# CHAPTER 4

# DATA ANALYSIS AND FINDINGS

## 4.1 Introduction

This chapter reports the findings of the present study. Data were collected in two coeducational public schools in Selangor. During the pilot project and data-collecting process, formal and informal classroom observations were made. Based on the researcher's observation and teaching experience, a general description of the mathematics classes has been compiled.

In a week, Form Two mathematics classes were taught in five 35-40 minutes periods. The classes are normally arranged in one double and three single periods in a week. Therefore, students have at least three to four days of mathematics classes in a week. Classrooms size in the two schools is generally big, between 30 to 40 students per class. Students usually sit in pairs, normally of the same gender. The teacher generally stands at the front of the class and once the teacher starts to teach the topic of the day, the lesson becomes much more teacher-centred. Government textbook is used as main reference. Departments generally provide teachers with minimal teaching materials that teachers are expected to supplement. The lesson will generally conclude with homework of the current sub-topic. Homework or home assignment is taken from the activity book that accompanies the textbook or sourced from external workbooks.

The study made use of the "What is Happening in this Class?" (WIHIC) questionnaire to assess students' perceptions of their learning environment (independent variables) and the Mathematics Achievement Test (MAT) for the performance (dependent variables). As research findings can never be more reliable than the data they

are based, the purpose then was to establish the validity and the reliability of the measures. The interaction between and among the variables are then further analysed and interpreted by the subsequent quantitative analysis. The finding in this chapter goes under the following aspects: validity and reliability of the WIHIC, validity and reliability the Mathematics Achievement Test (MAT), perception of students' mathematics classroom environment and the associations between the mathematics classroom environment and students' achievement.

## 4.2 Validity and reliability of the of the WIHIC questionnaire

WIHIC questionnaire was originally developed in English. Because of consistent result in past studies throughout Asia (Margianti, 2001; Fraser and Chioh, 2000; Riah and Fraser, 1998), the present study aims to assess students' perception of the learning environment using the Personal Form of WIHIC questionnaire. For the purpose of the present study, a 64-item version (eight scales) WIHIC was used. Before data collected with the Malay version of the WIHIC could be interpret with confidence together with the other instrument in the present study, it was important to be reasonably clear that the original structure of the instrument holds up empirically. Therefore, data collected from 250 students in the study were analysed to provide statistical validation of WIHIC.

### 4.2.1 Internal consistency reliability of WIHIC

The internal consistency reliability was used to indicate whether each item in a scale assessed a similar construct. The item-total correlation was then computed for each scale of the instrument. The purpose of item-total correlation is to find out whether the

items are contributing significantly to their respective scales. This computation involves the correlation between the score of each item in a scale with the total score of all the items in that scale. The benchmark for retaining an item is 0.3. Table 4.1 shows that the item-total correlations for items in Cohesion scale are greater than 0.3 and are significant at $p < 0.01$, except for item A6, A7 and A8. As a result, items A6, A7 and A8 were deleted from the cohesive scale.

Table 4.1

Item-total correlation for student cohesiveness scale

| Items in Student Cohesiveness Scale | Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|
| A1 | 0.44 | 0.52 |
| A2 | 0.35 | 0.55 |
| A3 | 0.30 | 0.56 |
| A4 | 0.39 | 0.53 |
| A5 | 0.50 | 0.49 |
| A6 | 0.13 | 0.62 |
| A7 | 0.12 | 0.62 |
| A8 | 0.25 | 0.58 |

Based on the same criteria (Refer to table 4.1 b-h in Appendix J) item B6, C7, D6, D7, D8, E7, F4, F5, F7, G3, H1 and H7 were deleted from their respective scale. The item-total correlations reduce the instrument now to 49 items. Item correlations were again computed for the remaining items in all the eight scales and the result are presented in Table 4.2.

Table 4.2

Item-correlations of WIHIC scales

| Items of Scale | Item-total Correlation |
|---|---|
| Student Cohesiveness | |
| A1 | .35 |
| A2 | .41 |
| A3 | .32 |
| A4 | .44 |
| A5 | .54 |
| Teacher Support | |
| B1 | .61 |
| B2 | .65 |
| B3 | .60 |
| B4 | .59 |
| B5 | .54 |
| B7 | .48 |
| B8 | .69 |
| Involvement | |
| C1 | .49 |
| C2 | .59 |
| C3 | .43 |
| C4 | .58 |
| C5 | .44 |
| C6 | .54 |
| C8 | .36 |
| Investigation | |
| D1 | .51 |
| D2 | .68 |
| D3 | .40 |
| D4 | .57 |
| D5 | .47 |

| Items of Scale | Item-total Correlation |
|---|---|
| Task orientation | |
| E1 | .53 |
| E2 | .60 |
| E3 | .64 |
| E4 | .35 |
| E5 | .46 |
| E6 | .42 |
| E8 | .43 |
| Cooperation | |
| F1 | .61 |
| F2 | .55 |
| F3 | .59 |
| F6 | .48 |
| F8 | .33 |
| Equity | |
| G1 | .37 |
| G2 | .50 |
| G4 | .52 |
| G5 | .41 |
| G6 | .38 |
| G7 | .49 |
| G8 | .38 |
| Emphasis on understanding | |
| H2 | .52 |
| H3 | .48 |
| H4 | .50 |
| H5 | .41 |
| H6 | .45 |
| H8 | .44 |

As shown in Table 4.2, the total-item correlations of all the items in WIHIC are significant at $p < .001$ with values greater than 0.3. This indicates that all the items contribute significantly to the single construct of WIHIC.

