CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter outlines an analysis of the data obtained. As this is a qualitative study, this analysis is, of necessity, based on the triangulation of data against multiple sources – the various tools of analysis employed (as outlined in Chapter 3, p.47).

Some quantification of data has been done to lend validity to the data obtained. These represent simple percentages that enable a clearer picture of the issues to emerge.

The chapter will begin with the backgrounds of the students observed, in order to gauge what they bring with them into the content-area classroom. It will be followed by an overview of the environment of the classroom in Uniten, and then lead into a discussion of reading and writing in the content-area courses. These latter issues will be dealt with by restating the research questions, and then examining the data obtained to find answers to the said questions, to determine how they correlate to the central issues of the study.

4.2 Background Information

There were 60 students in all, in the classes observed in this study (See Chapter 3, p.45), and they ranged in age from 18 to 21 years. They had all taken and passed the SPM examination with Grade I, and had taken the TOEFL examination, and had
obtained scores of at least 550 points (the qualification mark for entry into a faculty programme at Uniten). Their scores ranged from 550 points, to 667 points.

At any one time, not all the 60 students would be accountable. For instance, a total of 47 students returned a completed Long Questionnaire; 54 students returned a completed Short Questionnaire; there were 52 samples of students’ writing; and, a total of 32 students were interviewed.

To facilitate a more comprehensive analysis of data, the sample was segregated into two groups, based on their results in the TOEFL examination. The two groups that emerged were: the Low Group comprising 26 students (with scores that ranged from 550 to 590 points) and the High Group which comprised 21 students (with scores ranging from 591 to 667 points).

The groupings were maintained for the analysis of the data pertaining to background information on the sample, and in the analysis of their reading behaviour. However, this grouping was not adhered to when analyzing the writing behaviour. For this, actual examples of student writing were examined. Eventually, a composite picture of the students began to emerge, and an outline of the findings is delineated below.

4.2.1 Languages Spoken

To develop a picture of their language experience, the student informants were asked about the languages they spoke at home and with their peers. In the Low Group, the language of choice at home was a language other than English: 57.7% of the students reported that they spoke Bahasa Malaysia; while 23% spoke Mandarin or one of the
Chinese dialects. Only 15.4% spoke English at home. As for the language of choice for interaction with their peers: 57.7% reported that it was Bahasa Malaysia, while 23% conversed in English, and 19.2% in Mandarin. (*Please refer to the tables below*)

<table>
<thead>
<tr>
<th>Table 1: Languages spoken by students at home</th>
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<tbody>
<tr>
<td>Language</td>
</tr>
<tr>
<td>English</td>
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<tr>
<td>B.M.</td>
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<tr>
<td>Chinese</td>
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<th>Table 2: Languages spoken by students with their peers</th>
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<td></td>
</tr>
<tr>
<td>Language</td>
</tr>
<tr>
<td>English</td>
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<tr>
<td>B.M.</td>
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<td>Chinese</td>
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</table>

On the other hand, in the High Group, English was the home-language of 61.9%. Bahasa Malaysia was spoken by 19.2%, and Mandarin and the Chinese dialects made up 14.3%. Again, when it came to interaction with their peers, the languages of choice were: English 76.2%; Bahasa Malaysia 14.3%; and, Mandarin 9.5%.

It would appear that there is some correlation between the scores obtained in the TOEFL examination and the languages spoken in the home and in the school environment: where English is used more, it has resulted in better scores for the users. Thus, those in the High Group who reported higher usage of English, have higher scores than those in the Low Group where there were higher incidences of Bahasa Malaysia or other languages.
4.2.2 Perceptions of Competence in English

Student informants were also asked to rate their ability in English, in the four areas of listening, speaking, reading and writing. Again, their responses appear to correspond with the scores they obtained in the TOEFL examination.

In the Low Group, not one student felt that he was a very good listener. Half of the students, 50.0\%, felt they were good, the rest believing that they were only of average ability, while one student actually felt that he was a poor listener. In the High Group however, there were 14.3\% of the students who felt that they were very good listeners, with 57.1\% thinking that they were good. None felt that they made poor listeners. *(Please refer to Table 3, below)*

<table>
<thead>
<tr>
<th>Rating</th>
<th>Low Group</th>
<th>High Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>very good</td>
<td>0</td>
<td>14.3%</td>
</tr>
<tr>
<td>good</td>
<td>50.0%</td>
<td>57.1%</td>
</tr>
<tr>
<td>average</td>
<td>46.2%</td>
<td>28.6%</td>
</tr>
<tr>
<td>poor</td>
<td>3.8%</td>
<td>0</td>
</tr>
</tbody>
</table>

Again, student informants in the Low Group did not rate themselves highly in their speaking skills. Only one student felt that he was a very good speaker. 26.9\% felt they were good, while the rest felt they were either average (46.3\%), or poor (23.0\%). On the contrary, not one in the High Group felt that he was a poor speaker. Most of them felt that they were either good (47.6\%) or average (38.1\%), with 14.3\% confident that they were very good speakers. *(Please refer to Table 4, on the next page)*
Table 4: Students’ perceptions of their competence in Speaking

<table>
<thead>
<tr>
<th>Rating</th>
<th>Low Group</th>
<th>High Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>very good</td>
<td>3.8%</td>
<td>14.3%</td>
</tr>
<tr>
<td>good</td>
<td>26.9%</td>
<td>47.6%</td>
</tr>
<tr>
<td>average</td>
<td>46.3%</td>
<td>38.1%</td>
</tr>
<tr>
<td>poor</td>
<td>23.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

It is possible that students based their perceptions of their competence in English largely on their performance in the TOEFL examination. When interviewed, student informants revealed that the exam did mirror their perceptions of how good they felt they were. It must be noted that before they gained admission into Uniteen, these students had very little motivation to use English outside the English classroom (except for those who spoke English at home). It is useful to reflect here on how much actual learning of English occurred during those 11 years of taking the language as a subject in school.

With regard to their reading skills, more than half of the students (57.7%) in the Low Group felt that they were only average readers, with one student rating himself as poor. Only 38.5% felt they were good. On the other hand, 14.3% of the High Group felt that they were very good readers, with another 59.8% that they were good, while only 25.9% felt that they were only of average ability. *(Please see Table 5, below)*

Table 5: Students’ perceptions of their competence in Reading

<table>
<thead>
<tr>
<th>Rating</th>
<th>Low Group</th>
<th>High Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>very good</td>
<td>0</td>
<td>14.3%</td>
</tr>
<tr>
<td>good</td>
<td>38.5%</td>
<td>59.8%</td>
</tr>
<tr>
<td>average</td>
<td>57.7%</td>
<td>25.9%</td>
</tr>
<tr>
<td>poor</td>
<td>3.8%</td>
<td>0</td>
</tr>
</tbody>
</table>
Again, student informants reported that they based their answers on their perception of reading in the English language classroom, and the TOEFL exam results. Their responses did not include how well they read in their subject area. As will be seen later, most students did not feel that they had real problems reading their content-area textbooks.

In the area of writing, most of the student informants in the Low Group felt that they were either average writers (69.2%), or poor writers (7.7%). Only 23.0% felt they were good. On the other hand, 9.5% of the High Group rated themselves as very good, while 66.7% felt they were good. The rest thought themselves of average ability. Not one felt that he was a poor writer. (Please refer to Table 6, below)

Table 6: Students’ perceptions of their competence in Writing

<table>
<thead>
<tr>
<th>Rating</th>
<th>Low Group</th>
<th>High Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>very good</td>
<td>0</td>
<td>9.5%</td>
</tr>
<tr>
<td>good</td>
<td>23.0%</td>
<td>66.7%</td>
</tr>
<tr>
<td>average</td>
<td>69.2%</td>
<td>23.8%</td>
</tr>
<tr>
<td>poor</td>
<td>7.7%</td>
<td>0</td>
</tr>
</tbody>
</table>

Again, as with the other skills, when interviewed, student informants revealed that the above were descriptions of how they wrote for their English classes – not in their content-area classes. As will be seen later, there is very little writing per se in the first year content-area course, and students are acutely aware of this fact.

