CHAPTER FOUR

DATA ANALYSES AND FINDINGS

4.0 Introduction

This chapter will present the data collected from the study and its analysis. Data was collected based on the four Research Questions as follows:

1. What are the problems faced by teachers in teaching Science in English?
2. What are the problems faced by students in learning Science in the English language?
3. What are the teaching and learning strategies practiced by teachers and students in the teaching and learning of Science in English?
4. What are the responses of teachers and students in the teaching and learning of Science using the English Language?

Data for the study was collected based on the questionnaires distributed to all the 245 Form Three (PMR) students of Sekolah Menengah Kebangsaan Bukit Jelutong. Students' responses from the questionnaire were analysed using a mixed method consisting of qualitative and quantitative approaches in which the frequency and percentage were examined and explained. The data was gathered to find out the teachers and students' points of views on teaching and learning Science in English as well as the teaching and learning strategies employed. The data was also reviewed to find the teachers and the students' opinions or feedback on the implementation of teaching and learning of Science in English.

Table 4.1 shows the number of students streamed in the seven Form Three classes based on their previous Final Year Examination overall results and the performance level of each of the classes.

Table 4.1

Class Distribution and Performance Level

Class	**Number of Students**	**Performance Level**
3 Alpha	37	Excellent
3 Beta	40	Excellent
3 Delta	40	Average
3 Sigma	35	Average
3 Omega	35	Moderate
3 Epsilon	29	Weak
3 Zeta	29	Very weak
Total : 7 classes	**Total : 245 students**	

Table 4.1 shows the number of students in each of the classes. Students were placed in the respective class based on their final year examination results in all the subjects. The first 35 best students in the overall Form Two final year examination were placed in the first class in Form Three the following year. This same procedure was followed for the next 35 best students from the overall to be placed in the second class, third class and the following classes.

4.1 Research Question 1

1. What are problems faced by teachers in teaching Science in English?

The first research question is answered from the responses of the four Science teachers on the Teacher's questionnaire (Appendix J - Item 2). Table 4.2 lists the problems that were faced by the Science teachers in teaching Science using English as the medium of instruction. From the various problems stated by the four Science teachers, the

researcher highlighted the key problem or most apparent problem in teaching Science in English.

Table 4.2

Problems Faced by Teachers in Teaching Science in English.

Teachers	Problems in Teaching
Teacher 1 Pn.N (3 Alpha & 3 Sigma) Teaching Excellent and Average classes	● I still have to translate to Bahasa Malaysia after explaining in English. It is a waste of time. Less materials are covered. Students will lose interest as well as lose focus.
Teacher 2 Pn.A (3 Epsilon & 3 Zeta) Teaching Weak and Very Weak classes)	● Difficulty in the sense that I am not confident in constructing sentences in English. As a result I am unable to explain or teach the topic in English well. ● Due to lack of confidence in speaking English, I find it difficult to provide additional input in teaching a Science topic though I feel something to convey to the students when teaching a particular Science topic.
Teacher 3 Pn.H (3 Beta & 3 Delta) Teaching Excellent and Average classes	● The higher level concepts are quite difficult to explain in detail or to tell them about current issues in fluent English.
Teacher 4 Pn.Z (3 Omega) Teaching Moderate class	● Majority of students are able to understand but I have difficulty in trying to explain the concepts in complete and comprehensible sentences. ● It is difficult to explain highly technical concepts or scientific meanings to students in English. ● Low proficiency students find it difficult to understand because of their limited vocabulary (especially 'remove classes') and the textbook is too wordy with limited diagrams.

Table 4.3 summarizes the most significant problems faced by the four Science teachers in teaching Science using English language based on Table 4.2.

Table 4.3

Most significant problems among Science Teachers

Problem	**Frequency**	**Percentage**
Difficulty to explain Science concepts using English language.	3/4	75%
Time spent in translating to Bahasa Malaysia	1/4	25%
Total		**100%**

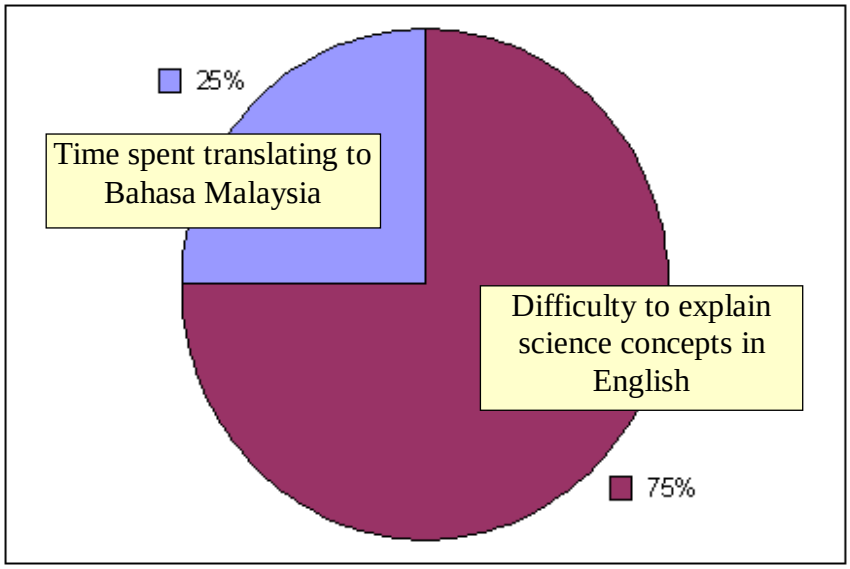

Figure 4.1

Most significant problems in teaching Science in English

From the teachers' responses towards the problems faced in the teaching of Science in English, it can be said that regardless of which level of class the teacher is teaching, the most significant problem that the Science teachers faced in teaching Science was difficulty in using English language to explain a concept. These findings are synonymous with that of Ambigapathi and Revathi (2004) as stated in Chapter 2

where teachers had difficulty to teach Science concepts in English. This was due to the limited language ability in English which resulted in code-switching to Bahasa Malaysia; the language they are more comfortable with (p. 55).

Figure 4.1 shows that 75% of teachers teaching Form Three disclosed that the difficulty to explain Science concepts in English language was the major problem in teaching Science. This could be due to lack of exposure in using English in teaching a content subject and the highly technical terminologies that are needed in explaining Science meanings. As such, the teacher needs more time in the preparation to teach a lesson in English though the Science topic can be easily explained in Bahasa Malaysia based on their experience in teaching using Bahasa Malaysia. This also ends up in teachers' reluctance to provide additional information on a topic taught or to link the topic to current global issues in the world as they lack vocabulary and possess a poor mastery of English language that hinders their interest to further engage in the Science teaching process.

According to Pn.N, the teacher who taught an excellent and average class consecutively claimed that she had to take extra time to elaborate in Bahasa Malaysia to a few selected students after teaching first in English. This was because to these students, some explanations of the Science topic were not clear. As such, they required further clarification in Bahasa Malaysia. This definitely resulted in the syllabus not being covered during the teaching period of the day. In weak classes, Pn.A, the teacher herself was not confident in transmitting the input in English though she knows the subject matter well. English language is a barrier for the teacher due to lack of usage in the past. Pn.H, the teacher who taught the excellent and average class claimed another problem in using English to explain concepts is that the teacher found difficulty in expressing appropriate phrasal verbs such as 'When oxygen is used up...', 'Carbon

dioxide is released when ...' . Such sentences may seem easy but teachers felt that during the teaching period, they were lost for words or were unable to express precisely, as English language does not come spontaneously during the teaching process. According to Pn.Z, the teacher who taught the moderate class, teachers have to plan the kinds of sentence structures they need to use in the teaching of different types of topics in Science in order to students understand the topic. It takes a lot of preparation and work in order to teach a topic. Pn.Z stated that she has to prepare the proper sentence structures in English to explain a scientific concept or experiment so that students could comprehend the lesson as well as the language. This is a problem related to using the English language to teach the Science content.

From Figure 4.1, 25% of teachers, which is only one teacher, agreed that time spent in translating Science content in Bahasa Malaysia is another problem.According to Pn.N, the teacher who taught the excellent and average class stated only a small number of students tend to rely on explaining the lesson in Bahasa Malaysia as they could not understand the highly technical meanings in English. This result in the teacher had to spend some time in translating to Bahasa Malaysia to make sure these students understand the lesson. This would take time as teacher could not complete syllabus within the time frame of teaching hours in a class.

Ewer, J.R (1976) claims that in teaching subjects such as Science "non-English speaking teacher of English" may not have mastered the "special varieties of the language".(p. 251). This is why the teacher could face difficulty in teaching the subject in a language in which she is not well versed in.

4.2 Research Question 2

2. What are the problems faced by students in learning Science in the English language?

The second research question was answered from the Student's Questionnaire (Appendix I – Item 1) and Teacher's Questionnaire (Appendix J – Item 3). Based on the responses from the 245 Form Three students, Table 4.4 highlights the various language difficulties that the students encountered in learning Science in English. The researcher has organized the data gathered and analyzed according to the most frequent problem faced by majority students in a particular class. Some students have mentioned more than one problem however others have cited at least one problem that they face in learning Science in English. Table 4.4 shows the most frequent language difficulties that has be stated by students and this figures were analyzed in frequency and percentages

Table 4.4

Language Difficulties among Students in Form Three classes

Language Difficulties in 3 Alpha – Excellent Students

No.	**Language Difficulties**	**Frequency**	**Percentage (%)**
1	No difficulties in using English	4	10.81
2	**Scientific names / Science concepts elaborated in English**	**15**	**40.54**
3	Writing in English in Paper 2 (Structured Questions)	3	8.11
4	Grammar, Spelling and Pronunciation	3	8.11
5	Sentence Structure on Science Writing	7	18.92
6	Teacher's use of English, grammatically incorrect sentences used by teacher	5	13.51
	TOTAL	**37 STUDENTS**	**100%**

Table 4.4 (continued)

Language Difficulties in 3 Beta – Excellent Students

No.	Language Difficulties	Frequency	Percentage (%)
1	No difficulties in using English	5	12.5
2	Do not understand meaning of words-scientific words, unable to understand meaning of terms	11	27.5
3	**Science language is complicated and unpredictable**	**12**	**30**
4	Vocabulary, grammar	6	15
5	Teacher's command of language and explanation	4	10
6	Lack understanding in English	2	5
	TOTAL	**40 STUDENTS**	**100%**

Language Difficulties in 3 Delta – Average Students

No.	Language Difficulties	Frequency	Percentage (%)
1	No difficulties	4	10
2	**Do not know certain or proper Science words**	**15**	**37.5**
3	Teacher's pronunciation	6	15
4	Unable to write proper sentence structure	5	12.5
5	Scientific words / terminologies	4	10
6	English language and grammar	4	10
7	Poor command of English due to L1 usage	2	5
	TOTAL	**40 STUDENTS**	**100%**

Table 4.4 (continued)

Language Difficulties in 3 Sigma – Average Students

No.	Language Difficulties	Frequency	Percentage (%)
1	No difficulties in using English	5	14.29
2	**Cannot understand meaning of words or concepts**	**8**	**22.86**
3	Scientific words	6	17.14
4	Grammar, vocabulary and spelling	6	17.14
5	Difficult to construct answer in English	4	11.43
6	Teacher's sentences, wrong choice of words	3	8.57
7	Lots of language problems- grammar and writing sentences	3	8.57
	TOTAL	**35 STUDENTS**	**100%**

Language Difficulties in 3 Omega – Moderate Students

No.	Language Difficulties	Frequency	Percentage (%)
1	**Hard to explain meaning in English**	**8**	**22.86**
2	**Writing Style,expressing answer**	**8**	**22.86**
3	Weak in understanding in English	5	14.29
4	Little of the lesson understood	5	14.29
5	Meaning not clear	4	11.43
6	Lack of vocabulary, words to write	3	8.57
7	Weak in spelling Science terms	2	5.71
	TOTAL	**35 STUDENTS**	**100%**

Table 4.4 (continued)

Language Difficulties in 3 Epsilon – Weak Students

No.	Language Difficulties	Frequency	Percentage (%)
1	Scientific terminology	4	13.79
2	English words	4	13.79
3	Concepts not understood	4	13.79
4	**Grammar and vocabulary**	**8**	**27.59**
5	Weak in basic grammar knowledge and choice of words in English	2	6.90
6	Language is difficult to understand	2	6.90
7	Cannot speak English	2	6.90
8	Pronunciation	3	10.34
	TOTAL	**29 STUDENTS**	**100**

Language Difficulties in 3 Zeta – Very Weak Students

No.	Language Difficulties	Frequency	Percentage (%)
1	Difficult science terminologies	4	13.79
2	English words	6	20.70
3	Concepts not understood	3	10.34
4	**Grammar and vocabulary**	**7**	**24.14**
5	Language is difficult to understand	3	10.34
6	Pronunciation	2	6.90
7	Can't speak English	4	13.79
	TOTAL	**29 STUDENTS**	**100%**

From Table 4.4, it can be derived that the highest percentage of students in excellent classes which is 40.54% in 3 Alpha and 30% in 3 Beta found the specific scientific language or Science terms in English are difficult to be grasped. These students felt that Science concepts elaborated in English language are difficult to be explained. This was because of the complicated sentence structures in Science that contain specific scientific terminologies, concepts and meanings with a formal writing

style which caused difficulty for students to express themselves appropriately in English.

