaching, good organization of subject matter and course, effective communication, positive attitudes toward students, fairness in evaluation and grading, and flexibility in approaches to teaching. O'Conner (1997) noted that lack of motivation, resistance, failure, and uninspired intellectual work can be traced to the fact that many students cannot learn well within the limited orientation provided them in the classroom. The richness of the knowledge about learning and teaching styles should give us the insight to adjust educational environments to make them more efficient and successful places (O' Conner, 1997). Reiff (1992) had also stated that if teachers understand students' learning styles and teach accordingly, this will help reduce both teacher and student disappointment. Ingham (1992) had encouraged parents and teachers to understand and look upon individual learning styles as something special and unique about children that can be used to their advantage and promote effective learning.

Methods

This study is based on data from a stratified sample, weighted for race and rural/ urban settings, of 52 national-type schools[1] located in the state of Selangor. Selangor is one of the more affluent states in Malaysia with highest recorded economic growth rate of 10.9% per annum in GDP for 1991-1995. The per capita GDP in 1995 at RM8687 was higher than the national average of RM5815 (Malaysia, 1996).

Standard Four students (age 9 and 10) were chosen to participate in this study, as this is the academic year free of all national examinations.1404 Standard 4 (age 9 and 10 years) pupils, 524 Standard 4 teachers, 51 principals and 1317 parents participated in the survey. Questionnaires were developed in accordance to the composite groups of factors outlined in the Conceptual Framework, and administered to students, parents, teachers and the school principals.

The composite group of child factors comprising of questions related to child's sociodemographic background, attitudes towards learning-teaching techniques and environment, and school activities and this was conducted as a group in the classroom. Data on academic performance of the student's cognitive ability and intelligence and were collected from student's school performance records and via the administration of the Raven's Test respectively.

The Raven Coloured Progressive Matrices (Raven, 1958, Raven, Court and Raven, 1983), a non-verbal visual-spatial task was utilized to assess the children's mental performance. It consists of 36 test items divided into three sets of 12 items. The colourful attractive design holds attention particularly in children. Everyone was given exactly the same series of problems in the same order and was asked to work, without interruption, from the beginning to the end of the scale. It was administered as a group test. A person's total score provides an index of his/her intellectual capacity, with relatively little influence from the cultural environment in which the individual grew up or his/her education.

Parents were informed of the study and invited to the school for a personal interview. Questions were asked pertaining to their sociodemographic background, home environment, attitudes towards child's education, and child-parent relationships. The principal was asked about the school facilities and human resources, performance, and achievements, while the teachers were asked about their qualifications, and their assessment and use of various styles/techniques of teaching methods. These questionnaires were all self-administered.

The variables used in this analysis are described in Table 1. Graphical and regression analyses are used to evaluate the factors affecting academic achievement. All analyses are weighted and were run on Stata 7.

[1] Vernacular-type and private schools were not included in the survey. These generally have much higher enrolment of Chinese (private schools) and Indian pupils.

Results

Socio-Demographic Characteristics

Of the1404 pupils, 29% were aged 9, and the rest aged 10. There were a slightly higher proportion of female students (51%). Malays were 85%, Indians 11%, and Chinese (4%), reflecting ethnic proportions in national schools[2]. The schools were located in both urban (83%) and rural (17%) areas. The mean age of the mother was 40.6 years and more than half (52%) were not working. A substantial number of the parents had tertiary education (22% of mothers; 30% of fathers, 17% of both). A substantial number of the parents were also professionals (15% of mothers; 28% of fathers, 11% of both). Mean monthly household income averaged RM3,595 (standard deviation = RM3,842) (US$1 = Malaysian Ringgit 3.80).

Academic and Intellectual Abilities

Table 2 shows the distribution of marks by subject, Bahasa Malaysia (Comprehension) (BMC), Bahasa Malaysia (Writing) (BMW), Mathematics (MATH), English (ENGLISH) and Science (SCIENCE). The average marks of all these subjects are shown as ACAD. Pupils do better in BMC and MATH, less well in SCIENCE and fare relatively poorly in BMW and ENGLISH. The distribution of Raven's test scores (RTS) in Selangor national schools is similar if not better than scores elsewhere especially at higher values of RTS, but appear worse compared to elsewhere at the lower levels of RTS (Table 3).

Figure 2 shows the scatterplots of the academic and Raven's scores. While the relationship between the academic subjects is roughly linear, that between academic subjects and RTS is not. High RTS can correspond to both low and high achievement; low RTS correspond generally to low academic achievement (although there are some high achievers). This can be more clearly seen if we consider the minimum and maximum academic grades obtained at the various levels of RTS, as shown in Table 4. The positive effect of RTS on academic subjects can be seen in the progressively higher minimum and maximum academic scores as level of RTS increases. Nevertheless, there are pupils who score fail grades despite a high RTS, and vice versa.

Our concern is to recognize the former, that is, those who might be termed as underachievers, so as to identify the type of intervention programmes might be gained especially from an examination of the latter group, that is, those who might be termed over-achievers. This requires an understanding of the relationship between academic performance

and intellectual ability, which can be attained by examining the determinants of academic performance.

Affective Factors and Academic Achievement

Two factors can be considered as affective factors in the study, namely learning styles and the teaching learning environment. The study identified 8 groups of learning styles. The groups were, Total Kinesthetic-Visual-Auditory (KVAT) Partial Kinesthetic-Visual-Auditory (KVAP), Kinesthetic-Visual (KV), Kinesthetic- Auditory (KA), Kinesthetic-Visual (KV), Auditory (A), Visual (V), and Visual-Auditory (VA). It was found that the mean scores for science achievement for students in KA, KVAP, KV, A, KVAT, K, V, and VA groups were 57.65, 45.37, 42.98, 53.44, 40.06, 49.64, 46.32 and 40.86, respectively. It can therefore be implied that the learning style of the pupil had an impact. In particular, the more visual the learning style of a pupil, the lower the score. The more kinesthetic or auditory the learning style of a pupil, the more the score. Similar results were obtained for Mathematics, the English language and Bahasa Melayu. The results of school performance of students can be summarized as below:

(i) Achievement in Science: KA>A>K>V>KVAP>KV>VA>KVAT
(ii) Achievement in Mathematics: KA>A>K>VA>KV>KVAP>V>KVAT
(iii) Achievement in English: KA>A>VA>K>V>KVAP>KV>KVAT
(iv) Achievement in Bahasa Melayu (Writing): KA>A>K>KVAP>KVAT>VA>KV>V
(v) Achievement in Bahasa Melayu (Comprehension): KA>A>K>KV>KVAP>V>KVAT>VA

Determinants of Academic Achievement

Within the conceptual framework of Figure 1, academic achievement is seen as a function of the following effects:

- Intellectual ability as measured by Raven's Test Scores
- Community and culture, as measured by ethnicity, gender and strata
- Socio-economic status (SES), as measured by parents education and income
- Pupil factors, as measured by developmental and motivational factors
- Family and school factors, as measured by the home environment and school environments

Academic achievement is measured by ACAD, the average of all scores. The predictor or independent variables and their postulated effects are shown in the last column of Table 1. Table 5 presents the results of various models explaining ACAD, estimated using regression analysis. The models introduce each of the groups of variables in turn:

Model 1: Intellectual ability
Model 2: Intellectual ability, community and culture
Model 3: Intellectual ability, community and culture, socio-economic status
Model 4: Intellectual ability, community and culture, socio-economic status, pupil factors
Model 5: Intellectual ability, community and culture, socio-economic status, pupil factors, family and school factors

The full model is Model 5, and diagnostic tests show that the residuals of the estimated regression satisfy the assumptions of regression analysis. The Shapiro-Wilks test of normality is not rejected, and the Cook-Weisberg test for heteroscedasticity is not rejected for RTS.