The data lends itself to analysis in that it shows that the students’ perceptions of their abilities in the various skills does correlate with their ability in the English language. Those in the Low Group recognize that they are not as good in the language as they
would like to be and consequently rate themselves lower in the four skills than their counterparts in the High Group.

Those in the High Group on the other hand, recognize that they have achieved a certain level of competence in the English language, and correspondingly rate themselves higher in all the categories. Their confidence is reflected in the fact that some see themselves as very good in certain areas, and none see themselves as poor in any one of the skills.

Their backgrounds and these perceptions represent what these students bring with them into the content-area classroom. The study next explores how these affect their classroom behaviour. However, before an analysis is attempted, it would be useful to have an overview of what the content-area classroom is like.

4.3 An Overview of the Content-Area Classroom (The Observations)

As the study proper began with the observation of the students in the classroom, it would be correspondingly justified to begin this discussion with insights gleaned from these actual observations.

All classes were conducted in English. Both the lecturers, for Physics and Chemistry, were American, and English was used exclusively. This was in keeping with Uniten’s policy (See Chapter 1, p.4) that the medium of instruction be in English. From the observations alone it was impossible to gauge if students had problems following the classes – they appeared to be attentive, sometimes taking notes from the whiteboard,
but generally looking up at the lecturer. This issue had to be pursued in the interviews with both the student informants and the Specialist Informants.

One gauge that appeared to signal that they were following the class was their response to the humourous interjections of both lecturers. For instance, the Physics lecturer often made mistakes in the signs (plus or minus) he assigned to the equations he worked on the board. When corrected by the students he would say, 'I was just testing you to see if you were paying attention' and the students would all laugh. There were many instances when the lecturers would say something funny, and, not once was there an instance of a student that was observed not knowing why the others were all laughing – indicating that he either was not paying attention, or did not understand the joke. (See excerpt from Observation #6, below. SI1 is the Physics lecturer.)

SI1: OK. Let's see what we have here ... (he reads out the problem. Then he turns to the board and begins drawing out diagram)
    I'm just putting down the ideas in the question. (He then writes out a formula on momentum)
    Now ... let's do this ... (he proceeds to substitute values for different parts of the formula)
    What does this equal to?

Students: Zero (They are able to follow what is going on. Later SI1 will explain that the problem, per se, is not difficult. What seems to be difficult for the students is to conceptualize what it is. When asked after the class, many students concur with what SI1 says. They too feel that their main problem is to figure out how to conceptualize what is being referred to in the question.)

SI1: (writes in 'zero' in the equation building up on the board. It is many lines long, but the students do not seem to have difficulty following what is going on.)

Students: (Call out values as SI1 reaches various points in the equation.)

SI1: We have two unknowns, right? What are we gonna do?

Students: (some murmurs)

SI1: Let's find out some value for one of them. (Another equation/formula goes up on the board)

Student 2: (calls out a mistake in the equation on the board)

SI1: You're right. Very good. (SI1 changes something in the equation and continues with the calculation)

    Check that out. What do you get?

Students: (Work on their calculators – they are punching in information. They begin calling out answers.)
SII: (continues working with the equation. He then stops. Something seems to be wrong.)
Can that be? (He looks at the material on the board)
Oh, here we are. Why did I do this? It’s wrong isn’t it?
Student 3: (inaudible – but apparently offering a reason for the error)
SII: He says that this is not tepat.
Students: Kinetic energy.
SII: That’s right (and goes on to explain why the equation is right so far)
Students: (begin calling out answers again.)
   29.3
SII: OK. Now for the second part of the equation.
Student 4: Sir, what happened to ‘cos 30’?
SII: Did I do something wrong? (He looks at what is on the board)
You caught me. I apologize. I think I did something wrong. (He goes back
to the numbers on the board and works through a section again. Students
call out numbers, and ‘plus’ and ‘minus’ to indicate what signs to use.)
OK guys. Way to go. Every Monday morning …. I’m like this. (He laughs.)
I don’t know how this came out the same. Ha! Ha!
Students: (Laugh)

This excerpt demonstrates two features: One, it shows that students are able to follow
the class, working along with the lecturer as he works through the Physics problem
that the students initially had difficulty with. Two, at the end the students’ laughter at
the lecturer’s joke indicates that they are paying attention and that they can appreciate
his attempt at humour – because they all laugh.

Both Specialist Informants contended that on the whole, the students understood what
they were saying and that they could follow the lectures. This was ascertained when
they made eye contact with the students, reading their body language, and generally
fielding questions that would obtain a response that told them that the students
understood. Both Specialist Informants were of the opinion that the topics covered in
their classes would not prove too difficult to their students because they were all
topics covered in their SPM syllabus – only that they were studied in greater depth
and detail at this level.
The student informants interviewed disclosed that they did not encounter problems understanding their foreign lecturers and that they could follow the classes. Also, they concurred with the Specialist Informants that they were indeed familiar with the content of both classes – both the Chemistry and Physics syllabuses taking off from points already covered by the students in their SPM syllabus. Hence, in both classes, a new lesson always began with an idea or concept that was familiar, that was then developed further and explored more deeply. Throughout the study, no totally new topic was introduced to the students, and this helped in their being able to cope with the input they received in the classroom. The knowledge they brought to their classes, their schema, helped them understand what developed in the class.

However, it must be noted that the students in both the Physics and Chemistry classes were passive students. Each class was a monologue by the lecturer, with the students occasionally providing murmured responses to questions raised. Occasionally, there would be a hand held up to question – but more often than not this was to correct some number on the board, or a sign that read wrongly. Only on three occasions in the Physics class, and once in the Chemistry class was there a request from a student for a repeat of an explanation that had just been given. It was found that the behaviour of the students in these classes was in keeping with what this researcher has always felt about Malaysian students – that they are shy and usually passive in class. And, this is also in keeping with what Yook (1995) notes in her study on Malaysian students. It would seem that lecturers need to recognize this aspect of Malaysian-student behaviour, and attempt to work around this to gauge students’ understanding of what is happening in class.
In this respect, it would seem that the Physics lecturer was more sensitive to the
general atmosphere of the classroom. He would sometimes pause and stare at the
students and then backtrack over what he had just explained, using a different
approach. (See excerpt from Observation #9, below. SII is the Physics lecturer.)

Building a diagram on the board, SII explains the different concepts involved. Students are
all looking up and also taking down notes from the board. (SII tells me that this is a difficult
question and the students know this. His eye contact with the students tells him that they are
all paying close attention.)

SII: ‘Is everyone OK with this?’ Silence. SII looks at the class and decides that they are not
OK. ‘Let’s do this one more time. Slowly.’ He goes back to the diagram. ‘I hope I’m not
making this more difficult. I see a lot of confusion in your eyes. Is it OK?’ Some nods from
the students. ‘Can I go on?’ Students murmur – some nod. SII cleans the board – signaling
that that problem is solved.

When queried on his behaviour, the Specialist Informant revealed that via eye contact
and the reading of his students' body language, he was able to gauge that they had not
understood what he had been teaching. So, he felt the need to explain it again. Had he
not done so, they would not have been able to follow the rest of the lesson, as it
depended on what had gone before – knowledge was cumulative, and it was necessary
to understand one level in order to progress to the next level.

During the interviews, and in the Short Questionnaire, student informants were
required to comment on whether they would let the lecturer know if they did not
understand something being explained during class. Many of the students, 46.9%,
replied that they did not like to ‘interrupt’ the class by asking questions. They
preferred to let the lecturer finish, and then see him after the lesson, or see him in his
room during office hours. Two students actually said that they were shy to ask
questions in class in case they were the only ones who did not understand. 62.5% also
said that they would ask their friends to explain material they did not understand. If
they still did not understand even after reading the textbook, only then would they approach the lecturers.