For the average level of classes, students claimed that their major difficulty in language was they do not know certain scientific words to explain a concept or even do not understand the meaning of certain Science words. This amounts to 37.5% in 3 Delta and 22.86% in 3 Sigma. This could be due to their limited knowledge in the subject-matter and low vocabulary in Science and English language which contributed to their difficulty in understanding the context and responding to the content.

The moderate level students which are from 3 Omega found two major difficulties in learning Science in English language. One was difficulty in explaining meaning in English whereas the other was the writing style in which to express their answers properly in the English language. This accounts for 22.86 % as the equal highest language difficulty among students in that class.

For the weak classes, their basic command of language is poor, therefore, they find learning Science in English a hard task as they were weak in grammar and vocabulary. This shows 27.59% respectively in 3 Epsilon and 24.14% in 3 Zeta. Furthermore, the density and complex science concepts and terminologies intensify the difficulty in learning Science as their basic command of the target language is weak. They may understand the content; however, due to their lack of exposure and understanding of English will impede their academic ability in the subject. If students are weak in English language, then they find it difficult to express the meanings and concepts in their own words as well as in understanding the meanings or concepts while learning.

The scientific writing style also seems to give an impact to students as they find it difficult to explain precisely the concepts using accurate words as well as elaborating

a Science concept in their own sentences. Students lack competency in grammar and have a limited choice of vocabulary to understand or comprehend a question well when it comes to writing or answering structured questions. Figure 4.2 shows the highest level of language difficulties students' encounter in the form three classes.

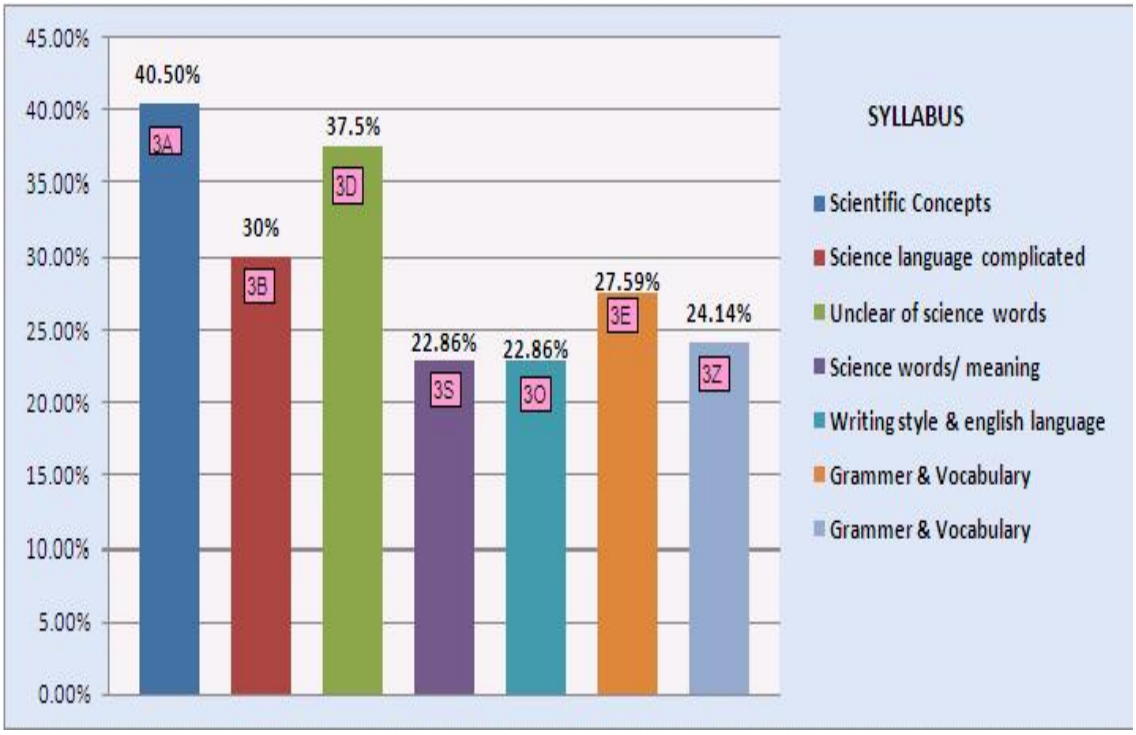

Figure 4.2

Language Difficulties Among Students in Form Three Classes

Table 4.5 shows Science teachers' points of views regarding the language difficulties that their students portray in the learning of Science in English. Teachers' perceptions are quite similar to how students have expressed them.

Littlewood (1984) posits that "psychological factors" have an impact on learning a second language (p. 97). He adds that, "learning occurs more easily if there are positive attitudes towards the second language community"(p. 97). Therefore,

students should be given positive input and encouragement in learning the second language in order to have an interest in learning a subject in the second language.

Table 4.5

Science Teachers' Viewpoints of Language Difficulties Faced by Students in the Science Classroom

Science Teachers	Opinions on Language Difficulties that Students Encounter in Learning Science in English
Pn.N (Excellent and Average Students)	➢ Scientific terminologies. ➢ Language used in textbook is too complex and wordy. Students tend to rely on simple sentence structure writing in explaining concepts.
Pn.H (Excellent and Average Students)	➢ Unsure of certain or proper words in science. ➢ Scientific terminologies and complex concepts.
Pn.Z (Moderate Students)	➢ Lack exposure speaking in English or knowledge, lack of interest in English words, vocabulary ➢ Hard to elaborate concepts in speaking and writing
Pn.A (Weak and Very Weak Students)	➢ Basic English is very weak, scientific English is demotivating, spelling and pronunciation problems. ➢ Hardly speak English.

4.3 Research Question 3

3. What are the teaching and learning strategies practiced by teachers and students in the teaching and learning of Science in English?

The third research question was answered from Student's Questionnaire (Appendix I – Item 2 and Item 3). The questions are as follows: Appendix I - Item 2: What are the learning strategies you use in learning Science in English?

Appendix I – Item 3: What are the teaching strategies employed by your Science teacher in teaching Science in English?

This question probes on learning strategies and student's viewpoints of teacher's teaching strategies in the classroom. From the Teacher's questionnaire, (Appendix J – Item 1) the teachers' personal teaching strategies employed in classroom teaching also answers this research question.

Table 4.6 shows the learning strategies that the Form Three students of SMK Bukit Jelutong employ in learning Science in English. For this question, the students have given various choices of answers and the researcher analyses according to the most frequent type of strategies most students use in their learning process. The learning strategies are categorized based on Chamot and O'Malley's (1994) Learning Strategies in the classroom and learning strategies for Science that have been proposed by Chamot and O'Malley in the CALLA Approach.

Table 4.6

Learning Strategies Employed by Students in Form Three Classes.

Learning Strategies in 3 Alpha – Excellent Students

Learning Strategies	**Frequency**	**Percentage (%)**
Metacognitive		
● Understanding through experiments / concepts, problem solving	15	40.5
Cognitive		
● Using the Dictionary	1	2.7
● Memorizing science facts, words.	5	13.5
● Revision, reading of Science books, other materials	4	10.8
● Mind maps	4	10.8
Social / Affective		
● Ask tuition teacher for help	4	10.8
● Discussion with friends	4	10.8
TOTAL	**37 STUDENTS**	**100%**

Table 4.6 (continued)

Learning Strategies in 3 Beta – Excellent Students

Learning Strategies	Frequency	Percentage (%)
Metacognitive		
● Revise first before lesson starts	7	17.5
● Think, understand and keep working consistently	5	12.5
● Paying attention in class as think of cause and effect	5	12.5
Cognitive		
● Rewrite in simple structures	5	12.5
● Highlight key points	5	12.5
● Revision, reading of Science books, other materials	6	15
Social / Affective		
● Ask teacher for further clarification	4	10
● Discussion with tuition teacher	3	7.5
TOTAL	**40 STUDENTS**	**100%**

Learning Strategies in 3 Delta – Average Students

Learning Strategies	Frequency	Percentage (%)
Metacognitive		
● Revise first before lesson starts	2	5
● Think, understand and keep working consistently	2	5
● Paying attention in class as think of cause and effect	7	17.5
Cognitive		
● Rewrite in simple structures	5	12.5
● Highlight key points	4	10
● Revision , reading of Science books, other materials	4	10
● Mind maps	4	10

● Short notes	4	10
● Exercises	3	7.5
Social / Affective		
● Ask teacher for further clarification	3	7.5
● Discussion with tuition teachers	2	5
TOTAL	**40 STUDENTS**	**100%**

Learning Strategies in 3 Sigma – Average Students

Learning Strategies	**Frequency**	**Percentage (%)**
Cognitive		
● Using the Dictionary	10	28.6
● Memorizing science facts, words.	7	20
● Revision, reading of Science books, other materials	6	17.1
● Preparing short notes	3	8.6
Social / Affective		
● Ask teacher for further clarification	4	11.4
● Discussion with tuition teachers	5	14.3
TOTAL	**35 STUDENTS**	**100%**

Learning Strategies in 3 Omega – Moderate Students

Learning Strategies	**Frequency**	**Percentage (%)**
Cognitive		
● Using the Dictionary	8	22.8
● Memorizing science facts, words.	7	20
● Revision, reading of Science books, other materials	3	8.6
● Mind maps	4	11.4
● Short notes	3	8.6

Social / Affective		
● Ask teacher for further clarification	5	14.3
● Group study	5	14.3
TOTAL	**35 STUDENTS**	**100%**

Learning Strategies in 3 Epsilon – Weak Students

Learning Strategies	**Frequency**	**Percentage (%)**
Cognitive		
● Using the Dictionary	2	6.9
● Memorizing science facts, words in simple form only	2	6.9
● Preparing short notes	2	6.9
● Mind maps	2	6.9
Social / Affective		
● Ask teacher for further understanding	7	24.1
● Discussion with friends	6	20.7
Do not have any strategies	8	27.6
TOTAL	**29 STUDENTS**	**100%**

Learning Strategies in 3 Zeta – Very Weak Students

Learning Strategies	**Frequency**	**Percentage (%)**
Cognitive		
● Using the Dictionary	1	3.4
● Memorizing science words in simple form	2	6.9
● Short notes	1	3.4
● Mind maps	2	6.9
Social / Affective		
● Ask teacher to explain again	6	20.7
● Discussion with friends	6	20.7
Do not have any strategies	11	38
TOTAL	**29 STUDENTS**	**100%**

Based on Table 4.6, it can be summarized that students in excellent classes tend to apply the Metacognitive strategies in learning Science in English. This accounts for 40.5% in 3 Alpha and 42.5% in 3 Beta. They are prepared first for the topics and plan on their learning approach before proceeding with the Science lesson in the classroom. As these students possess a good command of the language, they are prepared beforehand through revision or guidance from their tuition teachers. As they proceed with learning in the classroom, more hands-on is applied, therefore, they could use Metacognitive strategies effectively in comprehending the lesson.

In the average classes, the scenario differs from that of students in the excellent classes. Cognitive strategies were applied more in the learning process. Metacognitive strategies were applied in 3 Delta, an average class but was only 27.5% compared to Cognitive Strategies which were 60%. Meanwhile, 74.3% of 3 Sigma students prefer Cognitive strategies as well in learning Science in English. In fact, students in moderate classes too find that the use of Cognitive strategies, which is 71.4% as the most helpful strategy in learning Science in English. It is a better learning method for these students. This is because students felt that they were well prepared with such strategies and were able to perform better in exams. Cognitive strategies encourage students' direct involvement in the learning process and are able to ask for clarification on the spot. The Cognitive strategies also guide students in comprehending difficult concepts and meanings as they can be understood according to one's ability in the learning process.

The Social or Affective strategies were more applicable in weak classes as they need personal or peer discussion in order to master a lesson. This is evident as 72.4 % of students in 3 Epsilon and 79.4% of students in 3 Zeta were able to understand Science in English using the Social/Affective approach. These groups of students also tend to seek the teacher's explanation for further understanding of the lesson in a

simpler form. There were also students who did not use any strategies in learning Science as they have no understanding of learning strategies and put in no effort to learn the subject in order to understand better.