The estimates of Model 1 show that RTS alone explains about 29 per cent of the variation in ACAD. It remains significant even with the addition of all other factors in all the models. The next group of variables added is the community or culture variables, gender, strata and ethnicity (Model 2). Only MALE is significant negatively. It remains significant when SES is introduced in Model 3, but becomes insignificant in Models 4 and 5, when the other variables (pupil, family and school) are introduced. The SES variables are all significant, and remain so even when other variables are introduced. Here only mother's education is used, as mother's occupation, and father's education and occupation are all highly correlated with mother's education.

The study also obtained information on expenditure on education, but this was correlated with household income ($r=.46$, $p<.00$). The latter was a better predictor of ACAD, showing that in this relationship household income likely measures more than merely the amount spent on education. Since household income had a skewed distribution, the log of household income (LINC) was used instead. The results show that the higher the educational level of the mother (comparing SEC, TER against PRIMARY), and the higher the household income, the higher the academic score.

Several measures of the individual pupil were identified. Although only two ages were observed, age 9 and 10, age was a significant factor in grade achievement: the greater the age, the greater the score. The learning style of the pupil had an impact. In particular, the more visual the learning style of a pupil, the lower the score. The more kinesthetic or auditory

the learning style of a pupil, the more the score. However when family and school variables were introduced, K becomes insignificant. The more active child also on average had better scores, as did the child who had breakfast regularly. SELF, a measure of self-concept, was also an important positive determinant of ACAD. The questions selected for SELF were chosen to reflect individualism, a factor seen in pupils who are achievement oriented (Lee and Nagaraj, 1995).

Family effects were also measured in several ways. A battery of questions on academic nurturing was factored, and the first principal component, which explained 92 per cent of the variation in these variables, used to obtain CARE[3]. CARE was significant, with greater CARE leading to greater ACAD. WORK was not significant, but of the right sign. It is likely that it is not whether the mother works, but the amount of nurturing – as measured in CARE – that is important. The number of siblings was, as expected, significantly negative. However, unexpectedly, being hit sometimes (HITS) was positive and significant. This might reflect more the care and attention received rather than abuse. HITP, a measure of marital stability and a negative home environment, was as expected significantly negative.

To measure school effects, a number of variables were incorporated. Class size, the pupil-teacher ratio in the school, the school size as proxied by the number of teachers, the facilities, the educational level of teachers and the years of experience of the school principal were all considered. In addition, what the pupil felt about the school environment was also included. These variables were investigated separately, but it was then felt that a composite would be more useful. The first principal component, which measured 99 per cent of the variation in the responses, was used to obtain SCH, which measures the effect of large schools[4]. The results found SCH to have a positive significant effect on ACAD. This is contrast to expectations: large classes and schools are expected to imply less attention for a pupil. Perhaps instead large schools provide the kind of support required to achieve academically. Alternatively, it is possible that even the class sizes are already too large to make a difference.

Finally Table 5 shows the beta coefficients for the final model (Model 6) estimated, which includes only the variables found significant in explaining academic performance. Clearly intellectual ability is the most important predictor of academic performance. SES is an important contributor, as are most of the pupil factors. It is interesting to observe that SCH is

[3] The results of factoring are shown in Table A1. Each of the questions was almost equally important in the first principal component.

[4] The results of factoring are shown in Tables A2. GBD, SCHE and SCHP are unimportant. CSIZE and PUPTEACH load positively, while QUALITY loads negatively, in contrast to expectations. It would appear that this component is measuring the effect of large schools.

as important as LINC, and that TER contributes as much positively as V negatively to academic performance.

Further light on the role of intellectual ability in academic achievement is obtained if we consider the over- and under achievers, defined as those whose academic scores are less than one standard deviation from the predicted score based on the final model (Model 6)[5]. Table 6 shows the percentage distribution of type of achiever by RTS. While the proportion of under-achievers is less among those in the top 25%RTS scores, nevertheless more than a third of these top RTS scorers are under-achievers. Interestingly, 45 per cent of those in the bottom 25% of RTS Scores are over-achievers.

Table 7 presents the relative risk ratios for under and over-achievers as compared to the average achievers for different variables. The first column provides the results for the whole sample. On average the under-achiever is 2.8 times and the over-achiever 2.4 times as likely to be male compared to the average achiever. An additional sibling decreases the predicted log odds ratio of under- and over-achievers as compared to average achievers.

The effect of RTS scores may be seen by obtaining the odds ratios for the two sub-groups, the bottom 25% of RTS scorers and the top 25% of RTS scorers. Among the bottom 25%, the predicted log odds ratios do not vary across the three types of achievers. Among the top 25% of RTS scorers, the under-achiever is 69 times and the over-achiever 30 times as likely to be male compared to the average achiever. That is, comparing the under- and over-achiever in this group, males are more likely to be under-achievers. Mothers of over- and under-achievers are less likely to work compared to average achievers. An additional sibling again decreases the predicted log odds ratio of under- and over-achievers as compared to average achievers.

Discussion

The debate over the role of intellectual ability was revived with the publication of *The Bell Curve* (Herrnstein and Murray, 1994). According to Herrnstein and Murray, intellectual capacity is a far better predictor of future success than a child's initial socioeconomic status (or SES). Future success as measured through educational and occupational outcomes has been shown to be linked to early educational success, which in turn has been shown to be dependent on, among others, intellectual ability (such as, Sewell and Hauser, 1975). Teachman (1995) observes that research has found that the link between intellectual ability and grades in high school is strong enough that the socioeconomic background of students has comparatively little effect.

[5] There are a number of definitions that have been used, as noted by Reis and McCoach (2000). The method adopted here has also been used by Frick et al. (1991).

In a criticism of *The Bell Curve* thesis, Loury (1995, p.2) lists a number of factors on social background that research has shown as having an effect on children's academic achievement: "(1) peer influences in the form of perceived peer education plans; (2) parental expectations and aspirations for their children's schooling; (3) the income and racial composition of the community of origin; (4) the amount of time mothers spend in the labor market; (5) family structure--two parents versus a single parent, and whether parents are separated or divorced; (6) number of siblings and birth order; (7) religious denomination and church attendance; (8) grandparents' schooling; (9) age of the mother at birth; (10) measures of the quality of stimulation found in the home environment, including emotional and verbal responsivity of the mother, provision of appropriate play materials, time and quality of maternal involvement with the child .... parental instigation of and participation in intellectual activities, parental affection, rejection, and nurturance ... etc.; (11) language spoken at home; (12) discussions about college plans with teachers and other school officials; (13) parental emphasis on self-direction versus conformity; (14) ethnicity and immigrant status; (15) parental involvement in school activities; and (16) parental wealth and receipt of welfare income.

Teachman (1995) further investigated the effect of family environment on academic achievement by analyzing sibling data. However, he finds that “nothing seems to be going on in families that alters the basic relationship” between academic achievement and intellectual ability. … That is, elements of the family environment that affect the relationship between intellectual ability and academic achievement may not be experienced in the same fashion by all siblings.” This is supported by the work of Marjoribanks (1996) who finds that parenting styles affect academic achievement and school attitudes but do not influence the relationship between intellectual ability and school outcomes.

In reexamining *The Bell Curve* data, Fischer et al. (1996) offer an alternative explanation, stressing that economic fortune depends more on social circumstances than on intellectual ability, which is itself a product of society. Social policies can address social circumstances to ensure that the social divide is narrowed. That is, policies cannot just rely on intellectual ability to provide, directly or indirectly, the intellectual capital that an economy needs for growth.