The following excerpt demonstrates how students do not let the lecturer know if they do not understand. In the excerpt, the lecturer had previously assigned two problems for the class to solve. The excerpt opens with his returning their work to the students.

*(See excerpt from Observation #2, below. SI1 is the Physics lecturer.)*

SI1: Let me give you back your problems that you did for me yesterday. Some of them were very good; some were not good at all. (SI1 proceeds to return the papers to the students. Students look at their work – some smiling, some shaking their heads)

Does anybody want me to go over yesterday’s stuff? Anybody … want me to go over yesterday’s stuff? (a few hands go up)

*I feel that SI1 thinks that this is an important area and he wants the students to be sure of it before he moves on to new material. Later, SI1 confirms my feelings – he says that they need more work in this area, as they are quite weak in it, with some of them not very clear of the important concepts at all in this important area.*

Also, SI1 tells the researcher that almost 2/3 of the class were not able to do the problems assigned at the end of the lesson. SI1 says that he is very disappointed – he thought that they had understood.

Triangulation: when asked if the problems were difficult, and whether they could do it, students had said that they were difficult and that they had struggled to do them. This could either mean that students did not know how to do the problems or that they did not understand all that was explained in class. Either way, they had not spoken up and asked SI1 for help – in that way letting him know that he was going too fast, or needed to explain something again.

The students raising their hands indicates that they finally are acknowledging that they need help. If they had thought to do this on the previous day it would have proved more useful to them – they would not have had to struggle with the problem and solve it incorrectly. It must be noted that both SI1 and SI2 often stopped in the midst of a class to ask students whether they could follow the lesson. Invariably, there was little response to these queries.
The above excerpt reveals that eye contact and intuition, about whether students understand what transpires in class, can sometimes not be enough. As in this particular instance, the lecturer had not read his students correctly, and only discovered this when he examined their written work.

Both Specialist Informants concurred that they sometimes did not 'read' their students correctly in class. And, often, when students came up to them after the class with their questions, then only would they know where the problems lay, and would tackle these issues during the next class. (See excerpt from Observation #13, below. SI2 is the Chemistry lecturer.)

SI2 writes an equation on the board. SI2: 'Is that all right? What's the matter with that?' Students stare at the board. SI2 explains the equation. 2 students take down notes. The rest seem to be listening. One student asks a question about something in the equation. SI2 explains.

SI2 turns away from the board and looks at the class. His eyes sweep from left to right. The students stare at him or the board. (Later SI2 says that he was scanning their faces for comprehension. Sometimes I have no idea at all whether they understand what I've said or not. They are not about to tell me if they don't understand. A few will come up after class and ask a couple of questions, then I know that there was a gap. Most don't say or do a thing. It is so frustrating. I sometimes don't know whether to go on or not. They just sit there and stare -- I'm not even sure if they are awake!)

Again, the above excerpt shows the very passive nature of the students in the classroom. The Chemistry lecturer attempts to gauge how much of what he has been saying has been understood by the students. But, he cannot measure this. When interviewed later, he would reveal that he did not always have the time to do this -- to stop and find out whether students had understood. He said that there was a lot of material to be covered and the time for which to cover it was limited.

It was the Physics lecturer who seemed better able to respond promptly to his students' needs. He regularly assigned homework questions and group work that
needed to be handed in on a regular basis. While marking these, he would discover areas in which the students were weak and he would address these weaknesses in the following class. The Chemistry lecturer generally did not give homework nor assignments, except for two at the beginning of semester. He thus appeared to be less in tune with the needs of his students than the Physics lecturer.

4.3.1 The Need for Triangulation

That both classes were in English has already been noted. What is significant is that the researcher could not understand most of what was taking place in the classroom. This is because it dealt with what this researcher would like to term ‘the language of mathematics’. Every class was a class of formulas, equations and calculations. Every concept was represented by a formula. Every problem would be solved by quoting a formula, assigning values to the various parts of the formula, deriving equations from these and then proceeding to solve these. It was a world of numbers. And these numbers had meaning both for the lecturer and the students involved. As Widdowson (1979) and Carrell (1989) note, this shared ‘knowledge’ of the students and lecturers had a wealth of meaning for them. The researcher, being only qualified in the teaching of English as a second language, was not privy to much of this understanding between student and lecturer – she was an outsider in this discourse community – and needed to be helped to understand what was going on.

Hence, it was necessary to look to the other tools of analysis to help triangulate the data that had been obtained via observation. That the students followed the classes was apparent. That they must have been reading to keep up with the fast pace of both
classes also seemed apparent. To determine if her perceptions were correct, the data obtained from the interviews with both the Specialist Informants and the student informants, and the responses in both questionnaires became crucial for the triangulation of data for the purpose of analysis.

This overview offered a glimpse of the students' experience in the content-area classroom. In the following section, it would be relevant to examine what the academic task before the student is, and to see how it relates to the issues of the study.

4.4 The Students' Academic Task

Via all the tools of inquiry at the disposal of the ethnographic researcher, it was observed that first year students pursuing a degree in Engineering were required to perform specific tasks in the course of their study. One of the most common of tasks before an Engineering student was the need to solve 'problems'. These problems involved his working out the solution to a question that was formulated to test his understanding of a concept under study.

For instance, the Chemistry lecturer could assign a problem on the topic of 'equilibrium'. What the student then needs to do, is study the question, read up on the concept, and then attempt to apply this knowledge gleaned to the solution of the problem. Essentially, this would involve the selection of relevant formulas that relate to the topic in question, the evolution of equations from these, the substitution of known values into the equations, and the calculating of unknown values that would eventually lead to the solution to the problem given.
In essence, the academic task involves working with numbers. Knowledge of concepts is translated into numbers that are plotted into formulas and equations that need calculation. These calculations can vary from a single line, to the length of a page or two or more. Each line of calculation is an expression of knowledge regarding the process being undertaken, and the concepts involved. And as the calculation advances, so too does the expression, in terms of numbers, of how these concepts work with each other and lead to the solution of the problem.

Hence, the academic task of the student involves writing – the writing of numbers that carry meaning for the discourse community in question. And, the evolution of the numbers on the page reveals the thinking process of the writer: how he has looked at the problem, and how he has decided to solve it, bearing in mind the relevant concepts that apply in the area. The writer has to decide on what formulas to call into play. He has also to decide on the equations he can derive from these that will lead to the eventual solution of the problem.

Triangulation with both student informants and the Specialist Informants confirmed that there are many ways in which any particular problem can be solved. The student has to decide on a particular strategy that he wishes to adhere to, and follow this through to the solution. Which route to the solution he chooses will depend on how well he had understood the concept, and also on how well he is able to transfer this knowledge into application for problem solving. Thus a student better versed in a specific topic will find a quicker and easier solution to a problem than will a student who is not as sure. The former’s answer will be concise and straightforward, while that of the latter will contain many unnecessary steps. In evaluating the answers to the
problems assigned, the lecturer is able to ascertain how well his students have grasped
the topic under study.

It has thus far been established that the writing of the first-year Engineering student
involves, almost exclusively, work with numbers. It would be pertinent at this
juncture to query whether this task involves writing as it is understood by the ESP
practitioner. In first year Engineering (in the subjects of Physics and Chemistry), it
involves minimal writing of this type.

It was observed that there were no opportunities accorded to students for the writing
out of answers in explanations or descriptions, etc. When interviewed, both Specialist
Informants explained that they included very few of these type of questions in their
examinations and quizzes. Specialist Informant 1 (Physics) revealed that the most he
would include would be questions that asked students to decide on whether a
statement was true or false, and then explain why they felt that it was either true or
false. Specialist Informant 2 (Chemistry), on the other hand, revealed that he would
rarely include questions that required students to explain a concept, and certainly not
include one in a major examination. Experience from years of teaching at Uniten had
led him to the conclusion that students did not do well in these type of questions. And,
in order not to put his students at a disadvantage, he had taken to omitting them from
his repertoire of examination questions.