The highest choice of Learning Strategies applied by Form Three students in learning Science in English is summarized in Figure 4.3.

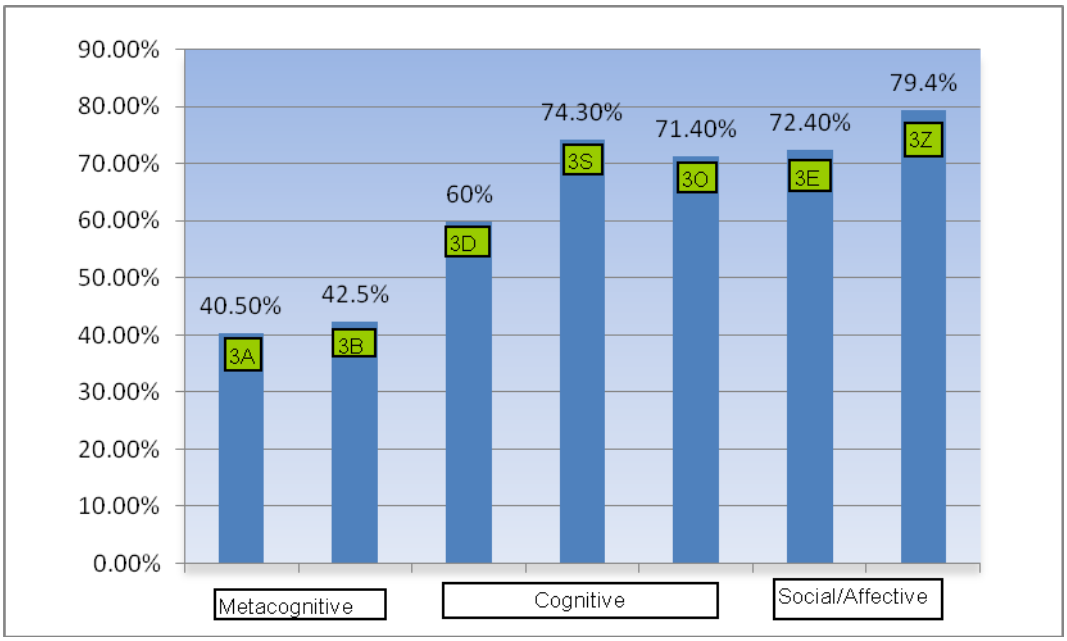

Figure 4.3

Learning Strategies in Various Form Three classes

Table 4.7 highlights students' points of view of the types of strategies that each teacher applies in teaching Science using English language. From here, the researcher probed which strategies are commonly used by Science teachers in teaching students according to the latter academic attainment. As has been stated earlier in Chapter 3, students have no idea of what Teaching and Learning Strategies are all about. The researcher has explained briefly on the Teaching and Learning Strategies during the questionnaire session. Students then pointed out their viewpoints on strategies that their Science teacher used in class based on the teaching method of how and in what way do

the Science teachers conduct lessons in class. Some students gave a few choices on the methods how their teacher teaches in class whereas some just wrote one answer of how they find their teacher teaches. Based on students' responses, the researcher then classified the methods applied in the Science classroom according to the strategies suggested by Chamot and O'Malley in the CALLA Approach.

Table 4.7

Students' Responses on Teaching Strategies Employed by Science Teachers in the classroom.

Teaching Strategies in 3 Alpha – Excellent Students

Teaching Strategies	**Frequency**	**Percentage (%)**
Metacognitive		
➢ Experiment in science laboratory	5	13.5
➢ Explain precise concepts / prompt further questions from students in problem solving	10	27
Cognitive		
➢ Notes, exercises	4	10.8
➢ Using Science CD-ROM, life experiences	4	10.8
➢ Mind maps, key words and points	3	8.1
Social / Affective		
➢ Translation of content to Bahasa Malaysia	9	24.3
➢ Personal explanation	2	5.4
TOTAL	**37 STUDENTS**	**100%**

Table 4.7 (continued)

Teaching Strategies in 3 Beta – Excellent Students

Teaching Strategies	Frequency	Percentage (%)
Metacognitive		
➢ Experiments in Science laboratory	3	7.5
➢ Explain precise concepts / prompt further questions from students in problem solving	4	10
Cognitive		
➢ Notes, exercises	6	15
➢ Using Science CD-ROM, life experiences	9	22.5
➢ Mind map, key words and points	6	15
Social / Affective		
➢ Translation of content to Bahasa Malaysia	3	7.5
➢ Teacher's personal explanation to students	9	22.5
TOTAL	**40 STUDENTS**	**100%**

Teaching Strategies in 3 Delta – Average Students

Teaching Strategies	Frequency	Percentage (%)
Metacognitive		
➢ Doing experiments in the Science laboratory	4	10
➢ Explain precise concepts / prompt further questions from students in problem solving	3	7.5
Cognitive		
➢ Notes, exercises	9	22.5
➢ Using Science CD-ROM, life experiences	7	17.5
➢ Mind map, key words and	6	15

points		
Social / Affective		
➢ Translation of content to Bahasa Malaysia	6	15
➢ Personal explanation to students	5	12.5
TOTAL	**40 STUDENTS**	**100%**

Teaching Strategies in 3 Sigma – Average Students

Teaching Strategies	**Frequency**	**Percentage (%)**
Metacognitive		
➢ Experiments in Science laboratory	2	5.7
➢ Explain precise concepts / prompt further questions from students in problem solving	2	5.7
Cognitive		
➢ Notes, exercises	9	25.7
➢ Using Science CD-ROM, life experiences	6	17.1
➢ Mind maps, key words and points	8	22.9
Social / Affective		
➢ Translation of content to Bahasa Malaysia	4	11.4
➢ Personal explanation	4	11.4
TOTAL	**35 STUDENTS**	**100%**

Teaching Strategies in 3 Omega – Moderate Students

Teaching Strategies	**Frequency**	**Percentage (%)**
Metacognitive		
➢ Experiments in Science laboratory	2	5.7
➢ Explain precise concepts / prompt further questions from students in problem solving	3	8.6

Cognitive		
➢ Notes, exercises	4	11.4
➢ Using Science CD-ROM, life experiences	5	14.3
➢ Mind maps, key words and points	9	25.7
Social / Affective		
➢ Translation of content to Bahasa Malaysia	6	17.1
➢ Personal explanation	6	17.1
TOTAL	**35 STUDENTS**	**100%**

Teaching Strategies in 3 Epsilon – Weak Students

Teaching Strategies	**Frequency**	**Percentage (%)**
Metacognitive		
➢ Experiments in science laboratory	1	3.4
➢ Explain precise concepts / prompt further questions from students in problem solving	1	3.4
Cognitive		
➢ Notes, exercises	4	13.8
➢ Using Science CD-ROM, life experiences	4	13.8
➢ Mind maps, key words and points	4	13.8
Social / Affective		
➢ Translation of content to Bahasa Malaysia	8	27.6
➢ Personal explanation	7	24.1
TOTAL	**29 STUDENTS**	**100%**

Table 4.7 (continued)

Teaching Strategies in 3 Zeta – Very Weak Students

Teaching Strategies	Frequency	Percentage (%)
Metacognitive		
➢ Experiments in Science laboratory	2	6.9
➢ Explain precise concepts / prompt further questions from students in problem solving	2	6.9
Cognitive		
➢ Notes, exercises	4	13.8
➢ Using Science CD-ROM, life experiences	3	10.3
➢ Mind maps, key words and points	3	10.3
Social / Affective		
➢ Translation of content to Bahasa Malaysia	9	31
➢ Personal explanation	6	20.7
TOTAL	**29 STUDENTS**	**100%**

Based on Table 4.7, 40.5% of students in 3 Alpha claimed that their teacher tend to apply the Metacognitive strategy more in teaching Science in English. This is because students' participation in the classroom involves the questioning of a concept, the function of a diagram, which requires teachers to explain at length about the concepts involved. Teachers too tend to prompt questions from each element taught on that day as it involves Higher Order Thinking Skills (HOT) in understanding lessons well. As the students have a good command of the language; therefore, the metacognitive strategies would help in developing the students understanding of concepts. However, students in 3 Beta, also an excellent level of students claimed that Cognitive strategies were used more by their teacher to teach science in English. This

shows that 52.5% of students agreed that their teacher had used Cognitive strategies because though the students were good in the subject; however the teacher felt it was through more practices such as mind map techniques, using power point presentation to explain concepts would ensure a better understanding of the subject-matter.

The average level students remarked that their teacher used Cognitive strategies in teaching Science using English language. The responses are 55% in 3 Delta and 65.7% in 3 Sigma . These students claim that the use of cognitive strategies help in getting direct answers and explanation of concepts and meanings to answer and understand a question. Students feel that short notes and mind mapping strategy skills help students learn better.

In the moderate level classes, students agreed that their teacher used Cognitive strategies which amount to 51.4%. These students need a simplified teaching method to determine that they could follow the Science lessons in the classroom. However, Social / Affective Strategies were also used to help some weak students heightened their comprehension in the Science lesson.

The Social and Affective Strategies were employed mostly in the weak classes, which amount to 51.7% both in 3 Epsilon and 3 Zeta. This is because the students seem to be weak in the English language. Due to a poor socio-economic family background and a low level of competency in English language, these students sought the teacher's personal explanation of the science lesson preferably in Bahasa Malaysia. Translation to Bahasa Malaysia had helped them understand the lesson taught and simple notes and mind maps contributed in amplifying short-term memory as far as Science terms and concepts are concerned.

Figure 4.4 depicts the Teaching Strategies that are highly used in the various Form Three classes.

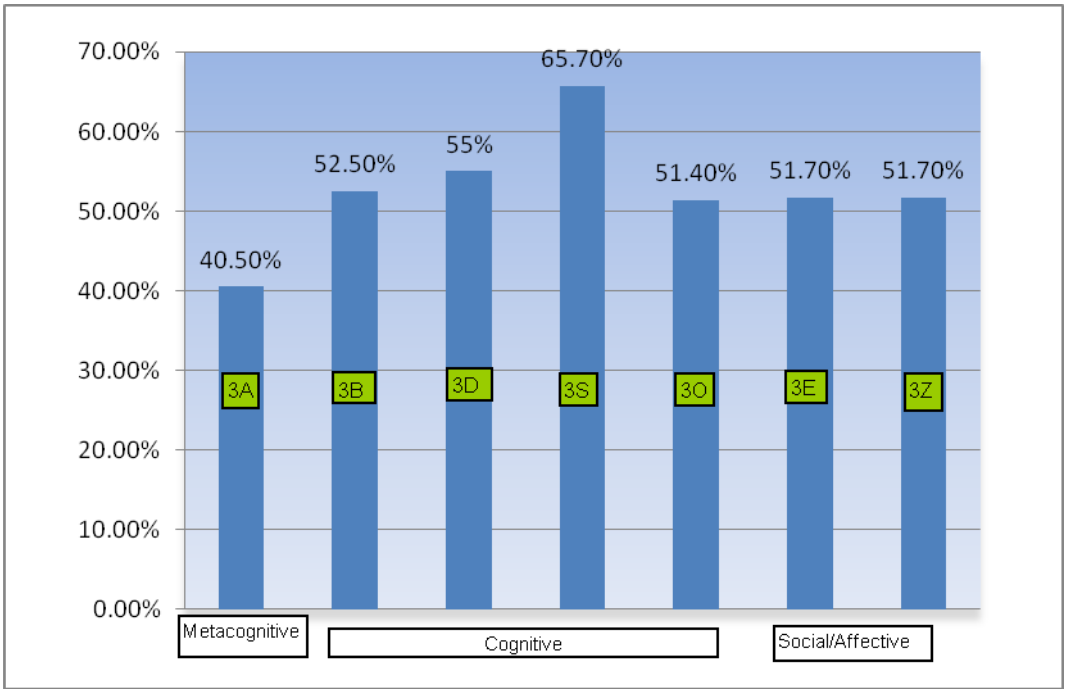

Figure 4.4

Teaching Strategies in Various Form Three Classes.

Table 4.8 shows the four Science teachers' personal teaching strategies that they used in their classes. Teachers too have no idea of what a Teaching Strategy is all about. The researcher then asked for the teacher's style or method of teaching in the classroom. As the teachers' responded in the questionnaire, the researcher then classified the methods used according to Chamot and O'Malley's CALLA Approach in teaching content and language. In general, the teaching strategies that the teachers employed were somehow similar to students' viewpoints of the strategies used. This response is shown in Figure 4.5 which illustrates Teaching Strategies that teachers used most in their classes.

