

A STUDY OF THE SUMMARIZING STRATEGIES USED BY ESL FIRST YEAR
SCIENCE STUDENTS AT THE UNIVERSITY OF BOTSWANA

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ABSTRACT

One of the major problems faced by speakers of English as a second language (ESL) or non-native speakers of English (NNS) is that when they go to college or university, they find themselves without sufficient academic literacy skills to enable them to navigate their learning successfully, such as the ability to summarize textual material. This thesis examines the summarizing strategies used by ESL first year science students at the University of Botswana. Using multiple data collection methods, otherwise known as triangulation or pluralistic research, which is a combination of quantitative and qualitative methods, one hundred and twenty randomly sampled students completed questionnaires and summarized a scientific text. In order to observe the students more closely, nine students (3 high-, 3 average- and 3 low-proficiency) were purposively selected from the sample and wrote a further summary. The nine students were later interviewed in order to find out from them the kinds of strategies they had used in summarizing the texts. To obtain systematic data, the summaries and the taped interview were coded and analyzed using a hybrid scoring classification previously used by other researchers.

The results from the Likert type of questionnaire suggest that the ESL first year science students are 'aware' of the appropriate reading, production and self-assessment strategies to use when summarizing. However, when the data from the questionnaire were cross-checked against the strategies they had used in the actual summarization of the text, most of their claims, especially those of the low-proficiency students, were not sustained. As a whole, the results show that high-proficiency students produce more accurate idea units and are more capable of generalizing ideas than low-proficiency students who

prefer to “cut and paste” ideas. There are also significant differences between high- and low proficiency students in the manner in which they decode the text: low-proficiency students produce more distortions in their summaries than high-proficiency students who generally give accurate information. Similarly, high-proficiency students are able to sort out global ideas from a labyrinth of localized ideas, unlike average- and low-proficiency students who include trivial information. The same trend is observed with paraphrasing and sentence combinations: high-proficiency students are generally able to recast and coordinate their ideas, unlike low-proficiency students who produce run-on ideas.

In terms of the discrete cognitive and meta-cognitive skills preferred by students, low proficiency students are noticeably unable to exploit pre-summarizing cognitive strategies such as discriminating, selecting, note-making, grouping, inferring meanings of new words and using synonyms to convey the intended meanings. There are also greater differences between high- and low-proficiency students when it comes to the use of meta-cognitive strategies. Unlike high-proficiency students who use their reservoir of meta-cognitive skills such as self-judgment, low-proficiency students ostensibly find it difficult to direct their summaries to the demands of the task and are unable to check the accuracy of their summaries.

The findings also show that some of the high-proficiency students and many average- and low-proficiency students distort idea units, find it difficult to use their own words and cannot distinguish between main and supporting details. This resulted in the production of circuitous summaries that often failed to capture the gist of the argument. The way the students processed the main ideas also reveals an inherent weakness: most students of different proficiency levels were unable to combine ideas from different

paragraphs to produce a coherent text. Not surprising, then, there were too many long summaries produced by both high- and low-proficiency students.

To tackle some of the problems related to summarization, pre-reading strategies can be taught, which activate relevant prior knowledge, so that the learning of new knowledge can be facilitated. During the reading process students can become more meta-cognitively aware by monitoring their level of understanding of the text by using, for example, the strategy suggested by Schraw (1998) of “stop, read and think”. Text analysis can also be used to help the students identify the main themes or macro-propositions in a text, and hence gain a more global perspective of the content, which is important for selecting the main ideas in a text. A particularly useful approach to fostering a deeper understanding of content is to use a form of reciprocal or peer-mediated teaching, in which students in pairs can articulate to each other their understanding of the main ideas expressed in the text.

As part of the solution to the problems faced by students when processing information, we need to take Sewlall’s (2000: 170) advice that there should be “a paradigm shift in the learning philosophy from content-based to an emphasis on the acquisition of skills”. In this regard, both content and ESL teachers need to train their students in the explicit use of summarizing strategies, and to plan interwoven lessons and learning activities that develop the learners’ intellectual ways of dealing with different learning problems so that they can make learning quicker, easier, more effective and exciting.

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PREFACE

If I am soon to rise and be counted,
Among those who have reached the pinnacle
Of their intellectual initiation,
Then I must give you this thesis now.

It will be a signpost upon which is written:
The pull him down (phd) credentials
Of the arduous, tempestuous journey
That started from the rocky foothill
To the chilly, lofty summit,
From where I can see:
Yonder, beyond...

But if I gave you lilliputian erudition,
Too easy to fathom, narrow to ponder
I would be bequeathing to the world –nothing
For us to extend our house of Applied Linguistics
From where I could not have become,
Who I am...

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1.0 CHAPTER ONE: DEFINITION OF THE RESEARCH PROBLEM

1.1 Nature of the problem

In the past two decades, researchers in applied linguistics have shown an increasing interest in determining what it is that distinguishes successful from less successful ESL learners. This interest has spawned a plethora of studies on second language learners (e.g. Chamot, Barnhardt, El-Dinary, & Robbins, 1996; Cohen 1998; Hsiao & Oxford, 2002; Hsiao, 2001; MacIntyre & Noels, 1996), particularly the learners' conscious use of modifiable language learning strategies (LLS), sometimes referred to as techniques, steps, formal protocols or executive functions. These studies have been conducted in the hope that such information will enable teachers to design teaching strategies that will overcome the students' learning problems.

Within the wider framework of learning strategies, offshoot research on the strategies used for summarizing information by ESL or non-native speakers (NNS) of English has attracted the interest of some researchers in applied linguistics because it has been realized that the ESL students' ability to summarize information is a vital skill required for navigating learning successfully at college and university level. Because it plays such a crucial role in fostering learning, it is included in the scaffolding of English for Academic Purposes (EAP) or English for Academic Development (EAD) courses that are designed to enhance the students' learning of their areas of specialization.

The issue of successful learning at tertiary level is related to academic literacy, especially what it means as a social practice, its theoretical perspectives and the implications on educational policy. Spear-heading the discourse of "New Literacy Studies" (NLS), Gee (1990, 1991, 2000, 2001) and Street (1984, 1988, 1995, 2000, 2001,

2003) demonstrate that literacy is not a monolithic phenomenon but has multiple dimensions: it varies according to time and space and the meaning different people ascribe to it.

In his work, Street (2003) makes a distinction between “autonomous” and “ideological” models of literacy . He notes that the stereotyped view in many academic fields is that literacy is “autonomous” and has effects on other social and cognitive practices. Its introduction to poor, “illiterate” people, villages, urban youth, etc has the effect of enhancing their cognitive skills, economic prospects and standing in society, regardless of the social and economic conditions that account for their “illiteracy” in the first place. He points out, however, that the “autonomous” view of literacy disguises the cultural and “ideological” assumptions that underpin it.

Instead, Street (2003) proposes an alternative “ideological” model of literacy, which suggests that it is culturally sensitive and varies from one context to another. He posits that literacy as a social practice is not neutral: it is a technical concept which is embedded in socially constructed epistemological principles. It is about knowledge: the ways in which people define literacy in reading and writing and their conception of knowledge.

Here, I am persuaded to agree with Street’s (2003) “ideological” characterization of literacy, especially his assertion that it is culture-bound and that it varies from one context to the other. In the context of the University of Botswana, where the ability to summarize is viewed as part of a process which promotes academic literacy, summarization is taught as “ideologically inscribed knowledge construction” (Lillis, 2003: 195), which empowers those students who master the skill by enabling them to

enter a 'new' culture, that of the academy (Berkenkotter & Huckin 1995; Geisler 1994). Here, I use Gee's (1990) meaning of 'empowerment' as competence in dominant discourses, one of which is the ability to summarize. The students who are able to process information efficiently are more likely to be quickly socialized into 'dominant' institutional practices (e.g. scientific discourse) than those who do not. Therefore, in order to take the students a step further, this study examines the strategies which ESL science students employ when summarizing scientific texts. The objective is to reveal the strategies which form part of this crucial skill, and by so doing, to make the power of academic literacy more accessible to a wider range of ESL science learners.

In this thesis, although I recognize Street's (2003) ideological notion of academic literacy, which views students' writing and learning as a process of empowerment, I also take note of Brandt & Clinton's (2002: 1) observation that there are "multiple interests, incorporating individual agents and their locales into larger enterprises that play out away from the immediate scene". The multiple factors that influence academic literacy are the students' ability to deploy a repertoire of linguistic practices, including genres, fields and disciplines, proficiency in the language of education, reading abilities, the mastery of a wider range of "semiotic systems" (Kress, 1998), such as the use of computer packages, overhead projectors, slide projectors, *et cetera*. Street (2004) suggests that students' academic literacies are embedded in their cultural identities and that institutional practices regarding the nature of academic literacy either empower students who master the required discourses or marginalize those who fail to acquire them. In other words, academic literacy is viewed within the context of the institution in which academic practices take place as sites of discourse and power.

As pointed out earlier (*vide ante*), in many universities where EAP/EAD is offered summarization is one of the key skills taught. Yet, we do not have enough information about the specific summarizing strategies used by ESL students, or the appropriate schemata involved in the distillation of information, such as the use of cognitive and meta-cognitive strategies. Because there is inadequate information about the steps taken by ESL students with different language proficiencies, this study attempts to widen our knowledge of the different strategies employed by ESL students when abstracting information. This is important because the ESL students' conscious ability to apply various summarizing strategies is central to what Cannon (2000: 10-11) identifies in Outcomes Based Education (OBE) as "possibly the most significant educational trend operating today", whose value for critical learning "questions the assumption that simply knowing or understanding disciplinary content enables a person to apply knowledge and argues instead that students actually have to be taught applications and capabilities".

I fully agree with Cannon (2000) because the ability to summarize not only fosters learning but also enables the learner to work independently as the learner will use what Richards and Lockhart (1994: 60) call "analytical strategies" that maximize effective learning such as the ability to interrogate the information and sift the gist from minute details. Jones (1994: 1) echoes this point regarding Outcomes Based Education (OBE) in South Africa when s/he recommends that learners should be "able to define their own learning goals and evaluate their achievement...and be able to transfer knowledge to solve problems creatively". But, of course, we cannot assume that learners will be able to transfer knowledge through some osmotic process: we need to know how the students process the information they read.

1.2 Background to the problem

Over many years, I have observed that ESL first year students in different faculties of the University of Botswana, particularly those in the faculty of science, have problems in understanding the gist of what they read. Part of the problem lies in the language policy of the country, which considers English exoglossic, that is to say, the language is viewed as foreign and Setswana is not only the national language (Tsonope and Janson, 1991) but also the language of national *pride* and *identity* (own italics) (National Commission on Education, 1977). Since Setswana is the lingua franca of the country and is the medium of instruction in the early years of primary education and continues to be used unofficially for teaching purposes at upper primary and secondary school, it means that, for all intents and purposes, English plays a secondary role in classroom interaction and day-to-day communication.

The result of this diglossic language situation, with English being the medium of instruction in institutions of higher learning while Setswana is the language of the hearth and home and the *de facto* medium of instruction at primary and secondary school, is that when Botswana ESL students go to university, many of them suddenly find themselves without the necessary linguistic and academic literacy skills to be able to maximize their learning. Their limited abilities conspire to influence the types of strategies they use when they are confronted with masses of information to read. And yet we do not know for sure what kinds of strategies these students use to process information, and at what point they need help in order to accomplish their learning goals.

Although there is a considerable corpus of research about the learning strategies

ESL learners employ (Bialystok, 1990; Chamot, 1996; Cohen, 1998; Flavell, 1992; Oxford, 1996), Cohen (1998) asks whether there are some strategies that are better than others; or whether it is the number and range of strategies that counts; or whether the use of strategies actually helps ESL learning; or whether training in the use of different strategies improves language learning. These pertinent questions suggest there are lacunae in our understanding of the strategies used by L2 students.

This point is acknowledged by Ellis (1994: 558) who maintains: “the study of learning strategies holds considerable promise, both for language pedagogy and for explaining individual differences in second language learning. It is probably true to say, however, that it is still in its infancy... and there are several gaps that need exploration”. And it is precisely because there are still ‘several gaps’ that a study of this nature is necessary in order to extend our knowledge of the information processing strategies ESL students use at university.

My inspiration to carry out this study on the summarizing strategies used by ESL first year science students at the University of Botswana is drawn from four major concerns. The first concern stems from my empirical observation spanning several years of teaching at this university that many first year science students, and indeed many students in other faculties, panic when faced with masses of textual material to read. They find it difficult to synthesize the information or to identify the main points. Drawing from this teaching experience, it seems ESL first year science students at this university think that everything that is written is important and true, and as a result miss the point that some information can be ignored if one is trying, for example, to get the gist of the text.

The second motivating factor arises from my concern for the long-term effects of

“teacher-centered” methods of teaching that high school students, and to some extent students at this university, go through during their period of learning. For much of the time, teachers “spoon-feed” the students by making notes for them, producing model answers, providing model summaries as well as ‘spotting’ questions that are likely to come in the final examinations. This method of teaching has grave consequences for the ability of the students to learn on their own when they go to university, where they are expected to learn independently.

A third factor that spurred me to conduct this study is the concern I have for first year science students at this university who struggle annually with their studies. Over many years, I have noticed that L2 learners at this university both with relatively high and low English proficiency are more concerned with ‘localized’ aspects, such as the meanings of new words, the syntax of sentences, and details of the text than with ‘global’ issues such as the gist of the text and its organization. This weakness is earlier noted by Carrel (1989) who suggests that L2 readers are retarded by the need to “repair” more gaps in their understanding than L1 readers do.

While there are many factors that can influence the students’ ability to understand what they read, such as cognitive and socio-affective factors, the familiarity, distance or opaqueness of the subject matter, the intensity of their motivation, cultural background, aptitude in the target language, reading and comprehension abilities and so forth, research on the wider field of language learning strategies (Bialystok, 1990; Chamot et al., 1987; Green & Oxford, 1995; Nyikos & Oxford, 1993) suggests that learners adopt different strategies, with more effective strategies used by ‘advanced’ learners.

What we learn from these earlier studies is that the way ESL learners use individual strategies for abstracting significant facts plays a crucial role in facilitating the processing of information and the progress they make in their academic work. But what is not known is precisely how ESL learners interactively comprehend, condense and reconstruct the main ideas from semantically complex information. Also, as Jones (2003:1) suggests, we do not know exactly which contextual factors aid or inhibit L2 students in summarizing a text; and we need to know more about the input factors emanating from the knowledge of the subject domain, the effect of the distance from the source of the text and how the audience factor influences the summary output.

I might also add that we are not even sure of the exact types, nature and range of the strategies L2 speakers prefer, or why and how they use them. These as yet unexplored issues justify this study, which focuses on examining the types of cognitive and meta-cognitive strategies preferred by ESL students in summarizing a given text. An equally compelling factor that calls for this study is that research on summarization inexplicably fizzled out in the 1990s. The premature abandonment of research in this area has left us with more questions than answers in terms of what it is that ESL or non-native English speakers do when faced with an information-processing task.

More importantly, we seek to understand what empowered individuals do when they summarize, so that we can pass that knowledge to those who are seeking to acquire the appropriate skills, i.e. those students who find it difficult to synthesize vital information from scientific texts. In other words, as a literacy broker, one seeks to make the world better by expanding the community of scientists beyond the frontiers of the small elite by facilitating the teaching of summarization, based on the understanding that

the acculturated ESL science students can be equipped with the academic literacy skills that can enable them to function effectively within the scientific community.

The fourth and last factor which prompted me to conduct this study is that the majority of studies on summarization by ESL students have been conducted mostly in the so-called “inner circle” countries such as the USA, UK, Canada and Australia, where the L2 subjects had been both linguistically and culturally immersed into a native English culture. As a result, many researchers (e.g. Gremmo & Riley, 1995; Hashim & Sahil, 1994; Hyland, 1993; Kouraogo, 1993; Oxford & Burry-Stock, 1995; Politzer & McGroarty, 1985; Rees-Miller, 1993) have warned of the dangers of an ethnocentric bias regarding what constitutes good language learning strategies. Some researchers (e.g. Oxford & Burry-Stock, 1995; Rees-Miller, 1993) have justifiably called for the replication of similar studies in “outer circle” countries where there are bi- or multilingual speakers.

1.3 Purpose of the study

The main purpose of the study is to find out the kinds of strategies used by L2 speakers in summarizing a text with complex ideas. On this matter, Scarcella & Oxford (1992: 63) maintain that strategies for L2 speakers are “specific actions, behaviors, steps, or techniques...used by students to enhance their own learning”. The objective of the study is to discover the “specific actions, behaviors, steps or techniques” that first year science students at the University of Botswana use when processing information. This is important because strategies are conscious steps taken by learners in order to accomplish given tasks, and by their very nature, they are avenues for academic achievement. And more recently, quantitative studies have underscored the significant relationship between

L2 learning strategies and language proficiency (e.g. Bedell & Oxford, 1996; Chamot, Barnhart, EL-Dinary, & Robbins, 1999; Cohen, 1998).

The ultimate purpose of studying summarizing strategies used by L2 speakers is to incorporate them into regular English for Academic Development (EAD) instruction in an integrated manner. For instance, regarding cognitive strategies, it is important to know in a much more systematic way the strategies the students use to organize their notes, how they group and recombine their information, and how they infer and put into context the information they read.

Similarly, with meta-cognitive strategies, it is important to know how students plan for a given task, and how they monitor, check and evaluate their production outcomes. Here, one needs to stress the importance of meta-cognitive strategies because they “involve both knowledge about learning (meta-cognitive knowledge) and control or regulation over learning (meta-cognitive strategies). Meta-cognitive knowledge refers to knowledge of one’s own cognitive processes and those of others....Regulation of learning, as distinguished from knowledge about learning, entails the use of meta-cognitive strategies” (O’Malley and Chamot 1990: 150). In this context, meta-cognitive strategies are closely associated with academic literacy in the sense that they enable the learner to plan, monitor and evaluate the learning process.

Put in other words, meta-cognition is the ability of the learner to stand back and critically evaluate him/herself, with a view to censoring those aspects that do not answer the specific demands of a given task. The ability to interrogate and assess information critically is essentially the crux of critical literacy, which enables the student to select vital information from books, journals and other texts, and be able to reflect on it.

Vygotsky (1978) maintains that the acquisition of meta-cognitive skills eventually leads to an independent, self-regulated learner who has the ability to acquire, store, retrieve and manipulate information for a specific purpose. I can also add that the acquisition of meta-cognitive skills is about the nurturing of critical literacy, which is expected at university. In a nutshell, the main purpose of this study is to develop a researched database that can throw light on how ESL students can be helped to recognize the power of consciously using strategies in order to make their learning quicker, easier, more effective and exciting.

1.4 Research questions

This study examines the summarizing strategies used by ESL first year science students at the University of Botswana, especially the cognitive and meta-cognitive strategies they use for reading, producing and evaluating their summary outcomes. More specifically, the study attempts to answer the following questions:

Given a reading text with complex ideas

1. Do low-proficiency ESL first-year science students produce more inaccurate or partially correct idea units (IUs) from the text than high-proficiency students?
2. Do low-proficiency ESL first year science students produce more frequently copied or run-on ideas of the original IUs than high high-proficiency students?
3. Do low-proficiency ESL first year science students produce more distortions of the original IUs than high-proficiency students?
4. Are high-proficiency ESL first year science students more capable of providing macro-propositions and understanding the meanings of new words than low-proficiency students?

5. Are high-proficiency ESL first-year science students more capable of using cognitive strategies, such as note-making, grouping, recombination, resourcing, deduction, and contextualization than low low-proficiency students?
6. Are high-proficiency ESL first-year science students more capable of using meta-cognitive strategies such as functional planning, self-monitoring and product evaluation than their low-proficiency counterparts?
7. Are there any fundamental differences between high- and low-proficiency ESL science students in the manner in which they distinguish global (main ideas) from localized features such as illustrations and examples?
8. Are there any major differences between low- and high-proficiency ESL first year science students in the manner in which they paraphrase information?
9. Are there any significant differences between low- and high-proficiency ESL first year science students in the manner in which they combine idea units to form a coherent summary?
10. Are there any gender-related summarizing strategies preferred?

The above questions are posited in order to study more systematically how low- and high-proficiency students, respectively, process a text with complex ideas. These questions are intended to keep the study on track so that one can focus on the strategies the students use in order to select the main points from a reading text. This is important because, if we know the summarizing strategies the ESL students use, we can teach them the strategies that help them gain access to academic literacy, which facilitates their assimilation into the scientific community.

1.5 Importance of the study

The study is useful for a number of reasons. Firstly, since there have been few studies on the summarizing strategies used by ESL students at university level in a multilingual community, this study will help to explain some of the problems ESL students encounter in trying to decode the meaning of a text. This is important because we need to commit our EAP/EAD theoretical and pedagogic approaches to an instruction that is informed by research. Grounding instruction in our understanding of the cognitive and meta-cognitive strategies used by our students in processing information is likely to take them not only beyond their normal communicative needs, but also equip them with the tools that enable them to function more interactively in an academic situation.

Secondly, knowing the strategies that ESL students use for information processing at university level helps both content and EAP/EAD teachers to increase the sophistication of their understanding of the students' preferences, and be able to provide feedback on the merits and demerits of using the chosen strategies. Such knowledge could throw some light on the ways in which university students adjust their learning strategies so that they can settle into the discourse and social milieu of their host environment. Also, the new knowledge could break the orthodox approach in EAP teaching that relies on what students *should be doing* instead of what they *are doing*.

Clearly, knowing how ESL students process information is an important step because we will move away from our stereotypical notions of the learning problems faced by ESL learners, and may begin to view them as unique beings who adopt strategies peculiar to their own cognitive and meta-cognitive development. Such knowledge may enable both content and EAP teachers to take an interest in the strategies

their students consciously use, by asking them to record and classify their information processing strategies. This is likely to enhance the students' ability to navigate their learning more effectively.

This teacher-generated inquiry could help ESL students become more meta-linguistically sophisticated, empowered to carry out retrospective analyses of themselves as language learners. It is also likely that teachers could become more sensitive to learners' problems as they would be able to appreciate the ways in which their students decode and encode information. Also, by knowing what it is that ESL students at university do when reading a text with complex ideas, lecturers may be able to challenge some of the stereotypical assumptions of EAP, such as the widely held view that English for academic learning is simply 'repair' or 'remedial' work that involves a few hours of fixing up the grammar of the students.

The most obvious value of this study is that if we know the cognitive and meta-cognitive strategies ESL students use for summarizing information, we can then build on them so that the students can gain access to styles that are crucial for language problem solving and creativity. And the wider perspective of this study is that not only does it attempt to situate research in an area that is still relatively virgin, it is also likely to stimulate research that might give us more information on the idiosyncratic ways in which a whole range of NNS in multilingual societies access information and how they can be helped to overcome learning problems in their different content subjects.

1.6 Delimitations of the study

A study of this nature has the potential to encroach upon other conceptually related areas. To limit the boundaries, I confine the study to establishing the kinds of

summarizing strategies ESL first year science students at the University of Botswana employ. The research focuses on studying the repertoire of summarizing strategies because that enables us to see how ESL learners sift salient points from a maze of interlocked ideas and how they recast them, a skill that fosters academic learning. The study does not measure the linguistic proficiency of the students because there are many extraneous variables that affect language proficiency, and such an attempt would make the study too huge to undertake.

Similarly, the study does not measure the academic reading abilities of the students because the area of reading alone is wide enough to form a separate study of its own. However, one has to acknowledge that research (Hammadou, 1991) has demonstrated that reading is not just understanding words, sentences, or even texts, but involves a complex integration of the readers' prior knowledge, language proficiency and their cognitive, meta-cognitive and socio-affective strategies. Block (1992) particularly notes that poor readers have difficulty in comprehending what they read and find it difficult to grasp the gist of the text. So, while reading is inextricably linked with strategies, this study focuses on the former only in so far as it provides information about 'how' a reader processes information.

Similarly, the study does not focus on the strategies of comprehension, such as the readers' background knowledge or schemata that are used to recover the intended meaning. This is because non-deterministic and non-exhaustive strategies are used for comprehension, with the success of this skill often being dependent on knowledge of the forms of the language as a clue to meaning. In other words knowing the forms of a language, as a way of comprehending meaning, does not necessarily guarantee an

automatic sensitivity to information processing strategies and the consequent pressure to mobilize the latter for academic learning. However, one needs to reiterate the fact that reading, comprehension and strategies are very much interwoven, as the literature review in Chapter Two will show. But in terms of defining the boundaries of this study, cognitive and meta-cognitive strategies used by ESL learners in trying to process textual material are the central focus because they are the deliberate steps that learners take in order to manage and achieve their desired goals.

Lastly, the study leaves out affective (or sometimes called socio-affective or social-affective) strategies because these strategies are associated with the way learners manage their emotions, feelings and how they learn with other people. Although these strategies are important in terms of developing the “whole learner”, they are excluded in this study because one would like to see how learners process textual information, and not what they feel about it. Above all, the study does not predict the potential academic success of the students because there are other variables that influence the ultimate success of ESL students at university. On the issue of academic success, the researcher is aware that academic literacy may be a strong predictor because it is the axis around which learning revolves.

1.7 Definition of operational terms

A study of this nature that uses many technical terms has the potential to convey different meanings for different people. It is therefore necessary to explain how the key terms are used. In this thesis, the term ‘study’ is used to mean the application of the researcher’s mind to the learning or understanding of how first year science students summarize textual material. According to the *Collins Concise Dictionary* (1992: 1337) a

'study' is an "investigation" or "examination" through careful observation, the purpose of which is to break down and scrutinize the minute details.

The term 'summarizing' is used in this thesis to mean the identification of the main ideas of a longer text. Here, the researcher agrees with Jones' (2003:1) explanation that "summarizing is how we take larger selections of a text and reduce them to their bare essentials: the gist, the key ideas, the main points that are worth noting and remembering". In a wider sense, summarization is referred to in this study as the expression of ideas in a brief form; the distillation, condensation, or reduction of a larger work into its primary notions. What we do when we summarize is to "strip away" the extra verbiage and extraneous examples. We focus on the heart of the matter, try to find the key words and phrases that, when reproduced later, still manage to capture the gist of what we have read.