Examination of the students' assigned work proved this to be true. There was one
section in one of the Physics examination papers that required students to justify why
they felt a 'true/false' question was true or false. Again, the last section of one
Chemistry examination required students to explain what a named concept involved. The other questions in all examinations proved to be problems that required solving problems via calculations, that is, numbers.

The scenario described above begs the question ‘why’: why is it that no questions are asked that require students to provide a written explanation in words? The researcher needed to ask this of the bona fide members of the discourse community in question – to explain why this was so. In explanation, both Specialist Informants conveyed the fact that in both Chemistry and Physics, an understanding of the concepts involved are crucial to success in these subjects. This understanding is expressed in both words and in mathematical solutions. In the United States, there is a tendency to lean towards written explanation. Specialist Informant 1 (Physics) revealed that this was so because students there were not as good as was required in Mathematics. Written explanations enabled them to better reveal their knowledge, while calculations generally set them at a disadvantage. He felt that the reverse was true in Malaysia. Students here were very good in Mathematics but found it difficult to express themselves in written language.

Hence, both the Specialist Informants revealed that they had come to realize that most students here cannot express themselves adequately in answers that require them to explain. When interviewed, Specialist Informant 1 (Physics) confided that Malaysian students were very good at Mathematics and that “they use this to get by, staying clear of long explanations”. Specialist Informant 2 (Chemistry) offered that he felt that students “refused to see” the word ‘explain’ in questions. He said that the students would do the part of the question that required the calculation and would leave out the
part on the explanation. He says, "I've even put the word 'explain' in boldface, in capital letters, and underlined it - sometimes employing all these devices at the same time - and still most students will not do it" - referring to the fact that students would not attempt to explain a concept in words. Both Specialist Informants had been working in Malaysia for many years, and had grown to learn and accept the idiosyncrasies of local students. Specialist Informant 1 (Physics) had also been informed by his predecessor that this was how Malaysian students behaved.

Rather than penalize students for this type of behaviour, over the years, the lecturers have evolved the type of examination questions that they feel are most advantageous to the students. Almost exclusively, their examination questions require them to solve problems mathematically.

Given the above, it would appear that the student has these academic tasks before him: To read his textbook or reference material for salient information; to follow what is said by the lecturer in the classroom; to work out as many problems as possible under every topic; to convey this knowledge gained to the lecturer via the answering of the questions posed in the homework, in quizzes and in examinations.

These tasks require all the four language skills: listening, speaking, reading and writing. In the area of reading, the student needs to understand the topic and all the concepts contained therein. In the area of writing, the task involves the working out of the calculations of problems; there is minimal writing of explanations and reasons. Both reading and writing require the mastery of thinking skills - the ability to call up
knowledge gleaned or learned thus far, and applying it in the best possible format to solve the problems at hand.

Having reviewed the academic tasks before the student, the following section will address his reading experience in the content-area classroom.

4.5 Reading

In this section, the data will be analyzed in relation to the research questions posed in Chapter 1, namely question one, and part of question three:

Question 1: What do first year Engineering students read in preparation for their academic tasks? How do they read? And, why?
Question 3: What problems do they face when reading?

To facilitate analysis of all the issues each entailed, each question will be subdivided into its component parts and analyzed individually, beginning with what it is that students read in preparation for their academic tasks.

4.5.1 Materials Read

Given the academic tasks before the student, it was necessary to not only discover just what it was that students read, but also their perceptions about reading – be it reading in general, or reading for academic purposes.
It must be stated at the outset that it is beyond the scope of this study to present a detailed analysis of all the reading material before the students. The concern here is with students' perceptions about their texts, and this is triangulated against what their lecturers, Specialist Informants 1 and 2, feel about it, as well as an actual examination of the documents in question.

An examination of the prescribed textbook revealed that it contained mainly mathematical detail – formulas, equations, rows of 'workings' on problems that needed to be solved. Paragraphs were generally short, and often one to two paragraphs were interspersed with calculations. The text was also filled with visual stimulus – graphs, pictures, diagrams, charts, flow charts and tables. These made up a significant portion of the stimuli offered in the text that students needed to assimilate to make up their knowledge of what the text entailed.

Each new concept proposed, was followed by examples of problems (that is, mathematical questions) that needed to be worked out given the knowledge inherent in the concept presented. These examples of problems were extensively worked out – that is, how to work them out was clearly delineated in the text. Usually, calculations were accompanied by diagrams outlining how the concept worked. Again, each chapter ended with long lists of problems for the learner to solve.

What the students actually read in preparation for their academic tasks was their textbook. This information was communicated via the Long Questionnaire and in the interviews. The textbook assigned was their main source of information. All the
students in the Low Group and most of the students in the High Group said that they did not refer to any other material (not including the notes that they made in class).

Every student in the Low Group confessed to not reading any material outside of the recommended textbook while 14.3% of students in the High Group said that they did refer to other material. This included one other text on the subject by another author, and notes handed down by 'senior' students. And, they offered that they referred to other material when they did not quite understand the explanations in their textbook, or when they wished to have a different perspective on the topic.

Reasons given for not venturing beyond the textbook included the fact that 80% of students in both groups felt that the textbook assigned was sufficient – especially when used together with the lecture given. They also felt that there was too little time in the semester for them to refer to other material, and that as long as they understood what they read in the textbook, it would suffice for them to do well in the course.

The above insight needs to be seen against the scenario prevalent in Malaysian schools. Most subjects have just one prescribed text, and it is all the students read. Usually it is all the teachers refer to. Also, students are tested on what is found in this textbook. Hence, there is little motivation for students to move beyond this text and search out information in other books. This experience is what they bring to their Uniten classroom. And unless they are motivated to move beyond this practice, they will not do so.
The students' responses were triangulated against the Specialist Informants' perceptions of reading. When interviewed, the two Specialist Informants were divided in their responses. Specialist Informant 1 (Physics) offered that if they read the textbook well and paid attention during his class, one textbook would suffice. He defended this by saying that there was a lot of material for the students to cover and that they would find it difficult to find time to read other books. It would make more sense for them to work on more problems and problem-solving with the book they had. He thus did not provide the stimulus for students to read further, and they in turn, did not.

Specialist Informant 2 (Chemistry) concurred that the prescribed textbook was sufficient in so far as most chapters in the Chemistry text went. However, there were a few chapters that he felt were not adequately dealt with in the book. He said that he had told the students about this and suggested other texts that they should read so that they could better understand the topics in question. He volunteered his own copies for their further reading, but that there were no students who took him up on his offer. However, his exams were not based on content from these extra texts – "that would be unfair to the students," he felt. Again, as with Specialist Informant 1 (Physics), Specialist Informant 2 (Chemistry), too, did not provide the motivation for his students to read further, and they did not.

Both Specialist Informants concurred that it would be advantageous for students to read more than just one textbook. A 'complete' understanding would involve looking up other views on a topic, assimilating these views and then formulating in their mind what the essence of a topic was. However, given the time constraints faced by the
students at Uniten, and the quantity of material that they were required to cover in the course of a semester, both felt that students could get by, and do well, with just concentrating on one text. This finding differs from what Williams (1997) posits in his study – that students need to read widely at tertiary level as this informs both their writing and their knowledge in general. However, perhaps at Uniten it was felt that in their first year, it would be better for students to receive a good ‘foundation’ in the subjects they study, and that one textbook would suffice for this purpose.

Notwithstanding what was said above, both Specialist Informants confirmed that it would be necessary for students to read more as they furthered their studies in Engineering. Both concurred that while the one-textbook system sufficed in the first year, it would become increasingly difficult for students to get by with this policy as they moved on to their second, third and fourth years. As with most other scholarship, students would need to read both extensively (that is, read from a variety of sources) as well as critically (that is, not accept everything they read as given fact) in order to do well (See Williams, 1997; and Salager-Meyer, 1997).