Table 4.8

Science Teachers' Teaching Strategies in Various Form Three Classes

Science Teachers	Class Taught and Level	Teaching Strategies
Pn.N	3 Apha – Excellent class 3 Sigma – Average class	■ Follow the syllabus. Use English as far as possible. Prompt questions in English on the topic by using CD-ROM provided to teach Science. Use reference books as well. ■ Initiate students understanding in a topic first. Relate to current issues worldwide. ■ For average classes, more worksheets, exercises and notes help to understand topics. Sometimes group discussion and explanation to students will help to understand better.
Pn.H	3 Beta – Excellent class 3 Delta – Average class	■ Teaching the science concepts. ■ Ask students to answer simple questions that relate to the concept. ■ Do reinforcement if students still cannot achieve the objective ■ Ask students to present their work in a group ■ Ask students to speak in English
Pn.Z	3 Omega – Moderate class	■ Emphasize on concepts in the understanding of the subject. ■ Usage of simple English during delivery ■ Reinforcement – make sure students understand concepts first ■ Reading aloud in class by students

		■ Use CD-ROM during teaching
Pn.A	3 Epsilon – Weak class 3 Zeta – Very weak class	■ Give explanation in class with the aid of mind-maps ■ Doing model questions and explain each question and possible answer ■ Carry out activities or experiments in groups to further talk and engage in the topic taught in class.

From Table 4.8, Pn.N, teaching an excellent class, which is 3 Alpha, applied Metacognitive strategies by prompting questions on a topic and involving students in a discussion of a topic. She also used a CD-ROM to prompt students to think first of the lesson to be taught. Students were also encouraged to speak on the lesson to be taught to tap students' high order thinking skills (HOTS) in the learning process. A presentation style is carried out in good level classes as students have mastered the language and needed more self access learning methods in the classroom to further improve in the subject. However, the Cognitive Strategies are also favoured by Pn.H, the teacher who taught the second excellent class which is 3 Beta. She considered that the use of Cognitive Strategies led to a more systematic teaching style which encouraged better understanding and confidence in teaching Science. Metacognitive strategies are used less compared to Cognitive Strategies.

For the average classes, 3 Delta and 3 Sigma, an explanation of the subject being taught, exercises, notes and reinforcement exercises resulted in an adequate understanding of the topic taught. In this way, students could learn the content of

Science and language used in explaining Science concepts. This supports the Cognitive teaching strategy in average classes.

For the moderate class, which is 3 Omega, explanation by the teacher using simpler sentence structures eased students' learning process. More exercises and some direct involvement with students fostered effective learning. Cognitive strategies are used more and some Social /Affective strategies are applied in moderate class.

For weak classes, students responded that the teacher used or practised Social/Affective strategies as the students needed closer monitoring during the teaching-learning process. Students agreed that the teacher focused on discussions and explanations done in small groups so that comprehension is optimum.

The information from Table 4.8 is summarized in Table 4.9 and Figure 4.5 shows the Teaching Strategies used by Form Three Science teachers in various classes.

Table 4.9

Teaching Strategies Used by Science Teachers

Teaching Strategy	**Class**	**Frequency**	**Percentage**
Metacognitive	3 Alpha	1/7	14.29
Cognitive	3 Beta – Excellent class , 3 Delta & 3 Sigma- Average class 3 Omega- Moderate class	4/7	57.14
Social / Affective	3 Epsilon & 3 Zeta – Weak & Very weak class	2/7	28.57
TOTAL			**100 %**

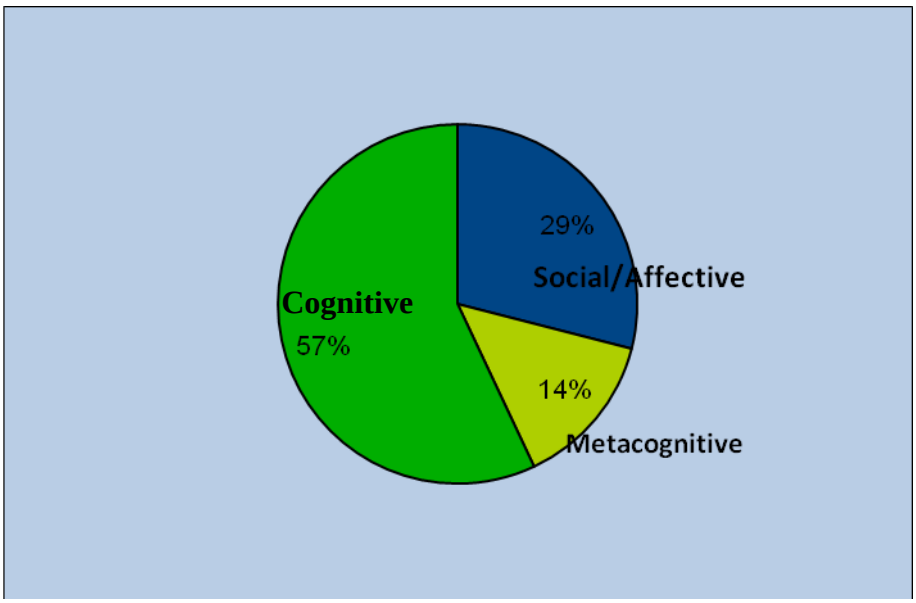

Figure 4.5

Teaching Strategies Used in Form Three Classes

4.4 Research Question 4

4. What are the responses of teachers and students in the teaching and learning of Science using the English Language?

The fourth research question is answered based on the Student's Questionnaire (Appendix I – Item 4 and Item 5). From Teacher's Questionnaire, (Appendix J - Item 4 and Item 5) teachers' responses are looked into. Table 4.10 highlights teachers' feedback towards the implementation of teaching of Science in English. Figure 4.6 shows the percentage of teachers' feedback towards the implementation.

Table 4.10

Teachers' Feedback Towards the Implementation and Reasons

Teachers	Feedback	Reasons
Teacher 1 Pn.N	AGREE	I do not have many problems. I find it easier since I was from an English-medium school More books can be referred to Can get tips from T.V, internet and articles.
Teacher 2 Pn.A	DISAGREE	Gives pressure to students who lack understanding and command of English. Poor language ability will limit their understanding of content and concepts taught; therefore, resulting in loss of interest in the subject. I prefer using Bahasa Malaysia as it is more direct in explaining concepts
Teacher 3 Pn.H	AGREE	It is tough at the beginning, but as time passes and with much practice , English could be accepted and teaching and learning process will be adaptable; It is a good move as far as national level is concern and for the future of the country.
Teacher 4 Pn.Z	AGREE	I think we should continue to teach the subject in English. The terms/ terminologies are more precise. Most reference books (Science) are in English. Other sources (internet) are also in English. Overall , students prefer the subject to be taught in English. Should be continued There are improvements in the students gradually.

Based on Table 4.10, the Science teachers' feedback show that three teachers from the total of four agree towards the implementation of Teaching and Learning Science using English as the language of instruction. Three teachers agree because

teaching and learning Science in English encourages further learning as most sources are found to be in English language and this encouraged an in-depth learning in understanding Science concepts and meaning. However, only one teacher expressed disagreement towards the implementation as they reflect on students' inability and lack potential to learn the subject in English. The teachers focused on weak students because these groups of students build a negative mind-set that learning Science in English is difficult to comprehend and not an enjoyable task. This could be due to a weak command of the language. These teachers favour Bahasa Malaysia as it conveys meaning directly and is easy to understand.

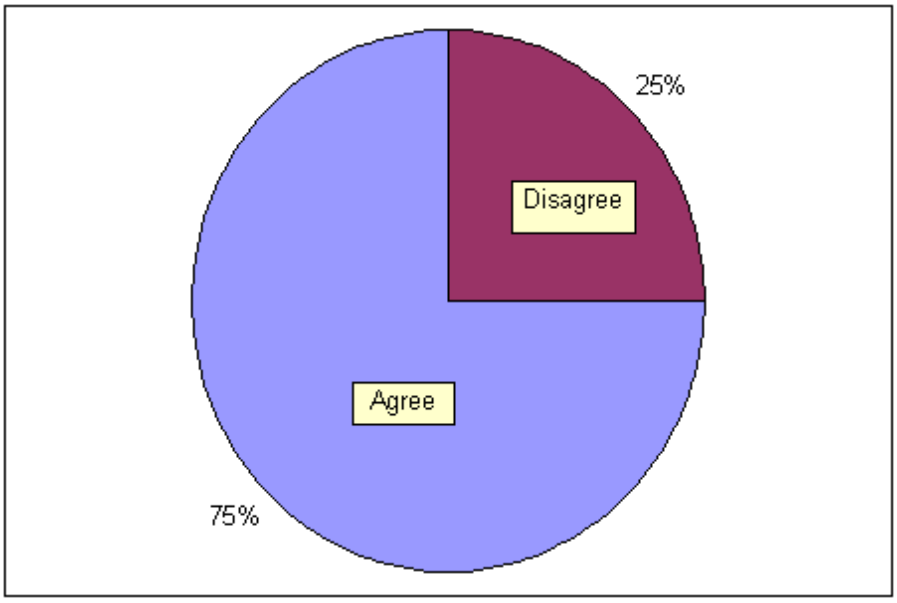

Figure 4.6

Teachers' Feedback towards the Implementation

In the eyes of the students, the feedback from good learners and weak learners seemed to differ. Students with a good English language background and those who have much exposure to English have no difficulty and agreed with the implementation

as it improves their English language skills and they can be on par with the international standard. This can be seen in Table 4.11 which highlights 87.5% students in good classes who agree to learn Science in English. In contrast, students with a moderate and weak English language mastery and lack of exposure to English language find it difficult, boring and burdensome as it heightens their pressure of understanding and following the Science lesson in English. These students, (59.1%) express disagreement in learning Science in English. This is in line with Wilkins, (1974) belief that environmental factors have an impact in the learning process in which the social context and the pupils' attitudes contribute to the students' reaction towards the implementation. Furthermore, the cultural background of students does influence their perception of learning using English as the medium of instruction (p. 47).

However, in the overall, more favourable answers have been expressed by students in learning Science in English. As shown in Table 4.11, from the total of 245 students, 171 students agreed on the issue on learning Science in English as acceptable and agreeable. This amounts to 69.8 %.

Table 4.11

Students' Feedback on Learning Science in English.

Excellent and Average classes.

Classes	Agree	Disagree	Total
3 Alpha	32	5	37
3 Beta	38	2	40
3 Delta	37	3	40
3 Sigma	26	9	35
Total	133	19	152

Percentage Agree = 87.5%

Percentage Disagree = 12.5%

Table 4.11 (continued)

Moderate, Weak and Very Weak classes- Disagree to Learning Science in English.

Classes(moderate and weak classes)	Agree	Disagree	Total
3 Omega	15	20	35
3 Epsilon	13	16	29
3 Zeta	10	19	29
Total	38	55	93
Overall	171	74	245

Percentage Disagree = 59.1%

Percentage Agree = 40.9%

OVERALL = $\frac{171}{245}$ x 100 % = 69.8% (Percentage Agreed in the overall)

Table 4.11 shows the students' feedback on the implementation of learning Science in English in different classes and their various opinions whereas Figure 4.7 shows the percentage of students' overall feedback towards the implementation.

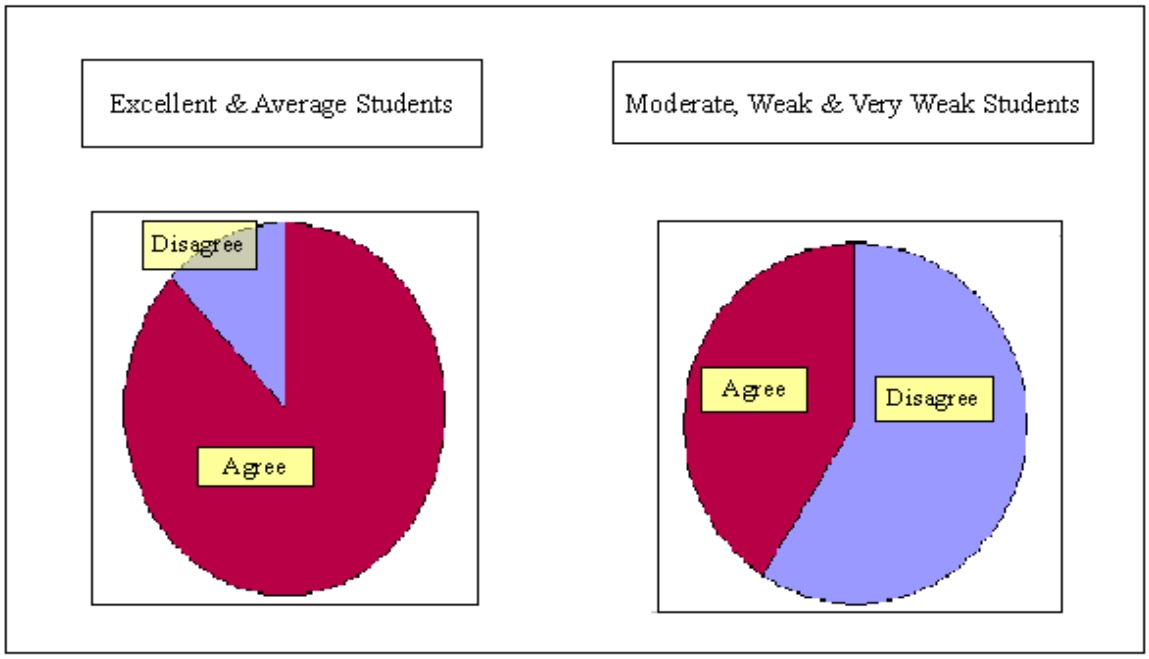

Figure 4.7

Overall Students' Opinion Towards the Implementation of Learning Science in English.