Table 4.3

Internal consistency reliability analysis of scales in WIHIC

| | Present study (2004) | Study of Rawnsley (1997) | Study of Margianti (2001) | Study of Fraser & Huang (1997) |
|---|---|---|---|---|
| Student Cohesiveness | .65 | .60 | .68 | .81 |
| Teacher Support | .84 | .85 | .77 | .88 |
| Involvement | .77 | .77 | .83 | .84 |
| Investigation | .76 | .67 | - | .88 |
| Task orientation | .77 | 83 | .79 | .88 |
| Cooperation | .74 | .63 | .84 | .89 |
| Equity | .72 | .82 | .87 | .93 |
| Emphasis on understanding | .73 | .62 | - | - |

Table 4.3 presents the Cronbach's Alpha coefficient of the WIHIC scales in the present study. The scales reliability ranges from 0.65 to 0.84. These internal consistency indices are comparable to those obtained when WIHIC scale was used with an Australian sample which ranged from 0.60 to 0.85 in Rawnsley (1997) and also in Margianti (2001). The Alpha coefficients of the scale Task Orientation and Equity was found to be lowest by comparison to the other three previous studies. Three scales, the Teacher Support, Student Cohesiveness and Cooperation Cronbach's Alpha coefficients was found within the ranges of the study of Rawnsley (1997) and Margianti (2001) but still lower by

comparison to the Fraser's previous study. The overall Cronbach's Alpha coefficients of the instrument at 0.87 are within acceptable limits and attest to the internal consistency of the scale. This analysis supports the contention that the WIHIC questionnaire is valid and reliable for the assessment of students' perceptions of their psychosocial classroom environments.

## 4.3 Validity and reliability of the Mathematics Achievement Test (MAT)

The students' response for all the 40 multiple-choice questions were scored and the test scores were analysed. For each item with the right option, a score of one point was awarded.

### 4.3.1 The test characteristics

Item analysis on the test yielded the facility and discrimination indices of the items (Appendix H). Using these indices, the performance of the test items was then examined (Appendix G). All test items except item one (Q1) qualify well as items for the test. However, item one (Q1) has been from the start, constructed with the intention to be easy for psychological reason that first item being easy motivates students. The analysis of the distractor discrimination index (Appendix I) for the reasonably good Question 18 and Question39 indicates that the distractors serve its function well. This is based on the criterion that the correct option still has a higher index value compared to the other three incorrect responses. This means that more students in the higher achievement group pick the correct response compare to the students in the lower achievement group. The item

analysis shows all items acceptable and the responses are valid for computation of the test reliability.

The test reliability computed using the Kuder Richardson 20 formula was found to be .83. According to Ng (1991), K-R 20 reliability estimates that are less than .80 for achievement tests are considered unsatisfactory. The reliability shows student's performance was internally consistent and the MAT was thus a good criterion measure for mathematics performance at Form Two level.

### 4.3.2 The students' performance and test of normality

Correlation analysis has a number of underlying assumptions, one of which is normality (Coakes and Steed, 2001). The students test scores must be tested for its normality before further statistical analysis is conducted. The normality test (Appendix K) computed on the 250 scores indicate that the test scores distribution are normally distributed with a slight positive skew as show in Figure 2 below. This is still within acceptable range and thus normality is assumed for further descriptive statistical analysis and interpretations.