4.5.2 Students’ Reading Strategies

Students in both the Low and High categories professed that they enjoyed reading, or at the very least did not find it a chore. And that most of what they read was in English. Even students in the Low Group felt that reading improved their English, and both groups contended that their thinking skills improved with the more reading they did. Students felt that they did not find it difficult to read in English as they were used to doing so.
Of the two students in each group who said that they did not enjoy reading, both said that they were daunted by the unfamiliar words and this slowed down their reading pace, and led to their not understanding the material.

When asked if they practised a specific reading strategy, 76.9% of those in the Low Group, and 52.4% in the High Group said that they did not. However, triangulation of this response with the responses in the interviews provided an illuminating picture. On the surface it would appear that most students did not profess a particular reading strategy. 19.0% of the students asked said, “I just read”.

However, it eventually appeared that students did practice some form of strategy when they read. The following table illustrates the main strategies employed by students when reading.

<table>
<thead>
<tr>
<th>Table 7: The main reading strategies favoured by students</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ read after the lecture</td>
</tr>
<tr>
<td>☐ make special note of:</td>
</tr>
<tr>
<td>• terminology</td>
</tr>
<tr>
<td>• explanations and concepts</td>
</tr>
<tr>
<td>• formulas</td>
</tr>
<tr>
<td>☐ refer to ‘Contents’ page for a gist of the chapter before reading</td>
</tr>
<tr>
<td>☐ refer to summary of the chapter before reading</td>
</tr>
<tr>
<td>☐ highlight areas of special importance for re-reading</td>
</tr>
<tr>
<td>☐ use the dictionary to look up difficult words</td>
</tr>
</tbody>
</table>

The Long Questionnaire revealed that for some students, a chapter would be read with reference to what the lecturer had taught in class earlier – 34.6% in the Low Group, 66.7% in the High Group. Special note would be made of the terminology mentioned in the chapter, as well as the explanations of concepts, and mention of formulas. It can be seen that this strategy is employed more by those in the High Group than those in
the Low Group. In cross-referencing this finding, 71.9% of those interviewed said that they employed this strategy when reading.

A comparable percentage in both groups, 46.1% of the Low Group and 42.9% of the High Group, said that they would look in the 'Contents' pages to see what could be found in the specific chapter – they would look up sub-headings and try to get the gist of the chapter. This having been done, they would read through the whole chapter. 19.2% of the Low Group would then read through the summary of the chapter provided to see whether they had missed any of the main points of the chapter. 42.9% in the High Group said that they did the same.

Alternatively, the Long Questionnaire revealed that 33.3% of the High Group said that they would scan the chapter looking for 'key words' only. They would pay particular attention to the calculations shown and the problems solved in the text. This strategy was not employed by those in the Low Group.

68.8% of those interviewed said that they would read through the whole chapter just once, highlighting those areas that they felt were important. They would then only read the highlighted parts when they prepared for an exam or when they needed to refer to the textbook when they attempted to solve a problem. 87.5% said that parts of the chapter would be re-read when they needed information to work through a problem, or when they encountered difficulty solving a problem. Otherwise, they would not bother with reading the chapter again.
For a particularly difficult topic, 46.2% in the Low group and 28.6% in the High Group said that they would sometimes read through the chapter slowly and try to understand every word. This was done once, and it was performed so that they did not miss out on any of the ideas presented in the textbook. However, they did not do this again, preparing for the examinations and quizzes by only referring to the highlighted portions of their texts then. This 'bottom-up' type of reading seemed more prevalent with the Low Group than with the High Group whose preference lay with scanning for key points.

Only a small percentage of students in both groups, 14.3% of students in the High Group and 15.4% in the Low Group, said that they would read through the chapter and then make notes to which they would refer later.

On the use of a dictionary, 61.5% in the Low Group and only 38.1% in the High Group said that they used one. 71.9% of those asked said that they did not have much use for a dictionary because they felt that the textbook was written in simple English. The only problem that they faced was understanding concepts, and most of the concepts they came across they had dealt with earlier in their SPM classes. Hence, they needed only to utilize their thinking skills to see how a particular concept worked in the particular area they were dealing with. Pre-occupation with words, another 'bottom-up' aspect of reading, again occurred more with students in the Low Group. Less students in the High Group felt the need for a dictionary – they recognized that theirs was not a problem with semantics but a problem with the understanding of concepts.
One strategy that nearly all (93.7%) interviewed said that they practised was that they would read after a class. They would attend the class and listen carefully to what the lecturer said – what he stressed, the parts that he said were important; parts that were not important; calculations that he worked out on the board that were felt to be crucial. These were noted down either mentally or in the margin of the textbook. After the class, they would read the relevant portions. They felt that this made reading easier, as they already had the contents of the chapter in their minds, and they were thus better able to focus and concentrate. Consequently, this made for better understanding, and better reading.

It would appear that students used the information obtained in class as what Anderson and Pearson (1988) referred to as ‘advance organizers’. The information obtained in class was used to bridge their own schema or background knowledge, with new information that was being taught. Then, when they read, they were better able to comprehend.

Thus far, this chapter has discussed what students read and how they go about reading. The following section examines what motivates students to read.

4.5.3 Why Students Read

Before proceeding to the reasons why students read, let us examine their perceptions of whether it was important to read at all for their Physics and Chemistry courses. Table 8 (next page) represents the students’ perceptions on the need to read for their courses.
Table 8: Students’ perceptions of the need to read for their courses

<table>
<thead>
<tr>
<th></th>
<th>Low Group</th>
<th>High Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>very important to read</td>
<td>73.1%</td>
<td>76.2%</td>
</tr>
<tr>
<td>can get by with some reading</td>
<td>26.9%</td>
<td>19.0%</td>
</tr>
<tr>
<td>not necessary to read at all</td>
<td>0</td>
<td>4.8%</td>
</tr>
</tbody>
</table>

76.2% of students in the High Group and 73.1% in the Low Group felt that it was very important to read up the topics covered in their textbook, and that they would not be able to avoid reading for both the subjects of Chemistry and Physics.

A comparable number of student informants in both groups, 19.0% in the High Group and 26.9% of the Low Group, felt that they could get by with reading just some of the recommended material – that it was not necessary to read all of it. Only a small percentage of the students in the High Group (4.8%) felt that they could go through the course without any reading at all. Not one of those in the Low Group felt this way, saying that they had to read some of the recommended material at least if they wished to get through the course.

Both Specialist Informants concurred that it was crucial that students read in their respective subjects. They felt this was so because they were only able to cover the bare necessities in the lectures. As such, students needed to read up the recommended areas to fathom the topic better, and to fatter out more details. It was not wise to depend solely on lectures to get by. To reinforce this belief, both lecturers would include material that they did not cover in class in examinations. When interviewed, student informants agreed that both lecturers did do this, and that they would be caught unawares if they had not read up before the examination.
Students read for a variety of reasons. Table 9, below, illustrates the reasons why students read.

**Table 9: Reasons why students read**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Low Group</th>
<th>High Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>to prepare for an examination</td>
<td>57.0%</td>
<td>57.0%</td>
</tr>
<tr>
<td>when doing homework assignments</td>
<td>30.8%</td>
<td>19.0%</td>
</tr>
<tr>
<td>to increase knowledge on a topic</td>
<td>30.8%</td>
<td>52.4%</td>
</tr>
<tr>
<td>to understand how calculations work</td>
<td>70.0%</td>
<td>70.0%</td>
</tr>
<tr>
<td>to understand the course/to be able to pass the examinations</td>
<td>92.3%</td>
<td>85.7%</td>
</tr>
</tbody>
</table>

Around 57% of the students in both groups said that they read especially in preparation for an upcoming exam. Another 30.8% (Low) and 19.0% (High) read when they did their homework assignments. 30.8% (Low) and 52.4% (High) also read to increase their knowledge on the topic. It would appear that those in the High Group had better retention powers, being able to attempt homework problems without reading, and again, being better motivated to read for more knowledge than those in the Low Group.