The results of this study has indeed found that a number of factors determine academic achievement, in addition to intellectual ability. This is similar to results reported in other studies (for example, Keith, 1992; Schultz, 1993; Schaefer & McDermott, 1999). Socio-economic status, the pupil, family environment, and school characteristics all affect academic achievement as well. Relative importance may be ascertained by considering beta coefficients, and as noted earlier, these suggest that intellectual ability is indeed the most important determinant, more so than SES. While this may seem to support *The Bell Curve*

arguments, the results also provide evidence that other factors, in particular parenting and academic nurturing skills that can be subject to policy measures can improve academic achievement given the level of intellectual ability.

For example, it is useful to note from Model 5 that eating breakfast (relatively easily implemented) leads to an increase of 2.90 marks, more than that obtained 1.20 for a unit increase (almost impossible to implement) in RTS. COCURR also shows a high positive effect (6.43), although this may be a reflection that pupils with better time management are more active rather than the other way around. Obviously, too, the impact of the family environment on the pupil is important, and policy can provide for emotional and other support when children face difficulties at home.

The school environment is another well known factor but these data do not suggest which aspects are the more important. What is apparent is that larger schools are better than smaller schools, probably because they may have better programmes in place for motivating their students. It also appears that the learning style of the pupil clearly has an effect on academic achievement. The typical Malaysian classroom is probably best suited to the kinesthetic learner, which fortunately many pupils are. However, the visual learner suffers most. Perhaps it is then fortunate that visual learning was not that apparent among the students in the study. Kinesthetic-auditory, auditory, and kinesthetic learning seemed to be the styles most preferred.

This could be in part due to the teaching styles of the teachers. Students could be overwhelmed by everyday routine exposure to auditory stimulus and copying of notes as the teachers seem to be using didactic styles of teaching in order to cover the syllabus so that students may be 'ready' to face the national examinations. Students most probably were memorizing too many facts in exam orientated drilling in the classrooms. This aspect is somewhat supported by qualitative observations of the teaching learning environment.

Observations revealed that teachers followed the text books closely. In the Science classrooms, attempts to adapt and make the suggested activities in the text books more interesting or challenging according to the surrounding school environment based upon constructivist principles did not seem to be observed. For example the rural schools near the *belukar* or the paddy fields could study the topic "*mengkaji alam kehidupan"*(man and environment) within their own context by organizing a short field trip. However what was observed was that teachers used pictures in the text books or charts to teach about plants and animals. For example students' interviews revealed the following:

"Belajar haiwan -cikgu tunjuk gambar je"
(When learning about animals, teacher just shows pictures)
Interview transcript, October 14, 2002 – a rural school

"Tiada keluar mana-mana pun. Tapi nak"
(We do not go out anywhere-but we would like to)
Interview transcript, October 14 2002 – a rural school

"Cikgu beri nota sahaja"(Teacher just gives notes)
Interview transcript, October 15, 2002 – an urban school

"Cikgu Banyak bercakap"(Teacher talks a lot)
Interview transcript, October 15, 2002 – an urban school

Most facilitatory, creative or activity based styles of teaching are carried out to try and inculcate critical or creative thinking during the lessons. Usually the questions directed at the students go a long way in doing just that. In the present study, observations in the Science and language classrooms showed that the questions put forward in class by the teachers were mainly content based. For example:

"Bila kutub utara magnet berdekatan dengan kutub selatan magnet lain apakah berlaku?'

Researcher's Journal October 15, 2002 – an urban school

Hence a possible inference here is that teachers are too concerned about the national examinations, that they fail somewhat to exploit their surroundings to their teaching advantage. Time and effort are indeed necessary to plan, organize and execute excursions for their students. It can also be inferred from the discussion above that that the learning styles of the students seem to be influenced by the teaching styles of the teachers.

Finally, under-achievement among those with high intellectual ability represents a loss in a system that values and provides future pathways for the academic achiever. That these seem to be largely male has great implications for human resource needs. But we need to begin at the beginning. Academic achievement is highly correlated with previous achievement, and in this data, 86 per cent of the variation in ACAD could be explained by previous academic achievement. The problems thus need to be addressed from the start, that is, from Primary 1.

Change must occur in the classroom. Material presented must cater to diverse learning styles, gender needs and intellectual abilities, so that all pupils will benefit. It appears that teaching styles have an impact on learning styles, and recognition of this effect will go a long way in adopting measures to reach each pupil in the classroom. Intervention programmes must also address nutrition and exercise needs of pupils.

A government, particularly one that assumes responsibility for every child's education, is accountable for the provision of optimal educational experiences for each and every child, for the benefit of the individual and the community. The nation must establish comprehensive and advanced learning opportunities that meet the needs of all children for academic excellence within a diverse classroom. As the *National Excellence: A Case for Developing America's Report* [6]states, "Students must emerge from their education eager to learn and be confident that they can join the intellectual, cultural, and work life of the nation."

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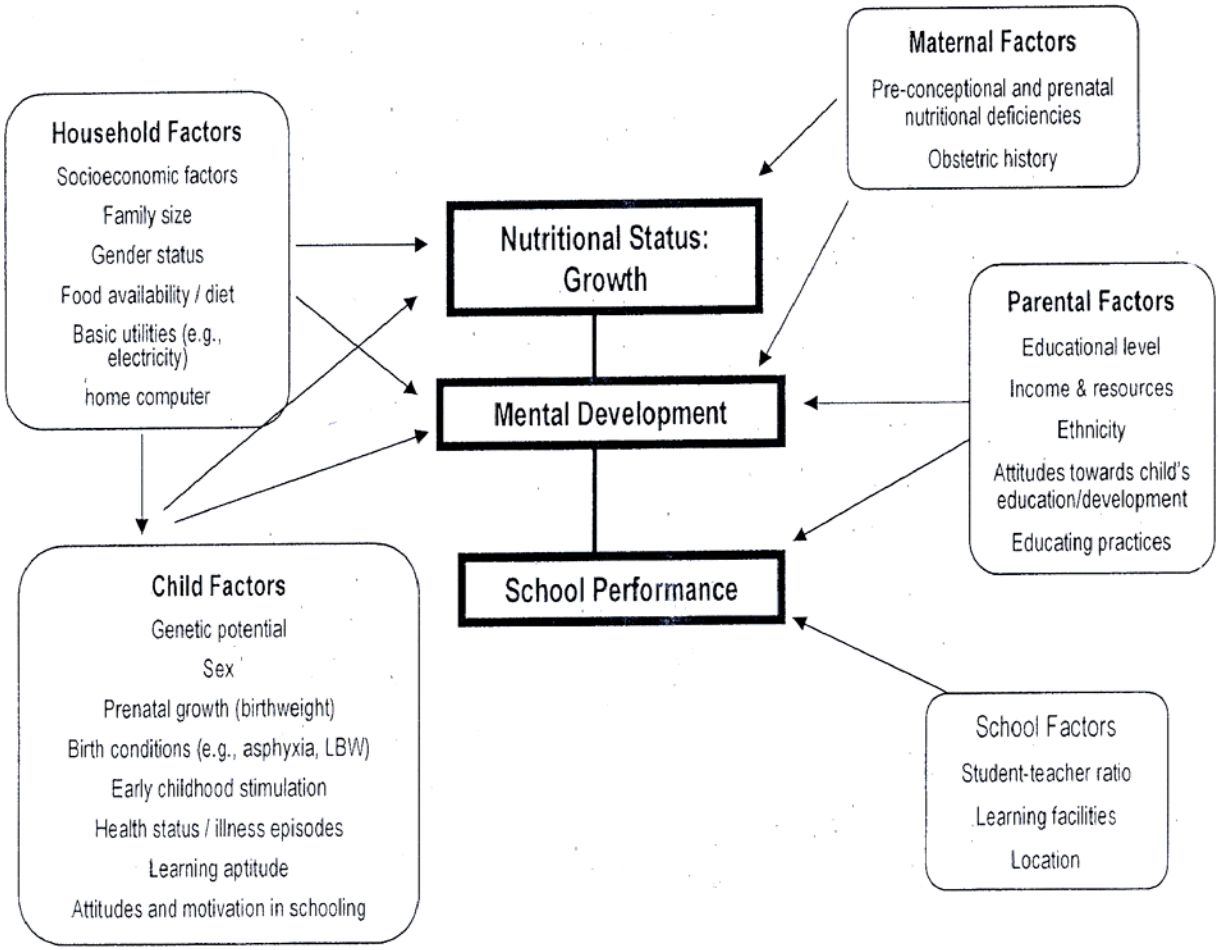