The ability to summarize information is important within the scientific discourse community because it enables students to retain the main ideas of what they read and to ignore unnecessary details that may be hard to transfer into the long term memory. The ability to strip away minute details, to synthesize, judge and evaluate texts is the very essence of academic literacy, which enables the learner to slog through an extensive swamp of information, weed out examples and details and be able to retain the key ideas. This process is underpinned by the assumption that summarization is not common-sensical, but is socio-culturally informed: students find the meaning of texts within their social praxes.

In general, summarization is characterized by four main qualities. Firstly, it is objective: that is, the summarizer's opinions should be avoided, and there should be no

judgments as to whether the text is good or bad. Secondly, it is complete and contains the main ideas of the original text. Thirdly, it is balanced and gives equal weight to each main idea raised by the original author. Fourthly, it is brief and the summarizer's task is to "boil information down to its most basic elements" (Melton, 2003: 1)

Another key term that needs to be defined clearly is 'strategy'. The concept is used in this thesis to refer to 'how' ESL learners orchestrate their cognitive and meta-cognitive skills in order to summarize the required information. Taken together they constitute "the steps or actions learners consciously select either to improve the learning of a second language, the use of it, or both" (Cohen, 1998:5). McDonough (1995: 2–6) points out that the use of the term 'strategy' overlaps with 'skills' and 'processes', and it has at least four connotations: guiding principle, heuristic estimation, compensation mechanism, and a plan for action. Cohen's (*vide supra*) definition of a strategy is similar to that of Brown's et al. (1981), who refer to it as a 'procedure' or 'technique' used to accomplish an immediate task. In this study I use 'strategy' synonymously with 'protocol', which is a formal procedure used when summarizing. As can be seen from the above definitions, summarizing strategies are closely linked with academic literacy because the strategies a student uses for scanning and skimming, planning and assessing the summary production outcome indicate the student's level of academic literacy.

Strategies are used in a range of second language learning situations, which include learning, performing a task, oral communication, compensating for a breakdown in communication, the exercise of language in different macro skills such as reading, writing, talking, listening, coping with difficult elements of language instruction and

taking tests. In this study the focus is on the strategies that L2 learners use for information processing, which enable them to distil the main ideas.

A distinction is made in this study between *learning* and *learner* strategies. The former is somewhat more passive than the latter, which involves the learners' active participation in the learning process, not simply as a performer, but as a problem solver and reflective organizer of knowledge. Because of the facilitative nature of learners' strategies, recent research on them has been more interested in what learners 'do' when they are faced with a learning problem. Second language learners can be observed in a number of educational fields in which they consciously apply mental mechanisms as they see fit, premising the pervading assumption that strategies promote autonomous learning and learners take responsibility for their own learning.

Crabbe (1993) notes, with some concern, that while teachers often give copious procedural instruction on how to accomplish activities designed to promote interaction and independent learning, they do not give instruction in 'how' to learn language. There is therefore some tension between regarding strategies as part of a theory of learning, describing the development of autonomy, and the implication that many learners need instruction in operating strategies independently.

But before we can teach the orchestration of strategies, we need to confirm what precisely a strategy is. And to this end the rule of thumb definition of a strategy in this thesis is that it is a specific action, step, or technique consciously employed by a learner in order to facilitate the processing of information, the result of which may lead to the learner's autonomy (Oxford, 1990). 'Autonomy' in this context refers to the willingness

to perform a language task with little or no assistance, with flexibility according to the situation, and with transferability to other contexts (Littlewood, 1996).

A crucial term that also needs clarification is ‘cognitive’ strategy. This term is originally borrowed from cognitive psychology, particularly from Rumelhart’s (1981) ‘schema theory’, which suggests that there are units within memory that contain knowledge and are organized in networks of conceptually related information. In trying to pin down this elusive term, O’Malley and Chamot (1990: 150) hit the mark when they spell out the essential properties that constitute a cognitive strategy as “the steps or operations used in learning or problem-solving that require direct analysis, transformation, or synthesis of learning materials”. This is my operational definition of a cognitive strategy.

But there are other definitions that need to be considered as well. Johnson (1996) simply refers to a cognitive strategy as “an adaptive control of thought”, while Richards & Renandya (2002: 121) call it an “identification, retention and retrieval of language elements”. These two definitions are somewhat tentative, as they do not indicate the processes that are involved in cognition. Oxford’s (1990) definition of a cognitive strategy as the process of “organizing, planning, deducing and re-sourcing in preferred ways” is acceptable because it encapsulates the essence of cognition.

A coterminous concept that also requires definition is ‘meta-cognition’. This is a strategy that defines the student’s meta-awareness of her or his literacy practices. In this thesis I use Flavell’s (1976: 232) definition of meta-cognition as “one’s knowledge concerning one’s own cognitive processes and products or anything related to them...and the active monitoring and consequent regulation and orchestration of these processes in

relation to the cognitive objects or data on which they bear in the service of some concrete goal or objective”. Here, the operative words are ‘active monitoring’, ‘regulation’ and ‘orchestration’ of cognition. These strategies include planning, monitoring, checking and self-evaluation. Flavell (1992) maintains that meta-cognitive strategies are especially likely to occur in situations that stimulate a lot of careful, highly conscious thinking, such as would occur in summarization. On the value of meta-cognitive strategies, O’Malley et al. (1985: 6) conclude: “students without meta-cognitive approaches are essentially learners without direction and ability to review their progress, accomplishments, and future learning directions”.

A term that is central to this thesis which needs clarification is ESL “proficiency”. I am aware that language teachers define ESL proficiency differently. For instance, many language teachers generally define ESL proficiency as the ability to communicate in the second language, while others emphasize the ability to listen, speak, read and write. This definition is fuzzy and rough on the edges as it does not say exactly what communication is, or what abilities are expected of ESL learners when they listen, speak, read and write. Also, this definition does not acknowledge Street’s (2003) “ideological” explanation of literacy, which suggests that as a social practice it is not neutral, but is culturally defined and varies from context to context.

Canale and Swain’s (1980) definition of ESL proficiency is closer to the way I define proficiency in this thesis. They point out that proficiency includes grammatical, sociolinguistic, discourse, and strategic competence. From this definition, the type of proficiency into which summarization can be fitted is strategic because it is achievement-oriented, as it involves the writer’s ability to use meta-cognitive strategies to achieve the

intended goal. In terms of English for Academic Development in an ESL context, especially where one is dealing with science students, Canale and Swain's definition is somewhat broad as it includes proficiencies such as sociolinguistic ones that may not be necessarily essential to ESL speakers, given the diversity of their socio-cultural backgrounds.

In this thesis, I use Bachman's (1990) model of ESL proficiency as my operational definition, which refers to organizational and pragmatic competence, i.e. the ability to use appropriate grammatical forms, competence in textual and illocutionary organization as well as sensitivity to variety and register. Bachman's definition differs from Canale and Swale's (1980) definition of proficiency in that it focuses on the power of academic literacy, which allows the harnessing of "the discourse practices of the speech community our learners are wishing to enter" (Paltridge, 1995: 43). In other words, my definition of ESL proficiency recognizes the role of cognitive and meta-cognitive academic language proficiency, which is premised on the assumption that proficiency is person-specific and context-related, depending on the learner's level of cognitive development. A more detailed explanation of how I measured the students' proficiency is given in section 3.2.1.

Another term which needs to be clearly defined is 'ESL', which is an acronym for English as a Second Language or simply L2. It is used in this study to refer to the natural or near natural acquisition and learning of English in addition to the students' 'mother' tongue or first language (L1). The communicative uses of English as a second language are wide-ranging, including education, business, commerce, trade, politics, religion, music, mass media, interpersonal communication, etc; and it is assumed that ESL

speakers will eventually make the second language their own to form an alternative code to their native language. The use of the term is often applied to immigrants in the USA, Britain, Australia, Canada, and New Zealand, and also refers to those who use English in most of the countries in Africa and Asia that were once ruled by Britain

The term ESL contrasts with English as a Foreign Language (EFL), which has a more restricted use, such as the use of English in Russia, Japan, China, Brazil, Congo, or Angola. The researcher is aware that the distinction between 'ESL' and 'EFL' is somewhat blurred, more especially because English is now used by a conglomeration of cultural groups for their global needs. In those countries where English is assumed to be a second language, there may be different levels of use such as between ESL speakers in Sierra Leone and Tanzania or between those in South Africa and India. There may even be idiosyncratic differences, with some ESL learners being more proficient than others who may use it more or less as a foreign language.

The spread of English in countries where it is used as a second or third language or even as a *lingua franca*, its role as an international language, the increased cultural and population mobility and the influence of television have made it increasingly difficult to use conventional terms such as 'foreign', 'second', 'first' or 'native' speaker. These factors have also shifted the linguistic centre of English from Britain, which now represents a small proportion of the global English speaking community. Because of the wide geographical spread of English, the term nonnative speakers (NNS) is used as an alternative to ESL to refer to those who use it in a multi-cultural community.

Though not central to this study, a 'native speaker' or first language speaker (L1) of English is defined as one who has naturally/unconsciously acquired the language

during Lenneberg's (1967) "critical period" between two and the age of puberty, a period when it is thought language is acquired quickly and effortlessly. In this study a native or L1 speaker of English is also defined as more or less an accomplished or proficient user of the language, regardless of the country of origin.

A crucial term that needs to be defined, because this study falls within its ambit, is English for Academic Purposes (EAP) or English for Academic Development (EAD). I use EAP as defined by Flowerdew & Peacock (2001: 8) and Jordan (1997: 1) who suggest that it is "teaching English with the aim of facilitating learners' study or research". Hyland & Hamp-Lyons (2002: 2) argue: "EAP has emerged from out of the broader field of English for Specific Purposes (ESP), a theoretically and pedagogically eclectic parent, but one committed to tailoring instruction to specific rather than general purposes".

In this study, English for Academic Development (EAD) is regarded as an outgrowth of EAP. I use EAD not only to refer to the English required for academic development but also to mean the fostering of cognitive academic language skills in the area of specialization. The philosophy underpinning EAD is that it is not enough for the student to be able to articulate him/her-self in social situations, but to be able to participate effectively in academic discourses that require effective language skills, such as summarizing.

In South Africa, the concept of Academic Development has grown out of an earlier endeavour, termed "Academic Support", which was originally intended to provide support to a small number of black students who had managed to gain admission to English-speaking historically white universities. The earliest Academic Support

initiatives in the 1980s located the phenomenon of “under-preparedness” or “disadvantage” (Volbricht, 2003; Boughey, 2003) in factors inherent to the individual students, such as “proficiency” in English or a lack of “conceptual knowledge” or “study skills”. The historically white universities then addressed these “problems” through additional tutorials or special courses.

Currently, there is a “neo-classical” (Tollefson, 1991) view of the construct of “under-preparedness” or “disadvantage”, which suggests that under-preparedness is not a phenomenon peculiar to specific races or language groups but is a problem affecting the majority of students who make their first move to university. To address the problems faced by students when they go to university, Kraak (1999, 2001) argues that the aim of academic development should not be to change the curriculum in unchanged institutions but to transform the institutions systematically so that they can reflect the aspirations of the changed demography of the student population (Ndebele, 1993 is also very vocal on this point). One way in which universities can do this is to provide additional support by socializing students into a new learning ‘culture’, which focuses more on students’ orientation to constructivist education, i.e. one that fosters interpretation of learning tasks and critical reflexivity than emphasizing knowledge as a conduit of surface learning and performance (Street, 2004).

The idea, then, is that many students, irrespective of their cultural backgrounds, carry to university inadequate academic language skills, more especially ESL students who need English not only for learning purposes but also for their academic development. In Southern Africa the problem is accentuated by the effects of globalization, which focus on the need for “high skills” in a world whose epicentre

revolves around Anglo-American norms. This means that EAD instruction needs to be grounded not only in an understanding of the cognitive, meta-cognitive and linguistic demands of specific academic disciplines but also on the need to develop high level English proficiencies that enable the learner to communicate effectively. This compels ESL practitioners to prepare learners beyond the narrow confines of English for specific purposes to developing new kinds of literacy, which equip students with the communicative skills that enable them to participate more effectively in academic discourse.

1.8 Need for research in summarizing strategies

With the encroachment of the concept of strategy into so many areas of English as a second language, there are many opportunities for research in particular areas that enhance learning at university. Consequently, a study of the summarizing strategies used by ESL first year science students at the University of Botswana is part of the quest for a deeper understanding of the conscious steps taken by ESL students when processing information. The need for research on summarization is particularly necessary so that we can fill the knowledge gap that was left after abandoning research on summarizing in the last decade of the twentieth century. Research on summarizing lost vitality before we had an opportunity to develop a coherent theory of how strategies work with summarization, how they are selected, invented, and discarded in favour of better ones, how they relate to enlarging the individual's linguistic repertoire, and how they relate to what the ESL learner can do when required to accomplish a language task.

Further, there are a host of issues that arise in each of the skill areas that need exploring: the relationship to proficiency, the generality of strategies across skill areas,

the utilization of different kinds of strategies by different learners, and whether there are marked differences between skilled and unskilled L2 learners in terms of their preferred strategy repertoire. The most compelling factor is that while there are many studies on reading and writing, there is little information on the tapestry of strategies preferred for information processing by ESL learners or NNS at university level. Such information is necessary in order to inform us about the ways in which these learners orchestrate their cognitive and meta-cognitive skills in order to tackle a learning task.

More specifically, there is a need to flesh out the concept of the “under prepared” and “adept” ESL University students in so far as they are able to maximize self-access in language learning. We need to answer basic questions such as whether proficient learners have a better set of strategies than less proficient ones or have greater flexibility in applying and discarding strategies according to whether they work for them, or have a strong monitoring sense, giving the skilled learners a head start in selecting strategies that facilitate effective information processing. Exactly how a skilled ESL information processor corresponds with an autonomous learner needs investigation. And, above all, we need to traverse some of the still uncharted terrain of EAD learning that will enrich our understanding of the manner in which ESL students in our universities grapple with their learning.

1.9 Organization of the thesis

The thesis is organized in nine chapters. The first chapter defines the research problem, explains the purpose of the study, posits the research questions and defines the operational terms. The second chapter reviews the literature by tracing the development of the field, the gaps that still exist and how the study fits into current research

paradigms. The literature review focuses on three major areas: language learning strategies, critical issues on reading and summarizing strategies. The third chapter describes the research methods that were used to collect data. The chapter explains the multiple data collection methods that were used for this study.

Chapters four to eight report on the findings of the study. The fourth chapter deals with survey results, mostly the data that were yielded through the use of a questionnaire. The three aspects it reports are: information processing strategies, summary production strategies and self-assessment strategies. The fifth chapter describes both the quantitative and qualitative results of the study. It focuses on the production strategies used by the students in summarizing the text (which concerned the technologies likely to control climate changes and meet the world's energy needs, as well as pointing out their limitations). The sixth chapter examines the qualitative use of cognitive and meta-cognitive strategies by the students, the seventh analyzes the strategies used by nine purposively selected students and the eighth discusses the strategies the nine students reported they used in an interview. The ninth chapter concludes the thesis by discussing the implications of the study, its limitations and the recommendations that arise from the study.

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this literature review my objective is to examine the central ideas, works and research studies on language learning strategies (LLS), reading and summarization. The aim is to show how the field has grown, the gaps that still exist and how this study is situated within the broader framework of L2 learning strategies. The literature review is organized into three parts: the first reviews the literature on “learning strategies”, “learner strategies”, “communication strategies” and “language learning strategies”. Here, the aim is to show the extent to which these concepts are interrelated, how the field has developed and how the ideas feed into the present study. The next stage of the literature review discusses some of the theoretical frameworks and key studies on reading strategies. Here, the objective is to examine the major ideas on reading that have shaped the state of the art, their significance, and how the present study fits into current research paradigms. The literature review on reading is particularly important because it is relevant to summarization, the process of which presupposes that expert readers notice features and meaningful patterns of information that are usually not noticed by novices; and unlike the latter, the former can see the relationship of ideas in a text (Bransford, Brown, & Cocking, 1999, p. xiii).

The third and last phase of the literature review focuses on summarizing strategies, especially cognitive and meta-cognitive strategies that are employed by L2 learners for the retrieval and evaluation of information. The literature review on summarization considers the contribution of cognitive psychology, especially schema theory, to academic literacy in which the ability to select the salient points provides, in a

broad sense, insights into the students' comprehension abilities. The ability to understand textual material indicates whether they are able to distil the main points, focus on the viewpoint of the author, whether they can reconstruct the super-ordinate ideas, and whether they can avoid subjectivity and distortion. These skills are critical for the successful navigation of learning at college and university.

2.2 Origin of Language Learning Strategies (LLS)

Over the last few decades, there has been a gradual but significant shift in the field of education, resulting in less emphasis on teachers and teaching and a greater stress on learners and learning. This change has also influenced our instructional focus on language education, with Nunan (1995, 1996) talking about “the learner-centered curriculum” and Tutor (1996) using the term “learner-centeredness” to reflect this new focus on the learner.

The realization that the responsibility for learning lies with the learners themselves has coincided with the popularization of communicative language teaching (CLT) methodology, which emphasizes more the strategic “use” of a language than its “usage”. In this approach, fluency is emphasized, but what is not, as much, is accuracy. Here, the dichotomy is clear: our major pre-occupation in L2 learning and teaching is to encourage individual learners to use the target language naturally and to make use of their repertoire of LLS so that they can negotiate more meaningful messages and be able to achieve their communicative goals. This approach shifts the responsibility for learning from the teacher to the learner, with the former mostly acting as a facilitator. Respected researchers in second language learning, such as O'Malley & Chamot (1990) and Oxford (1990) have noted that if L2 learners are to become autonomous, they need to be helped

to orchestrate their LLS, which will help them gain confidence in independently solving language problems in various learning situations. This will, in turn, help them maximize their *input*, a necessary condition for second language learning.

2.3 Characteristics of LLS

2.3.1 Learning Strategies

One of the problems associated with language learning strategies is that they overlap with other conceptually related strategies, such as “learning strategies”, “learner strategies” and “communication strategies”, which makes them somewhat indistinguishable. However, there are basic characteristics that define each one of them. Early literature, especially outside the L2 field (Dansereau, 1985; Weinstein, Goetz and Alexander, 1988; Weinstein & Mayer, 1986; Tarone, 1983) suggests that “learning strategies” (LS) are behaviours and thoughts that a learner engages in during learning and are intended to influence the learner’s encoding process. Recently, Fuchs, Fuchs, Mathes and Simmons (1997) have notably focused on ‘peer-assisted learning strategies’, and judging by the nature of these previous studies, LS are involved in all forms of learning, regardless of the content and context. They apply to the learning of all subjects, such as mathematics, science, history, languages and other subjects both in classroom settings and informal environments. Lessard-Clouston (1997:2) refers to them as “natural, habitual, and preferred way(s) of absorbing, processing and retaining new information and skills”. From the existing literature, it is clear that learning strategies are not only general but also do not reveal the specific language techniques L2 learners use for solving a problem or for processing information, which this study attempts to do.

2.3.2 Learner Strategies

A shift from an emphasis on the teacher to the learner has also meant that research in applied linguistics now increasingly spotlights “learner strategies” as opposed to the narrower and passive conception of “learning strategies”. Cohen (1998) suggests that this paradigmatic shift emphasizes learners’ active participation in the learning process, such as being a problem solver and reflective organizer of knowledge and skills required for effective use. McDonough (1995) states that learner strategies are particularly important for enabling us to observe the cognitive and meta-cognitive mechanisms employed by L2 learners when listening, reading, talking and writing. He further notes that they can be used to inform pedagogy, to explain language acquisition and to explain individual differences in the rate and route of learning.

While learner strategies enable us to study the styles used by individual L2 learners, to isolate and describe the styles for second language learning, and to see the compensatory strategies L2 learners use when they are faced with a communication problem, they neither inform us about the information processing techniques the learners use for solving language problems nor do they apply to a specific learning context. Like learning strategies, they can be applied to a wide range of learning situations, many of which are outside of applied linguistics. Learner strategies, therefore, do not correlate closely with summarizing strategies, as they are conscious plans used by L2 learners (and native speakers as well) when they are faced with a production problem, whereas summarization mostly requires the use of cognitive and meta-cognitive skills in order to process information.

As part of an out-growth of Learner Strategies, Language Learning Strategies (LLS) also began to attract the attention of applied linguists because they are used by ESL and EFL learners for learning the target language. Oxford (1990a: 1) views them as “...especially important for language learning because they are tools for active, self-directed involvement, which is essential for developing communicative competence”. In addition to developing the students’ communicative competence, they help learners become better language learners, as suggested by Graham (1997) and O’Malley and Chamot (1990).

Oxford (1990b: 71) in her detailed taxonomy, suggests there are different, yet often interrelated, LLS. She distinguishes between *direct LLS*, which “directly involve the subject matter”, and *indirect LLS*, which “do not directly involve the subject, but are essential to language learning nonetheless”. She subdivides direct LLS into three categories: the first sub-category is *memory* strategies that help in entering information into the long-term memory and retrieving information when needed for communication. The second sub-category is *internal mental* models used for forming, revising, receiving and producing messages in the target language. The third sub-category is *compensation strategies* that are employed to overcome any gaps in the knowledge of the target language. Oxford (1990b) further notes that indirect LLS are of three types. The first are meta-cognitive strategies that help learners to exercise executive control through planning, arranging, focusing, and evaluating their own learning. The second type are affective strategies that enable learners to control feelings, motivations, and attitudes related to language learning, and the third are social strategies that facilitate interaction with others in a discourse situation.

As can be seen from Oxford's (1990b) characterization, LLS form the basis of this study, which tries to discover the direct and indirect strategies (O'Mally & Chamot (1990) prefer to call them cognitive and meta-cognitive strategies respectively) that L2 learners prefer to use when summarizing a text. Another point to note is that Oxford's (1990b) taxonomy forms the nucleus of my strategy classification system (See Appendixes 5, 6 & 7), except that affective and social strategies are excluded because they contain extraneous variables that cannot be controlled in a summary. As has been pointed out already, the snag with these strategies is that they overlap and are therefore difficult to identify in isolation from the other.

2.3.3 Communication Strategies (CS)

Canale and Swain's (1980: 25) influential article recognized the importance of communicative competence in L2/FL teaching. They defined communicative competence as "how to cope in an authentic communicative situation and how to keep the communicative channel open". Canale and Swain's (1980) use of phrases such as 'how to cope' and 'how to keep the communication channel open' suggests that communication strategies are intentional, conscious and problem-oriented. That is to say, the learner employs them because s/he cannot gain access to the linguistic resources required to express an intended meaning. Ellis (1987: 182) defines them as "psycholinguistic plans, which exist as part of the language user's communicative competence. They are conscious plans which serve as substitutes for production plans which the learner is unable to implement".

Chimbganda (2000) suggests that communication strategies are compensatory or substitutive in nature and are concerned with risk-taking and risk avoidance. They may

be L1-based strategies (translating or code-switching), L2-based (paraphrasing and restructuring) and may be retrieval in nature, such as semantic simplification. More renowned researchers (Bialystok, 1990; Kasper & Kellerman, 1997; Paribakht, 1985; Sionis, 1995; Si Qing, 1990) have confirmed the psycholinguistic nature of CS and their use as a means of coping with difficulties in communicating in the second or foreign language. In terms of this study, communication strategies (CS) are considered as one type of LLS. They are relevant to this study because they are the tools that are readily available to an L2 learner when faced with a communication problem. They are also important for designing a classification system for analyzing summarizing products (see Appendices 5 & 6). However, the problem with them is that they are mostly applicable to speaking, and cannot easily be mapped into tight conceptual typologies because they occur in the speaker's mind, to which a researcher has no access.

2.4 Research into LLS

Researchers in several disparate fields of LLS make a strong claim that these strategies are fundamentally the building blocks of academic literacy. Much of the research on the actions, behaviors, steps or techniques taken by L2 learners in order to accomplish a task has been conducted by Oxford, either on her own or in collaboration with others (Oxford & Cohen, 2002, 1992; Oxford, 1999, 1996, 1990; Oxford & Leaver, 1996; Oxford & Ehrman, 1995). Of particular significance is Oxford's (1990, 1999) system of classification, which is so far the most comprehensive on strategies for language learning, the Strategy Inventory for Language Learning (SILL), which has three classes of 'direct' strategies (Memory, Cognitive and Compensation strategies) and three

classes of 'indirect' strategies (Meta-cognitive, Affective and Social). Most researchers of LLS have used this classification system in one way or the other.

Other notable studies on language learning strategies have been conducted by Bialystok (1990); Chamot, et al. (1999, 1996); Cohen (1998, 1990); Ellis (1994); McDonough (1995); Nunan (1996). The general focus of these studies has been to try to arrive at a workable classification system that can be used to classify the strategies that learners use. On this aspect, there have been sharp differences and in some cases conflicts, regarding the definition and classification of L2 strategies. For instance, a comparison of Rubin's (1981) and Oxford's (1990) classification on the one hand and O'Malley & Chamot's (1990) and Oxford's (1990) classification on the other shows that although there is agreement regarding the classification of some of the strategies, there are equally major differences, such as the classification of 'direct' and 'indirect' strategies. In this study, the classification that I use is eclectic: it is a synthesis of various earlier classifications (e.g. O'Malley & Chamot, 1990; Oxford, 1990; Phakiti, 2003) that are designed to suit the present study.

Another problem relating to some of the major studies in LLS is that to date they have been conducted mainly in language learning settings in the United States, focusing either on native speakers of English learning a foreign language (FL), or on groups of mixed nationalities studying English as a second language (ESL) with specific learning goals. Defining high- or low-proficiency learners based on these results has been noted for being ethnocentrically biased, with some researchers (Oxford & Bury-Stock, 1995; Rees-Miller, 1993) calling for a replication of language learning studies among bi- or multilingual speakers, which this study does.