Table 4.12 shows students' various reasons for the choices made towards the implementation after learning Science in English for three years. Their responses towards the implementation have been listed down in the table:

Table 4.12

Students' Reasons towards the Implementation of Learning Science in English

Reasons for Agreeing	Reasons for Disagreeing
✓ Good. Easier to understand ✓ improves language skills ✓ enables us to explain concepts accurately in writing ✓ interesting and fun as students hail from English speaking family background ✓ speak English fluently ✓ English is an international language as is widely used for communication ✓ English is used in higher education, therefore , it is a good start now ✓ matches international standards and enables us to pursue our further studies overseas ✓ most terms originate from English, therefore, it would be much simpler ✓ shows English is widely used today and it is essential for future development ✓ initial stage was difficult , however later became more used to it ✓ prefer English as it is direct ✓ English is the lingua franca so I definitely agree ✓ effective steps taken towards learning ✓ boost knowledge of English and English vocabulary ✓ improves oral skills	× Students not from English background find it difficult × lack of exposure in speaking English × Bahasa Malaysia is the spoken language at home and at school × Little difficulty. Not an effective move × depends on teacher's teaching style × difficult to understand sentence structure × expressing in appropriate words is difficult × Hard to handle. Too much informatin × teacher's English is bad and has weak pronunciation and grammar × not comfortable, unclear sometimes × Weak in English, confusing words. × Difficult when it comes to answering or understanding Paper 2(writing) × Challenging as it involves a wide use of English. Do not like writing English essays × Words are not easily explainable. need proper writing skills × Difficult. Bahasa Malaysia is direct × Need continuous and consistent practice in English. × Dull and boring in English × hard to handle

4.5 The Interview

Data for this study was also collected from the interview conducted with four selected students (see Appendix A1 to G1) in each of the Form Three classes and from the Form Three Science Teachers (see Appendix H1 to H 4) in the school. The interviews were conducted in June 2007. The purpose of the interviews was to seek direct responses for the research questions of this study.

The transcripts of the interview that were conducted with the selected 28 students from Form Three (see Appendix A1 – G4) and the respective four Science Teachers (see Appendix H1 to H 4) teaching Form Three classes can be referred in the Appendices attached.

4.5.1 The Students' Interviews

A total of 28 selected students were interviewed to elicit responses on the language difficulties they faced in learning Science in English, types of learning strategies used by the students to improve their understanding of Science in English and the feedback towards the government's policy on the use of English as a medium of instruction for Science. The 28 students were selected based on their achievement in the school Science exam in the March Test and Mid-Term Exam. The four students chosen from a class were categorized as one excellent student, one average student, one below average and one weak student in each of the form three classes according to the standard set for each class. A mixed group of students comprising boys and girls from all ethnic groups were selected from each class.

Below are the interview questions that were asked by the researcher to the 28 students from 18 June to 29 June 2007. Students were informed earlier of the interview and the purpose of the interview. Students were not shown the interview questions and

the interview was conducted in a natural conversational way. The interview questions were as follows:

1. How many years have you been learning Science in English?
2. What scores do you normally obtain for Science since you first stared learning Science in English from Form 1 until Form 3?
3. How would you categorize yourself in understanding English language?
4. Do you find any language difficulties in understanding Science in English? Why? Give some examples.
5. What language strategies do you use in learning Science in English?
6. What is your opinion towards the implementation of learning Science in English? Do you agree, disagree? Why? Give your reasons.

From the interviews conducted with the 28 students selected from the entire form three classes in SMK Bukit Jelutong, the following responses were gained in order to answer the research questions of this study.

4.5.1.1 Language Difficulties

Based on the interviews with the selected students in various classes, the responses from the interviews were similar to the students' responses in the questionnaire. The excellent level students did not have much difficulty with language as they have an English background with much exposure to the language with family members or friends. For some of the interviewees, English is the first language at home. Besides that, they also worked hard in doing revisions and preparing for the subject ahead before their teacher introduces the Science topics. The problems that students in Excellent level students highlighted was teachers' communicative ability in English was

poor. The excellent students in the last two weak classes claimed that they need slow teaching from the teacher though they could follow the Science lesson in English.

However, for average level students, they did encounter problems in language. Problems such as scientific words, unable to memorize concepts, extensively written Science matters with different scientific terminologies in each chapter, too many concepts to memorize were part of the problems. Besides that, writing sentences to explain a Science concept was quite challenging for them. Some interviewees also expressed how a teacher's incompetence in the language affected their interest and understanding of the content of Science. Some expressed that their teachers tend to read word-for-word from the textbook to teach a lesson and lack using their own words. Teachers tend to teach fast and depend solely on the textbook. These are some of the causes for students' inability to understand the topic and were demotivated to use the language. This supports Chaudron's (1988) study in which language usage in classroom learning need to be simplified and students should be able to follow the language of instruction in order to better understand the learning task (p. 8).

The below average students who were interviewed from the seven form three classes felt that they could cope with English as it depends on how the teacher teaches the Science lesson. In addition, they also claimed that if teachers could be more friendly and used simple phrases or explained interactively, they would enjoy learning Science in English. This group of students find difficulty when scientific words are used much as they could not interpret the meaning fast in English and also find difficulty to memorise Science words. They did not find much problem to learn in English but still prefered to be taught in Bahasa Malaysia on certain topics that contain much scientific terminology. These students also claimed that because of their early exposure in learning Science in primary school was in Bahasa Melayu, therefore, it was easier for

them to learn in Bahasa Malaysia compared to English in the secondary school. This supports Cummins (as cited in Fueyo, 1999, p. 96) that, studies in which more use of English in classroom learning encourages varied use words and sentence. Therefore, students could indulge in cognitive task as it promotes better learning of content and language.

Nevetheless, weak students found learning in English difficult compared to Bahasa Malaysia. This was because they mentioned that they were from a Malay background or Chinese educated background; therefore , they cannot understand the Science concepts in their own native language better compared to English as they had to focus more on the language than the content of the subject. For weak students, even writing English compositions was challenging, what more on scientific language.They too felt that the teacher only say out what was written in the textbook and they were unable to pick up what the teacher said. Students in weak classes too pointed out that the teachers themselves were not competent in English as they have a poor control of the target language. These students claimed that English words were difficult to understand and sometimes they could not follow the words that the teacher mentions or explains.Therefore, they were not encouraged or motivated in learning Science in a language which was difficult for them to comprehend and to be explained. This supports Krashen's Comprehensible Input Theory in which students need to have an early understanding of topic in order to further proceed in learning task. If students face difficulty in understanding basic concept, this would impede their further learning process.

4.5.1.2 Learning Strategies

The researcher matched the learning strategies mentioned by the participants to Chamot and O'Malley's (1994) CALLA Learning Strategies. From the interview, it could be deduced that students practiced Cognitive strategies more in the learning of Science in English. Excellent students from 3 Alpha and 3 Beta showed possibility of using Metacognitive strategies in seeking answers for questions, which involved creative and critical thinking such as making comparison, making association, generalizing , inferring and so on while learning Science. This is done through doing earlier revision or readings on the topic to be learnt in the week in the classroom. They also did readings on Science fiction books and learnt the topic earlier in tuition classes. This helped them in having a prior knowledge of the subject matter before attending school learning process. However, the Cognitive strategy was highly practice for successful learning of Science in English especially from excellent students in 3 Delta , 3 Sigma (average classes) and 3 Omega (moderate class). These was through revising a topic earlier by doing a mind map , short notes or revise immediately after school as to better memorize or remember what was taught in the classroom. However, the best student in the weak and the weakest class (3 Epsilon and 3 Zeta) respectively used Cognitive strategies more and sometimes used Social / Affective Strategy just to clarify doubts or uncertainty of concepts taught. The Social / Affective strategies were also useful for students' personal discussions with their teachers for better understanding of difficult Science topics. They were able to work on their own in carrying out tasks designed for them or comprehend a Science lesson after approaching the teacher. These students also sought teachers' assistance after school to further enhance understanding of the topic.

For average level students in 3 Alpha to 3 Omega, (excellent to moderate classes) claimed Cognitive strategies were highly used to learn Science in English. Carried out revision by following notes given in the CD courseware attached in their textbook as it gives a clear picture of a topic with a short description and notes. Students' also practiced using workbooks prepare short notes and attend extra classes to follow the learning of Science in English. Students in weak and very weak classes (3 Epsilon and 3 Zeta) used Social and Affective strategies for better understanding of topics or sub topics and for clarifying facts / subject-matter with friends. These groups preferred study groups, and group discussions to learn Science in English. Discussion of tuition notes or asking their teacher to explain slowly were also practiced.

For below average students from 3 Alpha to 3 Sigma (excellent to average classes) Cognitive strategies were helpful to understand a Science lesson. They preferred tuition notes as it helps to further understand a topic well. The notes are made simple and easier to follow. However, moderate students from 3 Omega to weak and very weak students from 3 Epsilon and 3 Zeta claimed that Social / Affective strategies were better to understand Science in English as it involved a lot of memorizing which these groups found difficult to retain. Teachers' assistance in simplifying Science and English helped these students to understand the lesson better.

For weak students in 3 Alpha to 3 Sigma (excellent to average classes) Cognitive strategies were applied in learning Science in English. They depend on the reference book, tuition notes or self study. However, weak students from 3 Omega to 3 Zeta (moderate to very weak classes) said that the Social and Affective strategies helped them as they had to rely on the teacher's explanations and translation to Bahasa Malaysia to understand a lesson. The teacher's personal guidance and briefing on a topic would help their understanding level of a topic. Language is a problem for

students in weak classes; therefore, their interest and attention span did not last long in a lesson. Peer group discussion too did not work well as their circle of friends was of the same level and weak in language. It was only through the teacher's personal attention and additional exercises in the classroom that can gauge their interest and motivation in learning Science in English. However, there were also responses that some students had no learning strategies in learning Science as they just copied notes from friends and their learning was to the extent of classroom teaching and learning process only.

4.5.1.3 Feedback towards the Implementation

When interviewed on students' perception towards the change in the medium of instruction to learn Science in English, students ranging from excellent to average agreed upon the shift in the medium of instruction from Bahasa Malaysia to English. This was because they found it more reliable as English was more precise and any reference book or information comes in English first. Therefore, these students could enhance their understanding of the Science concepts or the subject to the maximum. They were more interested to use English as the language was frequently used in their family and among friends. These students found it a wise move to use English as it was more academic and internationally recognized, especially when they go to further their higher studies in Medicine, Engineering or Computing. For students in good classes, they preferred it to be in English as they can foresee the benefits in the future and they have planned for their higher studies in Science courses. Since this group of students possess a good mastery of the English Language, their interest level increases and their motivation level too rises. Though the high use of scientific terms and complex

structures were challenging, they were positive towards such challenges and were able to cope with the learning process.

The below average and weak students had a mixed opinion view towards the switch to English in learning Science. Some below average and weak students claimed that that they agreed to the learning of Science in English though their command of English language is weak. These students agreed because they could improve their English and this will help them in their future. Only a small number of below average students and weak students who were interviewed disagreed to the learning of Science in English while the others agreed. This small number of students felt that the content of the subject could not be understood due to their language problem. When the Science contents were explained in Bahasa Malaysia, they could follow the lesson and answer the questions, because they found it easy but when the medium of instruction was made in English, they found it 'shocking', new, very confusing and burdensome. This was because their understanding of basic English language is low. This high use of scientific words and wordy sentence structures reduced their interest and motivation to learn Science in English.These students felt that learning in Bahasa Malaysia would help them to perform better in the exam or understand the topic. They found that the difficulty now was in learning English in order to explain Science concepts when they could easily explain it in Bahasa Malaysia.