Figure 1.1: Conceptual Framework

Figure 2. Academic and Raven's Test Scores

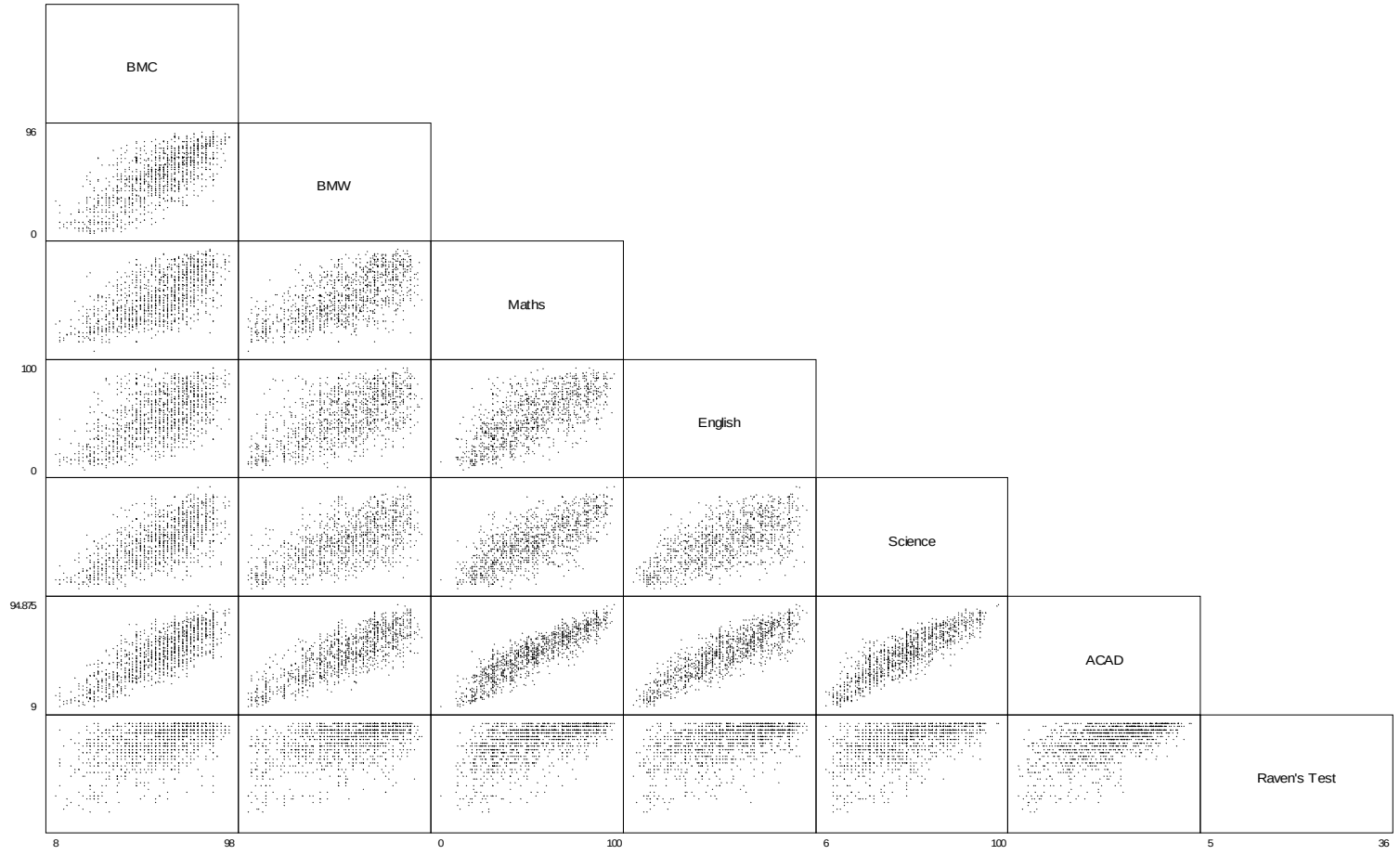

Table 1. Description of Variables Used in the Analyses

Variables	*Description*	*Expected Effect on Academic Achievement*	*Mean**	*Std Error*
Measures of Academic Achievement				
ACAD	Mean of marks for Bahasa Malaysia (both Comprehension and Writing), English, Math, Science		50.83	2.57
BMC	Bahasa Malaysia (Comprehension), Std 4 marks, lm49aa7			
BMW	Bahasa Malaysia (Writing), Std 4 Marks, lm49ab7			
MATH	Std 4 Math marks, lm49b7			
ENGLISH	Std 4 English marks, lm49c7			
SCIENCE	Std 4 Science marks, lm49d1			
Intellectual Ability/ Educability				
RTS	Raven's Score. Measures intellectual ability or educability	Positive	28.30	1.0
Cultural/ Community				
MALE	1 if male	Negative	0.55	0.97
MALAY	1 if Malay	Negative	0.82	0.04
CHINESE	1 if Chinese	Positive	0.96	0.01
INDIAN	1 if Indian	Negative	0.15	0.04
URBAN	1 if urban	Positive	0.80	0.05
Socio-economic Status				
PRIMARY	1 if mother primary education or no formal education			
SEC	1 if mother has secondary education, m17=2	Positive	0.63	0.05
TER	1 if mother has tertiary education, m17=3	Positive	0.11	0.03
LINC	Log of Household Income, m19	Positive	7.66	0.15
Pupil Measures				
AGE	Age of pupil, k9	Positive	9.69	0.04
K	0-3. Higher value, more kinesthetic learner, p8, p11, p26	None	2.34	0.09
V	0-6. Higher value, more visual learner, p13, p14, p15, p18, p20, p24	None	3.61	0.17
A	0-5. Higher value, more auditory, p12, p16, p19, p21, p25	None	3.78	0.11
COCURR	1 if pupil is in cocurricular activities, k20=1	Positive	0.89	0.03
EAT	1 if pupil eats breakfast, k13=1, breakfast everyday	Positive	0.47	0.04
SELF	0-3. Higher value, greater self-concept, sum of p28, p33, p37=2	Positive	0.64	0.10
Family Measures				
CARE	Principal component of responses to questions on nurturing the academic potential of the pupil, m32a-m32j	Positive		
WORK	Whether mother works or not, m15	Negative	0.45	0.06
SIB	Number of children, m14b3-1	Negative	3.27	0.26
HITS	1 if pupil has been hit by parents sometimes , k29= 1, 2	Negative	0.83	0.04
HITP	1 if pupil has seen father hitting mother or vice-versa , k27, k28==1,2; oft or sometimes		0.18	0.03
School Factors				
SCH	Principal component of following school factors			
CSIZE	Number of pupils in class	Negative	36.28	1.03
GBD	1 if qualification of headmaster is diploma or higher, gb10>1	Positive	0.71	0.09
SCHE	1 if pupil feels teachers have good relations between each other, p29=1	Positive	0.89	0.03
SCHP	1 if pupil feels school physical environment good, p34=1	Positive	0.61	0.07
FAC	0-17, count of facilities available, gb13a-gb13s	Positive	11.32	0.52
QUALITY	1 if there are teachers in Std 4 with post grad qualification, gb14d1	Positive	0.03	0.03
PUPTEACH	Pupil-teacher ratio in school, gb14b/gb14a	Negative	20.69	0.63
SCHSIZE	Number of teachers in school; gb14a	Positive	56.45	8.21