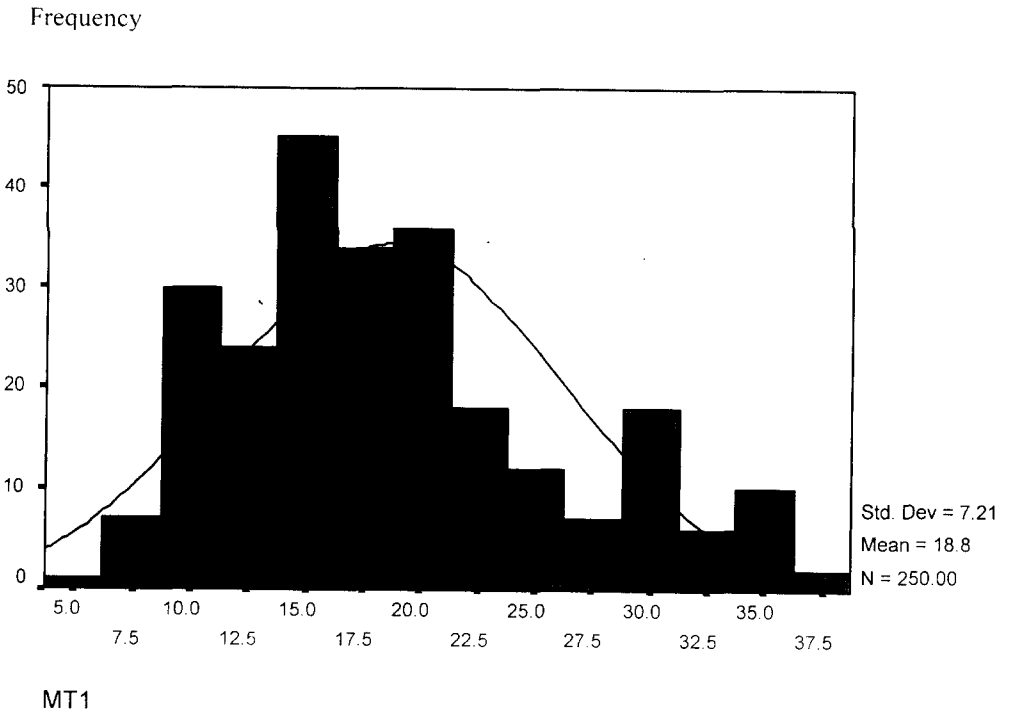


Figure 2 Mathematics test score distribution with normal curve

(MT1= Mathematics score)

4.4 Perception of students' mathematics classroom environment

This section explores the uses of the Personal Form of WIHIC questionnaire, which was validated in section 4.2. The data obtained using Personal Form of WIHIC questionnaire are used to describe the perceptions of students about their mathematics classroom based on the average item mean for the scales. The perceptions are then profiled based on the mean value of each scale. These profiles are supported by some of the qualitative data, which provide further insight to the environment of the mathematics classroom studied.

4.4.1 The perceptions of the sample population.

Table 4.4

Means, standard deviation, maximum and minimum of overall score of WIHIC scales.

| | Min | Max | Average item mean | Std. Deviation |
|---|---|---|---|---|
| Student cohesiveness | 1.50 | 4.83 | 3.68 | 0.62 |
| Teacher support | 1.00 | 4.86 | 3.09 | 0.80 |
| Involvement | 1.14 | 5.00 | 2.66 | 0.72 |
| Investigation | 1.00 | 4.67 | 3.03 | 0.71 |
| Task orientation | 1.71 | 5.00 | 3.73 | 0.68 |
| Cooperation | 1.40 | 5.00 | 3.47 | 0.72 |
| Equity | 1.71 | 5.00 | 3.56 | 0.70 |
| Emphasis on understanding | 1.00 | 5.00 | 3.39 | 0.72 |
| Mathematics Learning environment | 1.82 | 4.76 | 3.33 | 0.51 |

Based on Table 4.4, the average item mean is the scale mean divided by the number of items in that scale. From table 4.4, the mean value for the mathematics classroom learning environment is 3.3. This can be interpreted as that the students perceived positively about their mathematics learning environment. Based on the average item mean of the scales in table 4.4, the rank order of the student's perceptions of their mathematics classroom learning environment was found to be

Involvement < Investigation < Teacher Support < Emphasis on understanding <
(2.66) (3.03) (3.09) (3.39)

Cooperation < Equity < Student Cohesiveness < Task Orientation.
(3.47) (3.56) (3.68) (3.73)

Based on the scaling of 1 to 5 to indicate how often each of the of the WIHIC scales takes place in the mathematics classroom, where 1 refers to 'almost never happens', 2 to 'seldom happens', 3 to 'sometimes happens', 4 to 'often happens' and 5 to 'very often happens', these results suggest that the students perceived that they seldom are involve in the mathematics classroom (Involvement). They perceived they sometimes investigate mathematical problems (Investigation). They perceived sometimes their teacher is supportive and emphasizes on their understanding of work (Teacher Support). They perceived that they are often focused on their mathematics work in class (Task Orientation). They perceived often, they are friendly (student cohesiveness), are treated equally in their work and in their class contribution (Equity), and helpful with each other's work (cooperation).

The findings of this study were compared to that of Rawnsley (1997) and Margianti (2001) with their respective item means as shown in table 4.5.

It is noted that there is a consistency in five out of eight scales, namely, Student Cohesiveness, Task Orientation, Cooperation, Equity and Emphasis on Understanding. The item mean for Student Cohesiveness scale for this study is similar to that of Margianti (2001). The item mean for Teacher support in this study is also found in the range of Rawnsley's (1997) study. Students in this study also perceived low personal involvement in their mathematics class like in Margianti's (2001) study. However they

perceived they investigated mathematical problems in a variety of ways more than the students in Rawnsley's (1997) study. Thus, some of the findings in this study do concur with the findings of study in Australia by Rawnsley (1997) and that in Indonesia by Margianti (2001).

Table 4.5

Item mean of three studies

| | Present study (2004) | Study of Rawnsley (1997) | Study of Margianti (2001) |
|---|---|---|---|
| Student Cohesiveness | 3.68 | 3.3 | 3.70 |
| Teacher Support | 3.09 | 3.3 | 2.32 |
| Involvement | 2.66 | 3.0 | 2.46 |
| Investigation | 3.03 | 2.6 | - |
| Task Orientation | 3.73 | 3.7 | 3.80 |
| Cooperation | 3.47 | 3.5 | 3.40 |
| Equity | 3.56 | 3.7 | 3.68 |
| Emphasis on Understanding | 3.39 | 3.4 | - |

The WIHIC as used in the analysis consists of eight scales. The class mean scores for each scale, are used to profile the classes, as students perceive them. Past research studies as discussed in Chapter 2 extensively profiled classes using classroom environment instrument in the similar procedure. Table 4.6 shows the item means for each scale. Each scale consists of 5-7 items which students rated on a 5-point Likert scale.