Close to 70% of the students interviewed said that they read the text in order to understand how the calculations of problems worked. They explained that in order to understand how formulas were called into play, how values could be substituted into equations, and generally how to proceed with the calculations were all laid out in the text. Hence, these portions of the text, that contained these explanations, were deemed essential areas to be read and understood – because they explained the calculations. And, as has been noted earlier, the calculations were deemed of utmost importance to the students.
The majority of the student informants were convinced that they needed to read in order to understand the course and to pass it. 92.3% of the Low Group and 85.7% of the High Group felt that it was imperative to read if they wished to pass. Only two of those in the Low Group and 14.3% in the High Group felt that they could pass without reading at all. However, all agreed that if they did not read, they would not be able to ‘score’, that is, get good grades, rather than merely making the passing mark.

When interviewed, student informants qualified the response that they could get by without reading. 53.1% of those interviewed said that if they paid attention in class, and did their homework (that is, solve all the problems assigned), and did this task well – then, they may be able to pass without reading. This did not refer to the final examination but to the ‘smaller’ exams and quizzes that were held throughout the semester, at the interval of about two weeks. They felt that the topics touched on in the questions would be still fresh in their minds and so they felt that they could sometimes do the questions without reading beforehand.

Thus far, the study has examined why students read. The following section proceeds to explore the problems students have when reading.

4.5.4 Students’ Reading Problems

The following table (Table 10) summarizes the problems students face when reading.
Table 10: Students’ reading problems

- problems with the text itself
  - ‘long winded’
  - boring
  - writing style
- difficult vocabulary
- sections of chapters unclear
- difficulty understanding complex concepts

85.75% of the students in the High Group felt that they could read fairly well. This was in contrast to 76.9% of students in the Low Group who felt that they encountered some problems when they read.

Problems encountered by both groups included problems with the text itself. These included comments that the paragraphs were felt to be too long and therefore it was difficult for the student to keep in mind the topic of the paragraph as he read. Others felt that the author was too “long winded”, in that he would take too long to make a point, sometimes losing his reader along the way. 15.4% of the Low Group and 9.5% of the High Group felt this to be one problem that they often faced while reading. As a consequence of this, 13.0% of the Low Group and 17.4% of the High Group felt that these long paragraphs tended to bore them when they read, and that this in turn led to their problems with concentration when reading. About 20% in both groups felt that the writing style of the text itself was what made it difficult to read sometimes.

The fact that the text was in the English language was not seen as a problem by the students. 81.2%, when interviewed, said that they felt that they were better able to handle their reading because the lecturer had already gone through the main ideas and concepts with them in class. Keeping his explanations in mind, they were better able to understand what they read. Reading was not seen as a language activity. It was
content that was seen as important and students discounted the fact that the text was presented in English. Hence, it could be said that the lecturer successfully activated the schema brought to class by the students (from their SPM days), enabling students to be comfortable and confident with their reading.

68.8% of those interviewed felt that since they only read to learn how to solve the problems (that is, the calculations) they did not feel that their reading was difficult. They were able to ferret out the information that they needed without much difficulty.

Vocabulary and the use of words that seemed ambiguous to them was a problem for about 42.3% of the Low Group. No one in the High Group felt this to be a problem. They and the others in the Low Group did not see vocabulary as a major problem for the vocabulary used was only a way of expressing a concept. And, as long as they understood the concept, they would be able to understand what they read. When interviewed, student informants concurred with the above finding.

About 23% of the students asked said that they found some sections of chapters very confusing. When they encountered such sections, they would need to re-read them a few times before they could make sense of them. About 15.4% of the students in the Low Group and 9.5% in the High Group felt that some concepts were complex in themselves and thus they were difficult to comprehend when read.

87.6% of both groups felt that they would have the same problems reading in Bahasa Malaysia as they did in English. This response was triangulated against the responses of the student informants at the interviews, where 93.7% of the students interviewed
said that they would have similar problems as those listed above even if their readings were in Bahasa Malaysia. They added that they no longer needed to read in Bahasa Malaysia as all their work was in English, and that they found it easier and less confusing to keep to English when they worked. This finding seems to suggest that student problems with reading is not solely a problem with language proficiency. These could also be due to conceptual or textual problems.

Students were also asked what strategies they employed when they encountered problems with their reading. 34.6% of the Low Group and 57.1% of the High Group said that problems were never viewed as insurmountable and that they never gave up reading. *(Please refer to Table 11, below)*

61.5% of the Low Group and 42.9% of the High Group said that they sometimes pushed their books away for a while, but that they always returned to them after a break, to re-read it once more and to try and make sense of what they were reading.

<table>
<thead>
<tr>
<th>Table 11: Strategies employed by students when faced with reading problems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Group</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>continue reading despite problem</td>
</tr>
<tr>
<td>take a break from reading</td>
</tr>
<tr>
<td>ask a friend for help</td>
</tr>
<tr>
<td>discuss the topic with a friend(s)</td>
</tr>
<tr>
<td>ask the subject-lecturer for help</td>
</tr>
<tr>
<td>move on to the section on calculations</td>
</tr>
</tbody>
</table>

96.5% of the Low Group and 85.1% of the High Group said that they would ask for a friend’s help when they encountered problems in their reading. They would ask the friend to explain the portions of the text that they did not understand. 76.7% of the Low Group and 95.2% of the High Group said that this would include discussion of
the topic, and that together they would try to work out the gist of what the text was trying to say.

Some students felt that the best course of action was to approach their lecturers for help. 57.7% of the Low Group and 28.6% of the High Group said that they would sometimes ask for help, but that they preferred to work out their problems on their own, or with their peers first. Only 11.5% (Low) and 38.1% (High) said that they always sought help from their lecturers.

The above finding was triangulated against the interviews with the Specialist Informants. Both concurred that students would come to see them when they had problems understanding what they read, However, most of the time, they would be consulted to help with the working out of calculations of problems. Again, not many students came to see them. Both Specialist Informants concurred that less than 50% of their students would actually come to see them to seek help.

What other strategies did students employ when confronted with portions of text that they did not understand? Some students said they would “skip” these difficult portions and move on to something else. 76.9% (Low) and 85.7% (High) said that they would move on to the examples of calculations as they felt that the calculations were more important that the text anyway.

71.9% of student informants interviewed said that they would like to be able to read faster. They felt that they read too slowly at present and that if they could read faster
they would be able to cover more ground, and accomplish more reading. This is one area that they felt should have been addressed in their ESL programme.

Another 49.9% of the students interviewed felt that they would like to learn to make better notes. Most of the students observed in both the Physics and Chemistry classes did not do much note taking. They were observed to be looking up most of the time, only occasionally bending their heads when they wrote, usually in the margins of their textbooks, or in a note-pad. On examination of these 'notes', it was found that they seldom contained words – they inevitably were strings of numbers, formulas and equations, that were copied from the board. Also, 87.5% of the students said that they did not like to interrupt their concentration by making notes. It was deemed most important that they followed the lecture or they would miss something important.

It was observed that each class was almost two hours long. And, many new concepts were introduced within each lesson. Knowledge was cumulative, that is, what was explained in an earlier part of the lesson was then taken as understood, and the concept used without explanation in a later part of the lesson, or on another day. Thus, students felt it was crucial that they understood what was going on. Once they did not understand something, they would be unable to follow what came next and then they would be quite lost.

This correlates with what both Specialist Informants revealed when queried on the same point. They too felt that it was imperative for students to understand what was going on at all times. That is why they would scan students' faces and make eye contact with them to gauge the level of understanding. These expatriate lecturers were
aware that Malaysian students seldom revealed that they could not follow. This was noted in the classroom observation – students seldom participated in the lesson: whether to ask a question when they did not understand, or voice an opinion, or disagree with the lecturer. If the lecturer sensed that they did not follow, he would say, "Shall I go over this again? You seem a little lost." Only then would students answer in chorus, "yes". Hence, students felt that better note-taking skills would better equip them to deal with their academic task. Better notes would make for better re-reading, while reading a difficult or confusing section, and would help them when they read up for an examination.