* Weighted means

Table 2. Academic Scores

Subject	BMC	BMW	MATH	SCIENCE	ENGLISH	ACAD
Score Range	0 - 100					
Percentile						
25	48	38	40	38	35	40
50	64	55	56	54	48	55
75	76	71	78	67	65	68

Table 3. Comparison of Raven's Test Scores

	2002 Study	1993 Buenos Aires	1989 Taiwan N=300	1982 Dumfries N=37	2002 Study	1993 Buenos Aires, n=420	1982 Dumfries N=49
Age Group	9	9	9(3)-9(8)	9(3)-9(8)	10	10	10(3)-10(8)
Percentile							
5	22	24	18	16	22	25	18
10	24	26	21	19	24	27	22
25	28	28	27	24	29	29	26
50	31	31	31	28	33	32	31
75	34	33	34	31	34	34	33
90	35	35	35	33	36	35	34
95	36	36	36	35	36	36	35

Source: Comparative data from Raven, Raven and Court (1998),Tables CPM20 and CPM21.

Table 4. Minimum and Maximum Scores for Academic Performance in Various Subjects by Raven's Performance Group

RTS	**Minimum Scores**				
	BM	**ENGLISH**	**MATH**	**SCIENCE**	**ACAD**
Top 25%	24	11	19	6	14.5
50-75%	15	8	11	14	12
25-50%	10	6	10	8	13.8
Bottom 25%	7.5	0	0	6	9
Total	7.5	0	0	6	9
	Maximum Scores				
Top 25%	**BM**	**ENGLISH**	**MATH**	**SCIENCE**	**ACAD**
50-75%	94	100	100	100	94.9
25-50%	95	100	99	93	91.2
Bottom 25%	93	95	99	90	87.5
Total	87.5	96	85	90	82.8
	95	100	100	100	94.9

Table 5. Explaining Academic Achievement of Pupils: Regression Results on ACAD

	N	*1199*	*1199*	*1118*	*1117*	*1074*	*1074*
FACTOR		*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6, Beta*
		0.29	0.32	0.40	0.53	0.60	0.59
	CONS	-6.90	-6.44	-32.95*	-97.74*	-87.23*	-0.02*
Intellectual Ability	RTS	2.01*	1.94*	1.58*	1.30*	1.20*	0.35*
Culture/ Community	MALE		-5.05*	-3.01*	-1.94	-1.50	
	URBAN		5.55	0.95	0.71	-6.80	
	MALAY		-0.10	0.16	-0.77	-3.04	
	INDIAN		-3.08	-1.41	-1.84	-2.88	
Socio-economic status	SEC			6.05*	5.12*	2.87*	0.09*
	TER			9.30*	7.11*	5.84*	0.13*
	LINC			4.49*	4.49*	3.94*	0.16*
Pupil	AGE				5.81*	6.58*	0.15*
	K				2.54*	1.22	0.06*
	V				-1.84*	-1.70*	-0.13*
	A				1.86*	1.66*	0.09*
	COCURR				9.70*	6.43*	0.12*
	EAT				2.75*	2.90*	0.08*
	SELF				2.09*	1.38*	0.06*
Family	CARE					1.86*	0.10*
	WORK					0.74	
	SIB					0.33*	
	HITS					4.73*	0.10*
	HITP					-5.84*	-0.12*
School	SCH					4.93*	0.16*

Note: * indicates significance at least at p=.05. Details in Tables A3-A8

Table 6. Percentage Distribution of Type of Achiever by RTS Category

Type of Achiever	Bottom 25% of RTS Scores, RTS<28	25-75% of RTS Scores, 28<=RTS<=34	Top 25% of RTS Scores, RTS>34	Total
Under (< 1 SD)	0.49	0.47	0.37	0.45
Centre	0.06	0.06	0.08	0.07
Over (> 1 SD)	0.45	0.47	0.55	0.48
Total (N)	248	604	221	1074

Table 7. Relative Risk Ratios of Type of Achiever

Type of Achiever	Variables	All	Bottom 25% of RTS Scores, RTS<28	Top 25% of RTS Scores, RTS>34
	F value	8.10*	1.01	4.99*
Under				
	MALE	2.82*	1.33	68.73*
	INDIAN	0.99	3.53	1.50
	MALAY	0.58	1.56	1.89
	URBAN	0.65	0.50	0.74
	WORK	0.49	0.98	0.002*
	SIB	0.89*	1.09	0.52*
Over				
	MALE	2.44*	0.84	30.50*
	INDIAN	0.54	1.42	1.58
	MALAY	0.34*	1.09	0.57
	URBAN	0.39*	0.26	0.16
	WORK	0.48	1.22	0.004*
	SIB	0.87	1.08	0.54*

Note: * implies significance at least at p=.05. Details in Tables A9-A11.

Appendix 1: Some Questions from the Questionnaires

1. Learning Styles, K, V, A

	TIDAK	YA
8. Saya akan faham sekiranya saya **buat latihan** tentang apa yang telah diajar.	☐	☐
10. Saya akan ingat sekiranya saya banyak **membuat nota sendiri** tentang apa yang telah diajar.	☐	☐
11. Saya akan faham sekiranya saya **berbincang atau bercakap** dengan kawan saya tentang apa yang telah diajar.	☐	☐
12. Saya suka sekiranya pelajaran baru diajar oleh guru dengan menggunakan atau menunjukkan banyak **gambar atau rajah.**	☐	☐
13. Saya lebih suka pelajaran diajar dengan **memberi nota** daripada penerangan.	☐	☐
14. Saya suka buku yang mengandungi banyak **gambar**.	☐	☐
15. Saya suka baca buku yang mengandungi **banyak penerangan** dan kurang gambar.	☐	☐
16. Saya suka belajar dengan **kawan-kawan** di dalam kelas.	☐	☐
17. Saya lebih suka cikgu yang membuat **banyak penerangan** daripada menggunakan atau menunjukkan banyak gambar semasa mengajar.	☐	☐
18. Saya akan ingat sekiranya saya dapat **lihat** apa yang diajar.	☐	☐
19. Saya akan ingat sekiranya saya dapat **dengar** apa yang diajar.	☐	☐
20. Saya suka belajar **seorang diri (**sendirian**).**	☐	☐
21. Saya suka belajar **beramai-ramai**.	☐	☐
24. Apabila saya lihat rajah atau gambar, saya akan ingat gambar itu dan bukan apa yang dikatakan oleh cikgu tentang gambar itu.	☐	☐

25. Apabila saya lihat sesuatu rajah atau gambar, saya akan ingat apa yang dikatakan oleh cikgu tentang gambar itu dan bukan gambar itu.

26. Saya akan ingat tentang apa yang telah diajar sekiranya saya buat sesuatu kegiatan di dalam kelas (seperti ujikaji, lawatan sambil belajar, lakonan, kuiz, permainan dan lain-lain.)

2. SELF

YA

TIDAK

22. Saya sentiasa dapat peluang untuk tanya soalan kepada guru saya.

33. Saya rasa diri saya disayangi di sekolah saya.

37. Saya suka dan seronok dengan cara guru saya mengajar.

3. HIT, HITS

k27. Pernahkah anda melihat Ibu anda dipukul oleh bapa anda?

(1) Selalu
(2) Kadang-kadang
(3) Tidak Pernah

k28. Pernahkah anda melihat bapa anda pula dipukul oleh ibu anda?