Table 4.6

Scales mean of different classes

| | 2AX | 2AY | 2CX | 2CY | 2EX | 2EY | 2GY | Total |
|---|---|---|---|---|---|---|---|---|
| Student Cohesiveness | 3.86 | 3.78 | 3.74 | 3.72 | 3.60 | 3.54 | 3.50 | 3.68 |
| Teacher Support | 3.28 | 2.87 | 3.26 | 2.99 | 3.15 | 3.07 | 2.94 | 3.09 |
| Involvement | 2.83 | 2.74 | 2.65 | 2.49 | 2.78 | 2.47 | 2.56 | 2.66 |
| Investigation | 3.08 | 3.22 | 2.99 | 3.04 | 2.99 | 2.88 | 2.99 | 3.03 |
| Task Orientation | 3.85 | 3.68 | 3.73 | 3.87 | 3.72 | 3.74 | 3.52 | 3.73 |
| Cooperation | 3.64 | 3.53 | 3.64 | 3.35 | 3.52 | 3.20 | 3.26 | 3.47 |
| Equity | 3.67 | 3.44 | 3.78 | 3.50 | 3.49 | 3.61 | 3.39 | 3.56 |
| Emphasis on understanding | 3.58 | 3.44 | 3.47 | 3.32 | 3.38 | 3.32 | 3.17 | 3.39 |
| Mathematics classroom environment | 3.48 | 3.34 | 3.41 | 3.28 | 3.33 | 3.23 | 3.17 | 3.33 |

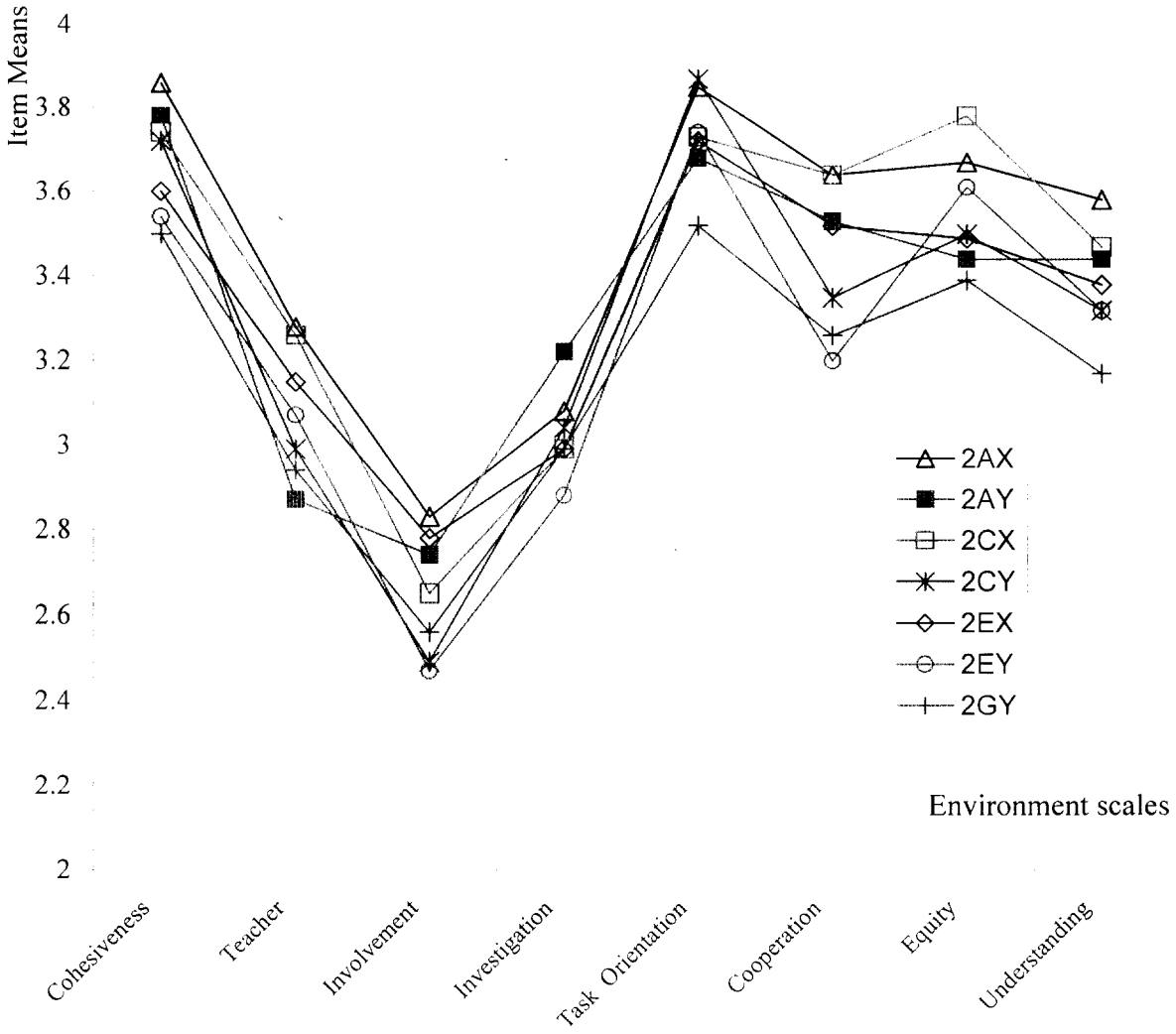


Figure 3
Profile of mathematics learning environment in different classes

All the eight scales mean scores of different classes are profiled as shown in Figure 3. Figure 3 shows that generally all the students' perception of involvement in their mathematics class is the lowest. This observation is further supported from the written responses (Appendix F) to the open-ended questionnaire. Three reasons were

given. One of them is illustrated by Ying (Figure 4) who wrote that ' I am a quiet person and quite hard to ask questions. If it is really important, then I will do so.'