2.4.1 Proficiency

More recently, some researchers have underscored the significant relationship between L2 learning strategies and language proficiency (e.g. Bedell & Oxford, 1996; Chamot et al., 1999; Cohen, 1998; Dreyer & Oxford, 1996; Hsiao & Oxford, 2002). The basic question that these studies have tried to answer is whether a skilled learner has a better set of strategies, or greater flexibility in applying and discarding strategies according to whether they work for him/her, than an unskilled learner. Hardly surprising, the literature suggests that, generally speaking, more successful learners are able to use more LLS effectively than less successful ones. But the results are by no means conclusive, because of such factors as the nature of the task, the unique situation of the subjects in each study, the scoring procedures, the reader's expectations and the cultural background of the participants (Hamp-Lyons, 1991; Bedel & Oxford, 1996). The results of this study reported in Chapters four to eight are also affected by these factors.

2.4.2 Stage of Learning

One of the critical questions about the use of LLS is whether learners at various academic levels use different strategies. Available literature on this aspect suggests that strategies used at the early stages of L2 development may be somewhat different from those used when the learners are more proficient, with more frequent and more effective strategies employed by 'advanced' learners. It is also suggested that more effective L2 learners intentionally and systematically select and combine strategies relevant to the language task at hand and to their own learning style preferences (Cohen, 1998; Ehrman & Oxford 1990, 1995; Wharton, 2000). Ertmer & Newby (1996) further suggest that

expert learners are more aware than novices of when they need to check for errors, why they fail to comprehend, and how they need to redirect their efforts.

In contrast, less-skilled L2 learners appear to use various strategies in a seemingly desperate and random way, and do not pay sufficient attention to the relevance of a strategy to the task at hand. They do not stop to evaluate their comprehension of the material, and generally do not examine the quality of their work or stop to make revisions as they go along. They seem to be satisfied with superficial engagement without attempting to examine a problem in depth, and fail to make connections or to see the relevance of the material they are reading (Abraham, & Vann, 1987; Vann & Abraham, 1990).

However, while this may be true in general, it does not necessarily mean that all learners become more effective strategy users as their L2 proficiency increases, and neither has it been proved that less successful learners just use any strategy in a 'desperate' and 'random' manner. In any case, these may be the 'compensatory' mechanisms (Ellis, 1987: 184) that the less-skilled learners adopt in order to solve a learning problem. From the literature available (Pressley & McCormick, 1995), it is clear that there are many other factors that bring about variability in the use of strategies, such as attitude, individual language aptitude, motivation, and how the learners have internalized the L2 for educational, social, economic and political discourse.

The claim that advanced learners tend to use a wide range of strategies, and that they are more willing to perform a language task with little or no assistance may also be because successful learners progress to advanced-level courses, with weaker ones simply dropping out. Similarly, we need to be cautious about what we call 'advanced' learners

because with the introduction of mass education, many mediocre learners are now finding it easier to enroll at colleges and universities, which means that there may be many more technically ‘advanced’ students whose LLS are not yet advanced. This is one of the aspects that this study attempts to investigate.

2.4.3 Language Learning Styles

Research suggests that the learning style that an L2 learner uses determines quite considerably the strategies the learner employs (Dirksen, 1990, Ehrman & Oxford, 1990; Oxford & Nyikos, 1989). It has also been reported that students from different cultural and language backgrounds prefer to use particular strategies (Green & Oxford, 1995; Wharton, 2000). The few studies that have been conducted on the learning styles that different ethnic groups prefer, suggest that Orientals prefer to use authority-oriented styles, such as the lecture method, instead of interactive styles of group or individualized learning that are usually preferred by skilled learners. My empirical observation of students at the University of Botswana where I teach English for Academic Development (EAD) to bi- and multi-lingual students, suggests that students at this university also seem to prefer an authority-oriented style instead of independent and analytical styles. Those who prefer an authority-oriented style usually require more guidance in summarizing a text. The point to note about language learning styles is that little is known so far about the strategies that bi- and multi-lingual learners in an African context use for information processing.

2.4.4 Motivation

Although differences exist regarding what constitutes motivation (Crookes & Schmidt, 1991), most studies investigating the effect of motivation have found a

relatively strong correlation between motivation and language learning success, with many finding motivation to be the most significant predictor of achievement (Oxford, Park-Oh, Ito, & Sumrall, 1993). Motivation has also been found to affect the use of LLS, with highly motivated students generally employing strategies more frequently than less motivated students. While it may be true that highly motivated students tend to use strategies more often than less motivated students, it defies logic to assume that all motivated students frequently use strategies and that all of them use strategies efficiently.

2.4.5 Cultural Background

Some research findings (Huang & Van Naerssen, 1987; Politzer, & McGroarty, 1985; Politzer 1983; Tyacke & Mendelsoh, 1986) indicate that Asians prefer strategies involving rote memorization and a focus on the linguistic code. These studies also suggest that Asians are more reluctant than Hispanics to try new learning techniques and do not respond well to strategy training. Such differences have led Politzer and McGroarty (1985) to question the assumptions of “good” language learning strategies that are ethnocentrically based.

The observation that Asians prefer old strategies does not only indicate the stereotypical and limited nature of the research, but also provokes further questions. The first is whether the conclusions can be considered valid and reliable, considering the fact that one is dealing with Asians who are quite diverse and that results depend on the extent to which a researcher interprets the findings of a given measuring instrument. The second question is whether a replication of the studies on ESL science students at an African university, where they are “instrumentally motivated” (Sionis, 1995) to study English for graduation purposes, would yield similar or different results.

Previous studies (Chamot, et al, 1987; Oxford, 1990a) have shown that the choice of strategies is influenced by the degree of cognateness between the learner's native language and the target language. This then raises the third question: would Bantu languages that have no common roots with English promote or hinder information processing, when the students have been studying through the medium of English for at least ten years and are exposed daily to television and other print media written in English? This study attempts to shed light on some of these questions.

2.4.6 Gender

Recently, researchers have investigated how male and female learners differ in their strategy use (e.g., Bacon, 1992; Bugel & Buunk, 1996; Chavez 2001; Young & Oxford, 1997). Generally these studies have indicated sex differences in the use of LLS, with females tending to use more strategies than males (Green & Oxford, 1995). From his studies, Sy (1994) concluded that female EFL students in China showed greater use of cognitive, meta-cognitive and affective strategies. In another Asian study, Hashim and Sahil (1994) found that Malaysian females (of Chinese, Malay, and Indian ethnic backgrounds) favoured affective strategies more than males; but there were no significant differences in other strategy categories. Phakiti's (2003) study of gender and strategy use in L2 reading of Thai university students, on the other hand, found no difference between females and males in their use of cognitive strategies; but found that males significantly used more meta-cognitive strategies than females.

The purpose of understanding the ways in which females and males orchestrate their strategies is to construct a rigorous theory that informs classroom practice. As Chavez (2001) points out, we need to be aware of how gender can affect development

and achievement in L2 learning, how teachers can use this awareness to help students of either gender to achieve maximum gains in LLS, and how we can accommodate individual students' needs, given the fact that females and males deserve an equal opportunity.

While these studies on the strategies preferred by different genders are important (as enunciated by Chavez, 2001), Phakiti's (2003) research, which found no differences between males and females in their use of cognitive strategies, does not support the widely held assumption that women use a wider repertoire of strategies. In my view, what this confirms is that we are still far from having a full picture of the strategies preferred by different sexes and races. As is evident from the range of studies cited above, there is need to replicate some of the studies in Africa where cultural norms are different from those of Asians or Westerners.

2.4.7 Teaching of LLS

Current research suggests that in certain circumstances, particularly when incorporated into the teacher's normal classroom behaviour, language learning strategies (LLS), including summarizing, can be successfully taught to L2 learners (Chamot et al., 1999; Cohen, 1998; Feyten, Flaitz, & LaRocca, 1999). These studies have shown that instruction is most successful when it is tied to the language tasks that students are normally expected to accomplish and when strategies are explicitly taught. However, whether the teaching of LLS promotes ESL learning or whether they are desirable or universally successful still remains unproven.

2.5 Reading

The explosion of research in second language reading has begun to focus on readers' strategies. Reading strategies are of interest for what they reveal about the way readers interact with written text and how strategies are related to text comprehension. The use of strategies in reading is also important because they indicate how readers conceive of a task, how they make sense of what they read, and what they do when they do not understand. In short, learners use reading strategies because they want to enhance their reading comprehension and overcome comprehension failures.

Early research, particularly in the seventies and eighties, concentrated on how to teach L2 learners to use a variety of strategies in order to read better. These strategies mostly consisted of skimming, scanning, contextual guessing, reading for meaning, utilizing background knowledge, recognizing text structure, grouping, semantic mapping, word association, inferring, guessing and so forth. Less common, however, have been empirical investigations into reading strategies used by successful and less-successful second language learners. Furthermore, while many of the previous studies (e.g., Alderson 1984; Baker & Brown, 1984; Brown, 1981; Hosenfield, 1976) have employed think-aloud techniques to obtain information about learners' reading strategies, few of these studies have examined the meta-cognitive awareness of readers. Particularly absent from early research in reading are theories upon which existing reading strategies could be based.

Current literature on reading now suggests that any robust understanding of a text depends on the development of a variety of reading strategies, and that reading is a multivariate skill involving a complex integration of cognitive, linguistic, and non-

linguistic skills ranging from very basic low-level processing strategies involved in understanding visual configurations, to high level skills of syntax, semantics, and discourse, and to still higher-order skills of text interpretation and integration of ideas with the reader's global knowledge.

To this effect, there has been ongoing debate for the last two decades as to the relative importance of each of these processing levels in L2 reading comprehension. Some researchers have argued for the primacy of higher-level syntactic, semantic and text integration skills, minimizing the role of basic lower-level processes (e.g. word recognition) in fluent reading and comprehension (Goodman, 1988, 1996; Smith, 1971, 1994). Other researchers (and I agree with this group, based on my observation of the reading habits of many L2 speakers at the University of Botswana) have argued for the importance of lower-level textual and word recognition processes in addition to higher processes even in skilled readers (e.g. Bell & Perfetti, 1994; Carr, Brown, Vavrus, & Evans, 1990; Cunningham, Stanovich, & Wilson, 1990; Daneman, 1996; Nassaji, 2003; Stanovich, 1991, 1993, 2000). Given these competing views on reading, I would like to discuss the literature relating to each one of them, so that one can gain insight into the processes that are involved in effective reading and comprehension for both unskilled and skilled readers.

2.5.1 Psycholinguistic views of reading

The traditional belief derived from Gestalt psychology is that readers first decode words, combining their meanings to form phrases, then sentences, and finally constructing the meaning of the whole text in a linear manner (Gough, 1972). In this view, the major role is attributed to lower-level textual components, with little

importance given to higher-level comprehension processes. Psycholinguistic views, in contrast, emphasize higher-level contextual and background knowledge, downplaying the contribution to reading of basic lower-level visual word recognition processes. Goodman (1973: 26) maintains: “readers are able to use syntactic and semantic cues to such a considerable extent that they need only minimal graphic cues in many cases”.

The above ideas have been supported by psycholinguistic views of L2 reading research that suggest background knowledge and expertise in a given subject contribute considerably to the understanding of a text, enabling richer analyses and textual interpretation (e.g., Bernhardt, 1991; Ellis, 2001; Graesser, Singer, & Trabasso, 1994; Kintsch, 1998; Lee, 1997; Nassaji, 2002, Robinson, 1995, 2003). A prevailing view of the mechanism to account for how background knowledge facilitates comprehension and memory is based on connectionist principles that suggest a reader constructs a text-base primarily via bottom-up processing, or decoding of the text. The text-base contains the macro-propositional meaning, i.e. the main theme, which then “becomes integrated into the reader’s global knowledge, forming a coherent mental representation of what the text is about” (Nassaji, 2002: 435).

However, certain difficulties arise from the assumptions about the role of background knowledge in comprehension. First of all, the idea that the reader’s knowledge base has a preexisting format (the knowledge a reader already has) provides a very static view of the role of knowledge, which is at variance with the idea that human knowledge is dynamic. To assume that there is an already existing schematic knowledge built up as a result of one’s experience of the world suggests that the human mind is like a machine containing knowledge in a certain form that can be accessed whenever needed.

This storage conception of the role of the mind is apparently limited in its explanation of many areas of human learning, which involve productivity and creativity of knowledge (Bereiter & Scardamalia, 1996; Case, 1996).

A second difficulty involves a bias towards the activation and use of knowledge rather than its construction in comprehension. The bulk of existing literature emphasizes activating and using rather than creating schemata. What this means is that if readers do not have the appropriate schemata (or if they do have them but do not activate them), comprehension will simply fail (Carrell, 1984; Lee, 1997). Such a view is difficult to support because, if we assume that in order to understand a text, a reader must activate already existing knowledge, can readers read before activating preexisting knowledge? Here, the implication is that a reader cannot proceed before using the already existing knowledge, which is unlikely to be the case.

A third issue concerns the role that background knowledge plays in processing a text, which suggests that it is one of the main factors through which information is sieved. Current research in reading comprehension (e.g. Kintsch, 1998) disputes the critical role played by prior knowledge. The top-down view of the role of knowledge, i.e. that one needs prior knowledge, has lost much of its previous theoretical appeal in L2 reading. A growing body of L2 research now exists to document the critical role of lower-level (bottom-up) processes such as word recognition in L2 reading comprehension (e.g., Haynes & Carr, 1990; Horiba, 1996; Koda, 1992, 1998, 1999; Nassaji & Geva, 1999; Segalowitz, Segalowitz, & Wood, 1998).

2.5.2 Schema Theory in ESL Text Comprehension

Nearly all studies in reading, text comprehension, summarization, cognition and meta-cognition derive their theoretical foundation, in one way or another, from schema theory, which is based on the belief that “every act of comprehension involves one’s knowledge of the world as well” (Anderson et al. in Carrell & Eisterhold 1983: 73). The theory suggests that readers develop a coherent interpretation of text through the interactive process of “combining textual information a reader brings to a text” (Widdowson in Grabe 1988: 56). The readers’ mental “stores” are termed ‘schemata’ (Cook 1997: 86) and are divided into two main types: ‘content schemata’ (background knowledge of the world) and ‘formal schemata’ (background knowledge of rhetorical structure).

Schema theory was first developed by Kintsch and Van Dijk (1978) in order to explain discourse comprehension and production. The theory assumes that the surface structure of discourse is interpreted as a set of propositions, with some of the propositions present in the surface structure and others being inferred. Inferring is done on the basis of prior knowledge, which is stored in long-term memory. According to the theory, the propositions thus formed, called micro-propositions, are processed by a working memory to establish coherence with the propositions already stored in short-term memory. Short-term memory acts as a buffer, while working memory searches for incoming propositions and those already in short term memory. The micro-propositions that are accepted and stored constitute the microstructures, which are processed into macro-structures through the application of macro-rules. The importance of this theory is that the reader’s macro-rules enable him/her to ‘delete’ unnecessary information, to ‘generalize’ propositions and

to ‘construct’ global ideas of which micro-propositions are part of the normal constituents.

2.5.3 Application of Schema Theory to ESL Reading

When applied to the process of text reading, Hudson (1982: 187) claims: “comprehension of a message entails drawing information from both the message and the internal schemata until sets are reconciled as a single schema or message”. Wallace (1992: 330) further claims: “the first part of a text activates a schema...which is either confirmed or disconfirmed by what follows”. Swales (1990: 88) maintains that schemata are culturally determined: “the environment sets up powerful expectations: we are already prepared for certain genres but not for others....” Swales (1990: 89), further says that any meaningful reading involves an identification of the genre, formal structure and topic, all of which activate schemata and allow readers to comprehend the text. In this, it is assumed that readers not only possess all the relevant schemata, but also activate them. Where the schemata are not activated, then some disruption of comprehension may occur. In fact, it is likely that “there may never be a total coincidence of schemas between writer and reader” (Wallace 1992: 28); which means that a reader may not always understand a text written by another person.

2.5.4 Schemata and EL Instructional Strategies in Reading

Several instructional strategies logically follow from schema theory. The most important implication of schema theory is the role of prior knowledge in information processing. In order for learners to be able to process information effectively, their existing schemata in relation to the new content need to be activated. The learners’ meta-cognitive strategies, such as reading the title of the text, looking at visuals in the text, and

making predictions based on the title, need to be activated. In order to draw attention to the learners' existing schemata and in order to help them make connections between existing schemata and the new information, Armbruster (1996) encourages the use of analogies and comparisons.

Another strategy emanating from the schema theory that can be used for ESL teaching is fostering the building of appropriate functional problem-solving schema (Price and Driscoll, 1997). Here, appropriate problem-solving schemata can be built by using realistic, familiar scenarios rather than more conventional abstract contexts. Also, instruction can maximize the provision of learner feedback in the form of numerous fully explained examples that explicitly guide learners in building their own schemata. An important implication of schema theory is the recognition of the role that culture and experience play in an individual's knowledge. ESL teachers must therefore pay attention to the cultural references in the material they present to students and should try to avoid texts that undermine the cultural values of the readers. Also, schema theory has implications for designing textbooks, and by extension designing other instructional materials. To facilitate learning, the materials should be organized according to the heuristic principle: from the known to the unknown that builds up from "resident schemata" to "absent schemata" (Scott, 2005: 4).

2.5.5 Problems with Schema Theory

Despite the current popularity of schema theory, there may be limits to its application concerning ESL reading and comprehension. The most obvious, which I have already mentioned under section 2.5.4 above, is that a content schema may fail to exist for a reader if it is not within the range of the reader's cultural experience. The reader's

culture can affect everything from the way one views reading, to understanding individual concepts. Reading problems are not just caused by schema deficiencies, the “relevant schema must be activated” (Carrell 1988: 105). In other words, readers may read a text with prior knowledge but their schemata may not necessarily be activated while reading. So, pre-reading must accomplish both goals: build new background knowledge as well as activate existing background knowledge.

Another problem related to the applicability of the theory is that ESL readers need “a massive receptive vocabulary that can be rapidly, accurately and automatically accessed” (Grabe, 1988: 63), if they are going to understand the text fully. Bamford and Day (1997: 47) state: “until students read in quantity, they will not become fluent readers”. To overcome this problem, students need to read extensively so that they can gain not only automatic word and phrase recognition but also become fluent readers. Also, pre-teaching vocabulary and background knowledge concurrently for the intended passage for summarization can considerably improve the students’ chances of understanding the text.

In addition, the theory appears not to work for learners reading at the limits of their linguistic abilities: “if the topic... is outside their experience or base of knowledge, they are adrift on an unknown sea” (Aebersold & Field, 1997: 41). When faced with unfamiliar topics, some students may overcompensate for absent schemata by reading in a slow, text-bound manner; others may do wild guessing (Carrell, 1988). Both strategies inevitably result in comprehension difficulties. Earlier research by Carrell & Eisterhold (1988) suggests that a text on a familiar topic is better recalled than a similar text on an unfamiliar topic. Swales (1990: 87) believes that this and other research “supports the

common sense expectancies that when content and form are familiar the texts will be relatively accessible". The relevance of the information on the limitations of schema theory to this study is that one needs to know the extent to which the theory can be applied to text processing, such as why some students fail to comprehend a text despite the fact that they may have some background knowledge about the subject matter.

2.5.6 Cognitive and Meta-cognitive Strategies in Reading

2.5.6.1 Cognitive Strategies

The use of cognition (mental processes engendered by learners in performing a task) and meta-cognition (self-assessment of one's progress) in reading has increasingly been recognized as a crucial factor for efficient information processing. Available literature shows that cognition and meta-cognition are closely interrelated, and any discussion of one of them is bound to overlap with the other. However, for purposes of this literature review, I will discuss them separately but will show how they complement each other.

In the last decade, there has been a surge of interest in cognitive strategies and how they apply to L2 learning. Current research is increasingly paying attention to the role of cognition in reading (e.g., Green & Oxford, 1995; Najar, 1998; Oxford, 1996). Contemporary research (Gagne et al., 1993) has yielded two particularly important findings concerning students' reading and comprehension. The first is that students must be strategic in their use of cognitive strategies in order to build connections between new knowledge and prior knowledge. The second is that students must utilize meta-cognitive knowledge in order to control their thinking. The first aspect of mental activities

(cognitive strategies) means that learners use them to acquire, retain, and retrieve different kinds of knowledge and performance. Cognitive strategies may also include such activities as acquiring, selecting and organizing information, rehearsing material to be learned, relating new material to information in the existing memory, and retrieving different kinds of knowledge.

In addition, cognitive psychologists have identified three types of knowledge: declarative, procedural and conditional. Declarative knowledge refers to the aspect of “knowing that” and implies the awareness of information. Procedural knowledge refers to the aspect of “knowing how” and relates to the information about procedures, rules, and principles. Conditional knowledge refers to the aspect of “knowing when to apply knowledge and why” (Gagne, et al., 1993). As can be seen from this characterization, cognitive strategies may be referred to as declarative and procedural knowledge, which help assimilate information into the long-term memory. On the other hand, meta-cognitive strategies refer to conditional knowledge, which operates the ‘executive control’ on the use of cognitive strategies. In other words, meta-cognitive strategies are the conscious steps taken by learners to monitor the progress of their learning.

Current research in cognitive and meta-cognitive strategies is preoccupied with trying to find a suitable classification system (Chamot, 1999; Hsiao & Oxford, 2002; Hsiao, 2001). As a result of these efforts, we now have a wide range of classification systems. But the boom in classification systems has also brought its own problems: teachers and researchers are often puzzled as to which classification system they can follow and whether certain classification systems are more representative of L2 reading, comprehension and summarizing than others. Also, research in the use of strategies has

not yet conclusively shown which strategies certain cultural groups prefer or which strategies students in different subject domains prefer. This study attempts to provide information on some of these questions, especially the strategies preferred by ESL first year science students.

2.5.6.2 Meta-cognitive Strategies

The use of meta-cognitive strategies, i.e. the steps taken by learners to monitor their progress as they learn or perform a task, and making changes and adapting their strategies if they think they are not doing so well (Winn, & Snyder, 1998), has been shown to be among the major factors explaining the differences between good and poor readers (Kinnunen & Vauras, 1995; Zhang, 1999, 2000). Researchers have consistently demonstrated that proficient readers typically execute one or more meta-cognitive behaviours as they read (Swanson & De La Paz, 1998). Poor readers, on the other hand, are not as adept as good readers in planning activities either to make cognitive progress or to monitor it and are unlikely to notice major blocks to text understanding. O'Malley & Chamot (1990: 44) define meta-cognitive strategies as "higher order executive skills that entail planning for, monitoring or evaluating the success of a learning activity". Meta-cognition includes taking conscious control of learning, planning and selecting appropriate strategies, monitoring the progress of learning, correcting errors, analyzing the effectiveness of strategies as well as changing learning behaviors when necessary.

Of late meta-cognitive strategies have received greater attention as compared to cognitive strategies, because they enable learners to become independent. The ability to learn independently leads to 'ownership', as the students realize that they can pursue their own intellectual needs by discovering a world of information previously unknown to

them. Research in the use of meta-cognitive strategies in L2 reading has underscored their usefulness (Adamson, 1990, 1992; Block, 1992; Flavell, 1992; Hsiao, 1997; Li & Munby 1996; Nassaji, 2003). Many of these studies have shown that learners who are able to orchestrate their meta-cognitive skills are able to achieve their learning tasks more successfully. Of particular significance are Li and Munby's (1996) qualitative study of graduate Chinese students in Canada, which showed that successful students consciously and actively invoked a repertoire of meta-cognitive reading strategies. They used the strategies to plan, monitor or control, evaluate and revise their comprehension while reading. The importance of this study is that not only is it situated within the important field of meta-cognition in reading, but it also provides empirical support for other studies of meta-cognitive strategies that are crucial for L2 academic reading. The other study that deserves mention, although it looked at a broader issue, is Wharton's (2000) investigation of the use of learning strategies of bilingual learners in Singapore. The study found evidence of a linear relationship between proficiency and the use of many learning strategies, with more strategy use at progressively higher self-rated proficiency levels.

Similarly, Nassaji's (2003) study of higher-level and lower-level text processing skills in advanced ESL reading comprehension at the University of Ontario, Canada, presents interesting findings. The study demonstrated that differences in the efficiency with which ESL readers process different linguistic information contribute to the discrimination between skilled and less-skilled ESL readers. He also noted that the efficiency of lower-level processing skills, such as word recognition and graphophonic processes, also distinguished skilled from less-skilled readers. Furthermore, lexical knowledge played the most crucial role in the discrimination between skilled and less-

skilled readers among the ESL readers. This finding gives credence to the idea that lower-level reading skills are not only important but are also an integral component of fluent and skilled reading.

Although the three studies I have cited above are crucially important for the information they yield on the use of meta-cognition, the transferability of the results is somewhat limited because they were conducted in totally different cultural settings. This, then, begs for a replication of a similar study in Botswana where English is considered exoglossic while at the same time it is the language of instruction at university. Similarly, Li and Munby's (1996) and Nassaji's (2003) studies that were conducted in Canada, where foreign Chinese students had been immersed in a native English culture, have a different research context. The second language situation that obtains in Canada is different from the one that exists in Botswana, where the vast majority of the students have limited contact with the target language. These peculiar factors, coupled with the fact that there is a limited body of research concerning the role of cognition and meta-cognition in summarization for ESL students in a diglossic language situation justify this study, so that we can have a more complete picture of how students in different communities and in a particular field orchestrate information processing strategies.

2.5.7 Transactional Reading

Another theory first put forth by Rosenblatt (1978), but not fully appreciated until much later (Clay, 1994), characterizes making meaning in reading as a 'transactional process' between the reader, the text, and the context. The theory places great importance on what background knowledge the reader brings to the text from her or his reservoir of past experience, knowledge and linguistic awareness (Cox & Boyd-Batstone, 1997; York,

2003). Transactional theory is similar to schema theory; but the point of departure is that it emphasizes interaction, unlike the schema theory that suggests meaning is determined by one's prior knowledge and cultural background. The transactional view contends that meaning may change depending on the reader's disposition, the interest value of the text and the total reading situation. This theory is important for promoting literacy, which emerges from the student's conscious engagement with the text.