(1) Selalu
(2) Kadang-kadang
(3) Tidak Pernah

k29. Pernahkah kedua ibubapa anda memukul atau memarahi anda?

(1) Selalu
(2) Kadang-kadang
(3) Tidak Pernah

4. CARE

m32. **Sila nyatakan berapa kerapkah anda melakukan perkara yang berikut:-**
How often do you do the following:

1. **Tidak langsung**/ Not at all	2. **Kadang-kadang**/Occasionally	3. **Selalu**/Often	4. **Kerap**/Very often	5) **Tidak perlu**/ No need to do

a. Adakah anda menetapkan had masa menonton televisyen dalam satu hari untuk anak ini? Do you set limits on how much time this CHILD can watch TV in a day?	**1**	**2**	**3**	**4**	**5**	**Tiada TV**
b. **Adakah anda menetapkan program televisyen yang patut Anak ini tonton?** Do you set limits on what TV programs this CHILD can watch?	**1**	**2**	**3**	**4**	**5**	**Tiada TV**
c. **Adakah anda menetapkan had masa Anak ini berjaga pada waktu malam?** Do you set limits on how late this CHILD can stay up at night?	**1**	**2**	**3**	**4**	**5**	
d. **Adakah anda memastikan Anak ini mengambil 3 makanan utama, iaitu sarapan, makan tengahari dan malam?** Do you ensure this CHILD eats the 3 main meals; that is breakfast, lunch and dinner?	**1**	**2**	**3**	**4**	**5**	
e. **Adakah anda meluangkan masa membaca bersama / kepada Anak ini?** Do you spend time reading with/to this CHILD?	**1**	**2**	**3**	**4**	**5**	
f. **Adakah anda cuba untuk membimbing atau mengawasi Anak ini membuat kerja sekolah?** Do you try to guide or supervise this CHILD in his/her homework?	**1**	**2**	**3**	**4**	**5**	
g. **Adakah anda menetapkan masa untuk Anak ini membuat kerja sekolah?** Do you set time when this CHILD does homework?	**1**	**2**	**3**	**4**	**5**	
h. **Berapa kerapkah anda meluangkan masa dan wang untuk aktiviti akademik dan bukan akademik Anak ini?** How often do you spend time or money on this CHILD's academic and non-academic activities?	**1**	**2**	**3**	**4**	**5**	
i. **Berapa kerapkah anda menyemak pencapaian peperiksaan/ujian Anak ini?** How often do you check/examine this CHILD's school grades?	**1**	**2**	**3**	**4**	**5**	
j. **Berapa kerapkah anda memeriksa kerja rumah Anak ini?** How often do you inspect this CHILD's homework?	**1**	**2**	**3**	**4**	**5**	

Appendix 2: Results

Table A1. Principal Factors for Academic Nurturing Responses
(obs=1306)

(principal factors; 1 factor retained)

Factor	Eigenvalue	Difference	Proportion	Cumulative
1	2.27994	1.52621	0.9177	0.9177
2	0.75373	0.60747	0.3034	1.2210
3	0.14626	0.04452	0.0589	1.2799
4	0.10174	0.08868	0.0409	1.3208
5	0.01305	0.01253	0.0053	1.3261
6	0.00053	0.17015	0.0002	1.3263
7	-0.16962	0.01960	-0.0683	1.2580
8	-0.18922	0.01006	-0.0762	1.1819
9	-0.19928	0.05332	-0.0802	1.1017
10	-0.25260	.	-0.1017	1.0000

Factor Loadings

Variable	1	Uniqueness
m32a	0.39425	0.84457
m32b	0.40380	0.83694
m32c	0.38966	0.84817
m32d	0.32009	0.89754
m32e	0.52742	0.72183
m32f	0.65226	0.57456
m32g	0.50623	0.74373
m32h	0.41096	0.83112
m32i	0.48644	0.76338
m32j	0.58462	0.65822

Cronbach alpha
Average interitem covariance: .1517421
Number of items in the scale: 10
Scale reliability coefficient: 0.7316

Table A2. Principal Factors for School Measures
(obs=1371)

(principal factors; 1 factor retained)

Factor	Eigenvalue	Difference	Proportion	Cumulative
1	1.90626	1.64982	0.9921	0.9921
2	0.25645	0.06293	0.1335	1.1255
3	0.19351	0.13507	0.1007	1.2262
4	0.05844	0.03702	0.0304	1.2566
5	0.02142	0.07695	0.0111	1.2678
6	-0.05553	0.13252	-0.0289	1.2389
7	-0.18805	0.08293	-0.0979	1.1410
8	-0.27098	.	-0.1410	1.0000

Factor Loadings

Variable	1	Uniqueness
csize	0.67872	0.53934
gbd	0.09105	0.99171
sche	0.03090	0.99904
schp	-0.04118	0.99830
fac	0.51797	0.73171
quality	-0.22472	0.94950
pupteach	0.84314	0.28911
schsize	0.63638	0.59502

Cronbach alpha

Average interitem correlation: 0.1233
Number of items in the scale: 8
Scale reliability coefficient: 0.5294

Table A3. Regression Results on ACAD, Model 1

Survey linear regression

```
pweight:  psweight                              Number of obs    =      1199
Strata:   strata                                Number of strata =         2
PSU:      psu                                   Number of PSUs   =        50
                                                Population size  = 44858.677
                                                F(   1,     48)  =    124.53
                                                Prob > F         =    0.0000
                                                R-squared        =    0.2881

------------------------------------------------------------------------------
        acad |      Coef.    Std. Err.      t    P>|t|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
     rtscore |   2.015217     .180589    11.16   0.000    1.652119    2.378316
       _cons |  -6.896253    4.708212    -1.46   0.150   -16.36275     2.57024
------------------------------------------------------------------------------
```

Table A4. Regression Results on ACAD, Model 2

Survey linear regression

```
pweight:  psweight                              Number of obs    =      1199
Strata:   strata                                Number of strata =         2
PSU:      psu                                   Number of PSUs   =        50
                                                Population size  = 44858.677
                                                F(   5,     44)  =     39.23
                                                Prob > F         =    0.0000
                                                R-squared        =    0.3214

------------------------------------------------------------------------------
        acad |      Coef.    Std. Err.      t    P>|t|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
     rtscore |   1.942248    .1411905    13.76   0.000    1.658366    2.226131
        male |   -5.04679    1.408158    -3.58   0.001   -7.878081   -2.215499
       urban |    5.54754    3.581289     1.55   0.128   -1.653125     12.7482
       malay |  -.1037945    3.503807    -0.03   0.976    -7.14867    6.941081
      indian |  -3.077995    2.694435    -1.14   0.259   -8.495519    2.339529
       _cons |  -6.438811    6.129007    -1.05   0.299     -18.762    5.884383
------------------------------------------------------------------------------
```

.