Before this section on reading is closed, it would be relevant to mention that students did not directly connect what they had learned in their ESL programme and the tasks they had to perform in the content-area classroom. 55% of students interviewed said that they did not feel that the ESL course had helped them in the content-area classroom. The other 45% could not pinpoint a particular instance of help, nor a particular skill learned in the ESL class that had helped – preferring to state that the ESL programme helped them in general to make the switch from an all-Bahasa Malaysia medium to an all-English medium. They explained that going through the programme helped them to start working in English, and that this kept them from being 'shocked' on their first day in the faculty, where everything was conducted in English.

This finding echoes Leki's (1995) finding that students did not refer to anything they had learned in their ESL programme when contemplating work in the content-area
classroom. Leki wondered if students had internalized the skills learned, and were thus performing them without realizing that they were using these skills.

Whatever their reason, Uniten student informants did not feel that the ESL programme had adequately prepared them for the tasks before them in the content-area classroom.

Nevertheless, despite their not acknowledging the role played by their ESL programme in helping to deal with their faculty experience, the students in this study appear to have made the switch from all-Bahasa Malaysia to all-English with varying degrees of success.

The discussion above outlined the development of students’ reading experience at Uniten. In the following section, the other aspect of the students’ experience in the content-area classroom is explored – their writing experience.

4.6 Writing

In this section, the data will be analyzed in relation to the research questions posed in Chapter 1, namely question two, and part of question three:

Question 2: What do first year Engineering students need to write? How do they write? Is the knowledge gleaned from their reading evidenced in their written work?

Question 3: What problems do they face when writing?
As with the earlier section on reading, in this section, each of the research questions will be further subdivided into its component parts to facilitate analysis.

4.6.1 How Students Write

In order to examine how students write it was found advantageous to look at what was considered to be ‘good’ writing examples. What was deemed ‘good’ writing was determined by the Specialist Informants, and the researcher explored with them why it was that a particular piece of writing was thought to be ‘good’. The writing examples that were examined were taken from one of the Chemistry examinations that the students sat once a fortnight.

In general, the Specialist Informants considered the students’ ability to explain a concept clearly. As most questions dealt with procedures, it was necessary for student-answers to outline the stages in a procedure clearly. Also, it was necessary for laws quoted, and concepts named, to be identified and explained. The Specialist Informants looked for evidence of reading in the written answers, and rewarded students accordingly. Grammar rules did not matter, as long as meaning was not sacrificed.

One of the main features that the Specialist Informants looked for was the student’s ability to explain a concept clearly. In essence this involved the student having to decide on his audience and proceed from this point. This task was made easier for the student in that the rubric of the question pointed out that the student is to write for someone who does not know anything about the topics in the question:
Write a short essay, explaining to a non-scientist, the principles and uses of ONE of these topics.

Therefore, in answering a question on the manufacture of ammonia gas, the student has to explain, from the start, what ammonia is, what it is made of, and then proceed from there. This addresses the problem noted by Freedman, et. al (1994), that is, that students had a problem identifying their ‘audience’ when writing. Hence, it is difficult for students to decide on how much detail to include. This is eliminated in the problem being discussed here. The rubric of the question clearly informs students that they are to write for a ‘non-scientist’. This should tell students that they must include as much detail as possible in order that the reader is able to understand and follow what he has written.

In the example that follows, the student seemed to have performed the required task well, and received a score of nine marks from a total mark of 10. (Please note: the student’s language errors have not been edited/corrected.)

The uses of ammonia include fertilizers and making explosives. Ammonia is produced in large amount in industries through a process called the Haber Process. Ammonia which has the molecular formula \( NH_3 \) is formed by reacting gaseous hydrogen and gaseous nitrogen together. However nitrogen gas (\( N_2 \)) is not easily obtained whereas hydrogen gas can be obtained by passing steam over burning coal to produce carbon monoxide and hydrogen gas.

In the above example the student has set out to describe the process clearly. He is conscious of the fact that he is explaining to a non-scientist, and thus provides basic information that will enable a lay person to follow what he is saying. Recognizing and deciding on how much detail to include in an answer is one of the problems.
encountered by students and it is dealt with in a later section (See Section 4.6.2, p.110).

As most of the questions asked dealt with the explanation of procedures, the students were required to show each step in the procedure clearly: starting at the beginning and following through to the end in the correct order. In the following extract, the student does this well, and is correspondingly given credit for his efforts. (Please note: the student’s language errors have not been edited/corrected.)

If the reaction takes place at 1 atmosphere pressure and at room temperature, 27 C, the reaction will take long time before it is completed. Therefore increasing the temperature and pressure of reaction will increased the rare of ammonia produced. However, under this temperature such as 500 C, will caused the ammonia produced to decomposed back to N2 gas and H2 gas. This will eventually lower the rate production of the ammonia.

The words underlined show the markers used by the student to indicate the fact that he is narrating a procedure. He uses the markers to indicate how the procedure will occur, and what can be expected when it is taking place. This makes for clear writing, and Specialist Informant 2 (Chemistry) felt that it was easy to follow as it had been clearly delineated in the answer.

Again, whenever a term or scientific law is quoted, the student is expected to explain what it means. The excerpt below shows how this is handled by one student. (Please note: the student’s language errors have not been edited/corrected.)
Because this reaction is slow, **catalyst** is used to make the reaction become faster. **Catalyst is a chemical substance that make the reaction faster but do not involve in the chemical reaction.**

The student uses the term ‘catalyst’ and realizes that he needs to qualify what it means (again keeping in mind that he is writing for a non-scientist) and so follows this with a definition of what a catalyst is.

Similarly, in the following excerpt, a student introduces a scientific law, and proceeds at once to explain what it means. (Please note: the student’s language errors have not been edited/corrected.)

... *Le Chatelier’s principle, the increase in pressure which mean the decrease in volume will favor the reaction in which it decrease the number of moles of the gas.*

Another point that Specialist Informant 2 (Chemistry) looked out for was evidence that the student had read up on the topic being tested. In the following extract, the student was given credit for his answer, that included the following points, because they had not been covered in class, and it showed that the student had read. (Please note: the student’s language errors have not been edited/corrected.)

*Enzyme catalysis is actually a biological catalysis. Enzyme are found in living thing for example human, plant or animal body. The reactant in enzyme catalysis is called substrate.*

*Enzyme catalysis is used for example in breaking up the complex ‘chain’ in food into a simple product for example form bread to one of its simple form, glukose.*

There was further evidence that much emphasis is placed on the students’ reading up on the topics being tested. This was seen in the way that the Chemistry lecturer graded
student papers that had misinterpreted the rubric of the question – instead of choosing one topic and writing on it, students had not noted the word ‘ONE’ and had written on all five topics.

Three students had done this. In each case, the lecturer had read through the students’ answers and had given them a passing grade – even though each answer, in each subsection was not a complete answer. In response to the researcher’s query, Specialist Informant 2 (Chemistry) responded that all three answers showed evidence that the students had read. If they had not read up on all the topics, they would not have been able to write anything on them. As such, he felt that he should reward the fact that they had been keeping up with their reading, and that this would stand them in good stead, both in keeping up with what he was teaching in class and for the final examination.

From the above it can be concluded that it is not deemed necessary that students’ work be perfect in terms of language – especially in terms of grammar. Both lecturers concurred that it was more important for the student to be able to explain a concept clearly and logically. That he would need a good grasp of the rules of grammar was agreed, but as long as the students’ flouting of the rules did not mar meaning, they were given credit for what they had written.

To illustrate, let us look at the excerpt below. The student is given full credit for this portion of his answer although a language teacher would find serious flaws in the work:
Another way to increase the rate of production is to increase the pressure. This corresponds to the Le Chatelier’s principle which says that high pressure favors processes with a net reaction number of moles decreases which is the same case for ammonia production.

Specialist Informant 2 (Chemistry) stated that the student had understood the conditions in which Le Chatelier’s principle operated, and so he was given due credit for his answer.