Following the transactional theory, Vygotsky (1986) proposed that reading is a 'social interaction' activity, which is situated in a social context. Key to Vygotsky's theory is his notion of the zone of proximal development (ZPD), which can be defined as the distance between a student's actual reading development level and her or his potential development level after guidance from the teacher or a more skilled language learner (Harris & Hodges, 1995). Taken together, the transactional and psycholinguistic theories have important implications for helping L2 students who come from a diverse cultural background. In our colleges and universities, students who come from so-called disadvantaged or impoverished learning backgrounds are often mistakenly counted as deficient because their background knowledge is based on their home culture, which differs from students coming from the mainstream school culture. Lee's (2000) research shows that scaffolding (the act of providing extra support) enhances the students' linguistic capabilities and raises them to a point where they are on a par with the rest of the students.

2.5.8 Miscuing

Research based on L1 studies using miscue analysis (Brown, Goodman, & Marek, 1996) suggests we can understand how the L2 reader processes information. Miscue analysis is a procedure that compares the reader's observed responses to expected responses, and then determines if there are any similarities or differences between the errors made by the reader and what is actually in the text. In analyzing the miscues, it is usually observed that the miscues of skilled readers are semantically and syntactically appropriate, whereas the miscues of less-skilled readers do not show such signs of contextual relevance.

While miscue analysis is an attempt to understand what differentiates a skilled from a less-skilled reader, it is questionable on a number of methodological and interpretive grounds. First of all, it lacks a universally acceptable miscue classification system, and does not generally consider the level of difficulty of the passage and the effect on comprehensibility. Secondly, it is not easy to determine the exact sources of problems, such as the reader's level of understanding and the processing strategies the reader employs. Thirdly, the methodology can only apply to reading aloud during the time a researcher can observe the miscues. Moreover, the fact that readers are asked to read aloud so that the researcher can identify their miscues consistently impedes reading comprehension. Lastly, the methodology is grounded on 'contrastive analysis', which focuses on errors rather than the reader's strategic construction of knowledge and meaning.

2.5.9 Interactive Reading

This is an important theory for reading which informs this study about how ESL students process information. Current literature on L2 reading favours interactive reading, which can be defined as a process involving the combination and integration of various sources of knowledge including both lower-level and higher-level sources (Nassaji, 2002, 2003). The interactive model of reading was initially developed by Rumelhart (1977), who proposed that the information-processing system involved in reading consists of different levels of processing that work independently. While the data-driven processing level is doing visual analysis, the syntactic and semantic processing systems are operating to generate hypotheses about the interpretation of the visual information coming from visual analyses. The output of each of these processing levels is then transferred to a “central organizer” in the form of hypotheses that can be confirmed or rejected in light of the total information accumulated from all other sources in the message centre. Comprehension then results from the combination and integration of all these different sources contained in the message centre.

This view is currently shared by many cognitive psychologists, who believe that efficient lower-level processes are important components of fluent reading and that less-skilled readers are those who are deficient at processing lower-level textual information rather than at using higher-level conceptually driven data (Cunningham et al., 1990; Levy & Carr, 1990; Pollatsek, 1993; Rayner & Sereno, 1994; Rieben & Perfetti, 1991). Similar views have also been echoed in the context of L2 reading (Bernhardt, 1991; Fender, 2001; Grabe, 1991; McLaughlin, 1990; N. Segalowitz, 2000). Segalowitz et al. (1998), for example, have noted that L2 reading is a complex cognitive processing skill, which

includes the development of rules governing lower-level processing and a progressive refinement of word-level decoding operations, as well the development of processing skills for comprehension. However, the problem with interactive reading is that while it favours an integration of skills, it still speaks of 'lower' and 'higher-level' skills, a distinction that is often difficult to make because the two skills are interrelated.

2.5.10 Discourse Comprehension

Lately, there has been an attempt to describe in an explicit manner the different cognitive processes involved in text comprehension. The leading voice on discourse comprehension is Kintsch (1988, 1998), whose theory of text comprehension was developed in conjunction with research on knowledge activation in psychology, and the suggestion that the idea of schema as posited in artificial intelligence is not applicable in the context of human comprehension. Kintsch (1988: 164) contends that "prediction or expectation-based systems that use frames or scripts do not adapt easily to new concepts; pre-structured knowledge hardly ever is exactly in the form that is needed". Kintsch (1988) further argues that if schematic notions are "powerful enough, they are too inflexible, and if they are general enough, they fail in their constraining function". In essence, Kintsch (1988) doubts the function of some of the claims of schema theory, such as the role of prior knowledge to reading.

Kintsch (1988) distinguishes between two main processes: a construction process, whereby a text-base containing the main ideas of the text is constructed from the textual input, and an integration process, whereby the constructed text-base becomes integrated into the reader's global knowledge, forming a coherent mental representation of what the text is about. In Kintsch's view (1988), comprehension depends on knowledge; but the

organization of knowledge is not “pre-stored”. Rather, it emerges in the context of the task, and is relatively unstructured as opposed to the highly structured knowledge suggested by schema theory (Kintsch, 1998). This notion is now widely accepted as a model for text comprehension in L2 literature (Sadoski, 1999; Sanford & Garrod, 1998) because it is clear that knowledge emerges from the task, instead of being simply activated from pre-stored information.

The process of constructing the text-base occurs in a number of ways. First of all, text propositions corresponding to the actual semantics of the text (also called micro-propositions) are constructed directly from words and phrases in the text (see sections 7.2.1.5 & 7.2.1.6 of Chapter Seven). The propositions thus generated activate in the knowledge net-work other propositions and their associates (both relevant and irrelevant) leading to a semantic network that includes both coherent and incoherent representations. This net-work will be revised subsequently through a process of elaboration and inference. The last step involves organizing the text-base and judging the importance of the different concepts and propositions. At this stage, the propositions generated are interconnected with both their previous and subsequent propositions, representing the local meaning (“microstructure”), and the higher-level concepts, the more global relationships in the text (“macrostructure”).

Once the initial semantic net is constructed, the integration process takes over, in which the information content produced becomes integrated into the larger discourse context. The integration process is a fine-tuning process that occurs at all levels of text processing, including word, sentence, and discourse levels. These processes occur in short cycles, in each of which a new network of textual meaning is constructed,

processed, and integrated with what is retained in the working memory from the previous cycle. Here, it is important to note that all these processes are deliberate and occur through connectionist principles (selection of strategies), in which the more appropriate strategies are selected and the less appropriate ones are discarded (Kintsch, 1998). However, if the information- processing network fails, the reader may engage in compensatory strategies, such as risk-taking (Sanford & Garrord, 1998) in order to accomplish the reading task.

Following the ideas on discourse comprehension, there have been several studies on the message construction-integration paradigm in L2 reading. Because there are many studies that have been conducted on this aspect, I would like to cite only the significant ones. One of the issues that has been investigated is the impact of difficult lexical and syntactic items in a text (Haynes & Carr, 1990; Koda, 1994; Zwaan & Brown, 1996). It was found that, even among highly advanced bilingual readers, unfamiliar syntactic and lexical terms delayed the interpretation and integration of information (see section 6.2.6 of Chapter 6). The same study also showed that unfamiliar discourse content did not allow the construction of a more concrete, explicit, and high-quality text because students have problems in understanding the text.

In addition, there is evidence for the idea that comprehension and recall depend on the efficacy of the text-base (Carrell, 1992; Horiba, 1996; Horiba, 2000; Taillefer, 1996; Zwaan & Brown, 1996). They found that where the text was 'authentic', or texts of a familiar discourse that provided background knowledge, the readers were not only able to remember the core information but were also able to encode the rhetorical functions of the text. Carrell (1992) investigated the effect of implicit and explicit awareness of a text

structure of high intermediate ESL learners. She found a significant influence of implicit awareness of text structure on the reader's recall performance; but did not find a similar effect for explicit awareness of text structure. What this finding suggests is that readers make use of their knowledge of text structure in organizing their recall protocols (formal, strategies) but they process and encode such textual features without necessarily being aware of them.

Other pieces of evidence for a construction-integration view come from studies that have shown that linguistic proficiency and prior knowledge make important but distinct contributions to reading comprehension (e.g., Barry & Lazarte, 1995, 1998; Chen & Donin, 1997; Hammadou, 1991). Investigating the effects of linguistic knowledge and domain-specific knowledge on the ability of Chinese students to read texts in both L1 and L2, Chen and Donin (*ibid*) found that linguistic knowledge had a consistent effect on lower-level lexical and syntactic processing, while domain-specific knowledge had a strong effect on higher level semantic and conceptual information but a minor effect on lower-level processes. What these findings suggest is that any researcher who wants to investigate the comprehension or the summarizing abilities of L2 readers must consider (1) the lexical and syntactic difficulty of the text, (2) the appropriateness of the subject domain, and (3) the background, linguistic or conceptual knowledge of the participants. These three aspects were considered in this study (see items 3.3.1.1, 3.3.1.2 & 3.5 of Chapter Three) because they influence how students process and understand texts.

2.5.11 Role of Vocabulary in Text Comprehension

The role of vocabulary in text comprehension has been previously investigated,

and generally it has been found that a wide vocabulary facilitates the understanding of a passage (Gass, 1999; Gass & Selinker, 2001; Lee & VanPatten, 2003; Paulido, 2004; VanPatten, 1996, 2003). These studies suggest that control of vocabulary enables the decoding of a text, and that extensive reading fosters vocabulary development. There are also numerous empirical studies on the effects of lexical, reader, text and task-based factors on comprehension (e.g., Hulstijn, Hollander, & Greidanus, 1996; Hulstijn & Laufer, 2001; Paribakht & Wesche, 1997; Pulido, 2000, 2003; Rott, 1999), as well as on the processes involved in lexical inferring (e.g., De Bot et al., 1997; Lee & Wolf, 1997; Paribakht & Wesche, 1999; Pulido, 2002; Rott, 2000). These studies confirm the fact that the acquisition of a large vocabulary facilitates comprehension and fast reading. The issue of the reciprocal relationship between reading comprehension and vocabulary knowledge has also been investigated (e.g., Bossers, 1992; Haynes & Baker, 1993; Laufer, 1992). The findings indicate that better readers tend to have larger pools of vocabularies, and those with larger vocabularies tend to be better readers.

Although current research suggests that the acquisition of a wide vocabulary improves comprehension and reading, still absent, however, are empirical studies on the nature of the relationship between comprehension, vocabulary, and the acquisition of a second or new language. Again, there is a lack of research that empirically investigates the nature of the complex relationships that exist between passage comprehension, on one hand and the various levels of vocabulary acquisition that accrue from passages, on the other. There is also a lack of research on the interaction with other factors known to influence reading processes and outcomes, such as background knowledge and reading ability. Furthermore, participants in previous vocabulary studies were grouped according

to course levels or course grades. These groupings have done little to control the level of variability in reading or vocabulary proficiency. We also do not have sufficient knowledge about the effect of genre-specific vocabulary on reading comprehension. The role of vocabulary in inferring the meanings of unfamiliar words is discussed in section 6.2.6 of Chapter Six.

2.5.12 Critical Theory

Any literature review on reading would not be complete if one did not talk about the role of “critical theory” in literacy, which is grounded in an ideology designed to bring about consciousness and social change. Critical theory is important because academic literacy is influenced by power relations and the centrality of identity in higher education. As language teachers, we are gate-keepers who intercede between the scientific literacy community and outsiders, i.e. students who seek to be socialized into the new culture. We facilitate the assimilation of new discourses; yet we (and the institutions we represent) are privileged to monopolize power to prescribe the discourses and literacies we want our learners to acquire and to disapprove of the students’ personal identities if they do not conform to established academic norms (Lea, 1994).

In reviewing the literature on critical literacy, I need to point out two things from the outset. Firstly, I do not assume that there is a unified “critical theory” regarding academic development and, secondly, the thesis is not necessarily underpinned by “critical theories”. However, a discussion of critical theories is necessary because it provides a critical lens for analyzing the ways in which social structures and practices marginalize or privilege learners in classrooms and lecture theatres.

In the context of South Africa, which has experienced many years of racially segregated education, “critical theory” takes the form of a “radical discourse” of “people’s education” (Kraak, 1999), aimed at transforming institutions of higher learning and changing their curricula to bring about egalitarianism among the different races. The main argument of those who advocate “radical discourse” (e.g. Fataar, 2001, 2003; Kraak, 1999, 2001; Scott, 2001; Volbrecht 2002, 2003) is that education is a social construct that advantages or disadvantages some and creates a sense of “inside-ness” or “outside-ness” to others. To address the situation, Mehl (1988: 17) emphasizes the need for radical change, arguing that “disadvantage” in South Africa is a majority rather than a minority phenomenon and that:

It is not simply a case of students carrying various educational deficits onto the campus with them because of the socio-economic and political dispensation, but rather a case of the universities themselves, as represented by academic and administrative staff, being deficient.

The radical reform movement, which is not without contestation, is well articulated by Morphet (1995) who identifies three dominant discourses. The first is a “support” discourse, with origins in the Academic Support initiatives outlined in section 1.7 of this thesis, which is intended to facilitate what Morrow (1993) terms “epistemological access” to disadvantaged black students. The second is a “policy” discourse, with a focus on institutional transformation, and the third is a “capacity” discourse, relating to inequalities in resources in historically white and black institutions.

In this thesis, the construct of academic “support” discourse and its successor, academic “development”, is pertinent. This is because the University of Botswana,

particularly the faculty of science, admits students who have not necessarily passed English Language at high school. The students, therefore, need ‘support’ in ‘developing’ academic skills in English so that they can become more proficient science learners. This study of summarizing strategies used by ESL first year science students is, thus, part of an attempt to understand how the students process information so that they can be helped to select the strategies that work for them, within a context which, it is acknowledged, espouses a somewhat ‘elitist’ view of what academic literacy is.

In contrast, the issue of “policy discourse” with a focus on institutional transformation and a “capacity discourse” relating to inequalities in resources is peripheral in the context of Botswana because the University of Botswana has always been desegregated and enjoys reasonable financial support from the government. The main problem (termed by Barnett (1995: 3-4) as the “discourse of practice”) is that EAD at this university still operates on the margins of mainstream departments, which reduces its esteem in the eyes of the ESL learner. The marginalization we experience is in the form of insufficient funding, teaching materials, teaching rooms, staff offices, little time given for teaching EAD courses and their lower recognition as compared with courses offered in conventional subjects, such as Biology, Chemistry, Mathematics, Physics, etc.

2.5.13 Application of critical theory to reading

If we apply “critical theory” to reading as defined by Freire (2000), reading should not end at understanding the surface level of meaning, but should uncover “affective and ideological conflicts” (Lea, 1994; Ivanic, 1998), such as meanings, nuances and ramifications that lie beneath a text. This is because any text has a social, political or economic context embedding competing class interests. When students read a

text, they should therefore try to read ‘between the lines’, determine the author’s intention, his/her audience, interest(s), and the underlining message(s).

Although students who wrote the summaries, which are the focus of this study, were not required to apply critical discourse analysis, such as determining the author’s intention, his/her audience, the ideological inclinations of the author etc, these aspects are, however, important for enhancing a deeper understanding of a text, because the students will go beyond understanding the surface meaning by interpreting subterranean issues that can only be ‘read between the lines’.

Freire (2000) holds the view that educators who would like to bring about social change must think carefully about the reading materials they expose their learners to, because reading materials can either empower or marginalize them depending on the class orientation, values, experiences, race, culture and world view the materials espouse. He also notes that quite often, educational systems programme students into rigid conformity to dogmatic practices by trying to erase their personal identities through cultural imperialism; and this is done through the materials the students read.

This point is made earlier by Phillipson (1992) and Pennycook (1994) who claim that the “ELT industry” is ideologically biased in favour of promoting the cultural capital of nations in the “Centre” at the expense of those on the “Periphery”. So, in their view, ESL teachers should be careful about the appropriateness of the materials they use so that they can exploit the cultural capital of the students. The choice of summarizing texts for this study takes into account this factor, i.e. the students’ cultural background and the relevance of the texts (see section 3.1).

To illustrate how Freire's version of "critical theory" (he derives critical pedagogy from critical theory) applies in learning situations, Sola and Bennet (1991) studied the communication behaviour of minority black students in East Harlem, New York. The researchers observed that the largely Puerto Rican and black American students used what they termed *sub rosa* discourse that involved "peculiar" ways of communicating among themselves, such as winks, gestures, stares, or loud speech. They noted that *sub rosa* discourse was used as a form of resistance to the official, instructional discourse.

Other "critical" studies situated in classrooms have provided insight into how the learning environment or space where teachers and students interact affects learning. Bourdieu's (1991) theoretical construct of *habitus* (the place where educators and learners interact) provided educators with a different way of viewing the social space between students and teachers. Gutierrez and Stone (2000) explained that inside the *habitus* dispositions are not influenced by any governed rules, but by practices, perceptions, and attitudes already in place.

The construct of *sub rosa* and *habitus* when applied to reading, helps us to appreciate what it means to belong to a certain cultural group. Freire's critical pedagogy informs us that orthodox pedagogy or reading materials outside the subject domain may not necessarily excite or engage the students. If the reading materials are culturally inappropriate, they may be surreptitiously resented. In a multi-cultural classroom, we therefore need to journey within and across the different cultures or subject borders so that we can tailor reading materials to the students' unique needs. This is likely to foster a

more meaningful dialogue with the reading materials, which in turn may promote the students' academic development.

2.6 Summarization

Research interest in the strategies used for summarizing a text coincided with a shift from focusing on teachers and teaching to a focus on learners and learning. Based on this paradigm shift, early studies on summarization concentrated on L1 speakers, and were interested in establishing whether they were able to grasp the main ideas and focus on the viewpoint of the author and whether they could avoid subjective comments and interpretations (Brown, Day & Jones, 1983; Day, 1980; Johns, 1984; Winograd, 1984). In this early stage, most of the research on summarization involved text comparisons of good and poor L1 readers in elementary and secondary schools. Baker & Brown (1984) established that poor readers had difficulty in understanding a summary task, while Meyer, Brandt, & Bluth, (1980) discovered that poor readers had problems in selecting important points; and Day (1980) and Winograd (1984) noted that poor readers had difficulty in condensing a text. At this early stage, most of the studies were conducted in the United States of America and Canada, and to a lesser extent in the United Kingdom.

The next phase of research in summarization focused on studying the summarizing protocols or formal procedures used by 'under-prepared' native-speaking university students, whose school leaving examination test scores and grade point averages would not normally qualify them to enter what Widdowson (1984) calls the "second culture", the culture of academia. The most notable study at this time is that of Johns (1985), which investigated the summary protocols used by "under-prepared" and "adept" university students. She discovered that "under prepared" students neither

included all the major points of the original text in their summary nor did they effectively combine the main ideas to form a coherent text. Johns' (1985) finding is important for two reasons. Firstly, it makes us aware of the summarizing problems faced by under-prepared students who, in the context of first year science students of the University of Botswana, are perhaps in the same or an even worse situation because of the second language factor. Secondly, Johns' (1985) finding encourages further research at university level so that we can have a clearer picture of the strategies used by students from different cultural backgrounds.

Perhaps the crucial point about Johns' (1985) study is that there are few studies, such as hers, involving summaries of university level students, and even fewer still of the summarizing strategies used by ESL students in multicultural societies. Because there are an increasing number of under-prepared students in universities where English is used as a medium of instruction, it is important to replicate her study so that we can understand their summarizing strategies and suggest techniques for improvement. In addition, none of the studies on "under-prepared" students has produced a comprehensive scheme in terms of which completed summaries can be coded to indicate how students reduce, replicate and distort the original text. There is, therefore, a need for such a study of the strategies used by university students, in order to determine what these students' skills are, and what needs to be done to improve their summarizing skills at this level.

Current research on summarizing strategies has shifted its focus from studying strategies used by "adept" or "under-prepared" native English speakers to those used by ESL/EFL students at college or University. The focus on the latter students is a result of the realization that such students are not only linguistically limited, but are also faced

with the daunting task of decoding the meaning of texts written in specialized registers, such as those found in scientific texts. One such milestone study is Johns & Mayes (1990), which analyzed the summary protocols of university ESL students at San Diego State University, Southern California. In this insightful study, they found that there was a difference between “high”- and “low”- proficiency students in the amount of direct copying of single idea units among the low group, perhaps because of their inability to apply self-monitoring rules. The other significant difference lay in the combinations of idea units, which indicated that high-proficiency students were more conscious of the rules of summarization than low-proficiency students.

However, the findings indicated that there were few significant differences between high- and low-proficiency ESL university students in the manipulation of idea units. Both groups had difficulty in condensing ideas from the original text, perhaps indicating a failure to use macro-rules of *generalization*. Both groups also failed to produce appropriate macro-propositions, that is, writer-invented ideas that provided a generalization about the text.

Although Johns and Mayes’ (1990) findings significantly broaden our knowledge of the summarizing strategies used by ESL students, their conclusions invite further investigation because we would like to know why there were no significant differences in the overall summary products between the “high”- and “low”-proficiency students. Could it be that the distinction they had made between “high”- and “low”-proficiency students (the latter who had been registered in “remedial” classes and “high”-proficiency students in sophomore or “advanced” classes) had masked unknown variables? Or could it be that

the summarizing task had not been discriminatory enough or that the classification system did not capture the distinctive traits of each of the groups?

As far as research on the summarizing strategies used by ESL learners is concerned, it would appear from available literature that Johns and Mayes' (1990) study marked the watershed between those studies directly involved in summarization and those branching off to look at the use of cognitive and meta-cognitive strategies in summarization. As a result, from 1990 onwards research interest focused on trying to understand the psycholinguistic or schematic processes that underpin comprehension and how these strategies can be classified (e.g. O'Malley & Chamot, 1990; Oxford, 1990). Since the 1990s, research on the use of strategies has been located within the broader issue of 'academic literacies', which regard reading and writing (summarization included) as social and ideological practices, particularly when dealing with students referred to by Street (2004) as "non-traditional students", many of whom enter university through flexible university admission rules.

However, the decline of research in summarization came about before researchers had even started to scratch the surface of research in plural societies where ESL students speak two or more languages. In other words, research in summarization faded out before researchers had conducted studies among the majority of the people in the world who live in multi-cultural or multi-lingual societies. My study, then, attempts to fill the gap that was left when research interest began to be eclipsed by studies in cognition and meta-cognition, instead of investigating the processes that reveal how ESL learners process information, which help learners to navigate their learning more successfully.

2.7 Summary of the Literature Review

The foregoing literature review has illustrated three important aspects. The first is that summarizing strategies are situated within the broader concept of language learning strategies, which are themselves closely related to other conceptually similar notions: learning strategies, learner strategies and communication strategies. The literature review has shown that while these concepts interface, there are fundamental characteristics that distinguish them. The aim of reviewing literature on these concepts has been to show how summarizing strategies are symbiotically linked with these concepts, and how our knowledge about the way ESL learners process information has exponentially grown over the past two or more decades.

The second aspect of this literature review has shown how reading proficiency is determined by the readers' comprehension strategies, which in turn influence summarization. The review has shown the part played by psycholinguistic, transactional, interactive, and discourse theories in shaping the strategies that a reader uses. The central argument of this part of the review is that efficient reading and comprehension come about as a result of combining both lower-level and higher-level information processing skills.

The literature review has argued that while schema theory is a valid metaphor for explaining how L2 learners decode and interpret information, its theoretical applications do not always result in improvements in comprehension, particularly where they result in insufficient attention to textual detail, and where there is an increase in schema interference. It has been shown that while available research on cognitive and meta-cognitive strategies increases our understanding of how ESL students process textual

information, most of the studies so far have been conducted in North America and Asia. There is a dearth of similar research in Africa where ESL conditions are different. We need, therefore, to replicate some of the studies in Africa, so that we can make more holistic conclusions.

The last section of the literature review has provided an overview of the strategies used for summarization. Here, it has been shown that although early studies showed considerable interest in the strategies used by skilled and less-skilled readers, the impetus on summarizing strategies inexplicably waned in the mid nineties before we had started to research the strategies preferred by learners in multi-cultural societies, who form the majority of the people in the world today. The scarce knowledge we have about the summarizing strategies preferred by multi-lingual learners is a reflection of linguists' neglect of this critical area of information processing. My study, therefore, attempts to fill the gap left when research in summarization has been overshadowed by studies in cognition and meta-cognition. In the next chapter, I describe the research methods that I used to collect data for this study, focusing especially on the multi-faceted data collection procedures that I used.

3.0 CHAPTER THREE: RESEARCH METHODS AND PROCEDURES

3.1 Introduction

In this chapter, I describe the research methods that I used in order to obtain different forms of data. I start by first describing the ontological and epistemological assumptions underpinning the research methodology and then go on to describe the specific methods that I used for collecting and analyzing the data. The theory of inquiry that informs this study is derived from both quantitative and qualitative methodology, which involves “multiple data collection methods”, otherwise known as “triangulation”, or the use of what Burns and Bush (2000: 231) call “pluralistic research”. The use of multiple research techniques is determined by the non experimental nature of the research (refer to section 1.4), which calls for the use of a variety of research methods in order to produce detailed explanations of the summarizing strategies used by ESL first year science students.

The methodological technique that I used for gathering quantitative data for this study is *survey*, which Leedy (1997: 190) describes as a “means to look beyond the casual glance or the superficial observation”. I used this technique for collecting biographical data (see Appendix 2) and information about the strategies the students use for processing, writing and evaluating the accuracy of their summary products (see Appendix 3). The survey approach belongs to the positivist group of research methods, which Myers (1997) describes as a procedure for collecting data objectively through statistically defined measures. To analyze the numerical data, I used descriptive statistics (see sections 5.1 & 5.3) that measure the central tendency, variation and correlation of the data.

In order to gain a deeper understanding of the summarizing strategies used by the students, I complemented quantitative methods with qualitative research methods, i.e. interviews and studying the students' summary texts. I used these methods because they focus on the understanding of research phenomena *in situ*; that is, within their naturally-occurring contexts. My aim of using qualitative methods is to tease out the meanings the phenomena have for the participants and to understand the particular social and cultural context within which the students employ strategies. Unlike quantitative methods which tend to lose the social and institutional context of textual data, the qualitative research methods which I used focused on 'how' and 'why' (Carson et al., 2001: 64) individual students preferred some strategies to others.