Table A5. Regression Results on ACAD, Model 3

Survey linear regression

```
pweight:  psweight                              Number of obs    =      1118
Strata:   strata                                Number of strata =         2
PSU:      psu                                   Number of PSUs   =        50
                                                Population size  = 41241.393
                                                F(   8,     41)  =     85.44
                                                Prob > F         =    0.0000
                                                R-squared        =    0.4094

------------------------------------------------------------------------------
        acad |      Coef.    Std. Err.      t    P>|t|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
     rtscore |   1.577108    .1379112    11.44   0.000    1.299819    1.854397
        male |  -3.013106    1.577263    -1.91   0.062   -6.184406    .1581939
       urban |   .9479012    3.272101     0.29   0.773   -5.631099    7.526902
       malay |    .155102    3.317113     0.05   0.963   -6.514401    6.824605
      indian |  -1.416917    2.728852    -0.52   0.606   -6.903642    4.069809
         sec |   6.050068    1.538091     3.93   0.000    2.957528    9.142607
         ter |    9.30265    2.884478     3.23   0.002    3.503019    15.10228
        linc |   4.488887    .9529638     4.71   0.000    2.572825    6.404949
       _cons |  -32.95053    10.69843    -3.08   0.003   -54.46118   -11.43989
------------------------------------------------------------------------------
```

Table A6. Regression Results on ACAD, Model 4

Survey linear regression

```
pweight:  psweight                              Number of obs    =      1117
Strata:   strata                                Number of strata =         2
PSU:      psu                                   Number of PSUs   =        50
                                                Population size  = 41207.706
                                                F(  15,     34)  =    207.01
                                                Prob > F         =    0.0000
                                                R-squared        =    0.5263
------------------------------------------------------------------------------
        acad |      Coef.    Std. Err.      t    P>|t|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
     rtscore |   1.295749    .1455635     8.90   0.000    1.003074    1.588424
        male |  -1.936444      1.8632    -1.04   0.304   -5.682659    1.809772
       urban |   .7142818     2.93587     0.24   0.809   -5.188681    6.617244
       malay |  -.7675702    3.021822    -0.25   0.801   -6.843351    5.308211
      indian |  -1.838579    2.372983    -0.77   0.442   -6.609781    2.932623
         sec |   5.122161    1.395826     3.67   0.001    2.315664    7.928658
         ter |   7.114056    2.797384     2.54   0.014    1.489539    12.73857
        linc |   4.489138    .7478905     6.00   0.000    2.985403    5.992872
         age |   5.809615    1.877531     3.09   0.003    2.034586    9.584644
           k |   2.541811    1.280233     1.99   0.053   -.0322711    5.115892
           v |  -1.840058    .4622262    -3.98   0.000   -2.769427   -.9106904
           a |   1.864192    .7285801     2.56   0.014    .3992836      3.3291
      cocurr |   9.699568    2.665574     3.64   0.001    4.340073    15.05906
         eat |   2.746283    1.122951     2.45   0.018    .4884387    5.004127
        self |    2.08968    .5683035     3.68   0.001    .9470297    3.232331
       _cons |  -97.73788    15.43172    -6.33   0.000   -128.7654   -66.71033
------------------------------------------------------------------------------
.
```

Table A7. Regression Results on ACAD, Model 5

```
Survey linear regression

pweight:  psweight                                Number of obs    =      1071
Strata:   strata                                  Number of strata =         2
PSU:      psu                                     Number of PSUs   =        48
                                                  Population size  = 40641.463
                                                  F(  21,     26)  =    401.21
                                                  Prob > F         =    0.0000
                                                  R-squared        =    0.6044

------------------------------------------------------------------------------
        acad |      Coef.    Std. Err.      t    P>|t|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
     rtscore |     1.2008    .1382036     8.69   0.000    .9226102    1.478989
        male |   -1.49951    1.777687    -0.84   0.403   -5.077809    2.078789
       urban |  -6.804706    4.320777    -1.57   0.122   -15.50198    1.892566
      indian |  -3.039933    1.799342    -1.69   0.098    -6.66182    .5819546
       malay |  -2.881456    1.845751    -1.56   0.125    -6.59676    .8338474
         sec |   2.872846    1.442949     1.99   0.052   -.0316597    5.777351
         ter |   5.836738    2.767975     2.11   0.040    .2650923    11.40838
        linc |   3.940823    .9327884     4.22   0.000    2.063217    5.818429
         age |   6.585247    1.422774     4.63   0.000    3.721352    9.449143
           k |   1.224683    .7692403     1.59   0.118   -.3237171    2.773084
           v |  -1.700963    .5553769    -3.06   0.004   -2.818878   -.5830468
           a |   1.657103    .7378425     2.25   0.030    .1719029    3.142303
      cocurr |   6.432092     2.15424     2.99   0.005    2.095832    10.76835
         eat |   2.900917    1.281973     2.26   0.028    .3204388    5.481395
        self |   1.377103    .5795993     2.38   0.022    .2104305    2.543776
        care |    1.86462    .7149281     2.61   0.012     .425544    3.303695
        work |  -.7366739    1.491777    -0.49   0.624   -3.739465    2.266117
         sib |  -.3337483     .181059    -1.84   0.072   -.6982012    .0307047
        hits |   4.731997    1.615812     2.93   0.005    1.479536    7.984458
        hitp |  -5.845711    2.397411    -2.44   0.019   -10.67145   -1.019974
         sch |   4.929905    1.564124     3.15   0.003    1.781487    8.078323
       _cons |  -84.23065    14.98162    -5.62   0.000   -114.3871   -54.07422
------------------------------------------------------------------------------

. swilk res

                  Shapiro-Wilk W test for normal data
    Variable |    Obs        W          V          z     Prob>z
-------------+-------------------------------------------------
         res |   1071    0.99890      0.741     -0.745  0.77180

hettest rts

Cook-Weisberg test for heteroskedasticity using variables specified
     Ho: Constant variance
         chi2(1)      =      0.48
         Prob > chi2  =      0.4884
```

Table A8. Means of Variables Used in Regression Model 6

Survey mean estimation

```
pweight:  psweight                              Number of obs    =      1074
Strata:   strata                                Number of strata =         2
PSU:      psu                                   Number of PSUs   =        48
                                                Population size  = 40740.917
```

Mean	Estimate	Std. Err.	[95% Conf.	Interval]	Deff
acad	56.42722	2.807343	50.77633	62.07811	27.52115
rtscore	30.95804	.4285613	30.09539	31.82069	8.814126
sec	.5927317	.0362562	.5197518	.6657117	5.842857
ter	.2505055	.0521014	.1456309	.35538	15.51358
linc	7.838161	.1199452	7.596723	8.079598	20.51421
age	9.728812	.0291815	9.670073	9.787551	4.623046
k	2.420986	.0661648	2.287803	2.554169	9.731614
v	3.426085	.1937635	3.036059	3.816111	21.35699
a	3.844309	.0863684	3.670459	4.01816	6.933986
cocurr	.9258346	.0212542	.8830522	.9686171	7.059175
eat	.4616389	.0324772	.3962658	.527012	4.553859
self	.6512731	.0843753	.4814345	.8211117	12.53944
care	.0436191	.0865813	-.1306601	.2178983	11.95255
hits	.8302882	.0240919	.7817938	.8787826	4.419766
hitp	.1297062	.0367756	.0556807	.2037317	12.85562
sch	.1972538	.2447932	-.2954893	.6899969	72.35065

Table A9 Regression Results on ACAD, Model 6

Survey linear regression

```
pweight:  psweight                              Number of obs    =      1074
Strata:   strata                                Number of strata =         2
PSU:      psu                                   Number of PSUs   =        48
                                                Population size  = 40740.917
                                                F(  15,     32)  =    404.99
                                                Prob > F         =    0.0000
                                                R-squared        =    0.5925
```

acad	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rtscore	1.207353	.1272396	9.49	0.000	.9512327	1.463473
sec	3.3339	1.421584	2.35	0.023	.4724003	6.1954
ter	6.093419	2.778849	2.19	0.033	.4998856	11.68695
linc	3.260137	.639317	5.10	0.000	1.973259	4.547015
age	6.027942	1.466372	4.11	0.000	3.076288	8.979596
k	1.563495	.7387761	2.12	0.040	.0764153	3.050574
v	-1.934467	.5492907	-3.52	0.001	-3.040132	-.8288019
a	1.546871	.7271982	2.13	0.039	.083097	3.010645
cocurr	7.837854	2.42011	3.24	0.002	2.966427	12.70928
eat	3.020089	1.23662	2.44	0.018	.5309034	5.509275
self	1.363045	.7198361	1.89	0.065	-.0859101	2.812
care	2.026746	.7035038	2.88	0.006	.6106663	3.442826
hits	4.648776	1.57583	2.95	0.005	1.476795	7.820758
hitp	-6.238101	1.988958	-3.14	0.003	-10.24166	-2.234537
sch	3.417972	1.155863	2.96	0.005	1.09134	5.744605
_cons	-85.10676	15.05864	-5.65	0.000	-115.4182	-54.7953