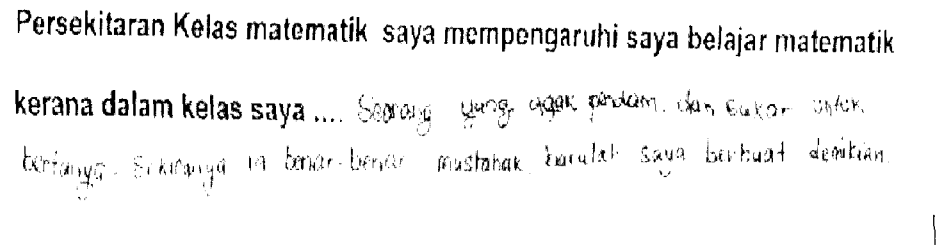
Persekitaran Kelas matematik saya mempengaruhi saya belajar matematik kerana dalam kelas saya ....

Figure 4 Written responses by Ying

Similar comments were given by two other students (Appendix F) as

> 'I am a coward my friends help me by asking teacher the questions'
>
> 'I am shy to ask question. I wish I dare to ask question but I'm afraid it make me look stupid'

The second reason for the low perception of involvement is directed attributed to their friends and the mathematics teacher. Bala wrote 'they're many students who like to ask mathematics but I don't like the teacher. He doesn't seem keen to teach us because he thinks we are all smart enough'. His response is shown in Figure 5. Bala involvement in the question and answer session in the class may be minimal since he perceived that there are others who are more keen to ask questions. Bala may also show lack of class participation because he does not like his teacher.

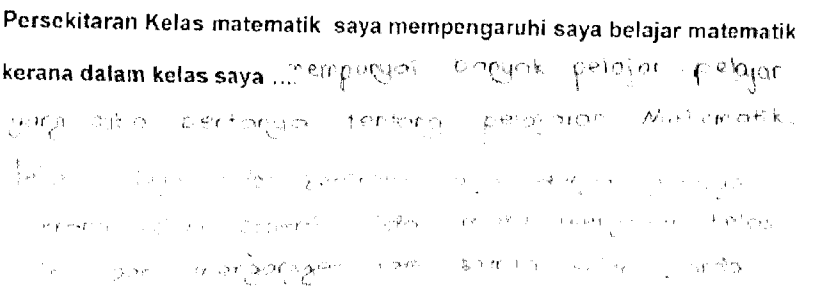


Figure 5 Written response by Bala

A number of student commented that their teacher is fierce and bias. Students who perceived their teacher fierce or bias will not participate actively in class and this could account for the low perceptions in Involvement scale.

There third reason is in the medium of instructions. A number of students who could not follow English as an instruction felt left out during the lesson. Their inadequacies in English Language jeopardize them to ask questions in class. One of them is illustrated by Nabila (Figure 6) who wrote that ' often I don not understand because it is in English. I am shy to say I do not understand English'.

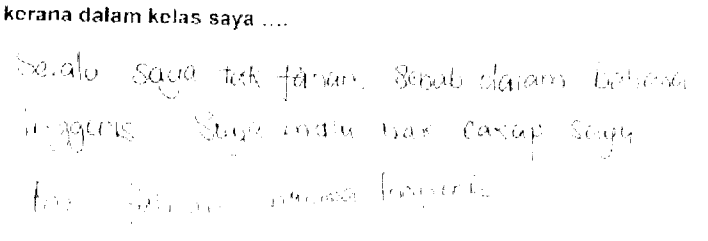


Figure 6 Written response by Nabila

Studies have shown teaching in mathematics classroom in Malaysia is still very much teacher-centred (Saw, 1996; Fatimah, 1996; Amir, 1996). This could be one of the

factors contributing to low perception of Involvement in mathematics classroom. Students perceived low on two other scales, the Investigation scale and the Teacher Support scale. The low perception in Investigation scale comes as no surprise as mathematics lessons in Malaysia is frequently text oriented with low emphasis on investigative behaviour. Students wrote remarks such as, 'boring' and 'same old stuff', to describe the nature of the mathematics work in class and also about the assignment given as homework.

As for the low perceptions of Teacher Support scale, some of the written responses collected during the study that reveal that the change in the medium of instruction had created frustration among students who felt the teacher should 'slow down' for them and really 'check' if they were following the lessons. With a normal class size of 30-40 students, it is somehow quite a task even for the best mathematics teacher to evaluate this effect in a 35-40 minutes lesson. These comments include

> 'My teacher don't pay any attention to me at all'
>
> 'He only walks to the back of the classroom if we look lost. I'm at the back of the class because I'm big'.
>
> 'My teacher doesn't care about student who could not understand, she just moves on to the next topic'.
>
> 'He gives a lot of homework, it gives me a lot of pressure when I cannot complete the homework'.