The methodological assumption underlying the qualitative methods used in this study is interpretivism, which focuses on deconstructing surface appearances to reveal the hidden meanings. Gall et al. (1996) suggest that there are three ways of analyzing qualitative data: interpretational, structural and reflective analyses. An interpretational analysis refers to examining the data for constructs, themes and patterns that can be used to describe and explain the phenomenon being studied. A structural analysis means that the researcher examines the data in order to discover the patterns inherent in the discourse and a reflective analysis means that the researcher uses his/her intuition and judgment to evaluate the data. In chapters 4-8 that report on the findings of this study, I applied these underlying principles by 'describing', 'explaining', and 'evaluating' the summarizing strategies used by the students (see chapters 6, 7 & 8).

My main reason for using interpretivism is to achieve triangulation of the data gathered, so that I can understand the meaning and social context of the data (Guba &

Lincoln, 1994; Peter, 1992). Volkmann (1992: 88) sums up the objective of interpretivism as paying “attention to experience and the intention to describe the experience.... In addition, the researcher often has personal experience with the phenomenon and aims to heighten his/her own awareness of the experience while simultaneously examining the experience through the eyes of the other participants”.

3.2 Quantitative Data Collection Methods

3.2.1 Subjects

One hundred and twenty students out of about six hundred first year science students were selected using a combination of probability and non-probability sampling techniques. Using the random sampling technique, all the names of the twelve science first year classes were put in a bowl and I drew out four classes. Because the students took various science groupings, such as (1) Mathematics, Physics and Chemistry or (2) Mathematics, Chemistry and Biology or (3) Mathematics, Physics, Chemistry and Biology or any other level one courses that were designed for special groups such as the Bachelor of Nursing Science, I also used stratified sampling to ensure that the nursing group was represented in the sample. Altogether there were 40 female and 80 male students who participated in the study. I selected the nine students who did the second summary task using the non-probability sampling technique of purposive selection based on my judgment of typically “good”, “average” and “weak” summaries.

The students had completed a semester at the University of Botswana during which time they had been taught by different Communication and Study Skills (CSS) lecturers covering, among other skills, studying skills, listening skills, note-making,

summarizing and report writing. Regarding summarization, the students had spent an average of two to three hours learning how to summarize –perhaps accounting for their theoretical knowledge of good strategies. They had also been taught library information skills and computer skills, courses that are intended to enhance the academic literacy of the students. On average the students had been learning English for twelve to fifteen years (see Figure 6 below), and in their primary and secondary school education they had gone through the Communicative Language Teaching (CLT) approach that emphasizes the development of interactive skills, favouring ‘fluency’ over ‘accuracy’ and ‘content’ over ‘form’.

On average the students were 19-20 years of age, with nursing students generally being older than the mainstream science students, some of whom were over forty years of age (see Figure 1 below). Overall, the students had reached a language learning stage when they were being governed by Krashen’s (1981) and Dulay *et al.*’s (1982) ‘socio-affective filter’ process, which depends on the needs, attitudes and emotional states of the learners. The vast majority of the students (94) indicated that they first spoke Setswana

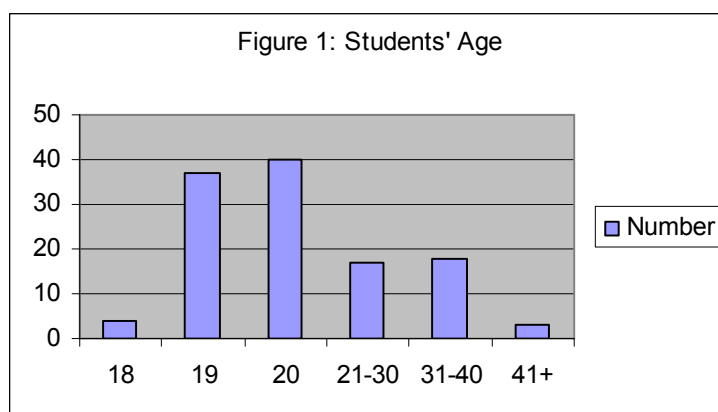


Figure 1: Students' Ages

when they were children. There were 16 who spoke Kalanga as their first language, a language spoken in the north-eastern part of Botswana that is similar to Shona in Zimbabwe, 3 spoke English as their first language and 7 spoke other languages (see Figure 2 below).

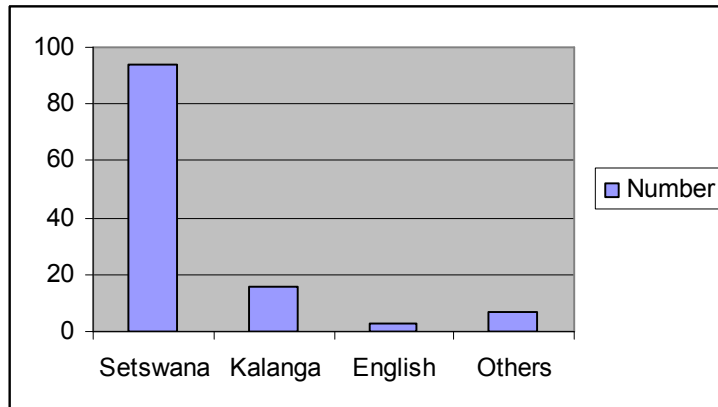


Figure 2: Language first spoken as a child

On average, the students speak 1-2 other African languages and the vast majority of them speak Setswana at home, with a few saying they speak Kalanga or English (see Figure 3 below). Similarly, the students largely speak Setswana in their communities, with a sizeable number indicating that they speak English (see Figure 4 below). On average the students had started learning English (see Figure 6 below) when they were 7-8 years old, a time when they were half way through Lenneberg's (1967) 'critical period' of language learning that lasts from two years of age to puberty. On the whole, they had been learning English for 12 - 14 years (see Figure 5). What these biographical data indicate is that the vast majority of the first year science students did not use English as an alternative language for communicating with either family members or members of their community. Instead, they preferred to use English for utilitarian purposes, as confirmed by their overwhelming indication that they were learning English as a

requirement for graduation and for communicating with the outside world (see Figure 9 below).

The use of English for restricted purposes is confirmed by the majority of the science students (see Figures 7 & 8 below) who indicated that they occasionally used summarizing skills, and when they did so, it was for class exercises given by the teacher or lecturer. They did not use the skill for navigating their own learning, which would enable them to process and evaluate academic material more efficiently.

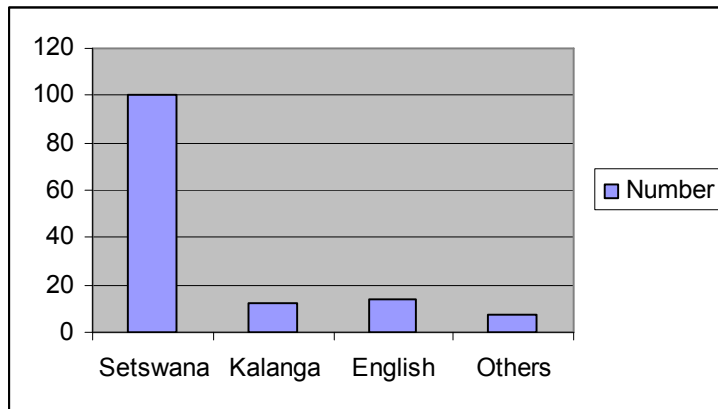


Figure 3: Language spoken at home

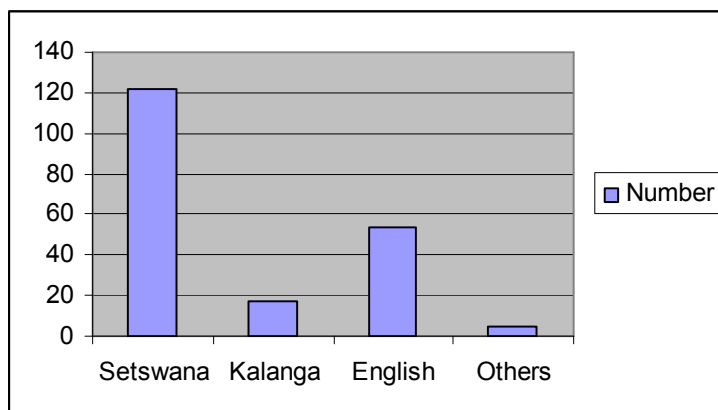


Figure 4: Language spoken in student's community

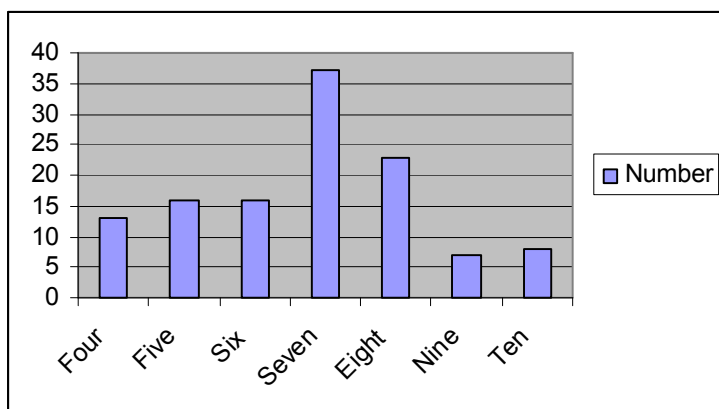


Figure 5: Age when students started learning English

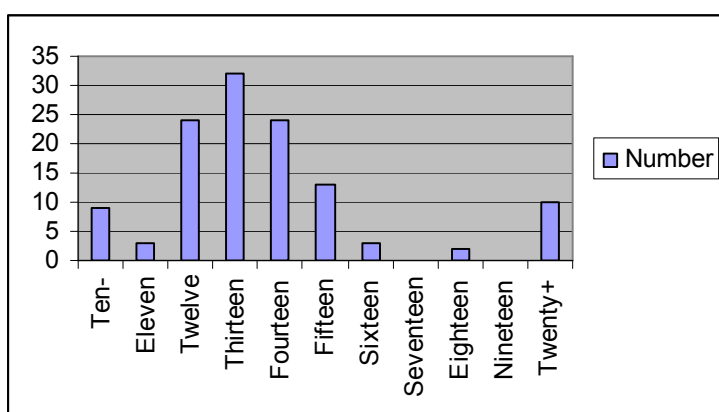


Figure 6: Number of years learning English

The fact that the students mostly used Setswana for their day-to-day communication narrowed their opportunity to learn English. This was confirmed by rating their own ability to use English as ‘average’ (see Figure 10), which was also confirmed by their obtaining an average of ‘C’ and ‘D’ grades in English Language in their last high school public examination (see Figure 11), such as the Botswana General Certificate of Secondary Education (BGCSE) and the International General Certificate of Secondary Education (IGCSE).

Ordinarily the University of Botswana does not admit students without a minimum of a 'C' grade in English Language, but because there is a shortage of skills in science-related areas in the country, science students are given a special dispensation. What this means is that almost a third of the first year science students (see Figure 11) have an impoverished background in the language they use for university education. This in turn impacts on the types of strategies they use for summarization, because whatever scientific material they read and write will require the use of cognitive and meta-cognitive skills of the type embodied in summarization.

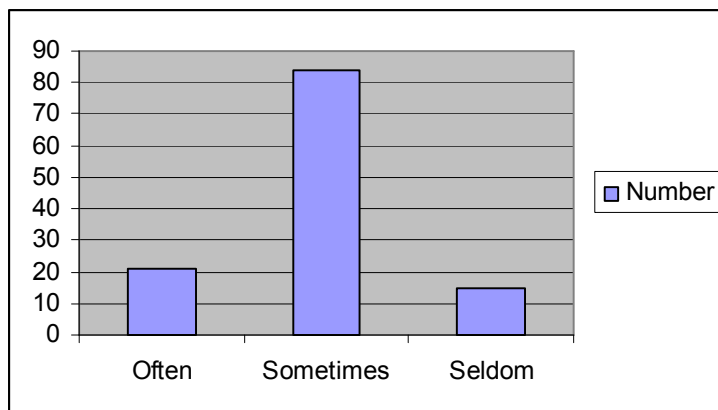


Figure 7: Frequency of applying summarizing skills

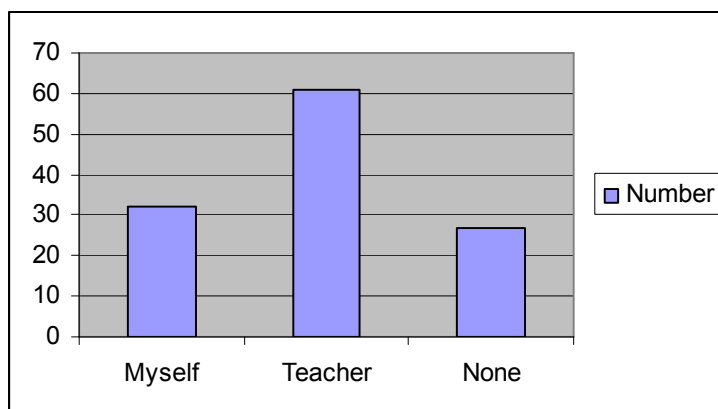


Figure 8: For whom summarizing is done

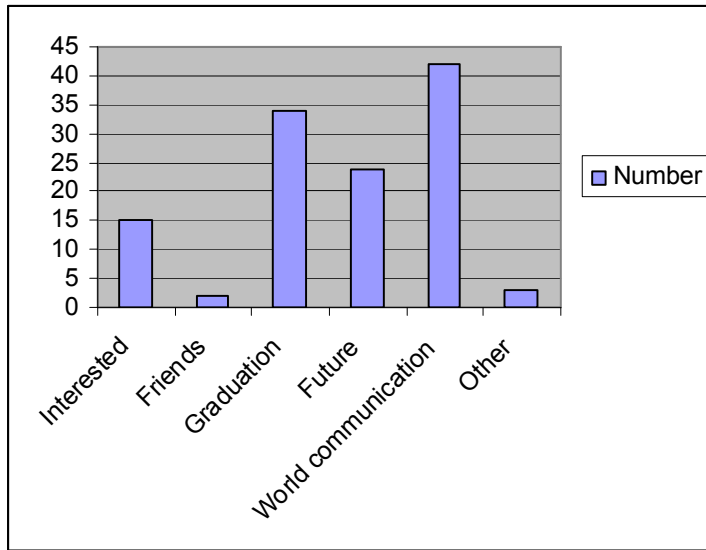


Figure 9: Reason for learning English

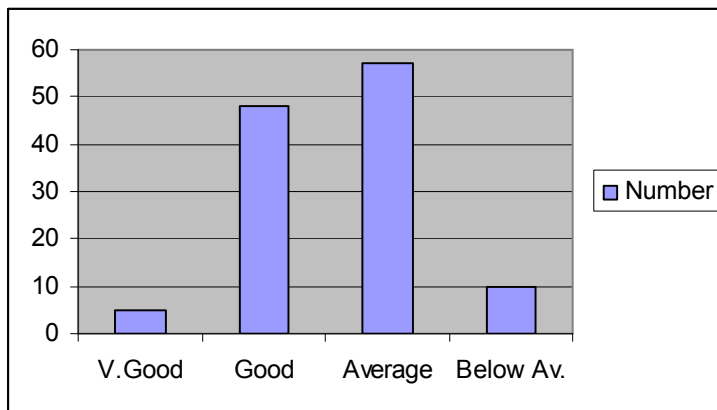


Figure 10: Students' self-estimated ability to use English

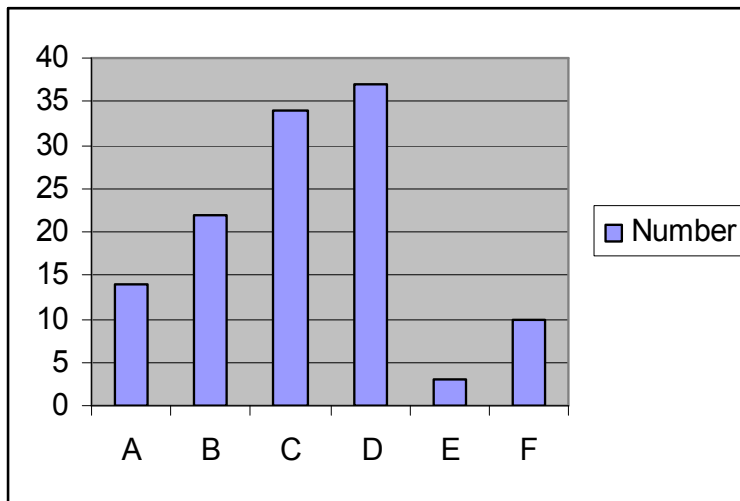


Figure 11: Students' English Grades at High School

Another variable that needs to be noted about the subjects is that, despite the fact that they enjoyed learning English, especially developing their communication and reading skills, they did not enjoy writing, such as writing essays, reports and summaries (see Figures 12, 13 & 14). This has grave consequences for their learning because they do not enjoy learning important skills that are central to their academic development in science.

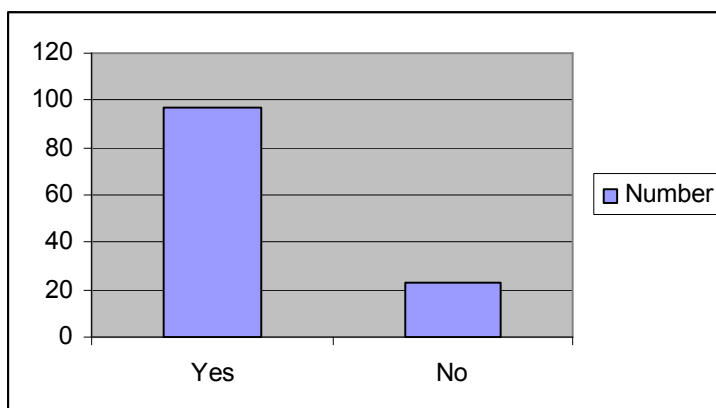


Figure 12: Enjoyment of English

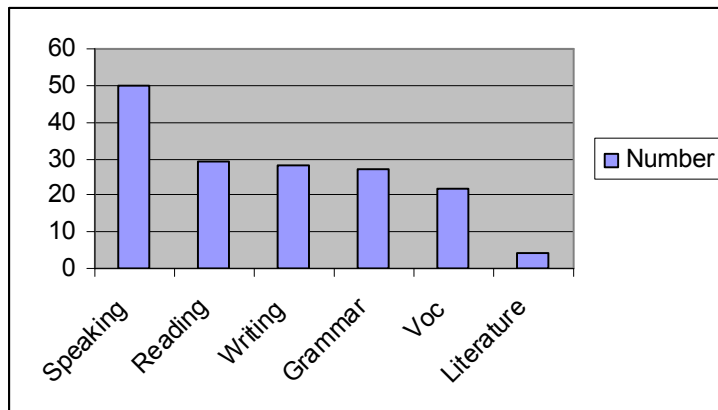


Figure 13: Aspect of English students enjoyed

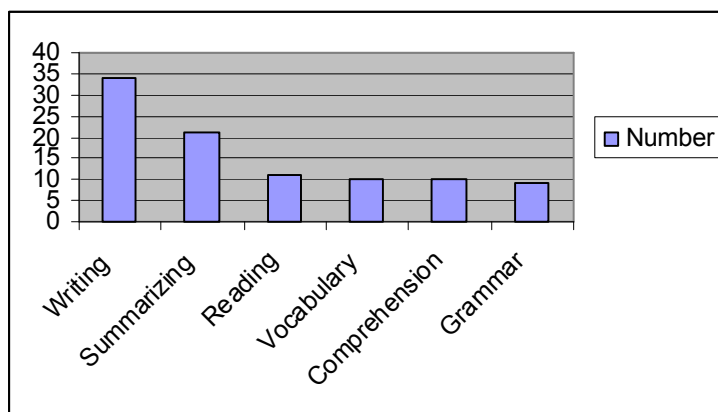


Figure 14: Aspects of English students did not enjoy

An important characteristic of the study population that needs to be noted is the preponderance of male students among the mainstream science students, and female students among the nursing group, which is symptomatic of a gender imbalance in these professions. In analyzing the preferred strategies, the question of ethnicity or first language of the student was not considered because currently there is no evidence suggesting that some Bantu languages are more favourably disposed to orchestrating summarizing strategies in English than others. However, I considered gender representativeness in both the random and purposively selected sample because available

literature, although inconclusive and inconsistent, suggests that females and males favour different cognitive and meta-cognitive strategies.

The subjects were classified into “high”-, “average”- and “low”-proficiency based on the marks they had obtained in the first summarizing task (see sections 3.3.1.1 & 4.5 for details). High-proficiency students were those who had obtained a raw score of 15-20 marks out of 20; average-proficiency students were those with 10-14 marks and low-proficiency students were those with 0-9 marks.

These marks were arrived at by using a marking guide with a list of correct idea units generated from the students’ answers (see item 5.3) and guidelines shown in Appendices 5 and 6 titled “summary scoring taxonomy” and “scoring cognitive and meta-cognitive strategies”. Basically, the marking involved checking how many correct idea units the student had included in the summary and how the student had used cognitive strategies such as note-making, grouping, and inferencing. I also considered production strategies, such as how the student had captured the gist of the text, how the student had recast, paraphrased and transformed the main ideas and whether the student had distorted the original text. Also, I considered how the student had applied meta-cognitive strategies, such as paying attention to the specific demands of the task and the monitoring of the student’s final summary product through correcting one’s mistakes.

In order to validate the fairness and accuracy of my marking, a colleague who teaches Communication and Study Skills (CSS) marked independently each of the 120 scripts. We then compared the marks and classifications. Where we differed in the mark allocation, we both re-marked the summary, guided especially by the idea units the

student had written. Altogether, we classified 20 students as high-proficiency, 48 as average- and 52 as low-proficiency (see Table 1 below).

Table 1: Proficiency Levels by sex

Sex	High	Average	Low	Total	%
Female	4	15	21	40	33
Male	16	33	31	80	67
Totals	20 (16.6%)	48 (40%)	52 (43.3%)	120	100

In order to verify the reliability of my classification of students into “high”-, “average”- and “low”-proficiency, I compared their proficiency with two independent measures, i.e. the students’ English Language grades at high school (IGCSE & BGCSE) and their marks in Communication and Study Skills (CSS) at the end of the first semester before they did the summary task. The students’ grades in English Language at high school (factor in the element of subjectivity, and see Table 2 below) show that there is some correlation with my classification. For instance, of the 20 students classified “high-proficiency”, their median grade is A, while “average-proficiency” and “low-proficiency” students have grades that cluster around C and D respectively. If grades A & B can be interpreted as “high”, C as “average”, and D, E & F as “low”, then one can see that there is some correlation between my categorization based on the summary task and the grades the students obtained in English Language at high school.

Table 2: Comparison between students' English Language High School grades (BGCSE & IGCSE) and the researcher's categorization of proficiency levels

High Sc. Grades	High Proficiency	Av. Proficiency	Low Proficiency	Total
A	11	3	-	14
B	6	10	6	22
C	3	20	11	34
D	-	13	24	37
E	-	1	2	3
F	-	1	9	10
Totals	20	48	52	120

Source: U.B. 2004 first year students' admission records

However, it should be noted that about a quarter of the “average-proficiency” (13) students obtained A & B grades in English Language, which technically qualifies them to be categorized as “high-proficiency”. Similarly, about one third of the “average-proficiency” (15) students obtained D, E & F grades. These grades fall into the “low” category because the students did not reach the minimum of a grade C pass, which is the minimum grade required in English Language for admission into the rest of the faculties of the University of Botswana. The same observation can be made about a third of the “low-proficiency” students who obtained B & C grades in English Language, which qualifies them for the category of “average-proficiency”. Overall, what these high school English Language grades indicate is that although there is some correlation between my classification and the grades, the boundaries overlap, which is not surprising because any classification system is bound to have loose ends.

An analysis of the students' official grades in Communication and Study Skills of the University of Botswana (see Table 3 below) at the end of the first semester in

December of 2004 before they wrote the research summary also shows a similar correlation with my broad classification of “high”-, “average”- and “low”-proficiency. All the high-proficiency students obtained grades ranging from “good” to “outstanding”, whereas average-proficiency students obtained grades ranging from marginal fail to very good. Although 20 of the average students were able to obtain marks in the “good” category, the distinguishing factor is that none of them were able to obtain top grades, such as excellent and outstanding. The students whom I classified as “low-proficiency” obtained grades clustering around grades C+, C and C-. However, like the grades the students obtained in English Language at high school, there are overlaps which perhaps point to the problematic nature of trying to classify a changing variable such as language proficiency.

Table 3: Comparison between students’ Communication & Study Skills (CSS) grades (1st Semester) and the researcher’s categorization of proficiency

Marks %	Grade	Meaning	High Prof.	Ave. Prof.	Low Prof.	Totals
80-100	A	Outstanding	2			2
75-79.9	B+	Excellent	8			8
70-74.9	B	Very Good	6	4	1	11
65-69.9	B-	Good	4	16	10	30
60-64.9	C+	Satisfactory		11	8	19
55-59.9	C	Pass		6	10	16
50-54.9	C-	Marginal Pass		8	15	23
45-49.9	D+	Marginal Fail		3	6	9
40-44.9	D	Fail			1	1
35-39.9	D-	Zero grade point			1	1
0-34.9	E					
Totals			20	48	52	120

Source: 2004 CSSU examination records

3.2.2 Questionnaire

For collecting quantitative data I used a questionnaire, which McDaniel and Gates (2002: 125) define as “a set of questions designed to generate the data necessary to accomplish the objectives of the research; it is a formalized schedule for collecting information from respondents”. Luck and Rubin (1987: 173) simply define a questionnaire as “a formalized schedule to obtain and record specified and relevant information with tolerable accuracy and completeness”. The questionnaire that I used for collecting data was constructed in such a way that it stimulated and jogged the respondents’ memory through introspection.