Due to that fact, this small number of below average and weak students did not favour the change in the medium of instruction to learn Science as they felt it was the contents that should be focused in Science learning and not the English language. Due to that preconception, they felt that the shift in the medium of instruction in learning Science has made their life difficult and they did not enjoy the learning process. This proves studies by Collier (1999) in which community way of life has impact in learning

a second language. If society has acceptance towards changes in education process then, this would encourage favourable outcome from everyone (p. 17).

4.5.2 The Teachers' Interviews

The researcher carried out the four Science teachers' interviews after informing them of the purpose of the interview. They were willing to be interviewed and gave full support in responding to the interview questions. The interview took place on 3rd and 4th July 2007 in the teachers' staff room after the researcher had made appointments with the respective teachers. The interview was conducted for 15 minutes with each teacher at different times on the two days. The following structured interview questions were posed to the four Science teachers teaching Form Three Science in English. The questions were as follows:

1. How many years have you been teaching Science?
2. How do you find the switch from Bahasa Malaysia to English in teaching science?
3. Can you describe what category your science class fall in?(good/ average/ weak)
4. What are the problems you face while teaching science in English in the classroom?
5. Do you find any difficulties using English in teaching Science to students? Why? Give examples.
6. What teaching strategies do you use in teaching Science in English in the classroom?
7. Have you come across problems among students in using the English language when you teach them? Give examples

8. What is your opinion towards the implementation of teaching science in English?

   From the four Science teachers' interviews, the following responses were gained in order to answer the research questions of this study.

The four Science teachers' responses to the interview questions above have been summarized in the following key-words which highlight the research questions of this study.

4.5.2.1 Problems in Teaching

For the interview session with the four Science teachers, the researcher asked each of them to specifically elaborate on the major problems he/she faced while teaching their respective classes regardless of the performance levels of the classes. From the interviews with the teachers, the most significant problem that the Science teachers faced in teaching Science in English was explaining Science concepts using their own ability in the English language. This was because the teachers need to interpret the Science concepts in simpler forms using English language. This did not come naturally for the teachers who had much language ability in Bahasa Malaysia to immediately explain precisely in English as they lacked the language registers and vocabulary. They found it a waste of time to explain many times in English and at the same time to hold students interest in listening to what the former wanted to explain. This resulted in only less material that could be covered and most of the syllabus was not covered on time.

Teachers too lacked confidence and the language ability in using English language completely in the teaching process as more practice was needed to boost their

language skills. Teachers expressed their inability to express themselves clearly in English of the vast knowledge in Science. This was because of their lack of confidence in constructing proper sentence structures. Teachers sometimes were only able to use simple English structures; therefore, it was difficult to give additional input on the topic taught, as language is a barrier for the teacher. Though there was lots of information to be transmitted to students in the teaching process, but due to English language being an obstacle, the purpose is defeated in the teaching and learning process.

Some teachers felt that higher-level concepts were quite difficult to explain in detail or any current issue pertaining to the science topic was hard to be described in fluent English. This highly technical language and vast choice of words deters the effective transmission of knowledge and input to students. For example; How the contraceptive pills work to prevent pregnancy...How electricity operates/ functions...and others. This type of sentences involve scientific terms and grammatically proper structures in order to convey the meaning accurately. This would be an added burden for the teacher who had to do much preparation in language first before the content was explained to students.

Other problems that the teachers admit were from students' perspective in learning Science in English as this too contributes to a teacher's problem in teaching Science. A majority of students were able to understand concepts but had difficulty in trying to explain the concepts in complete sentences. Low achieving students sometimes found it difficult to understand because they have limited vocabulary (especially remove class students). For them, the textbooks or reference books were too wordy and they needed simplified notes and sentence structures to better understand a science topic. Therefore, this resulted in the Science teachers facing a tough time to ensure that the students understand the topic and had to spend more time in explaining

one concept for a long time. When many sub topics needed to be covered within a given period or exam duration time, these Science teachers would have to cover most topics in Bahasa Malaysia in order to cover the topics quickly.Sometimes, they just had to read through what is displayed on the screen from the Science CD-ROM played or give out notes and go through quickly to finish the lesson for the day.

These four Science teachers have also highlighted some problems that they had seen among students in the classroom while teaching Science in English. The difficulties that students faced in the learning of Science in English were weak in vocabulary of technical words, not confident in talking or writing in English, and their poor grammar. Certain terminologies were “new” to students as compound words were difficult in Science. Students' tendency to translate words or sentences literally was unavoidable in Science learning and some students from weaker classes too faced difficulty in writing concepts into proper sentences. Other difficulties lied in students' inability to comprehend Science concepts in English as they were weak in understanding the complex sentence structures in English and this resulted in Science being difficult to be understood.

When students were unable to understand the explanation on a Science lesson by the teachers using English language, then the Science concepts could not be mastered by the former because they found the sentence structures complex, meaning embedded and therefore, all these reduced the interest in learning Science in English. Other problems occured when students found difficulty in understanding certain Science terminologies in English and difficulty in memorizing sentence structures in English as they lacked exposure to language usage. For example, a teacher stated that when a student was asked to define the 'photosynthesis concept', he / she was able to do so easily in Malay but in English, they know the process, meaning and definition but

lacked the choice of words in English to say it clearly or write exactly in proper sentences. This was why students were unable to score in Paper 2 (Structured Questions) in the Science exam as it involved writing complete and proper sentence structures with the right choice of words and correct Science terminology.

For students in excellent and average levels classes, English language was not a major problem as they were exposed to the English language through speaking at home, with friends, watching English programmes or others. It was only the scientific language that mattered compared to the normal English lesson as scientific language involved a high density of technical terms, understanding the function of a word may be in a scientific context, dealing with complex sentence structures and a high use of scientific vocabulary and complex sentences. All these tasks will need one to do extra revision, preparation and study skills to master the contents.

On the contrary, for moderate, weak and very weak classes, contents and language both come hand-in-hand as difficulty in learning Science in English. Students in weak classes lacked exposure using English in their daily life. They felt they had no purpose to speak or write in English and their native language or mother tongue was widely used for every purpose. They were placed in classes with the same level or capabilities of students and found no necessity to speak or use English. Therefore, the command of language was weak and they only learned English as a subject and for exam purposes. This resulted in their dissatisfaction towards learning a content subject in a language that demotes the interest when they could easily learn and communicate in Bahasa Malaysia.

4.5.2.2 Teaching Strategies

From the interviews, it can be derived that the teaching strategies that teachers employed differed according to the academic and language ability of students in their respective classes. For excellent classes, the teachers followed the syllabus accurately and used English language first to teach the content subject. More teaching aids, for example, charts, CD ROMs and reference books helped in the teaching process. Metacognitive and Cognitive strategies were highly practiced in these classes. Only when students found difficulty in understanding difficult topics, did teachers translate or use Social and Affective strategies to give a clear understanding of the topic taught but this was done only when necessary.

For average classes, more explanation and elaboration using cognitive skills helped students in understanding the lessons taught. Diagrams, mind maps, more exercises after each topic taught helped simplify difficult topics. Follow-up lessons, experiments or activities supplemented on the comprehension of topics taught in the classroom. More reinforcement exercises and practices were given to average class students to enhance their comprehension.

Cognitive Strategies were used in moderate level classes too. This helped in giving a clear view of what the topic was to be learned on the day. However, Social and Affective Strategies were needed to help students to better understand the lesson taught as there were some weak students who required personal assistance in understanding the lesson.

For weak and very weak classes, the teachers used Cognitive Strategies very limited and had to apply Social and Affective strategies widely as most of them found it very difficult to understand in English though much elaboration was given by the teachers in the classroom.

4.5.2.3 Feedback Towards the Implementation

Teachers' feedback on the implementation showed that teachers with a vast experience in teaching science found that English has made a return as they learned Science in English during their school time. Though having taught in Bahasa Malaysia for a long period of time, these three Science teachers from the total of four Science teachers agreed to the shift in English to teach Science. This was because English is an international language and many Science references can be easily obtained in English. Besides that, authentic materials could be accessed from the internet, television and other sources, which are in English. This helped the teaching process. These teachers agreed it should be continued as a gradual process of improvement, progression and development.

On the other hand, there was some disagreement highlighted by only one Science teacher as this implementation helped students with an English background or who are exposed to English in their daily life, but not weak or rural students who lacked exposure to listening or speaking the English Language in their daily life. It only added pressure to weak students as the language barrier hinders their understanding of the Science contents and affected their interest in learning Science. These teacher felt that sufficient revision would help in teaching the lesson effectively in the classroom with the use of the LCD, laptop, and CD ROMs it helped in making the lesson more interesting and effective to all groups of students.

From the teachers' feedback it can be said that if a teacher is able to master the content and language well, the lesson will be effectively carried out. Teachers should use simple structures to explain Science concepts, give reinforement and drilling exercises to help in enhancing students' understanding of their science lessons. However, here again the time factor and syllabus-based teaching and learning need to

be paid attention to in order to complete the teaching in the year as students are exam-orientated and various topics need to be covered within the time period given. Teaching Science in English makes students attempt two things at the same time, learn and understand English, and the need to understand and remember the Science content. Therefore, meticulously planned teaching methods will create good learning to take place and improve the problems in the years to come.

4.6 Observations

The researcher also carried out observations in three selected classrooms in answering the research questions. The classes were one excellent level that was 3 Alpha, one average level that was 3 Delta and one was the last class in Form Three, 3 Zeta, which comprised weak level students.

The researcher seeked the permission of the respective Science teachers by informing them of the purpose of the observation. The three respective Science teachers agreed for the observation to take place which was solely for the purpose of this research study. The researcher focused the observation only on problems teachers face in teaching, language difficulties that students encountered in the learning process and the teaching and learning strategies employed by teachers and students. The researcher held an observation checklist focusing on the problems faced by teachers in teaching Science in English and the teaching strategies employed for this study. The researcher included the following aspects as highlighted by Richards (1990) in his observation checklist as can be seen in Table 4.13.

Table 4.13

Observation Checklist

Observation	Description
Classroom Management	➔ Teacher orientated or student-centered ➔ Classroom environment (positive or negative)
Teacher-Student Interaction	➔ How much they are engaged or committed? ➔ How much interest or attention maintained?
Task	➔ Pacing of task (time) ➔ What kind of task, how much are they engaged in lesson?
Teaching Resources	➔ Teaching aids,effective?
Problems in Teaching	➔ Language, teaching materials
Teaching Strategies	➔ Meta cognitive, Cognitive or Social/Affective strategies
Quality of Input	➔ Natural speaking style or a foreigner talk ➔ how often or to what extent does the teacher use translating or native tongue in teaching?
Questions and Feedback	➔ How does the teacher correct errors and the answers and repeats for clarification ➔ How is communication breakdown dealt with?

(Sources : Taken from Jack C.Richard, 1990 , p.126-127)

All the three observations are reported in the text itself for easy analysis of the teaching-learning process based on Richard's (1990) Observation checklist. This is to enable easy analysis of the teaching and learning of Science in English as well as for direct use in teaching and learning process while the observation was carried out.

4.6.1 Observation in an Excellent Class

Class : 3 Alpha (First Class)

Level : Excellent

Date : 6 July 2007

Time : 9.30-10.10 (40 minute lesson)

Venue : Science classroom

The students were prepared with their presentation topics on ‘Nuclear Power Station' and how it works. The topic was in their Form 3 syllabus and the presentation took place in their science classroom. A group of four students presented their topic. A student-centered lesson was the highlight for that day. One student displayed the nuclear power station model and how it functions. He explained in simple English. Since it was a good class, the presenter had no difficulty in speaking in English. Proper sentence structures were used. The explanation was well organized. They used the scientific words related to the topic such as ‘Condensation’, but only a few asked what it meant. The presenter could explain in his own words what it means and how it relates to the topic. The presenters applied Metacognitive strategies while explaining the concepts using the Malaysian context ‘water dam’, ‘water supply’, ‘generator’ and other relevant words. The rest of the students were keen on listening and interrupted to ask for clarification of how it works, how the system functions using a generator. The presenting students took turns to answer questions asked by other students and responded well. The students could draw out the internal structure of the magnetic function in the nuclear power station and further elaborated on how the system works in simple sentences, in a slow manner. At this point, the teacher repeated their points and added information (a quick brief to what the student had said) with her own explanation and examples. This was to reaffirm the part that students were unclear while the

presentation was done. There was a two-way interaction between teachers and students during the presentation as the teacher prompted further questions from the presentation and also cleared doubts of students who were unsure of certain scientific terms, their meanings and the elaboration. Students worked with their friends and more interaction pertaining to the topic presented was seen among students in different groups. The task was related to their syllabus and relevant for students to write out answers in Paper 2 Structure Questions in the PMR Science subject. Students presented using "Mahjong Paper", drew diagrams clearly with parts labeled, and functions well-elaborated. Other students made short notes, copied down notes as the presenters explained the topic or sketched a mind map on the topic. The presenters were good in their spoken language and translating in Bahasa Malaysia hardly took place. For students who were slow in picking up the concepts taught by the teacher, they personally gathered in a group, explained to one another by drawing a diagram on a pieced paper, and giving a simple explanation on the parts and functions.