One of the comments that was found interesting was by Nan. He wrote (as illustrated in Figure 7) ' My teacher teach in front (of the class) only. Never look at all of us at the back'. Nan perceived lack of teacher support because the teacher hardly walks

to the back of the class. Similar comments like the ones made by Nan were repeatedly found during this study. This implies where a teacher moves around the class has an appreciable effect on students perception of their teacher's interest in their work.


Figure 7

Written Response by Nan

However, the lack in Teacher Support could be an indicator as to the possible reason Cooperation scale was perceived higher than Teacher Support scale. Students who perceived lack of teacher support turn to their friends for help. Many have written positive notes about their friends support such as

> 'I'm not good in mathematics, but my friends always help me with my homework'.
>
> 'When I don't understand, my friend lets me copy her work'.

Most of the comments received and place under Cooperation scale also reveals that the 'cooperation' they had was always discussion centered on the homework but not group work or special mathematics projects. These comments highlight the uniformity of mathematics task in the classroom. All the students work through the same books and consequently showed the same low perceptions on the Investigation scale.

Among the comments written about Cooperations, students always refer to their friends sitting next to them as their main support for help in class. In Hazif response, he wrote ' Mathematics class is boring because my teacher use English. My friend beside me does not help me solve mathematics problem'. His response is illustrated in Figure 8.

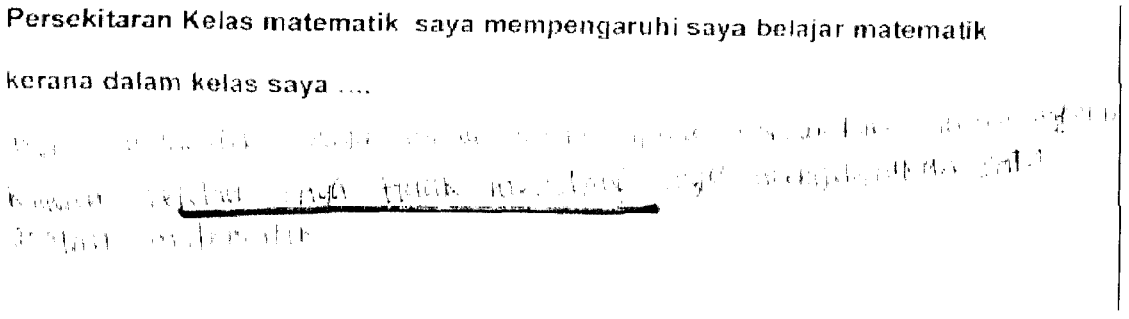


Figure 8 Written Response by Hazif.

Hazif perceived mathematics class as ' boring' when his two supports failed him. He may not understand the teacher instruction (Teacher support) and his friend beside him do not help him (Cooperation). Hazif's negative perception of mathematics environment is attributed to his classmate and teacher rather than to himself as individuals. This sort of rationale is consistent with the attribution theory (Weiner, 1986), which suggests that student's attribute blame, in this case, the perceived lack of support, to external factors such as other students or teacher in the classroom. Hazif's perception of mathematics class also indicates a strong dependency on his friend sitting next to him. This finding suggest in a mathematics class, the supportive role of the person sitting next to a student is important, implying the importance of careful sitting arrangement in class. This suggestion is supported by repeated appearance of comments in the written responses that

students wrote such as ' I refer to my friend beside me', 'My friend next to me help me ask...' and 'My partner me let me copy ...'

Equity scale was rank higher than Emphasis on Understanding scale. In this study, these two scales were sometimes found to be inter-related. Students who perceived that they are not treated equally (Equity) also perceived that their teacher seldom emphasizes on their understanding of work. These comments include

> 'He only cares for selected students only and checks on them only'
>
> 'I don't like it when the teacher skips earlier section just because we are in the smarter class.'

The change in medium of instruction may contribute to low perceptions of involvement and teacher support. And it may be the cause for the low perception of emphasis on understanding. Comments were noted by three students (Appendix F) as

> 'I was once good in mathematics but I do not understand mathematics in English language because my English is weak'
>
> ' I hope mathematics change back to Malay language'
>
> 'I am weak in mathematics. Now my marks is going down because it is in English'

These comments indicated that students have problems in understanding mathematics because of the language change. They perceived their teacher seldom explain enough for them to comprehend the lesson and thus did not place greater emphasize on their

understanding. Students in 'weak' class like 2EX perceived emphasis on understanding by the teacher an important aspect in the mathematics teacher classroom. Positive comment noted such as by Ern who wrote ' my teacher helps me sincerely. My mathematics teacher explains to me when I have mathematics difficulty. My mathematics teacher gives me encouragement. That is why I feel mathematics class is fun '. Her comments is illustrated in Figure 9