The questionnaire contained a total of 60 items of the Likert-format (see Appendices 2 & 3), and I personally administered it to 120 students, all of whom successfully completed the task by filling in their responses. The survey instrument was *cross-sectional*, that is, information was collected at one point in time during the students’ normal Communication and Study Skills (CSS) lecture hour, as opposed to a longitudinal survey in which data are collected over a longer period of time. The questionnaire was divided into two parts. The first part carried biographical data followed by a summarizing task for which the students were required to summarize “the technologies that are likely to control climate changes and meet the world’s energy needs, as well as pointing out the limitations of these technologies”. The selection of the text was influenced by studies of schema theory (Literature Review, sections 2.5.3 & 2.5.4), which suggest that background knowledge influences the understanding of new reading material. Immediately after writing the summary, the students were asked to reflect on the strategies they had used for summarizing the text and to write them down. This was

an open-ended section where they were required to state, respectively, the main strategies they had used to (a) help them understand the text, (b) summarize the required information, and (c) fine-tune the final summary product.

The second part of the questionnaire, which I administered during the second lecture hour of the same week, had three sections: (a) information processing strategies, (b) summary production strategies, and (c) self-assessment strategies. After being given a stem question for each of the sections, the students were required to circle their response to each question on a scale of: (1) Strongly Disagree, (2) Disagree, (3) Agree, or (4) Strongly Agree. Most of the skills requiring information processing and summary production belonged to the cognitive domain, such as looking at the title, scanning and skimming, looking for key words, phrases and topic sentences; while those requiring self-assessment encompassed meta-cognition, i.e. checking that the information in the summary is directed to the task, verifying that main ideas are not omitted or distorted and checking that the summary reads fluently.

The type of questionnaire that I used for this study resembled Phakiti's (2003) cognitive and meta-cognitive strategy use instrument, which he used in one of the major government universities in northern Thailand. Phakiti's (ibid) questionnaire had thirty-five items, and the respondents were required to read each statement and to indicate how they had thought during the test. They were to choose one of the following descriptors: (1) Never, (2) Sometimes, (3) Often, (4) Usually, and (5) Always. As can be seen from Phakiti's instrument, it focused on the cognitive and meta-cognitive strategies the students thought they had used in the test they had previously written. My questionnaire was different in that it had four descriptors: (1) Strongly Disagree, (2) Disagree, (3)

Agree, and (4) Strongly Agree, and it focused on the summarizing strategies the students thought they had used. I used the questionnaire to establish from the students the types of strategies they would use when they are asked to summarize a text (Appendix 3).

3.2.2.1 Validity of the Questionnaire

In order to maintain what Oosterhof (1994: 66) calls “construct-related evidence of *validity*”, which Bachman & Palmer (1996: 21) refer to as “the extent to which a researcher can interpret the results of a given measuring instrument as an indicator of the abilities or constructs one wants to measure”; and in order to maintain *reliability*, which is defined by Wright & Stone (1979) as “the degree to which an instrument is measuring something consistently”, I submitted the instrument for scrutiny and approval to my supervisors and pre-tested it in a pilot study (see section 3.2.1.3 of this chapter)

There are three aspects of validity that I particularly wanted to be verified: content validity, face validity and construct validity. In this study, I took content validity to mean the accuracy with which the instrument measured the factors, the tasks or the stimuli intended to be measured. The basic question that needed to be verified was whether the items in the instrument “represented” the universe of content to be investigated. The second aspect that I wanted to be checked is the ‘face’ validity of the instrument. Some researchers equate face validity with content validity, but in this study I took it to mean whether the instrument appeared at face value to measure what it was intended to measure. Here, the supervisors were very helpful in suggesting the inclusion of a “root” statement that sparked off the responses of the students, e.g. they recommended the inclusion of “When I am asked to write a summary of a text, such as a newspaper, article,

passage, handout or book”, followed by a description of statements of what the student does and the response options (see Appendix 3).

3.2.2.2 Reliability of the Questionnaire

The issue that I was concerned with was the reliability of the instrument. Reliability in this context refers to the extent to which the questionnaire is replicable, that is, if the research were to be repeated by someone else, the same findings would result. According to Healy & Perry (2000), the best way of guaranteeing reliability is to ensure that the content and constructs the questionnaire is trying to measure are valid, and that the sampled students carry the elements and traits that are representative of the survey population. In order to achieve this, I balanced the questions between reading strategies, summary production strategies and product evaluation strategies. I also made sure that both genders were represented in the study population and that the various age groups of the participants were represented. In addition, I considered other factors such as the time of day when I would administer the instrument, the students’ level of anxiety and fatigue before and after a lecture or test.

3.2.2.3 Pilot Study of the Questionnaire

To ensure that nothing was left to chance about the validity and reliability of the instrument, I pre-tested it in a pilot study of ten randomly sampled science students from three different classes. The sampled students for the pilot study comprised four female and six male students and they were 19-22 years of age. I excluded these students from the actual study because the preliminary study would have affected their later responses. I conducted the pilot study ten days before the scheduled administration of the main study. The students completed both the first and second instruments in one hour and fifteen

minutes. They were asked to make written comments at the end of the instruments regarding the clarity and length of the questions and they were asked to indicate whether the questions in the questionnaire had stimulated their interest, so that I could get feedback on the relevance, clarity and interest value of the questions. An analysis of the comments (see Appendix 1) showed that the majority of the participants had enjoyed filling in the questionnaire and that the questions were clear enough.

However, two students indicated that they had not been quite sure of the meanings of some of the terms in the statements, such as “scan”, “skim”, “determine”, “version”, “draft”, “verify” and “reflect”. Three of the students further pointed out that the summary task had been difficult and that they needed more time to do it. To address these concerns in the actual study, I decided to give one full hour for the first task that elicited biographical data, a summarizing task and a reflection of the strategies they had used. I also decided to allow 20 minutes for the completion of the second part of the instrument that contained cloze items, and to explain some of the key words (e.g. strategy, summarize, scan & skim, reflect, verify) that the students in the pilot group had indicated they did not understand.

3.2.2.4 Merits of the Instrument

The most compelling reason for using a questionnaire as one of the instruments for data collection is that, unlike the drawbacks experienced in qualitative research, such as the possibility of subjectivity in interpreting the data, the questionnaire allowed for the collection of significant amounts of data in an economical and efficient manner, and the data could be statistically analyzed using a statistical package for social sciences (SPSS) version 12.0 that can calculate automatically central measures, such as mean and standard

deviation). The other factor that I took into account was that the procedure for gathering, analyzing and formatting the data could be easily controlled, which minimized the chances for ‘doctoring’ the findings.

The use of the questionnaire had an added advantage of being administered in a strictly controlled format, which ensured that all the respondents were asked the same questions and were exposed to the same response options. The standardization of the questions also ensured that complex terminologies were likely to be understood in the same way. Moreover, the standardization of the questions ensured that I was guaranteed that every respondent was confronted with questions that addressed a range of research objectives. Above all, I could tabulate the results statistically using descriptive statistics involving the measures of central tendency.

However, from a methodological point of view, one needs to be cognizant of the fact that the use of a questionnaire can be flawed by the sampling technique used. For instance, there can be a random sampling error as a result of chance variation, which is the difference between the sample value and the true value of the research population. In order to minimize this problem, I used sampled populations that were representative of the central traits of the ESL first year science students, namely factoring in dichotomous variables such as female versus male students, young versus old students and ‘mainstream science’ versus ‘peripheral science’ students, such as nursing science students.

By using a questionnaire to collect data, it is also possible that one can have “systematic error”, which results from mistakes in the research design. In the worst scenario, there can be a surrogate error resulting from a failure to define the research

problem properly. From an ethnographic point of view, a questionnaire can be criticized for being deterministic, sterile, ritualistic, rigid, and empiricist; and its main weakness is that it tends to decontextualize human behaviour by removing the event from the real world.

The strongest criticism comes from the school of Frankfurt Marxists (DeVaus, 1991) who dismiss the questionnaire as intrinsically ‘manipulative’, ‘scientific’ and ‘technistic’, arguing that the information yielded by it gives power to those in control, who then manipulate it for ideological purposes. To minimize these threats to the validity of the instrument and to enhance the dependability of the data interpretation, I used diverse data interpretation methods.

3.3 Qualitative Data Collection Methods

To avoid relying too heavily on the results of the questionnaire and to apply the principle of ‘triangulation’ or ‘multiple data collection methods’, I used qualitative research techniques that focus on explaining the “quality” of the summary products. Burns & Bush (2000: 230) describe qualitative research as the process of “collecting, analyzing and interpreting data by observing what people *do* and *say*” (own italics). McDaniel & Gates (2002:122) go further to suggest: “qualitative research is a term used loosely to refer to research whose findings are not subject to quantification or quantitative analysis”. The Cranfield School of Management (2000: 19) insists that the main purpose of qualitative research is “to answer the ‘why’ question”. I might also add that qualitative research is concerned with in-depth examination and interpretation of a specific temporal and spatial domain focusing on the *why* and *how* part of the research phenomena.

Gall *et al.* (1996) stress that the purpose of qualitative research is: “watching people in their own territory, and interacting with them in their own language, on their own terms”. Gall *et al.*’s (1996) meaning of qualitative research agrees with that of historical-comparative researchers who maintain that the aim of qualitative research is to critique the “front” being put on by research subjects in order to get at the “deep structure” of the problem being investigated (Cresswell, 1994). Van Maanen (1979: 520) captures the essence of qualitative research methods when he talks of them as “an array of interpretive techniques which seek to describe, decode, translate and otherwise come to terms with the meaning, not the frequency, of certain more or less naturally occurring phenomenon in the social world”.

3.3.1 Summarizing Research Tasks

3.3.1.1 First task

For collecting qualitative data, there were two research tasks the participants were required to perform. The first, which I personally administered to 120 students, consisted of a text of 642 words taken from the *New Scientist* of 8 June 2002 entitled: “Far out ideas may be the last hope for curbing global warming” (see Appendix 2). The text deals with the technologies that are likely to control climatic changes and meet the world’s energy needs. It argues that none of the current power-generation technologies will be able to control greenhouse gas emissions and meet the world’s energy requirements. It advocates the tapping of solar power in orbit using parasols to deflect solar energy away from the atmosphere, to use satellites for harvesting solar power and to explore the possibility of turning down the global thermostat so as to reduce solar heating. The text also points out the limitations of these technologies.

The students were required to summarize “the technologies that are likely to control climate changes and meet the world’s energy needs, as well as pointing out the limitations of these technologies”. The choice of the text was influenced by its familiarity to science students. The choice of the article from the “New Scientist”, and not from one of their prescribed textbooks, was intended to expose the students to other textual forms beyond the textbook, which is one way of promoting their academic literacy skills. The main reason for selecting the text is its scientific relevance, familiar content, cognitive level, rhetorical appropriateness, (i.e. discourse organization, style, meaning, etc) as well as its universal cultural appeal. These aspects are known to have an effect on the comprehension of a text. I administered the summary task in February of 2005 during the first lecture hour of the Communication and Study Skills (CSS) 112 course. The course focuses on the development of academic literacy skills, such as speaking, reading, listening, writing and basic study skills. Its goal is to develop autonomous students who are able to cope with the demands of university learning and who can communicate effectively in their professional area.

The students first completed the section on personal information, then went on to do the summary and completed the task by stating the strategies they had used to *read* the text, to *write* the summary and to *evaluate* the outcome of their final summary products. The whole process took one hour to complete. I had told the students as part of the instruction that their summary products would be analyzed so that I could have an idea about the strategies they had used for reading and processing the text. I also told the students that the information would be conveyed to other CSS lecturers so that they could know how the first year science students process information, and how they could be

helped to read and process information more efficiently. During the second lecture hour of the same week, I administered to the same 120 students the second part of the questionnaire that contained 40 cloze items dealing with reading, summary production and evaluation strategies.

3.3.1.2 Second Task

The second text for summarization, which contained one thousand and two hundred words, was taken from the *New Scientist* of 9 November 2002. I personally administered it to nine purposively selected students (3 high-, 3 average- and 3 low-proficiency) who completed it in one hour. I chose the nine students as representative cases of the sample population, and the main aim was to observe at close range how the students summarized the text. My selection of “high”, “average” and “low-proficiency” students was based on the performance of the students in the first task using a scoring classification scheme discussed in section 3.4 of this chapter.

The text deals with how ozone is formed when nitrogen oxides, hydrogen and hydrocarbons from vehicle fumes interact in the presence of sunlight. The text points out that although people become tolerant to ozone after many days of exposure, experiments carried out on the effect of ozone indicate that it leads to a significant increase in lung inflammation. Furthermore, long-term exposure leads to the formation of fibrosis of the lungs, in which dead tissues replace functioning tissues. Research also suggests that the ozone contains sulphuric acid, which combines with other pollutants to become more harmful, especially increasing the rate of coughs and infections of the lower respiratory tract. I chose the text on the ozone for the same reasons stated above and also because science students at first year university level are likely to be familiar with the ozone and

its effects. The students were required to summarize the different pieces of evidence, which show that the ozone harms the lungs. I personally supervised the task so that I could see for myself how the students summarized the text.

3.4 Procedure of Scoring Summary Strategies

The procedure of scoring the summarizing strategies in this study followed the Bakhtinian (1981, 1986) approach, which treats texts as discourse situated in a particular context. In order to understand the themes, the Bakhtinian approach suggests a careful analysis of written discourse along the lines of literary analysis that looks at various aspects, such as the themes, plot, characterization, imagery and so forth. I reinforced the Bakhtinian approach by employing the *grounded method* that uses a coding system to reorganize themes in a given text. Strauss & Corbin (1990: 56-59) maintain: “coding serves to summarize, synthesize, and sort out the emergent themes”. To facilitate the coding system, I numbered the summary scripts from 1-120. The coding of the students’ summaries was derived from the quasi -quantitative method of *content analysis* (Borg & Mohler, (1994: 327-341) that involves the initial step of sorting out the content into themes (see Appendix 7), and then devising a manifest coding scheme in order to make judgement on the type of strategy the student used. The technique involved reading the summaries closely and reading back and forth so that I could understand the quality, meaning, and context of the students’ summarizing strategies.

I analyzed the summaries through a multistage scheme. At first I read the students’ summaries without attempting to categorize the strategies they had used. I then read the summaries for the second time during which I noted the general categories of the strategies the students had used. After the third reading, I developed a systematic coding

scheme (See Appendix 7) to classify the strategies each student had used. Taken together, the last two steps constitute what is generally known as “open coding”, which involves breaking down, examining, comparing, conceptualizing, and categorizing the data (Strauss & Corbin 1990: 61). I then recorded each of the student’s coded strategies on a separate sheet of paper.

The scoring scheme developed for this study is a hybrid version of the classifications previously used by other researchers, such as Carrell (1989), Johns (1985), Johns & Mayes (1990), Kintsch & van Dijk (1978) and Winograd (1984). I also fused into my classification system taxonomies that had been previously used to classify cognitive and meta-cognitive strategies, such as the ones used by Bialystok & Frohlich (1980), Faerch & Kasper (1983), Paribakht (1985), and the adapted versions of Si Qing (1990) and Sionis (1995). For this study, I found the classifications of cognitive and meta-cognitive strategies devised by Chamot (1987, 1996) Li & Munby (1996) and Oxford (1996, 1999) to be particularly instructive, especially the one devised by Phakiti (2003), because his taxonomy is clear and grounded in the students’ actual work

For determining the summary strategies the students had used, I designed a classification system (see Appendix 7) that included the reproduction of the *gist* or *essence* of the original text. The gist was subdivided into three: G1 (the student reproduced the full gist of the text), G2 (the student reproduced part of the gist) and G3 (the student reproduced very little or falsified the gist). The next item on the classification scale is *idea units* (IUs), which were the extent to which the student had produced correct (C), partly correct (PC) or incorrect (INC) ideas. Next is macro-proposition, which was the student’s ability to *recast* information in a more generalized manner. *Generalization*

was treated at three levels: full generalization of the ideas (FG), partial generalization (PG) or very little to no generalization (NG). Under *paraphrasing* (PARA), I considered whether the student had been trying to use his/her own words (P), whether the student had partially paraphrased (PP) or whether the student had simply copied (C) the original information without attempting to recast it.

The other critically important summarizing strategies that I considered were ‘linguistic’ and ‘syntactic’ simplification (LS & SS), which were related to the production of ideas. In this study, linguistic simplification (LS) was viewed as the student’s failure to understand the rhetorical organization of the text resulting in the production of linguistically simplified sentences that glossed over the macro-propositions of the text. On the other hand, syntactic simplification (SS) was regarded as the deletion, omission or alteration of an important macro-proposition, which was an indication of a failure to understand the crucial ideas of the text.

Furthermore, I considered the manner in which the student had been able to distinguish between *global ideas* (GI) (main ideas) from *localized ideas* (G2) (minor ideas) such as illustrations, examples or details. This aspect involved the student’s ability to select important points from a maze of supporting details. I also considered the way in which a student had avoided or included *distortions* (D), which were at three levels: the idea units, macro-propositions and how the student understood new words. Under ‘distortions’, I mainly looked at whether the student had deleted the main idea units (D1) to the extent that the meaning of the original message had been lost, and whether any added information had misrepresented the initial meaning. At the macro-propositional, I considered distortion as either inaccurate information, personal or irrelevant comments

(D2); and at the vocabulary level, I considered distortion as ‘twisting’ the meanings of key words (D3) to produce different meanings, such as misrepresenting the idea that some of the technologies are “exorbitantly expensive”, e.g. giving the wrong impression that there is no money for using some of the technologies.

In addition, I considered the *combination* of ideas as one of the conscious strategies for summarization, such as how students combined sub-sets of information. On this aspect, I considered three elements: the first was ‘transformation’, where the student had used coordination and subordination (C1) to form a cohesive summary in one paragraph. Where a student had written the summary in half-baked combinations relying more on the original words and sentences, I scored it C2. The third type (C3) was *run-on combination* (ROC), in which several sentences from the original passage had been appropriated verbatim in a less organized fashion than those transformations where the student had attempted to recast the sentences in an innovative manner.

For judging the students’ use of cognitive and meta-cognitive strategies (see Appendix 6), I used a classification system that I refined from Chamot’s (1987, 1996), Nassaji’s (2003), Oxford’s, (1990, 1999), Phakiti’s (2003) and Purpura’s (1999) taxonomies. Taking cues from these earlier classifications, I designed a simple scoring scheme as follows:

A. *Cognitive Strategies*

1. Note making (NM): I considered this to be the underlining or jotting down of the main ideas, or writing down the ideas in an outline form or a rough draft.
2. Grouping (GRP): I considered this to be the reordering or reclassifying of the main ideas into a conceptually related unit.

3. Recombination/Resourcing (RR): I considered this as the construction of sentences that are coordinated and subordinated in a self-expressive manner.
4. Deduction/Inferencing (DI): I considered this to be the student's ability to use available information from the original text to guess the meanings of unfamiliar expressions or new words.
5. Contextualization (CNTZ): I considered this to be the student's ability to reproduce relevant ideas.
6. Repetition (R): I considered this to be the reproduction of the same ideas in different words, which is the result of poor or lack of planning.

B. *Meta-cognitive Strategies*

1. Selective/Directed Attention (SA): This referred to the student's ability to differentiate between main ideas as demanded by the task and minor points in the form of examples or illustrations, which could be ignored in the final summary.
2. Planning (P): This aspect referred to the student's ability to direct one's attention to the specific demands of the summarizing task measured by the relevance of the main and supporting ideas.
3. Self-Monitoring/Evaluation (SME): This aspect referred to the student's ability to check, verify, or correct one's mistakes. I judged this by (a) the student's amount of self-correction done in the summary draft and (b) by the student's ability to include all the required points in the final summary.

3.4.1 Interviews

In order to collect as much qualitative data as possible, I interviewed the nine purposively selected participants who had done the second summary task. The interview followed a flexible semi-structured pattern (see Appendix 10). According to Patton (1990), “purposeful sampling is done to increase the utility of information obtained from small samples. Participants are chosen because they are likely to be knowledgeable and informative about the phenomenon the researcher is studying”. For the interview, I took into account the representativeness of the 9 participants (3 “high”, 3 “average” and 3 “low”-proficiency students) by adhering to the principle of maximum variation sampling (Patton, 1990). The nine interviewees represented a cross section of the study population, as particular attention was paid to salient variables such as the gender and age of the participants. To conceal their identity, the nine students were given *nom de plumes* and all students’ names mentioned in this study are not their real names.

The taped semi-structured interviews were conducted on separate days in March and April of 2005 when each of the students had a free lecture hour. Each interview lasted about 20-30 minutes so that I could hear from each student the strategies that s/he had used when summarizing. I conducted the interviews according to standard procedures of qualitative interviewing suggested by Kvale (1996), Rubin & Rubin (1995) and Spradley (1979), namely that each participant has to be interviewed once. The interview centered on eliciting information on how the student had processed each of the texts, how s/he had produced the written summary and how s/he had ensured that it carried the required information, read fluently and that it did not distort the original text.

Before each recorded interview, I tried to establish rapport, empathy and understanding with the interviewee by talking generally about the student's academic progress and welfare. I did this in order to reduce the tension caused by the interview complex (Hitchcock & Hughes, 1994), which is the relationship between the interviewer and interviewee. The main problem that I tried to overcome was the 'power relationship' between the interviewee (student) and the interviewer (lecturer). This was done through a flexible and partially structured interview that was sensitive to the context and subject of the interview. The interview itself did not follow a rigid set of pre-arranged questions. Underlying each interview was the need to stimulate a spontaneous dialogue that would enhance, albeit in a small way, the student's interpersonal communication skills by talking about the strategies that the student had used in summarizing the two texts.

After the interviews, the recordings were transcribed in full by two second year English majors. The transcripts were then returned to the interviewees for verification. After the interviewees' comments about the correctness of the transcripts, I then analyzed the transcripts (see section 8.3 of Chapter Eight) using a coding system emerging from the data, such as reading, summary production and self-evaluation strategies. The analysis focused on reconstructing the strategies the interviewees claimed they had used, and this entailed making personal interpretations of the data. To ensure that confidentiality was maintained, I gave each interviewee a pseudonym, and to the same end, any characteristics that betrayed them were disguised.

3.5 Value of the Qualitative Methods

In this study I found qualitative research methodology not only exciting but also a technique that required careful planning, persistent application and critical thinking. For

instance, by coding and breaking down information into constituent parts, I was able to see the ‘unity’ in ‘diversity’ of the research phenomenon. Above all, by using multiple mixes of qualitative research methods I was able to nurture and complement the quantitative methods that I had used. The greatest strength of using qualitative methods, such as content analysis and coding, was that I was able to dig beneath the surface of the data and to go beyond the artificial domain of quantitative methods that often fail to answer the ‘why’ and ‘how’ part of research. The most valuable aspect of using qualitative research techniques, in spite of the criticism leveled by die-hard quantitative researchers who argue that qualitative research is prone to subjectivity and bias, is that I was able to exploit the extra data by looking at micro issues of summarization, such as sentence coordination and meta-statements, which helped to increase the range, scope and quality of the research outcome.

3.6 Summary of Research Methods

In this chapter I have described the methods that I used for collecting different forms of data. I used multiple data collection methods or pluralistic research because of the non-experimental nature of the research, which focused on a ‘study’ of the strategies used for summarizing by ESL first year science students. This type of research called for the use of different data sources and analyses in order to achieve a reasonable measure of validity and reliability in the findings.

The first thing that I did in this chapter was to outline the methodology used. I indicated that I used both quantitative and qualitative methods, which rely on positivist and interpretive techniques. I described the type and nature of questionnaire that I used, which enabled me to collect an array of quantifiable data to increase my chances of

having a multi-dimensional view of the summarizing strategies used by the science students. I also described the type of qualitative research methods that I used, whose main purpose was to focus on the *how* and *why* part of the data.

Given the fact that I used both quantitative and qualitative methods, I went on to outline the concept of triangulation, which is the use of a variety of sources, analyses, and techniques to achieve ‘trustworthiness’ in the findings. This involved an in-depth description of the profile of the research participants, the summary tasks that I used for data collection and the scoring procedures. To complete the description of the research methods that I used, I outlined the semi-structured interviews that I carried out with purposively selected students so that I could have a deeper understanding of the students’ summarizing strategies. In the next six chapters I present and discuss the findings and implications of the study.

4.0 CHAPTER FOUR: SURVEY RESULTS

4.1 Introduction

In this chapter I present quantitative findings of the strategies the students reported they use for information processing, writing and evaluating the accuracy of their summary products (see Appendix 3). The results in this chapter reflect the strategies the students indicated they use, based upon their self beliefs and efficacy. In chapters five, six, seven and eight I present qualitative results, which are based on a contextual analysis of the strategies the students used in summarizing texts on global warming and the ozone (see Appendices 2, 3, 4, 5, 6, 7, 8, 9, & 10). It is in these later chapters that I compare the strategies used by high-, average- and low-proficiency students (see Appendix 9), especially focusing on the quality of the strategies, their frequency, range and scope.

In this chapter, the survey results are presented using descriptive statistics that show what the results look like, how they are broadly spread, and how they are related in terms of one aspect to another of the same data (Leedy, 1997: 252). The findings are shown in bar graphs and tables. The Statistical Package for Social Science (SPSS) version 12.0 was used to calculate these measures; but I did not use analysis of variance (ANOVA) or multivariate analysis of variance (MANOVA) tests, as the data are non experimental in nature.

4.2 Information Processing Strategies

4.2.1 Directed attention

The information processing strategies the students reported they use were in response to statements 1-15 of Section B of the second research instrument (see Appendix 3), which was administered after the students had written a summary. In

analyzing the responses, I regrouped them into four themes that reflected the strategies the students had stated they used when processing information, namely ‘self-directed attention’, ‘scanning and skimming’, ‘marginal information processing strategies’ and ‘inappropriate information processing strategies’. The first emerging theme was ‘self-directed attention’, which requires the students to focus on the demands of the task. Questions 1, 2, 3 and 14 are the ones that required the students to indicate the strategies they used in order to direct themselves to the summarizing task (see Figure 15 below).