Another group presented on the 'Gas Turbine Generator' after the first presentation. However, these groups of students were not good in describing the concepts, as they tended to refer to the textbook and read sentence by sentence during their presentation. They understood the concepts well; however, they lacked using proper sentence structures and getting the right terms to explain the functions of a particular part in the generator. They tried their best to use their own words when other students prompted questions on how a spark plug functions. It was a moderate description because they could not explain 'in flow' or had to pause on and off to get the proper scientific terms while explaining. Students were confused with words like 'compressor' and 'function' and seeked more clarification while they presented. The teacher interrupted to state clearly the meaning of word(s) and functions and gave

examples. Then the presenters added relevant examples and explained in their own words after the teacher's input was given. The teacher then asked all the students to refer to their textbook and went through again the types of energy , using terms such as 'generator', 'Hydro electric power', 'Diesel power', and others. Students were attentive as the teacher talked on points precisely by using only English. It was full of technically related terms to energy and long compound words and the teacher too spoke using complex sentences. Students just referred to their textbook. Some underlined the salient points while others copied quickly what the teacher spoke. The teacher's method was more of "chalk and talk". Students interrupted when the teacher was explaining and were seeking slow explanation using words as 'compressor filtered' repeatedly. The teacher paused and described slowly using many technical words. Students wrote down what the teacher said. The teacher then asked students to compare the similarities and differences in energy in pair work. The lesson was continued in the following class.

The researcher noticed that the problems in teaching began when the teacher referred to the textbook notes and read out the explanation given in the textbook as students could not quickly summarize the gist of the content taught by the teacher. The teacher just explained the concept and asked her students to read that paragraph. The teacher too used lengthy phrases, which were with too many technical terms that made students lack of focus towards learning process. The teaching strategies used were the metacognitive strategy and it was effective at this level of class as they have memorized or mastered the basic concepts, science terms and meaning. The students could relate the lesson with a higher level of thinking related to the topic taught and giving relevant examples. In order for students to be very clear of the topic, the teacher applied more exercise and practices. Social and affective strategies were less used as students in the

excellent class were more prepared before lessons and used memory skills in pointing out the facts in Science.

For the purpose of this study, an Observation Checklist was used by the researcher during the observation session. The Observation Checklist in Table. 4.13 was used to match against the researcher's class observation. This is shown in Table 4.14.

Table 4.14 below shows the teaching and learning outcomes in 3 Alpha , the excellent class.

Table 4.14

Teaching and Learning Outcome in 3 Alpha – Excellent class

Observation	Description
Classroom Management	➔ **Teacher orientated or student-centered** Since students presentation was carried out, the lesson was more student-orientated with teacher monitoring students presentation style. ➔ **Classroom environment (positive or negative)** The learning process was positive and engaging.
Teacher-Student Interaction	➔ **How much they are engaged or committed?** Almost all students were active learners and concentrate the learning process. Some asked questions to the presenters to clear doubt, some ask for the meaning of the scientific concepts while others were taking down notes. ➔ **How much interest or attention maintained?** Students showed much interest and were attentive as this could be seen from their involvement in the topics being presented. As the topics were important for their PMR examination, particularly in Paper 2 Science paper, students paid much attention to the topics while their friends were presenting.
Task	➔ **Pacing of task (time)** Group presentation. It was 15 minutes per group: 10 minutes for presentation and discussion for 5 minutes ➔ **What kind of task, how much are they engaged in lesson?** The presenters in each group were fully involved as they have to explain certain parts in their presentation. Others were taking notes and asking for further information after the presentation. Some were refering to reference books during the presentation.

Teaching Resources	➔ **Teaching aids,effective?** Quite ineffective as only 'mahjong papers' were used during presentation. No power point presentation or slides were used though the class was equiped with LCD projector. Students drew diagrams and explained components in detail on the presentation paper.More of presenting what has been prepared earlier.
Problems in Teaching	➔ **Language, teaching materials** After presentation, teacher recapitulated or gave additional input regarding the presentation topics. Students were copying down what teacher said. At some point, the teacher highlighted the key words or important parts in the topic that could be tested in the exam. Teacher tended to use simple structures and explained in her own words as she is an experienced teacher with 15 years in teaching Science.
Teaching Strategies	➔ **Meta cognitive, cognitive or social/affective strategies** Before the presentation began, teacher used Meta cognitive strategy to provoke students to listen carefully to the following presentation. After the presentation, teacher asked students for responses on possible answers for the metacognitive question that was asked earlier. Teacher then explained her answer to the question and related the topic to the current Science uses in life. Teacher related to real life situation and links theory to practical in Science.
Quality of Input	➔ **Natural speaking style or a foreigner talk** Teacher uses natural speaking style as she is fluent in English but tends to speak fast. Quite a monotonous tone. The teacher's projection of voice too was not loud: therefore, students had to fully concentrate on what the teacher explains though at some part teacher tend to read out what was given in the textbook regarding the topic. ➔ **How often or to what extent does the teacher use translating or native tongue in teaching?** When students approach for further clarification, teacher tends to explain in Bahasa Malaysia. Her own language ability was good but tends to be fast and uses soft voice modulation.
Questios and Feedback	➔ **How does the teacher correct errors and the answers and repeats for clarification** Teacher points out the wrong answers when students explain their answers. Teacher stresses on how the accurate word or meaning has to be explained in order to get it right. ➔ **How is communication breakdown dealt with?**

	Teacher slowly repeats or puts in a mind map form to enable students to understand the topic. At this point Bahasa Malaysia was used to make the learning easier.

4.6.2 Observation in an Average class.

Class : 3 Delta (Third Class)

Level : Average

Date : 25 June 2007

Time : 10.10-10.50 (40 minutes)

Venue : Science Laboratory

Teacher introduced a new chapter and a topic in the Form 3 syllabus, which was 'Electricity'. Teacher used LCD , laptop and showed "Definition, Concept and Function of Electricity". It was a teacher-oriented teaching method as teacher controlled the teaching and learning process. The problematic students were asked to sit in front in a group as the teacher could guide them personally while the other students sat in other groups in the science laboratory.

The teacher introduced and explained the topic of electricity. Teacher projected a video tape on people working and how electricity works. Students paid full attention . Teacher explained that at the end of the lesson, students should be able to identify examples of electricity and kinds of electricity. Teacher asked students to open the textbook and the Science Process Workbook. Students were attentive and teacher elaborated on the topic. Teacher prompted questions on electricity and examples and students responded quickly based on their understanding and what they saw on the VCD. Teacher asked sources of electric energy to be named. Students gave various answers. Weak students tried to give one or two answers but were quite slow in their

responses. Teacher continued asking appliances of sources of electrical energy. Students responded loudly. Students were then asked to match electrical cells with solar cells and students made trials and errors attempts. The weak students asked their teacher in Bahasa Malaysia and their teacher explained in groups to them. Some gave quick answers in English. Teacher then emphasized on the answers and repeated the functions. Teacher then explained the differences and devices required in electrical energy and gave options A, B, C ,and D. Students were quick in answering and naming them. The weak students inclined to read and respond later. Some sought translation in Bahasa Malaysia in order to get the answers. Their teacher guided them personally.

Their teacher then showed the similarity of electrical energy and water. She explained in English and her students listened attentively. She also translated a little for the weak students or students who were not clear as they interrupted to seek an understanding of what their teacher was saying. She explained carefully for their understanding and at some point used Bahasa Malaysia to emphasize the point.

The teacher continued with electron +ve and –ve functions. A student was in doubt of how it worked and she gave examples and briefed the procedure of +ve and –ve electrons. The teacher also showed a VCD on the process in a scientific graph for 'battery'. At this point, students with their partners pointed at the screen and discussed the procedure of electrons. They also jotted down some points as the teacher explained. Students also quickly labeled the diagram in their Science practical notebook and asked further questions of the battery electron. The teacher showed the diagram and drew a mind map of the formulas for V=Voltage, I=Current and R=Resistance. The teacher recalled the unit sign Ohm. Students copied the formula and the short notes.

The teacher showed a sample question involving the formula and on doing calculations. The students eagerly tried out other questions after the teacher showed some samples. If their answers were wrong, the teacher repeated the errors in English and explained again. The two-way communication was entirely in simple English and only the weak students remained quiet. The teacher personally drilled the students in English. Although they were able to find the right answers, they were unable to say or express them in English.

Students in the laboratory preferred to sit in groups with their circle of friends to discuss what the teacher briefed in class. They share notes and points jotted down quickly. Peer discussion was seen when one or two were unable to follow in English where the group members explained in Malay or used Chinese among Chinese students.

The teacher's method was more of prompting questions and selecting students at random to answer to get their full attention and to involve all the students in the learning process. This created a sense of development in the classroom lesson and their thinking was not diverted to other irrelevant discussion. The teacher used simple and direct sentences. Students were able to converse in English but in simple sentence structures only. The teacher's use of the Science CD Rom, laptop and LCD sustained students attention throughout the lesson as the teacher could go back to the fundamental concepts and emphasized on certain scientific words and terms related to the topic.

The teaching strategies that the teacher applied were more of the Cognitive strategies as the teacher directly focused on important elements in the chapter and how this will be tested in exam questions. However, the Science teacher had tendency to read from the VCD the definition or concepts elaborated, and then simplified in her own words of what it meant. Since this was an average level class, students could understand what the teacher was trying to explain but the students seemed to be limited

in their vocabulary when it came to writing the answers or explaining in their own words. They were not quick in thinking and responding in English. However, language was not a barrier for these students because of only a limited choice of vocabulary, scientific names and simple structures seemed to prevail.

Table 4.15 below shows the teaching and learning outcome in 3 Delta, the average class.

Table 4.15

Teaching and Learning Outcome in 3 Delta – Average class

Observation	Description
Classroom Management	➔ **Teacher orientated or student-centered** The lesson was teacher-orientated as teacher was introducing a new topic and students focused on the video tape played on the topic to be taught ➔ **Classroom environment (positive or negative)** The learning process was positive as students were introduced to a new topic. However, students tend to be talking in groups, not listening to teacher's explanation at some point as not all the groups could be monitored by their teacher while she was teaching
Teacher-Student Interaction	➔ **How much are they engaged or committed?** Almost three quarters of students were engaged in the lesson as they were explained a new topic which involved some calculations. Students too tend to refer to their text book on the new topic that was being taught. A quarter of the students were busy with their other homework or not paying attention to the lesson They were talking with other students sitting beside them. ➔ **How much interest or attention is maintained?** As this topic was an important topic for the exam and frequently asked in the exam, students paid more attention after their teacher informed them of the importance. They too were much interested during the calculation parts. However, while their teacher was explaining the scientific concepts in highly technical words, the students were more quiet and focusing on their teacher. Some interrupted as they did not understand certain Science words which their teacher uttered or explained.
Task	➔ **Pacing of task (time**) The teaching and learning process was slow and

	steady. Teacher was not fast and explained little by little though she depended entirely on the slide presented from the Science CD-ROM. ➔ **What kind of task, how much are they engaged in the lesson?** It was theory and notes on the new topic. Students were depending fully on teacher's explanation alone.They copied down notes from the screen after teacher explained the concepts and meaning in each slide .
Teaching Resources	➔ **Teaching aids,effective?** Effective as information in the CD-ROM is clear, simple and colourful. Students enjoy the notes which were shown in the mind-map. The calculation and exam type sample questions enabled students to engage in the learning process and work with partners in discussing for the right answer. Students also had their Science workbook and were doing the calculation question in the workbook after teacher explained the concepts.
Problems in Teaching	➔ **Language, teaching materials** Teacher tends to read exactly what was on the screen and only used a few words to explain further. Sometimes teacher struggled with speaking a sentence in a flow and tended to pause often to get the pronunciation right. Teacher also asked students to refer to the text book for additional input and copy down certain sentences which were important.
Teaching Strategies	➔ **Meta cognitive, cognitive or social/affective strategies** Cognitive strategy was highly used as more notes, important key words, mind map and activity based learning was carried out by teacher during the observation. Social / Affective strategy was used when students called teacher for one-to-one explanation on particular points or meanings.
Quality of Input	➔ **Natural speaking style or a foreigner talk** Teacher used simple English language as she depended on notes on CD-ROM and text book. Very minimal effort to use own words. However, the teacher tried conducting the lesson in English though she was not fluent and avoided Bahasa Malaysia. ➔ **How often or to what extent does the teacher use translating or native tongue in teaching?** Teacher used English throughout lesson and used Bahasa Malaysia only when students approached her personally and requested to explain in Bahasa Malaysia.