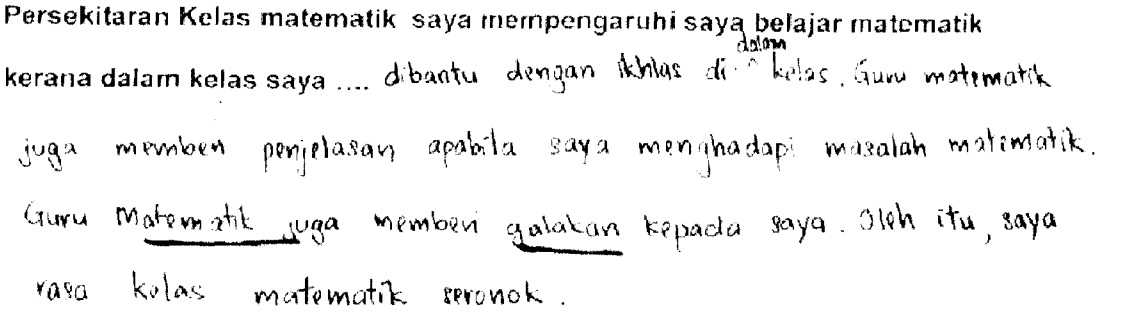
Persekitaran Kelas matematik saya mempengaruhi saya belajar matematik kerana dalam kelas saya .... dibantu dengan ikhlas di dalam kelas. Guru matematik juga memberi penjelasan apabila saya menghadapi masalah matematik. Guru Matematik juga memberi galakan kepada saya. Oleh itu, saya rasa kelas matematik seronok.

Figure 9 Written response by Ern

Similar comments were given by her other class members such as,

> 'My mathematics teacher teach us, step by step. My mathematics teacher walk around and check on us.'
>
> 'I know I am bit weak but my teacher always help me. My teacher pays close attention to me.'
>
> 'My teacher makes me like mathematics. My mathematics teacher is strict but kind and so patience with our noisy class.'
>
> 'I am glad she/he is my mathematics teacher. She/He is so helpful. She/he makes sure I understand. I know I am weak but I like mathematics now.'

Qualitative study by Wong (1996) on Hong Kong students' perception of mathematics classroom found that 'the ideal mathematics teacher in the eyes of the students is one who explains clearly, show concern about the students, treats them as friends, makes sure that they understand...' (p.101). This study finds similar perception as those in Wong (1996). This finding also reinforces the position of the Emphasis on Understanding scale in the WIHIC questionnaire for mathematics class as done by Rawnsley (1997).

### 4.4.2 Profile of the Schools.

The second profile was to compare mathematics classroom environment of the two schools. The mean test score for school X and Y are given in Table 4.7. The *t*-test on the mathematics achievement of the two school (Appendix L) shows some significant difference and thus warrant for an investigation into the general factors that contribute to the schools mathematics environment.

Table 4.7

Test score mean for schools

| School | N | Mean | Std Deviation | S.E.Mean |
|---|---|---|---|---|
| School X | 129 | 19.98 | 7.28 | .64 |
| School Y | 121 | 17.55 | 6.96 | .63 |

Profile of the two schools was created based on the mean item scale for school X and Y (Appendix L). The profile of the two schools shown graphically in Figure 10 does

not indicate any obvious scale differences. The fact that each scale almost maps onto one another, point per point indicate that despite the significant difference in the mathematics mean scores between the two schools, there is hardly any differences in the students' perceptions of the mathematics classroom environment in the two schools.

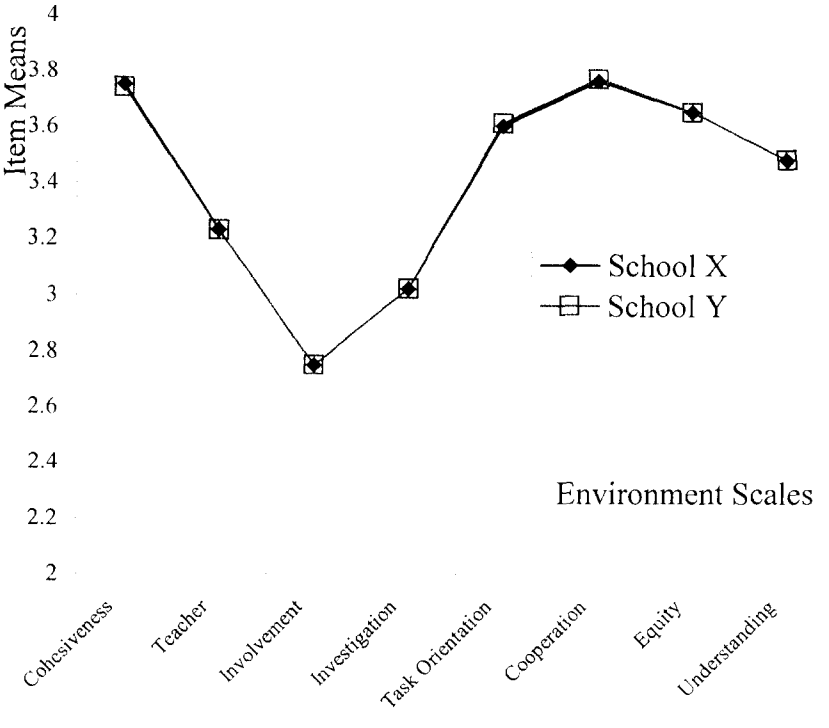


Figure 10 Profiles of school X and school Y

4.4.3 Summary of student perceptions of their mathematics classroom environment

In general, students perceived positively about their mathematics learning environment. Students perceived that they seldom are involved in the mathematics classroom. They perceived they sometimes investigate mathematical problems and are

often focused on their mathematics work in class. They perceived sometimes their teacher is supportive and emphasizes on their understanding of work. They perceived often, they are friendly, are treated equally in their work and in their class contribution, and are helpful with each other's work.