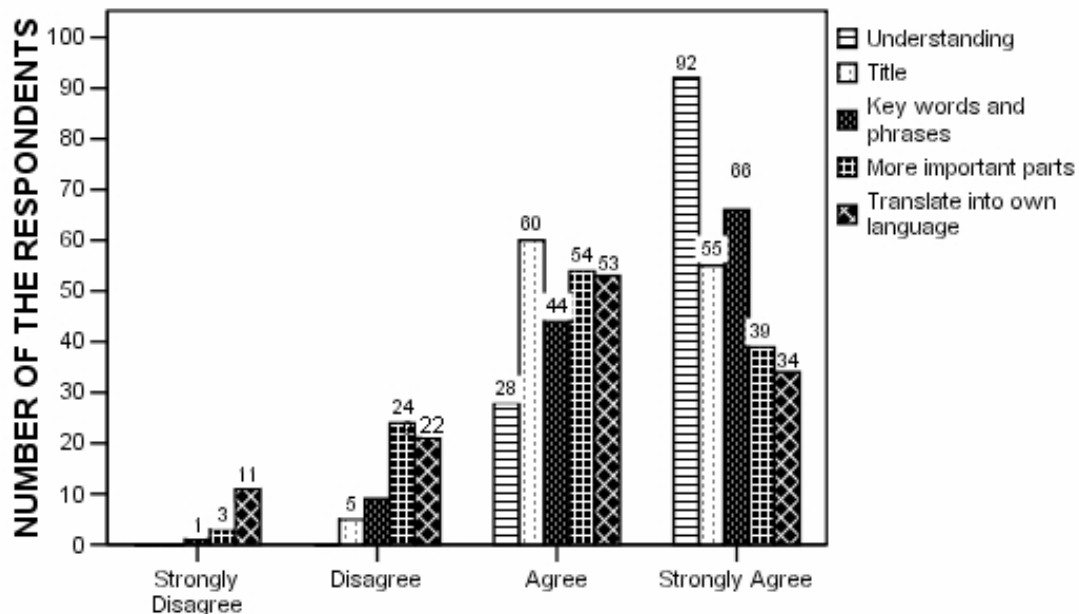


Figure 15: Self-directed attention

Figure 15 shows that out of the sampled population of 120 students, 92 strongly agreed and 28 agreed that they try to understand first what they are supposed to summarize. For question 2, which asks the students to indicate the degree to which they pay attention to the title of a text, they also overwhelmingly indicated that they strongly agree (55) and agree (60) that they first look at the title in order to get the sense of what

the text is saying. Regarding the strategy of focusing on key words to get the gist of the text (question 3 of Appendix 3), 66 and 44 students, respectively, reported they either strongly agree or agree that they look for key words and phrases that allow them to get the general feel of the text. This strategy is in keeping with psycholinguistic views of interactive reading which suggest effective information processing strategies involve combining both lower-level visual information processing strategies, through word recognition, syntactic and semantic processing, with higher-level strategies that emphasize contextual and background knowledge (Nassaji, 2002, 2003).

However, when it comes to determining which parts of a text are more important than others (question 14), a skill that is vitally important for locating the required information, only 39 students indicated that they strongly agree that they use such a strategy, compared with 54 who agree that they use the strategy. It is not surprising that there were fewer students who strongly agree that they need to decide which parts are more important than others before summarizing, because this is a skill that involves the use of meta-cognition, which entails “higher order executive skills” (O’Malley & Chamot, 1990: 44). The limited use of a self-evaluation mechanism confirms the findings of previous studies, particularly those of Pellegrino (1994, 1996) and Schraw (1994), who noted that college students with poor monitoring skills are less able to manage their learning, and perform worse than good monitors.

4.2.2 Scanning and Skimming

Figure 16 below, titled “scanning and skimming”, refers to the strategies the students reported they use for abstracting the main points from a text. These responses refer to questions 4, 5, 6 and 11 of the questionnaire. The students’ responses to

statements 4 and 5 (which ask whether they first scan and skim and whether they look at the topic sentence of each paragraph to guide them in understanding the gist of the text) indicate that they generally employed these skills, except that they did not strongly agree that they used these strategies. In fact, the responses of the students to question 5, which asks whether they look at the topic sentence of each paragraph, indicates that 9 students strongly disagree and 46 students disagree, which represents nearly half of the sampled students. Statements 6 and 11, which refer to underlining and making notes of key points, and making sure one understands the whole text before summarizing, received the highest rating. This shows that the students have a positive approach to information processing strategies, perhaps because they had already been taught summarizing skills before they did the research task.

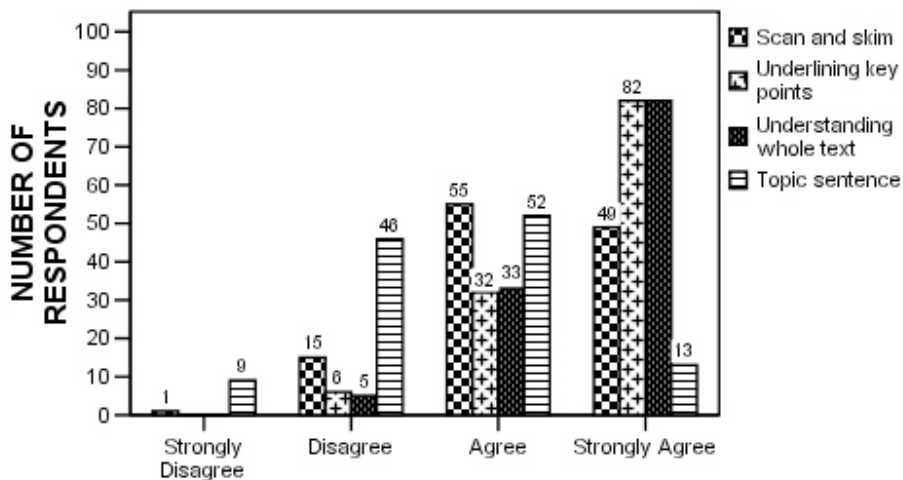


Figure 16: Scanning and skimming

The students' information processing strategies for scanning and skimming, underlining key points, and trying to understand topic sentences and the meaning of the whole text before summarizing are consistent with Kintsch's (1998) idea of discourse comprehension. He suggests that in reading a text, one first goes through a construction

process, whereby the main ideas of the text are constructed through prediction, until the text-base is integrated into the reader's global knowledge, forming a coherent mental representation of what the text is about.

4.2.3 Marginal information processing strategies

I classified statements 9, 12 and 13 as marginal information processing strategies because they are not central to information processing (see Appendix 3 & Figure 17). These statements required the students to show the degree to which they focus on words surrounding an unknown word in order to determine its meaning, the extent to which they think about “under-the-surface” meanings of words and how they relate the information in the text to what they already know.

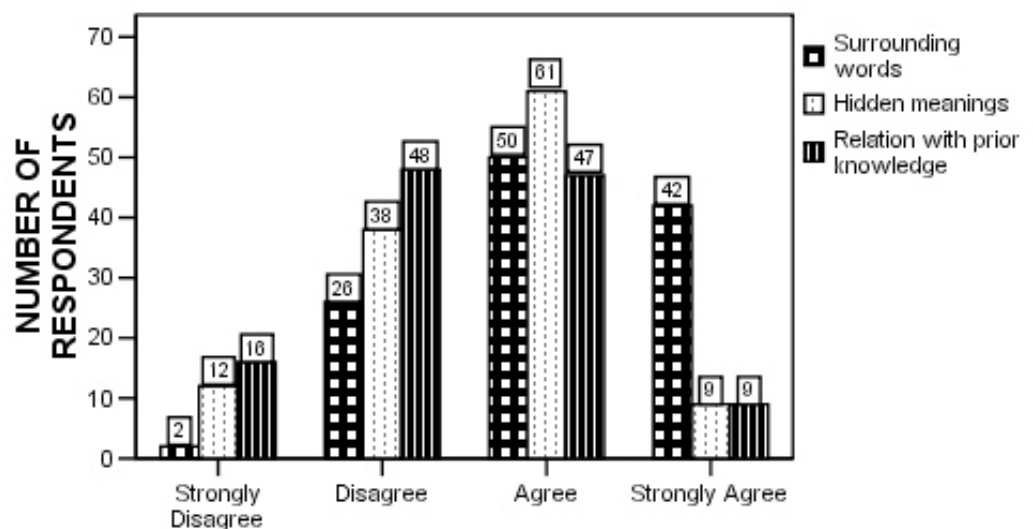


Figure 17: Marginal information processing strategies

Students' responses to the “marginal” information processing strategies are quite interesting. While 92 students either strongly agreed or agreed that they pay attention to words surrounding an unknown word, the situation is somewhat different when it comes to the extent to which they pay attention to hidden meanings and how they relate the text

to prior knowledge. Although 70 students reported that they either strongly agreed or agreed that they thought about the meanings of unknown words, there is a significant number (50) who either strongly disagreed or disagreed. Similarly, 64 students either disagreed or strongly disagreed that they relate new information to what they already know, while 56 agreed or strongly agreed that they relate the new information to previous experiences.

What this means is that over half of the ESL first year science students at the University of Botswana pay attention to hidden meanings or relate new information to what they already know. This is consistent with studies on the effects of lexical inferencing (e.g. De Bot et al., 1997) which suggest that a control of vocabulary enables the decoding of a text. Also, relating new information to prior knowledge is consistent with schema theory (Kintsch and Van Dijk, 1978), which assumes that a coherent interpretation of a text takes place through the interactive process of combining “content schemata” or background information with “formal schemata” or background rhetorical structures (Cook, 1997). Those students who reported that they did not relate new information to prior knowledge (over half), fall into the category that Scott (2005) refers to as not conforming to the heuristic principle of building from “resident” to “absent” schemata; that is to say, moving from “old” to “new” knowledge, or as it is known in cognitive psychology, moving from “known” to the “unknown”.

4.2.4 Inappropriate information processing strategies

Strategies reflected in statements 7, 8, 10 and 15 of the second questionnaire (see Appendix 3) are the ones that I termed “inappropriate” strategies because they do not foster summarizing skills. These statements require the students to indicate the extent to

which they focus on examples and details in a text, the meaning of new words, the meaning of sentences and whether they translate the main ideas into their primary language in order to understand them better. These strategies do not promote information processing, but are often employed by readers who do not have technical expertise in reading a text.

Figure 18 below shows the extent to which the students used “inappropriate” strategies. With regard to the extent to which they focus on details and examples, 70 students disagreed or strongly disagreed and 50 agreed or strongly agreed. On the degree to which they focus on the meaning of new words, similar responses were given: 65 students disagreed or strongly disagreed, and 55 agreed or strongly agreed. The students’

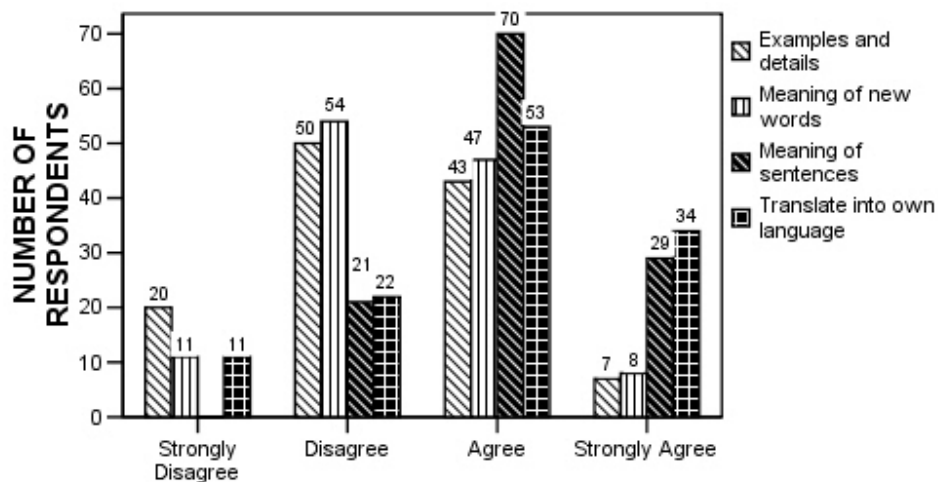


Figure 18: Inappropriate information processing strategies

responses showed that although more than half of them indicated they did not focus on details and meanings of new words, nearly half of them indicated they did so. This is cause for concern because, while the majority of the students focus on macro issues

(which is the right thing to do), almost an equal number focuses on micro issues, such as examples and illustrations.

Regarding what the students do at the sentence level, an overwhelming number (99 out of 120) agreed or strongly agreed that they focus on the meaning of sentences while 21 disagreed. This reading behaviour is inconsistent with the practice of effective reading, which suggests that a reader should try to understand the gist of a text and its rhetorical patterns. Swales (1990:89) says that any meaningful reading involves an identification of the genre, formal structure and topic, all of which activate schemata and allow readers to comprehend the text. Jacoby et al. (1995) concur that an awareness of discourse functions enhances the students' understanding of the structure, rhetoric and specific genre.

Concerning translation, 87 students (as opposed to 33) agreed or strongly agreed that they translate the main ideas into their home languages in order to understand them better. In theory (Ellis, 1987:184-5) the strategy of translating ideas from the second language into one's first language in order to internalize the ideas, is laudable. This compensatory strategy is used when a learner has a problem in understanding the required information, but decides to persevere by tapping into the linguistic repertoire of the first language in order to retrieve the required information.

However, the compensatory strategy of translating from the target into the home language has three shortcomings. The first is that there is not enough time at university level to translate all the ideas that a learner does not fully understand into one's primary language. The second is that a student who does not understand the ideas in the second language is likely to translate them inaccurately into her/his first language. The third is

that translation can make an L2 learner easily regress into the comfort zone of the home language, thereby slowing down the development of “strategic competence” in the second language, defined by Canale and Swain (1980:25) as “how to cope in an authentic communicative situation and how to keep the communicative channel open”. A better approach to deal with this problem is to employ other compensatory strategies such as paraphrasing, substitution or restructuring, using the second language.

4.3 Summary production strategies

4.3.1 Planning

The summary production strategies the students reported they use were in response to statements covering questions 16-30 of the questionnaire (see Appendix 3). I categorized the responses into four broad themes: planning, recasting/paraphrasing, reproduction and inappropriate strategies. Questions 16, 17, 18 and 20 were classified as planning; 21, 23, 24 and 27 as recasting or paraphrasing; 22, 25 and 26 as reproduction; and 28, 29 and 30 as inappropriate strategies. Figures 19-23 below provide a graphic representation of the responses to each of these four planning strategies respectively.

The responses show that the vast majority of students plan on how to write a summary. Out of the 120 students involved in the study, 98 agreed or strongly agreed that they plan for a course of action and 117 strongly agreed or agreed that they first identify the required information before summarizing. Regarding the writing of notes first before writing the final version, 90 students either agreed or strongly agreed that they employ the strategy, while 30 expressed a contrary view. As to whether they first make a draft and then write the final version, a similar positive response was given, with 96 students indicating that they strongly agree or agree that they first make a draft.

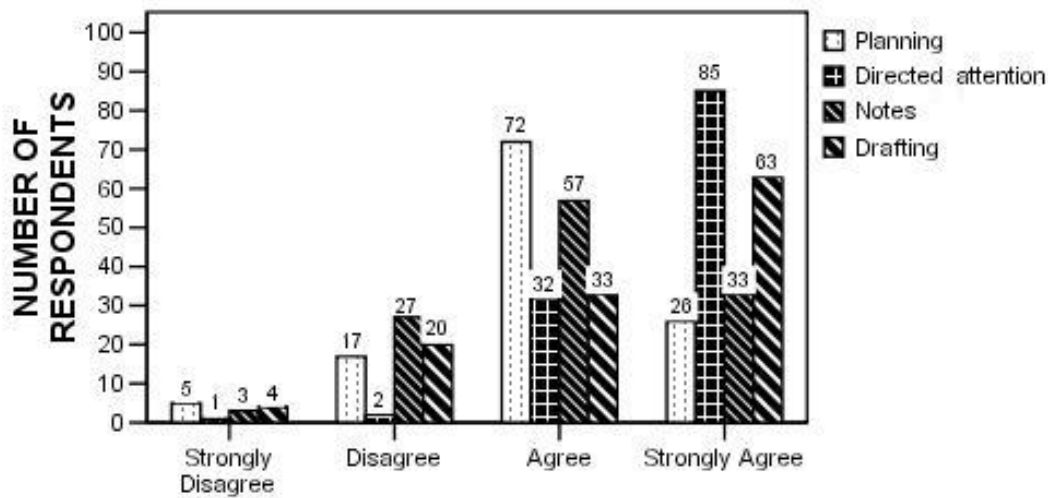


Figure 19: Planning strategies for summary production

The students' responses to the planning strategies they use for summary production are plausible, as they show an awareness of what is required in order to produce a meaningful summary. Again, this awareness might have resulted from the fact that the students had been taught summarizing skills prior to doing this research summary task. As early as 1981, Holec noted that learners who fix objectives, plan for a course of action, define the content, select the methods and techniques for accomplishing a given task, and monitor their progress towards their objectives are more likely to be successful than those who do not. Brown, Day, and Jones (1983) also found that the summaries of students of various levels improved considerably with careful planning. However, the problem is that being aware of the procedures to be followed for producing a successful summary is not enough: a student has to apply the skills successfully to ensure that there is no breakdown in the production process. This is what many low-proficiency students failed to do, as is shown in the next chapter, which reports on qualitative results.

4.3.2 Recasting/Paraphrasing

As with planning, the students' responses to statements on the extent to which they recast information are very positive (see Figure 20 below). The statements that I classified as requiring recasting are 21, 23, 24 and 27. On whether the students use their own words when summarizing, 109 students agreed or strongly agreed that they do so, and 84 students either agreed or strongly agreed that they try to generalize the main ideas. Here, it is worth noting that 36 students or (30% of the sampled population) indicated that they do not recast the main ideas, which implies that they simply replicate them.

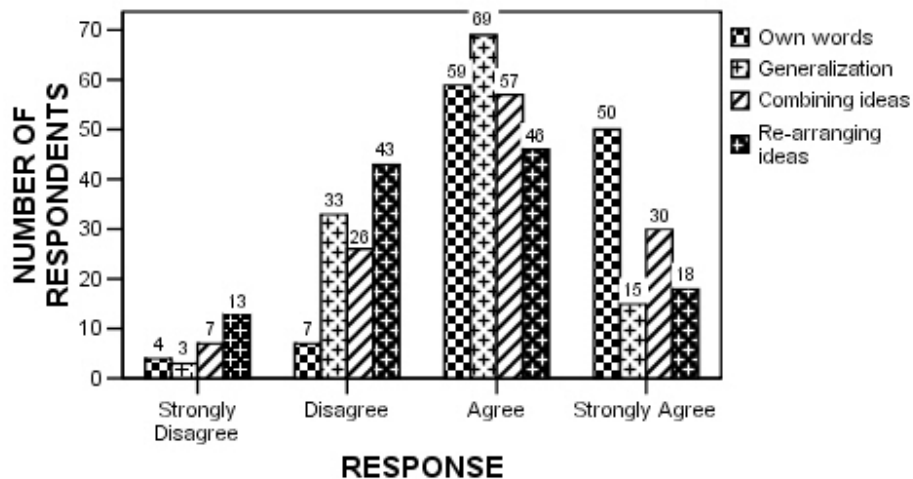


Figure 20: Students' strategies for recasting ideas

Regarding efforts to combine two or more ideas into one complex sentence so that one can produce a coherent summary, 87 students agreed or strongly agreed that they combine the ideas. Again, as in the case of generalization, 33 students or 28% said they do not combine sentences to produce new transformations. This suggests they probably appropriate whole parts without paying attention to the conciseness of the ideas. The strategy that received the lowest rating is regrouping of ideas, with 64 students agreeing or strongly agreeing and 56 disagreeing or strongly disagreeing. The low rating implies

that many students do not see the need to reorganize the ideas so that they can come up with new transformations, i.e. how students marshal ideas in a novel way.

4.3.3 Reproduction

The students' responses to questions 22, 25 and 26 about how they produce ideas showed that they use a variety of strategies (see Figure 21 below). In response to the question on whether they tend to rely on the words found in the text, 66 students either disagreed or strongly disagreed while 54 either agreed or strongly agreed. Theoretically speaking, the 66 students who disagreed or strongly disagreed chose a productive strategy, because students are supposed to use their own words when summarizing. However, this does not always apply to scientific writing because there are many scientific words that have no substitutes, and this is perhaps the reason why nearly half of the sampled students agreed or strongly agreed that they tend to rely on the words they find in the text.

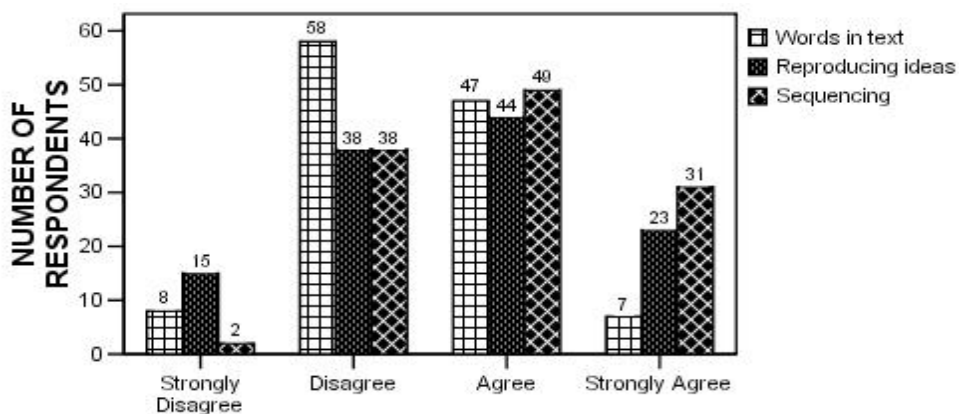


Figure 21: Students' strategies for reproducing ideas

With regard to the re-wording of ideas in a summary, 67 students agreed or strongly agreed that they reproduce the ideas exactly as they are in the original text and 53 disagreed or strongly disagreed. In response to question 26, which required the students to state the extent to which they re-order ideas in a summary, 80 agreed or strongly agreed that they reproduce ideas in the order in which they appear in the original text. This information suggests that many science students at first year level at the University of Botswana resort to “safety valve” measures, by not imposing their own order in a summary.

4.3.4 Inappropriate Summary Production Strategies

What is refreshing about the students’ responses on summary production strategies is that over 80% of the students indicated that they avoid appropriate strategies suggested in statements 19, 28, 29 and 30. These strategies involve writing the final version without first making notes, expanding the main ideas, adding relevant but uncalled for information and making personal comments (see Figure 22 below).

The results in figure 22 below show that 97 students disagreed or strongly disagreed that they immediately write their final summaries from underlined ideas without first making rough notes. As to whether they expand the main ideas, 93 students disagreed or strongly disagreed while 99 students strongly disagreed or disagreed that they add relevant but uncalled for information. An equally high number (101 students) indicated that they do not make personal comments when writing a summary. While the students can be lauded for being aware of what to avoid when summarizing, one is concerned with the 20% who use these inappropriate strategies. In section 45 of this chapter, I show which strategies are preferred by high-, average- and low-proficiency

students, which explains why 20% of the sampled population employ inappropriate strategies.

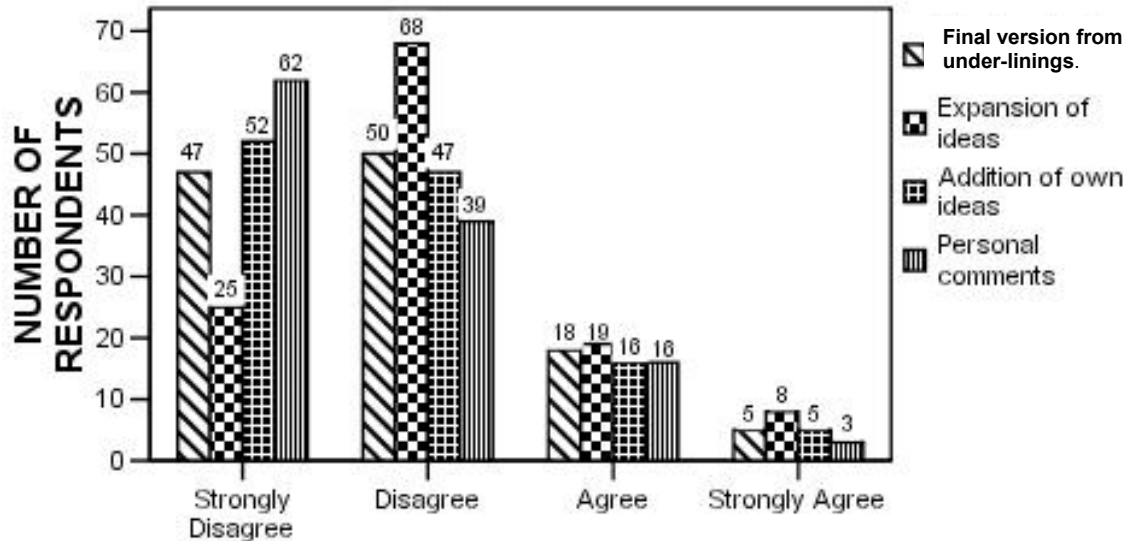


Figure 22: Incorrect summary production strategies

4.4 Self-Assessment Strategies

In section D of the questionnaire (see Appendix 3), there are ten statements (numbered 31-40) which refer to what students do to ensure that their final summary versions are fine-tuned. In analyzing the data, I sub-divided the responses into four themes: directed attention, correction, self-evaluation and inappropriate strategies. Taken together, the majority of the students stated that they employ self-assessment strategies (see Figure 23 below).