Hence, to a content lecturer, a good written answer was deemed to be one that incorporated all the elements stated above. In other words, it would need to be well organized if it began with an introduction of the topic. It should then delineate the steps required in the procedure, explaining concepts and defining terms used and laws quoted. The language of the piece would of necessity be clear and simple, with language errors being disregarded as long as meaning was not affected. An example of a script that was felt to fit this ‘formula’ is reproduced in Appendix 3. The student received full marks (10 out of 10) for this answer.

One other point that merits mention was a characteristic noted in three of the Physics scripts examined. The question was a ‘true/false’ question, and the student was required to explain why he felt that the statement given was true or false. The question was as follows:

5. Write if the statement is true or false and in a sentence or two explain your answer

e. In shear stress the force applied is always perpendicular to the surface to which it is applied.
The following example is an answer which was perceived by Specialist Informant 1 (Physics) to have explained the concept clearly, and therefore was awarded the full marks:

*False.*

*Because the force is always parallel to the surface to which is applied in shear stress.*

However, the following answer also received full marks:

*False.*

\[
\text{shear strain} = \frac{F}{A} = \frac{F_{\text{parallel}}}{A}
\]

In contrast to the first answer, the above answer proved inadequate to the researcher. This is so as it did not explain why the student thought the statement was false. It merely quoted a formula, and the student did not even indicate what the various parts of the formula represented. When queried, the Specialist Informant explained that the student's answer showed that he had understood why the statement given was false: he had quoted a relevant formula that showed why it was so. He further explained that there was no necessity to state what 'F' and 'A' stood for as they were standard symbols in Physics, and that anyone in the field would be able to recognize their significance without prompting. All the knowledge he possessed is reflected in this choice of formula. This again brings to mind the premise that the formulas and equations in science are merely the 'first level' structures that are visible. Each line of a formula or equation carries with it multi-levels of meaning, each with a wealth of shared meaning and significance, at once understood by members of the discourse.
community. As such, Specialist Informant 1 (Physics) revealed that this was a complete answer and that it merited the full marks allocated.

Having explored what the Specialist Informants perceived were the elements necessary for good writing, it would be pertinent now to examine some of the problems encountered by the students.

4.6.2 Students’ Writing Problems

As in the earlier section, the researcher enlisted the help of both Specialist Informants to identify what they perceived to be the problems encountered by Uniten students when writing.

As mentioned in Section 4.5.1 earlier, one of the main problems students faced was the problem of audience – they were unable to remember that they had to write for a non-scientist, and therefore were unable to establish their audience, did not give sufficient information in their writing. Even if it had not been stipulated in the rubric of the question, both Specialist Informants concurred that a good answer must explain any terminology used, and any laws quoted. Students cannot assume that the examiner ‘knows’ what they mean. They have to demonstrate that they understand the principles they are quoting, by explaining them clearly. Students, thus, need to understand what Freedman, et al (1994) posit: that they need to demonstrate to the lecturer how much they know, and how much they have learned.

Consequently, one of the problems students faced was that they were not able to explain the terms they used. In the following extract, the student may know what he is
writing about but he is unable to communicate this knowledge to the examiner, and so is penalized.

In the reaction ... heat is release and thus an exothermic reaction. From the reaction, we can see that the number of moles of the reactants (specifically 4) is more that the number of moles of the product (specifically 2). Therefore by increasing the pressure of the vessel in which these reactants and products exists will move the reaction to the right. In other words, more NH3 (g) will be formed. This is to offset the change made on it (the increase of pressure) according to Le Chatelier’s principle.

The items underlined show where the student was required to explain what was meant. Specialist Informant 2 (Chemistry) revealed that explaining what these terms were about would have made for a clearer explanation and would have garnered the student more marks.

On the other hand, the fact that the student has knowledge of the topic is not sufficient to give him a passing grade. The Specialist Informant revealed that in the following excerpt, the student-writer had been unable to communicate his knowledge on the topic via this answer:

To increase the yield this reaction is better done at low temperature likely to be where ammonia will be in a liquid phase while nitrogen and oksigen is in the gas phase. At equilibrium that is the rate of the forward reaction is equal to the rate of the reverse reaction it is better to perform at high pressure.

The student was given some credit for this answer but he did not make the passing grade. The answer is confused and convoluted, the student being unable to explain
how the process of ammonia production is taking place, and why certain prevailing conditions will make for poor yield or high yield of the gas. The Specialist Informant maintained that to qualify for more marks the student would need to go into an explanation of these points, and to demonstrate his knowledge clearly.

The following two examples represent two scripts reproduced in their entirety. In both cases the answer received a failing grade because the Specialist Informant felt that the students had not read up on the topics, as the answers contained the bare minimum of information necessary.

Script 1:

*Ammonia is used as a fertilizer. The equation to produce ammonia is*

\[ 3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g}) \]

*To speed up the reaction, catalyst is put in the reactant. The catalyst that are used in this process is iron and oxide of aluminum.*

*This process is done under high pressure (500 atm) and low temperature.*

Script 2:

*Catalysis is a process where a substance is added into the reactants to increase the rate of the reaction. The substance added is known as the catalyst.*

From the interview with the Specialist Informant, it was found that the information contained in both answers did not demonstrate that the students had read up at all on the topics. The information given was very general, especially in the case of script 2, and was probably all that the students remembered from the lecture. The students in both instances were penalized for not having read up on the topic beforehand, and for
not being able to represent their knowledge gleaned from reading, in the answer they submitted.

Therefore, in the above case, it can be seen that students need to read and supplement what has been done in the classroom, as the lecture is felt to be very brief and merely skims the surface of what needs to be covered. Students are required to read to supplement this knowledge and to include what they have read when they write.

A question that arises here is: did the students not read, or did they simply not study for the examination? During the interviews, the student informants revealed that they had studied for the exam, but that they had not been prepared for a question that required a long essay-type answer. They maintained that this was uncharacteristic of the lecturer, and so they were caught unawares.

The fact that he did not give essay questions as a rule was confirmed by Specialist Informant 2 (Chemistry). But, he revealed that he occasionally liked to put in one question that needed such an answer to see if students could explain what they were doing. He said that he was generally disappointed with the responses of the students, and had long since decided that these type of questions would not be included in the final examination. This was because he felt that students would be at a disadvantage as they did not do these questions well as a rule. Hence it would lower their overall mark, and this would be unfair to the students.

Although both the Specialist Informants concurred that they felt that it was not crucial for students to have an excellent command of the language to do well in their courses,
it was generally evident that adherence to some of the basic rules of the language was
certainly an advantage – as it led to clear writing that was easily understood, and was
thus rewarded with a better grade.

In the excerpt that follows, the lecturer felt that the student did in fact understand the
concept he was attempting to explain. However, his efforts at grappling with English
proved unsatisfactory – he has a problem organizing his thoughts, and presenting
them in coherent English:

*Enzyme is one of a catalyst. Enzyme is a substance that exist in a body (and in any life
creature too) that digest large and complex substances that we eat to small and simple
substances. Without enzyme catalysis, the complex substance will turn to simple substances in
a long period of time.*

It is presumed that the gist of what the student wished to convey was that enzyme
catalysts increase the rate of reaction. The Specialist Informant revealed that this was
probably what he was trying to say, and gave him a few marks for the answer.
However, he would have received a better grade if he had been better able to express
himself.

4.7 Conclusion

This chapter explored the student’s experience in the content-area classroom. It
looked at what he read, how he read, why he read and the problems he faced when
reading. It also looked at the student’s writing experience – exploring what the
specialist informants feel make for a good piece of written work. It also examined what some of the student’s weakness in writing were.

In the following chapter, the implications of the findings discovered thus far will be discussed in relation to the last research question posed in Chapter 1, namely:

Question 4: How would an ESP programme address student needs in the content-area classroom?

The discussion will proceed with a view to understanding the findings, and to discover how they can inform the formulation of an ESP programme at Uniten.