Questios and Feedback	➔ **How does the teacher correct errors and the answers and repeats for clarification** Teacher pointed out incorrect wordings or sentences and helped to explain slowly though teacher was not competent in the English language. ➔ **How is communication breakdown dealt with?** Teacher repeated in English in simple ways or through short notes. If students were still unable to follow, she switched to Bahasa Malaysia to help them understand.

4.6.3 Observation in a Very Weak class

Class : 3 Zeta (Last Class)

Level : Weak

Date : 11 July 2007

Time : 11.10-11.50 (40 minutes)

Teacher recapped on the topic taught last week on 'Water as Solvent" and asked the students to refer to their science reference book. Students were ready with their reference book. The teacher asked short questions to recall the important points of the topic. Only a small number answered quickly, even that with a pronunciation problem, as they were not sure of the exact sound. She had to repeat in Bahasa Malaysia for some group of students in the class. The teacher stressed the word thrice and all the others pronounced loudly after the teacher. The teacher then explained water in the human body and the percentage it comprised. Students could answer quickly. Teacher then asked about water used in life and asked for examples. Students could give various uses of water in everyday life but gave short answers. No complete sentence was said by the students. Here, most students quickly tend to answer in Bahasa Malaysia first. Teacher then gave key words in English and those students that were able to pick up, immediately could respond in simple, short English words.

It was a set induction that the teacher applied to catch the student's attention towards the lesson 'Water as Solvent' as this was a weak class and the students were slow in catching up with scientific terms at the beginning of the lesson. The teacher was also bilingual while uttering a few sentences just to check that the students were paying attention continuously. If the teacher kept talking in English, the listening capacity of the students seemed not to last and they divert focus on their own activities while the teacher explained the words in English. Therefore, language was a barrier, the teacher had to translate on and off to ensure all students understood the concept properly. The teacher then reminded them on the previous week's experiment carried out in the science lab on water, salt, and stressed the difference between 'solute', 'solvent' , and 'solution'.

The teacher wrote down the word and showed examples:

Solute + solvent + solution.

(Salt) (Water) (Salt solution)……..So water is called a universal solvent and stressed on the pronunciation of the words. Students repeated loudly.

The teacher recalled an alcohol experiment that was done last week and wrote the sample as organic solvent such as alcohol and turpentine. Only a few students could immediately respond on the experiment done. Teacher also gave clue words starting with the letter v_ _ _ _ _ _e for the solvent that can evaporate very easily. The teacher asked anyone who could name it and a student quickly uttered the word 'volatile' with wrong pronunciation. The teacher corrected his error in pronunciation and asked the student to repeat and the others followed after him. Some students were able to recall the experiment and the word after that.

The teacher then used liquid examples in real life experience and asked the uses of the organic solvent. Most of the students had no idea of the word. Teacher tried explaining in Bahasa Malaysia a little, just to remind students of the topic. A small number of students quickly named words as 'alcohol', 'acetone', 'enzyme' and 'ether' after referring to their reference text and their exercise book notes. The teacher showed two bottles which contained ether and alcohol and passed the bottle around asking students to take a sniff but not to inhale it. The teacher showed a demonstration between 'sniff' and 'inhale'. The teacher, too, had to translate the word 'sniff' and 'inhale' in Bahasa Malaysia as the students kept on asking the words in Bahasa Malaysia. Then the students were eager to know why they could not inhale for long and the teacher replied it was bad for their health. They were curious to get a chance to smell the difference between the two liquid bottles.

At this stage, the teacher then showed another bottle containing 'Acetone' and asked of its function. One student remembered and answered quickly in Bahasa Malaysia. The teacher approved her answer and repeated in English the function was to dissolve nail polish. The teacher showed nail polish and called a Chinese girl to apply the nail polish. Other students were excited. The teacher asked her to wait for it to dry and passed the action bottle for the other students to see the colour and sniff it. The teacher then added that the use of 'ether' was to extract fat. The students quickly jotted down in their reference text when the teacher explained the use and function of it. The teacher then singled out students to read a few lines from the textbook on 'Organic Solvents'. While reading, the teacher interrupted and asked the others to highlight or underline the important words, phrases or sentences. The teacher then introduced another term for organic solvent: 'Carcinogenic' and mentioned that it caused cancer and is inflammable. Students kept on saying the words. The teacher translated in

Bahasa Malaysia and explained precisely so that students were very clear on the answer.

The teacher then asked all the students whether they had sniffed the alcohol and asked the differences. Students replied in Bahasa Malaysia. A small number answered in English on the differences in smell that they felt. The teacher explained the differences in English and reinforced in Bahasa Malaysia. The teacher then called the Chinese girl who had applied the nail polish to show how 'acetone' can dissolve nail polish. The students kept on saying the word 'dissolve' and the teacher explained what 'dissolve' was in English followed by a little translation in Bahasa Malaysia. The teacher showed the demonstration using 'acetone' on nail polish and the others were excited to see as though it was like a "magic". The teacher stressed that it is not magic and explained the scientific reaction of what happened in English little by little.

This is followed by teacher repeating the explanation in Bahasa Malaysia for clarification. The teacher then drew a table showing some organic solvent and functions and asked students to copy down the notes. At the end of the lesson, they were given some worksheets to fill up blanks and write the function of 'solvent' taught without referring to their text and only based on their understanding. Students could write answers but made spelling mistakes. Some were able to write shorts answers quickly but when questions were asked on how the process works or write on the functions given, students could not express properly in English. They tend to ask the teacher the words they had in mind in Bahasa Malaysia and expected the teacher to translate in English. The sentence structures too seemed ungrammatical but they were weak in writing in English and their choice of vocabulary was limited.

Social and affective strategies worked well in such a class as students were only engaged in the learning process when the teacher brings simple, daily life experiences

and examples in the teaching context. They felt involved in the learning process. However, it took time to upgrade the language skills of these students as they were not hardworking or fully attentive when the lesson was thoroughly taught in English. This could be due to their family background and upbringing where Bahasa Malaysia and their native language were spoken frequently. They lacked exposure to English and only understood simple words and meanings.

Cognitive strategies worked for students to prepare for exams and answer exam questions. They need simple, short answers to remember. However, spelling and pronunciation was another issue as they were keen to use Malay spelling words to write answers. Students from a Chinese school background and Tamil school background in weak classes had no proper way of writing even in Malay as they used direct translation from their native language to the second language. Some tried to answer in English but their meaning was incomprehensible and hardly makes sense.

Table 4.16 below shows the teaching and learning outcome in 3 Zeta , very weak class.

Table 4.16

Teaching and Learning Outcome in a Very Weak class

Observation	Description
Classroom Management	➔ **Teacher orientated or student-centered** The lesson was both teacher and student orientated as teacher involved the whole classroom in the learning process. As it was a weak class, the whole class had to depend on whatever the teacher said during the teaching period and also tended to work in pairs or small groups to understand what the lesson was. ➔ **Classroom environment (positive or negative)** The learning process was positive as teacher and student were engaged together in the lesson. But students interest did not seem to be sustained if teacher keeps talking in English. When Bahasa Malaysia was used the response was encouraging and students were active.
Teacher-Student	➔ **How much they are engaged or committed?**

Interaction	All students were committed in the learning process. However, active learners were only about 10 students from the total 29 students as only this group responded to much of the learning task. ➔ **How much interest or attention was maintained?** The whole class was enjoying the lesson as their teacher brought some experiments to the class and called all the students to be involved in the science experiment. They liked it and communicated with one another during the experiment. However, the students were not seriously involved in using English during their Science lesson and were more relaxed in understanding the topic .
Task	➔ **Pacing of task (time**) The teacher had to carry out the teaching process very slowly in English as students were not quick to respond to what the teacher demanded. She had to demonstrate first slowly when she spoke or uttered the meanings of the concept that were being taught. ➔ **What kind of task, how much are they engaged in the lesson?** It was more of experiment type and students were personally involved to experience the Science concepts taught. They were excited to know what the lesson was all about.
Teaching Resources	➔ **Teaching aids,effective?** Very effective as it was more of a hands-on experiment or practical session. Students could experience by themselves and see by themselves what happens during the experiment. Lesson was also engaging.
Problems in Teaching	➔ **Language, teaching materials** Teacher was a good user of English, therefore, she could easily explain the lesson. However the teacher had to be slow in explaining the lesson as these were very weak students who were incompetent in English and provided little explanation at a time during the teaching session. The teacher gave short notes in handouts for the student's reference. Teacher also relied on the textbook as the experiment was stated in the textbook and students were asked to refer to it.
Teaching Strategies	➔ **Meta cognitive, cognitive or social/affective strategies** Social / Affective strategies were widely used as the teacher gathered students in groups of four and talked to them during the experiment. Teacher also used the drillling method of repeating Science words or concepts were explained repeatedly so that these

	weak students could follow the teacher. Very limited cognitive strategies were used as only a few active learners were engaged in the cognitive learning process like taking down notes, drawing mind maps and others.
Quality of Input	➔ **Natural speaking style or a foreigner talk** Teacher used simple language to teach the lesson. Her language ability was good and she adapted according to her students' understanding of the language. Very simple choice of words were used by the teacher to explain the topic. Notes were given in handouts for student's own reading . Teacher also asked students to highlight key points in the notes given in the handout to enable students to remember just the main points in a topic taught. However, that weak class required much explanation in Bahasa Malaysia so the students could understand their teacher. ➔ **How often or to what extent does the teacher use translating or native tongue in teaching?** Teacher had to use Bahasa Malaysia to half of the class because these students could follow the topic but could not respond in sentences using English language. They tend to ask questions or reply in Bahasa Malaysia. As a result of that situation, the teacher used Bahasa Malaysia after explaining first in English to the students. This was to help them understand easily at least the simple concepts.
Questions and Feedback	➔ **How does the teacher correct errors and the answers and repeats for clarification** Teacher immediately repeated concepts for clarification and corrected students' errors on the spot. ➔ **How is communication breakdown dealt with?** Teacher had to use Bahasa Malaysia when students were not able to follow even the simplest form. If they were not attended to immediately, these weak students willl lose interest and focus on their own activity which was irrelevant during the learning period. So the teacher explained in Bahasa Malaysia as this helped them to follow easily the lesson taught.

Based on the three observations carried out by the researcher, the problems in language occur basically in weak students as they lack the acquisition of the English language. When specialized vocabulary such as Science words and concepts are taught ,

it is even difficult for this group of students as their communicative English itself is poor. These weak students tend to depend much on Bahasa Malaysia to understand the Science lesson. The Teacher can never expect much learning to take place in English when it was more of teacher-centered when the lesson was going on in English. Students' hardly respond using English language. The learning strategies were mostly Social / Affective from teacher as to help these weak students follow the lesson. They are not independent learners and will only focus the learning process if the teacher initiates them.

For the average class, students are able to cope or follow the learning process. However, not all tend to involve in the learning using English fluently. Some students need repetitive teaching in English to be able to understand the topic taught. Language was not a problem but only the heavy use of scientific concepts and writing sentence structure appropriately was a bit challenging. They needed clarification from their teacher in explaining a Science process. Cognitive Strategies work well in average level class as they were diligent and were focused while teacher explained the lesson. Students were mostly involved in the learning process.

For the excellent class, students are engaged actively in the learning process. Since their language acquisition was good, teacher could explain wholely in English and students were active listeners as well. However, the scientific concepts were quite challenging for these students as it is not widely used in normal communicative English. Such technical terms were new to students and they seeked their teacher's assistance in further explaining the concept. Metacognitive Strategies were mostly used by these students as they were directly involved in the learning process in the classroom.

From the findings of this study, it shows that problems pertaining to teaching or learning Science in English supports findings of previous studies carried out by other researchers such as studies by Ambigapathi and Revathi (2004)on teachers' difficulties to use English as medium of instruction to teach Science and studies by Thilagavathi (2005) on teachers' inadequate use of vocabulary in English to teach Science concepts. However, studies highlighting students or learners' problem in learning Science using English were not looked into in-depth. In fact, previous studies on teaching and learning Science in English in Malaysia have not recommended Learning and Teaching Strategies as a possible step in helping to understand content knowledge and second language learning. By applying appropriate Teaching and Learning Strategy, as suggested by Chamot and O'Malley (1994) in Cognitive and Academic Language Learning Approach (CALLA), this helps to cater student's learning process according to their different learning ability. For teachers, the teaching task is be well-organized by applying appropriate teaching strategies that best suit their students' ability in classroom in order to teach content subject using a second language.