## 4.5 Associations between the mathematics classroom environment and student achievement

This section focussed on the associations between students' perceptions of their classroom learning environment and student achievement. One of the uses of classroom environment instruments reviewed in chapter 2 was an as independent variable. This study addresses associations between the mathematics classroom environment and the dependent variables of mathematics achievement. Their mathematics scores obtained from the MAT instrument was a measure of achievement.

The results of simple correlation analysis reported students' perception of the mathematics classroom environment to achievement has a correlation of .20 at $p < .001$. This suggests there is a statistically significant positive association between students' mathematics achievement and their mathematics classroom learning environment.

Table 4.8 also presents the data showing correlations between each scales of WIHIC and students mathematics achievement scores.

The multiple correlations for the present study are significant for almost all scale except for teacher support and equity. The insignificant correlations between teacher support and students achievement could be interpreted as though student perceived that the presence of teachers' help and guidance has no significance to their mathematics

achievement. However, a closer examination of the data revealed that the weak correlation is probably due to the effects of low perceptions of Teacher support in a high achieving class for example in Class 2 AY.

Table 4.8

Multiple correlations between mathematics achievement and WIHIC scale

| | Strength of Environment – mathematics achievement association | | |
|---|---|---|---|
| | Present Study (2004) | Rawnsley Study (1997) | Margianti (2001) |
| Student Cohesiveness | 0.16* | -0.05 | 0.05** |
| Teacher Support | 0.02 | -0.10 | -0.04 |
| Involvement | 0.20** | 0.00 | 0.03 |
| Investigation | 0.24** | -0.02 | - |
| Task Orientation | 0.19** | -0.01 | -0.07 |
| Cooperation | 0.17** | 0.09 | 0.03 |
| Equity | 0.00 | -0.04 | 0.11** |
| Emphasis on understanding | 0.18** | -0.01 | |

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Table 4.9 shows the mean scores of the Mathematics Achievement Test for all the classes in the study. Class 2AY mean score is the highest and their score distribution is negatively skew. This indicates that this class relatively, among the seven classes has a larger proportion of high achiever. Analysis of the Teacher Support scale mean in Table 4.6 shows that Class 2AY has the lowest value. The low perceptions of Teacher Support in a high achieving class like 2AY can be a statistical upset. This rationale is supported by the fact that Class 2AX (MAT score is the second highest) has the highest mean value for Teacher Support scale. This rationale is reinforced by the findings that the Emphasis on Understanding scale correlates positively with achievement. This means higher mathematics achievement is associated when students perceived the teacher questions, explain and emphasizes student understanding of work. This is a correlation, which is supportive of the efforts of teachers.

Table 4.9

Mathematics Achievement Test mean score for class

| Class | Mean | N | Std. Deviation | Std. Error of Skewness | Skewness |
|---|---|---|---|---|---|
| 2AX | 21.51 | 41 | 7.46 | 0.37 | 0.49 |
| 2AY | 27.24 | 33 | 6.11 | 0.41 | -0.36 |
| 2CX | 16.49 | 43 | 6.57 | 0.36 | 1.06 |
| 2CY | 20.24 | 29 | 5.36 | 0.43 | 1.26 |
| 2EX | 14.41 | 37 | 4.46 | 0.39 | 0.79 |
| 2EY | 16.84 | 31 | 4.22 | 0.42 | 0.79 |
| 2GY | 15.81 | 36 | 6.69 | 0.39 | 1.16 |
| Total | 18.80 | 250.00 | 7.21 | 0.15 | 0.71 |

Based on Table 4.8, the Investigation scale was the highest in correlation with achievement. This association suggests that students who have highest mathematics achievement perceived that they are more involved in investigative work in their mathematics class, that is they investigate mathematical problems in a variety of ways to find solutions. The scale correlations also implies higher mathematics achievement are associated with students who perceived that they are focused in their mathematics work in class (Task orientation), are involved in questioning, answering and discussing their work (Involvement) and work cooperatively rather than competitively (Cooperation).

These findings however are not similar to the previous study. Comparison of the findings in the three studies shows the scales correlation not really consistent with each other. Rawnsley's (1997) study reported hardly any significant associations between mathematics achievements with the environment scales. The findings of the scale correlations analysis in this study also do not reflect similarities with Margianti's (2001).

However, the correlation coefficient between mathematics environment and mathematics achievement in all three study are consistent. Rawnsley (1997) reported a correlation of .22 and Margianti (2001) reported a correlation of .19 at $p < .001$. Consequently this study reported correlation of .20 at $p < .001$ concurs with the two previous studies. This also replicated results of past research studies (Fraser & McRobbie, 1993; Wong & Fraser, 1996a; Goh & Fraser, 1996) in that there were statistically significant associations between certain aspects of the nature of the classroom learning environment and students' cognitive outcomes.