Table A10. Regression Results on ACAD, Model 6, Beta Coefficients

Survey linear regression

```
pweight:  psweight                              Number of obs    =      1074
Strata:   strata                                Number of strata =         2
PSU:      psu                                   Number of PSUs   =        48
                                                Population size  = 40740.917
                                                F(  15,     32)  =    404.99
                                                Prob > F         =    0.0000
                                                R-squared        =    0.5925
```

acad	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
rts	.3534008	.0372439	9.49	0.000	.2784326	.428369
sec	.088681	.0378138	2.35	0.023	.0125657	.1647963
ter	.1327205	.060526	2.19	0.033	.010888	.254553
linc	.1637995	.0321213	5.10	0.000	.0991427	.2284563
age	.1510014	.036733	4.11	0.000	.0770617	.224941
k	.0600453	.0283724	2.12	0.040	.0029347	.117156
v	-.1386493	.0393694	-3.52	0.001	-.2178957	-.0594028
a	.092388	.0434325	2.13	0.039	.004963	.179813
cocurr	.1198143	.0369953	3.24	0.002	.0453466	.194282
eat	.0811462	.0332265	2.44	0.018	.0142647	.1480276
self	.056927	.0300637	1.89	0.065	-.003588	.117442
care	.0950636	.0329975	2.88	0.006	.028643	.1614842
hits	.1009994	.0342365	2.95	0.005	.0320849	.169914
hitp	-.1226743	.0391135	-3.14	0.003	-.2014058	-.0439429
sch	.1636183	.0553312	2.96	0.005	.0522425	.2749942
_cons	-.016728	.0501155	-0.33	0.740	-.1176054	.0841493

Table A11. Multivariate Logit of Type of Achiever

```
pweight:  psweight                              Number of obs    =      1071
Strata:   strata                                Number of strata =         2
PSU:      psu                                   Number of PSUs   =        48
                                                Population size  = 40641.463
                                                F(  12,     35)  =      8.10
                                                Prob > F         =    0.0000
```

grp	RRR	Std. Err.	t	P>|t|	[95% Conf.	Interval]
under						
male	2.818928	.6702385	4.36	0.000	1.746761	4.549194
indian	.9910238	.6695739	-0.01	0.989	.2543595	3.861181
malay	.5819158	.3091419	-1.02	0.313	.1997322	1.6954
urban	.6516773	.3255464	-0.86	0.396	.238413	1.781293
work	.4913253	.3146586	-1.11	0.273	.1353672	1.783302
sib	.8901909	.052229	-1.98	0.053	.79103	1.001782
over						
male	2.442288	1.198392	1.82	0.075	.9095903	6.557643
indian	.5443885	.3399363	-0.97	0.335	.1548933	1.913309
malay	.3435499	.1359121	-2.70	0.010	.1549355	.7617787
urban	.3861152	.1153583	-3.19	0.003	.2116111	.7045233
work	.4780786	.3402944	-1.04	0.305	.1140919	2.00329
sib	.8680197	.0747562	-1.64	0.107	.7298641	1.032327

(Outcome grp==centre is the comparison group)

Table A12. Multivariate Logit of Type of Achiever for Top 25% Scorers in RTS

Survey multinomial logistic regression

```
pweight:  psweight                                Number of obs    =       221
Strata:   strata                                  Number of strata =         2
PSU:      psu                                     Number of PSUs   =        45
                                                  Population size  = 9007.7306
                                                  F(  12,     32)  =      4.99
                                                  Prob > F         =    0.0001
```

grp	RRR	Std. Err.	t	P>|t|	[95% Conf.	Interval]
under						
male	68.7259	88.99276	3.27	0.002	5.046643	935.9191
indian	1.502239	2.119238	0.29	0.774	.0873326	25.84052
malay	1.886185	1.931416	0.62	0.539	.23919	14.87392
urban	.7428129	1.62618	-0.14	0.893	.0089842	61.416
work	.0021809	.0046297	-2.89	0.006	.0000302	.1577244
sib	.5225648	.1975143	-1.72	0.093	.2438365	1.119906
over						
male	30.50009	37.03728	2.81	0.007	2.634762	353.0701
indian	1.582325	1.502958	0.48	0.631	.2330171	10.74493
malay	.5734714	.4899674	-0.65	0.519	.1023778	3.212313
urban	.1584341	.290827	-1.00	0.321	.0039096	6.42048
work	.0037781	.0076935	-2.74	0.009	.0000622	.2295092
sib	.5452547	.1638459	-2.02	0.050	.2974507	.9995024

(Outcome grp==centre is the comparison group)

Table A13. Multivariate Logit of Type of Achiever for Bottom 25% Scorers in RTS

Survey multinomial logistic regression

```
pweight:  psweight                                Number of obs    =       246
Strata:   strata                                  Number of strata =         2
PSU:      psu                                     Number of PSUs   =        44
                                                  Population size  = 7323.9534
                                                  F(  12,     31)  =      1.01
                                                  Prob > F         =    0.4642
```

grp	RRR	Std. Err.	t	P>|t|	[95% Conf.	Interval]
under						
male	1.328519	.5603229	0.67	0.504	.5671729	3.111862
indian	3.530119	5.046167	0.88	0.383	.1972198	63.18709
malay	1.558277	2.474904	0.28	0.781	.0631906	38.42704
urban	.4956708	.5038719	-0.69	0.494	.0637163	3.855993
work	.9810753	.6241109	-0.03	0.976	.2717403	3.542017
sib	1.088342	.299241	0.31	0.760	.6248656	1.895589
over						
male	.8545112	.4533326	-0.30	0.768	.2929211	2.492785
indian	1.420634	1.585095	0.31	0.755	.1494783	13.50163
malay	1.09138	1.458664	0.07	0.948	.0735501	16.19452
urban	.260552	.2652493	-1.32	0.194	.0333927	2.032998
work	1.215783	.9484042	0.25	0.803	.2518628	5.868783
sib	1.076877	.3173459	0.25	0.803	.5941367	1.951846

(Outcome grp==centre is the comparison group)

```
. factor nteach totexp qd onesub twosub, pf mine(1)
(obs=1385)

            (principal factors; 1 factor retained)
  Factor     Eigenvalue     Difference    Proportion    Cumulative
-------------------------------------------------------------------------
     1        2.78224         2.46508      0.9654         0.9654
     2        0.31717         0.33999      0.1101         1.0754
     3       -0.02283         0.02540     -0.0079         1.0675
     4       -0.04822         0.09812     -0.0167         1.0508
     5       -0.14634               .     -0.0508         1.0000

               Factor Loadings
    Variable |      1    Uniqueness
-------------+----------------------
      nteach |   0.96391    0.07087
      totexp |   0.74913    0.43880
     qdteach |   0.86649    0.24920
      onesub |   0.46551    0.78330
      twosub |   0.56957    0.67559


. . alpha nteach totexp qd onesub twosub, s

Test scale = mean(standardized items)

Average interitem correlation:      0.5061
Number of items in the scale:            5
Scale reliability coefficient:      0.8367

. score teacher
            (based on unrotated factors)
            (1 scoring not used)

               Scoring Coefficients
    Variable |      1
-------------+----------
      nteach |   0.77881
      totexp |   0.07882
     qdteach |   0.15172
      onesub |  -0.00105
      twosub |  -0.00472
```