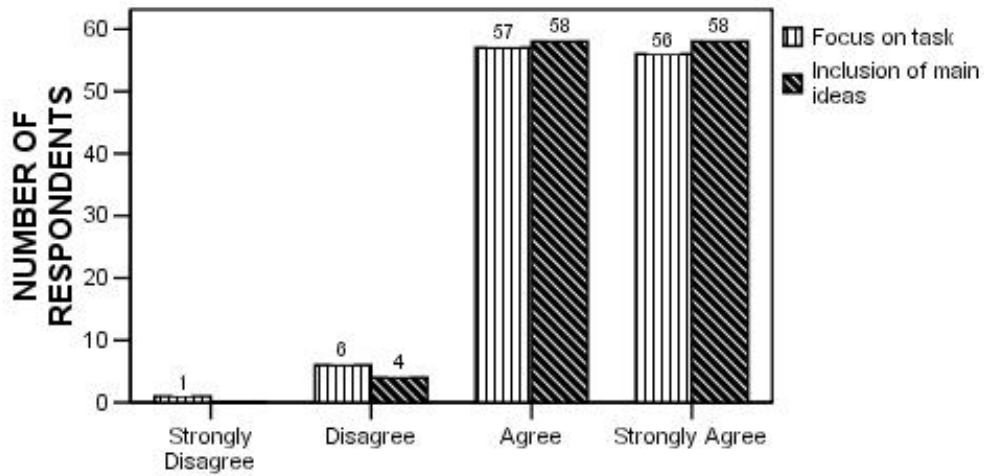


Figure 23: Directed attention

As can be seen in figure 23, 116 students agreed or strongly agreed they verify that they have not omitted any of the main points and 113 agreed or strongly agreed they check that their summaries are focused on the set task. Also, (see Figure 24 below) 117 students agreed or strongly agreed they check that their summaries read fluently before they hand them in. An equally high number of students (115) strongly agreed or agreed that they correct their mistakes, while 117 students agreed or strongly agreed they ensure that they use an appropriate language.

Also, students generally agreed or strongly agreed that they evaluate their own summaries before submitting them (see Figure 25 below). The bar chart shows that 99 students agreed or strongly agreed that they double-check that the original ideas are not distorted before handing in their work. As to whether they reflect on the quality of their final summary products, 102 students agreed or strongly agreed that they do so, while 111 strongly agreed or agreed that they revise the final version before submitting it. However, fewer students (87) agreed or strongly agreed that they compare the final

version with the original text, and 101 students strongly disagreed or disagreed that they include interesting information, which may not have been in the original text.

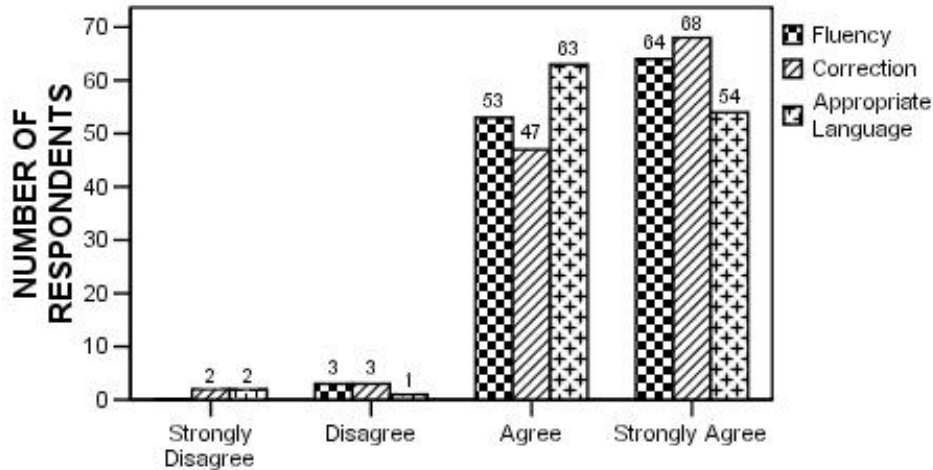


Figure 24: Self correction strategies

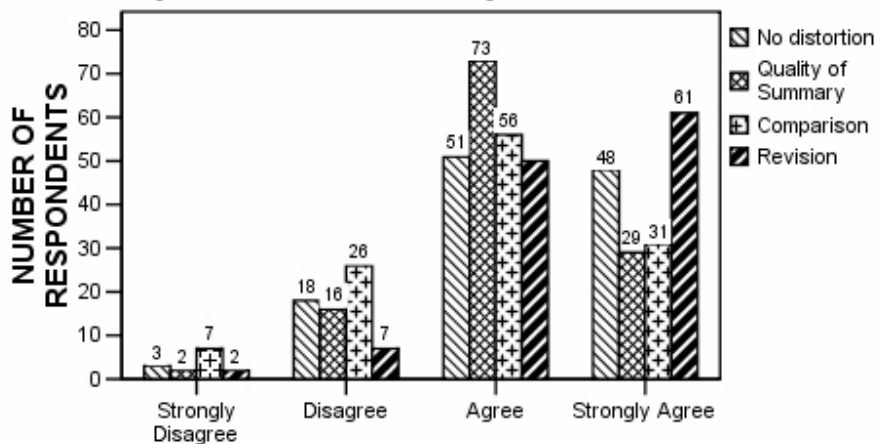


Figure 25: Self assessment strategies

The students' overwhelmingly positive responses shown in figures 23, 24 and 25 above are not consistent with current research (e.g. Bedell & Oxford, 1996; Cohen, 1998; Li & Munby, 1996), which suggests L2 learners, especially low-proficiency learners, have problems in using meta-cognitive strategies such as self-evaluation. The use of

meta-cognitive strategies has also been shown to be one of the major factors differentiating between high-proficiency and low-proficiency readers (e.g. Kinnunen & Vauras, 1995; Zhang, 1999, 2000). Furthermore, research has consistently demonstrated that poor readers are not as adept as good readers in planning for activities that make meta-cognitive strategies work well (Swanson & De La Paz, 1998).

The inconsistency between the students' claims that they double-check and reflect on their work and previous research, which indicates that low proficiency students have problems in evaluating their work, can be explained by the fact that the data in this chapter are based on the responses given by students by simply circling statements in the questionnaire, which they thought best describes what they do to ensure that their final summaries are well polished. This is the weakness of data obtained through a questionnaire because subjects tend to report what they think the researcher wants to hear, and also because pre-defined answers tend to stifle answers.

The inconsistency supports Cresswell's (1994) concern that data obtained through a questionnaire often provide the "front" being put on by respondents: they do not penetrate the "deep structure" of the problem being investigated. The inconsistency between what the students indicated in the questionnaire and what they actually did when they were given a passage to summarize is discussed in the next section.

4.5 Students' Self-reported Summary Strategies

Immediately after the students had completed writing the research summary task (see Appendix 2), they were instructed to reflect on the strategies they had used to write the summary and to write down (a) four strategies they had used to help them understand

the text, (b) four steps they had followed in writing the summary and (c) four techniques they had used to ensure that their final summaries had been fine-tuned.

An analysis of the strategies the students had identified as the ones they had used for reading the summary text, producing the summary and evaluating their summary outcomes, shows a remarkable difference between the different proficiency levels of students (see Tables 2, 3 & 4 below). As a whole, high-proficiency students reported using more cognitive strategies (e.g. scanning and skimming, note-making, planning, drafting, recasting, grouping, combination and ordering) and meta-cognitive strategies (e.g. self-correction, verification and product evaluation) than average- or low-proficiency students.

Of particular significance is the low-proficiency students' inability to explicate the self-evaluation strategies they had used to ensure that their final summaries were fine-tuned. The low-proficiency students' inability to explain the strategies they had used for assessing their final summaries is consistent with the findings of previous researchers (e.g. Flavell, Miller & Miller, 1993), which indicated that unskilled L2 learners are unable to assess their own work. The results also answer affirmatively research questions 5 and 6. These questions ask whether high-proficiency ESL first-year science students are more capable of using cognitive strategies such as note-making, grouping, recombination, resourcing, deduction and contextualization than low-proficiency students; and whether high-proficiency ESL first year science students are more capable of using meta-cognitive strategies such as functional planning, self-monitoring and product evaluation than their low-proficiency counterparts. From the data in tables 2, 3 and 4, high-proficiency students are clearly ahead of low-proficiency students in terms of the

cognitive and meta-cognitive strategies they prefer to use. The results also shed light on research question 10, about whether there are any gender-related summarizing strategies preferred. The data in tables 2, 3 and 4 show that there are no gender-related strategies preferred right across the different proficiency levels .

Table 4: Summarizing strategies preferred by high-proficiency students

	Out of 16	Out of 4	Out of 20	
<u>Reading Strategies</u>	<u>Male %</u>	<u>Female %</u>	<u>Total No</u>	<u>Total %</u>
Understanding	87% (14)	100 % (4)	18	90 %
Scanning & Skimming	81.3% (13)	50 % (2)	15	75 %
Noting	87 % (14)	100 % (4)	18	90 %
Meaning	13 % (2)	75 % (3)	5	25 %
<u>Production Strategies</u>	<u>Male %</u>	<u>Female %</u>	<u>Total No.</u>	<u>Total %</u>
Planning	81.3% (13)	0 % (0)	13	65 %
Drafting	56 % (9)	75 % (3)	12	60 %
Recasting	44 % (7)	25 % (1)	8	40 %
Ordering	38% (6)	75 % (3)	9	45 %
<u>Self-assessment</u>	<u>Male %</u>	<u>Female %</u>	<u>Total No.</u>	<u>Total %</u>
Directed attention	75 % (12)	25 % (1)	13	65 %
Verification	69% (11)	50 % (2)	13	65 %
Correction	63 % (10)	75 % (3)	13	65%
Evaluation	44 % (7)	25 % (1)	8	45 %
Mean	65 %	56 %	12	61 %

Table 5: Summarizing strategies preferred by average-proficiency students
 Out of 33 Out of 15 Out of 48

<u>Reading Strategies</u>	<u>Male %</u>	<u>Female %</u>	<u>Total No.</u>	<u>Total %</u>
Understanding	78 % (26)	47 % (7)	33	69 %
Scanning & Skimming	33 % (11)	47 % (7)	18	38 %
Noting	58 % (19)	60 % (9)	28	58 %
Meaning	33 % (11)	20 % (3)	14	29 %
<u>Production Strategies</u>	<u>Male %</u>	<u>Female %</u>	<u>Total No.</u>	<u>Total %</u>
Planning	52% (17)	7 % (1)	18	38 %
Drafting	45 % (7)	47 % (7)	22	46 %
Recasting	39 % (13)	27 % (4)	17	35 %
Ordering	30 % (10)	27 % (4)	14	29 %
<u>Self-assessment</u>	<u>Male %</u>	<u>Female %</u>	<u>Total No.</u>	<u>Total %</u>
Directed attention	39 % (13)	53 % (8)	21	43 %
Verification	67 % (22)	53 % (8)	30	63 %
Correction	58 % (19)	33 % (5)	24	50 %
Evaluation	27 % (9)	20% (3)	12	25 %
Mean	47 %	36 %	21	44 %

Table 6: Summarizing strategies preferred by low-proficiency students
Out of 31 Out of 21 Out of 52

<u>Reading Strategies</u>	<u>Male %</u>	<u>Female %</u>	<u>Total No.</u>	<u>Total %</u>
Understanding	48 % (15)	29 % (6)	21	40 %
Scanning & Skimming	35 % (11)	29 % (6)	17	33 %
Noting	48 % (15)	43 % (9)	24	46 %
Meaning	19 % (6)	24 % (5)	11	21 %
<u>Production Strategies</u>	<u>Male %</u>	<u>Female %</u>	<u>Total No.</u>	<u>Total %</u>
Planning	19 % (6)	5 % (1)	7	13 %
Drafting	26 % (8)	33 % (7)	15	29 %
Recasting	39 % (12)	10 % (2)	14	27 %
Ordering	26 % (8)	5 % (1)	9	17 %
<u>Self-assessment</u>	<u>Male %</u>	<u>Female %</u>	<u>Total No.</u>	<u>Total %</u>
Directed attention	19 % (6)	14 % (3)	9	17 %
Verification	16 % (5)	24 % (5)	10	19 %
Correction	29 % (9)	14 % (3)	12	23 %
Evaluation	13 % (4)	5 % (1)	5	10 %
Mean	28 %	20 %	13	25 %

4.6 Summary of survey results

As a whole, the survey results show that first-year ESL science students with different proficiency levels are “aware” of the appropriate reading, production and self-assessment strategies to use when summarizing. In particular, they either strongly agreed

or agreed that they first scan and skim a summarizing text, focus on the main points, ignore examples and details, plan their work, use their own words and correct their summaries before submitting them.

However, when the data from the Likert type of questionnaire were cross-checked against the strategies the students reported they had used in the actual summarization of the text, many of their claims, especially those of the low-proficiency students, were not sustained. Instead, there was a clear difference between the strategies preferred by high-proficiency and low-proficiency students. In particular, low-proficiency students were generally unable to substantiate the self-assessment strategies they had used. This supports the findings of several previous studies (e.g. Rivers, 2001; Nassaji, 2003) that have reported on the inability of low-proficiency students to assess their own cognition.

Also, the survey data do not show any differences in the strategies preferred by each gender. This is contrary to the findings of Strategy Inventory of Language Learning (SILL) studies on gender (e.g. Green & Oxford, 1995) and those on cognition and meta-cognition (e.g. Chavez, 2001; Kaylani, 1996; Shoerey, 1999) which reported a significantly higher use of cognitive and meta-cognitive strategies by females than males. The lack of differentiation in the strategies preferred by each gender can be attributed to the fact that in this study the students have a fairly homogeneous science background. They entered university after they had been subjected to the same selection criteria, except nursing science students who were selected using different criteria, such as their length of service.

In short, the survey data show that most of the students are aware of the strategies they are supposed to use when summarizing, perhaps because they had been taught

summarizing skills before they did the research task. What needs to be noted is that the survey data reveal the strategies the ESL first-year science students claimed they used. The data do not necessarily reveal the students' actual practices. This is because the questionnaire used for collecting the survey data provided a platform for premeditated responses, which tended to conceal the subterranean practices. This problem is tackled in the next chapter, which reports on the qualitative data. In the first part of Chapter Five, the students' performances in the research summary on the technologies that are likely to control climate changes are descriptively analyzed. In the second part, the qualitative aspects of the strategies used by representative students with different proficiency levels are analyzed. These show variance in the manner in which students with different proficiencies are able to execute production strategies.

5.0 CHAPTER FIVE: SUMMARY PRODUCTION STRATEGIES

5.1 Introduction

In this chapter I describe the strategies that were used by students to produce summaries on the technologies that are likely to control climate changes and meet the world's energy needs, as well as pointing out the limitations of these technologies. I first present the students' raw scores on the summary and later on analyze their production strategies. The strategies that I focus on are: production techniques of the main idea units, the gist, the strategies for generalizing information, for treating global vis-à-vis localized ideas, paraphrasing and strategies for combining idea units.

The main objective of this chapter is to compare the strategies preferred by high-, average- and low-proficiency students. In analyzing the strategies, I compare and contrast the strategies used by representative samples of each group and draw conclusions on why they use such strategies. To analyze the strategies, I use both descriptive statistics and qualitative data interpretation techniques to answer the "why" and "how" part of the research phenomena.

By analyzing the students' summary production strategies, an attempt is made to answer research questions 1, 2, 3, 4, 7, 8 and 9 (see Chapter One, section 1.4). The first research question is concerned with the production of main idea units. It asks whether low proficiency ESL first-year science students at the University of Botswana produce more inaccurate or partially correct idea units (IUs) from the text than high-proficiency students. The second research question asks whether low-proficiency ESL first-year science students produce more copied or run-on ideas than high-proficiency students. The third asks whether low-proficiency ESL first-year science students produce more

distortions of the original IUs than high-proficiency students. The fourth asks whether high-proficiency ESL first year science students are more capable of providing macro-propositions and the meanings of new words than low proficiency students. The seventh asks whether there is any fundamental difference between low- and high- proficiency students in the manner in which they distinguish between global and localized ideas. The eighth and ninth ask whether there are any major differences between low- and high-proficiency students in the manner in which they paraphrase and combine ideas. Research questions five and six, which ask whether high-proficiency students are more capable of using cognitive and meta-cognitive strategies, are answered in chapter six.

5.2 Students' performance

In order to understand the strategies the students used for summarizing the research text, I first of all marked the summaries using a scoring sheet as my marking guide and a list of the idea units (IUs) the students were expected to give (see Appendix 4 and 5). In order to achieve co-rater reliability, a colleague independently marked the same scripts and then we compared the marks and agreed on a joint mark for each student. The students who scored 15-20 marks were considered as high-proficiency, those who scored 10-14 were classified as average and those with a mark between 0-9 were rated as low proficiency (see Tables 7 a, b and c below for the performance of the students, in the summary task).

Table 7a: High-proficiency students' performance

Out of 20	Male	Female	Total
20	0	0	0
19	1	1	2
18	0	2	2
17	1	1	2
16	4	0	4
15	10	0	10

Table 7b: Average-proficiency students' performance

Out of 20	Male	Female	Total
14	3	1	4
13	2	5	7
12	4	3	7
11	5	2	7
10	19	4	23

Table 7c: Low-proficiency students' performance

Out of 20	Male	Female	Total
9	1	2	3
8	2	0	2
7	1	1	2
6	1	3	4
5	8	3	11
4	6	9	15
3	9	3	12
2	3	0	3
1	0	0	0

Table 7a, b & c above show that 20 students scored marks in the high-proficiency category, 48 and 52 students scored marks in the average- and low-proficiency levels respectively. In terms of gender-related performance, there were no significant differences between male and female students, except that the four female students who were classified as high-proficiency were outstanding in their performance. This is consistent with SILL-based research (e.g. Oxford, 1999; Young & Oxford, 1997) that has shown that females tend to use more effective strategies than males, which enable them to excel in high-stakes examinations. Table 8 and figure 26 below show a normal standard deviation of 1.41 for the performance of high-proficiency students. Table 9 and figure 27 also show a normal standard deviation of 1.39 for average-proficiency students; but low proficiency students (see Table 10 and Figure 28) recorded a somewhat higher

standard deviation of 1.78. The higher standard deviation for low-proficiency students is caused by the wider range of marks of 2 - 9.

Table 8: Descriptive statistics of high-proficiency students

	N	Minimum	Maximum	Mean	Std. Deviation
HIGH PROFICIENCY	20	15	19	16.10	1.410
High Proficiency Male	16	15.00	19.00	15.6250	1.08781
High Proficiency Fem	4	17.00	19.00	18.0000	.81650

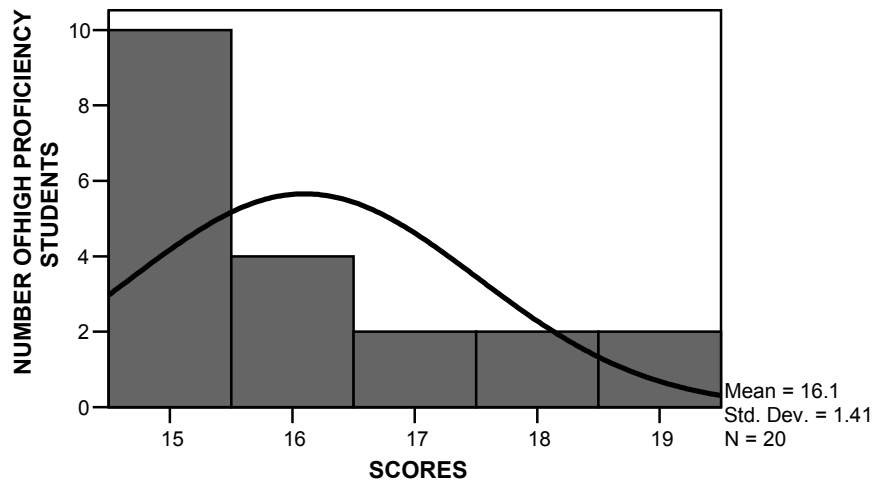


Figure 26: Histogram for the distribution of marks for high-proficiency students

Table 9: Descriptive statistics of average-proficiency students

	N	Minimum	Maximum	Mean	Std. Deviation
AVERAGE-PROFICIENCY	48	10	14	11.21	1.398
APM	33	10.00	14.00	10.9394	1.34488
APF	13	10.00	14.00	11.9231	1.44115

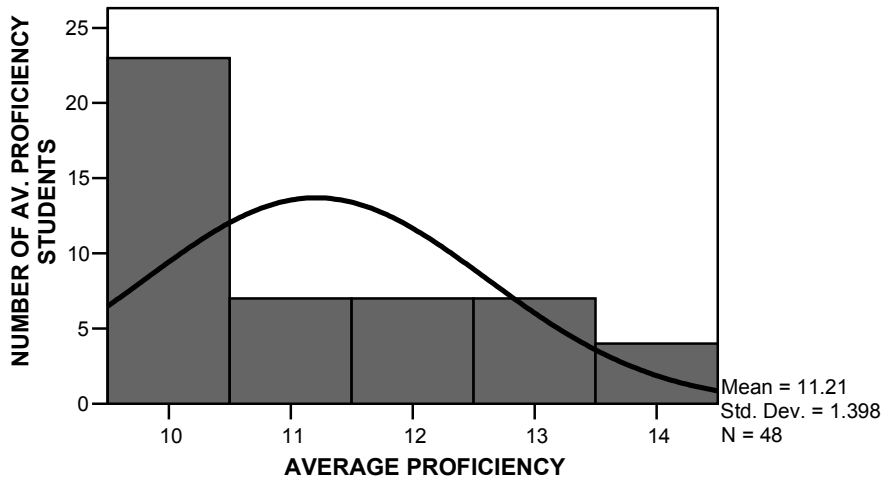


Figure 27: Histogram for the distribution of marks for average-proficiency students

Table 10: Descriptive statistics of low-proficiency students

	N	Minimum	Maximum	Mean	Std. Deviation
LOW PROFICIENCY	52	2	9	4.58	1.764
LPM	31	2.00	9.00	4.3548	1.78042
LPF	20	3.00	9.00	5.0000	1.71679

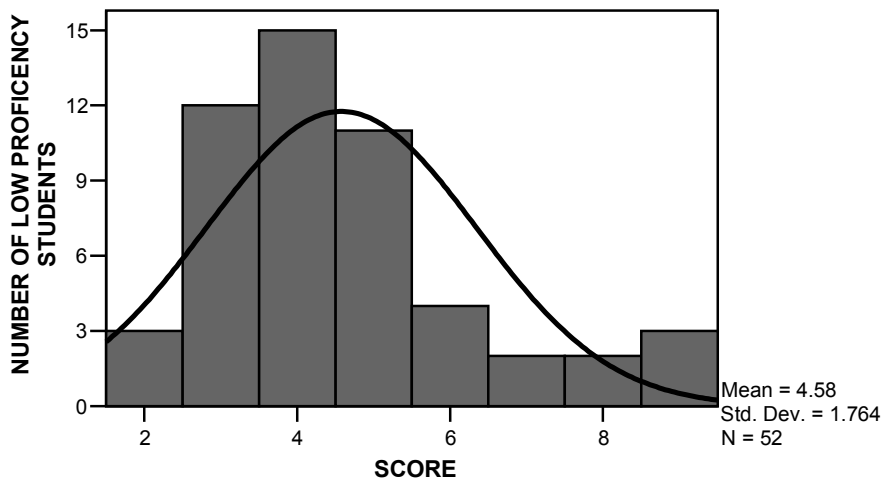


Figure 28: Histogram for the distribution of marks for low-proficiency students

5.3 Idea Units

The first research question posited is: Do low-proficiency ESL first year-science students produce more inaccurate or partially correct idea units (IUs) from the text than high-proficiency students? To answer this question, the summaries of the 20 high-proficiency students were analyzed. There are 6 IU's shown below that appeared consistently in at least 16 of the 20 high-proficiency students' summaries, and I considered them to be the main idea units required for the summary. The first five IU's, each with its limitations, count for 10 ideas. The sixth is optional because it is not, strictly speaking, part of the new technologies, but could still be included depending on how the student contextualizes it. Like each of the other IU's, it counts for two if its limitations are given. Each student's summary was then carefully read in order to determine how many of the six IU's were included.

The following IU's given by high-proficiency students were used as a benchmark for marking each student's summary in response to the research task. The instruction of the task was as follows: Read the following text, which talks about strange and unusual technologies. Then write a summary of the text in which you mention technologies that are likely to control climate changes and meet the world's energy needs as well as pointing out the limitations of these technologies:

1. Solar power could be collected in orbit and then beamed back to earth using lenses called parasols. Limitation: it is expensive and current technology is inadequate to accomplish the task.

2. Breeder reactors could be used to produce more nuclear fuel; but the fuel has low efficiency, is unsafe and there is a possibility of developing it into weapons of mass destruction.
3. Vast satellites could harvest solar power, with microwaves or laser beams being used to get power to any point on earth, but the technology is expensive.
4. Relay satellites could beam energy from massive solar arrays carpeting the moon, but they are equally expensive.
5. The global thermostat could be turned down by reducing solar heating, but would require great caution.
6. Additional idea units: Ground based biomass could be used to generate power, but would require a very large part of the earth to be filled with crops that can be turned into energy. Also, wind and solar power could be considered, but these are part-time sources and would require energy-consuming super-conducting cables linked to a computer-controlled global net-work.

Table 11 and figure 29 below show the distribution of marks according to the levels of proficiency of the students. As can be seen from the frequency polygon (figure 29), low-proficiency students on average produced two or three main (IUs) out of ten, whereas high-proficiency students produced an average of eight IUs, while average students produced four or five. From this data, it can be concluded that low-proficiency students find it difficult to produce most of the required information, probably because they have not yet fully developed their self-monitoring mechanism, which allows them to pay sufficient attention to the task at hand (Vann & Abraham, 1990). On the other hand, high -

proficiency students are able to locate the required information because they employ self-monitoring mechanisms that act as reminders for tackling the task at hand (Scarcella & Oxford, 1992).

Table 11: Idea units included by different proficiency levels

Score	High	Average	Low	
Including 0	0	0	0	
Including 1	0	0	0	
Including 2	0	0	24	
Including 3	0	0	15	
Including 4	0	1	9	
Including 5	0	29	4	
Including 6	0	14	0	
Including 7	10	4	0	
Including 8	5	0	0	
Including 9	1	0	0	
Including all	4	0	0	
Totals	20	48	52	120

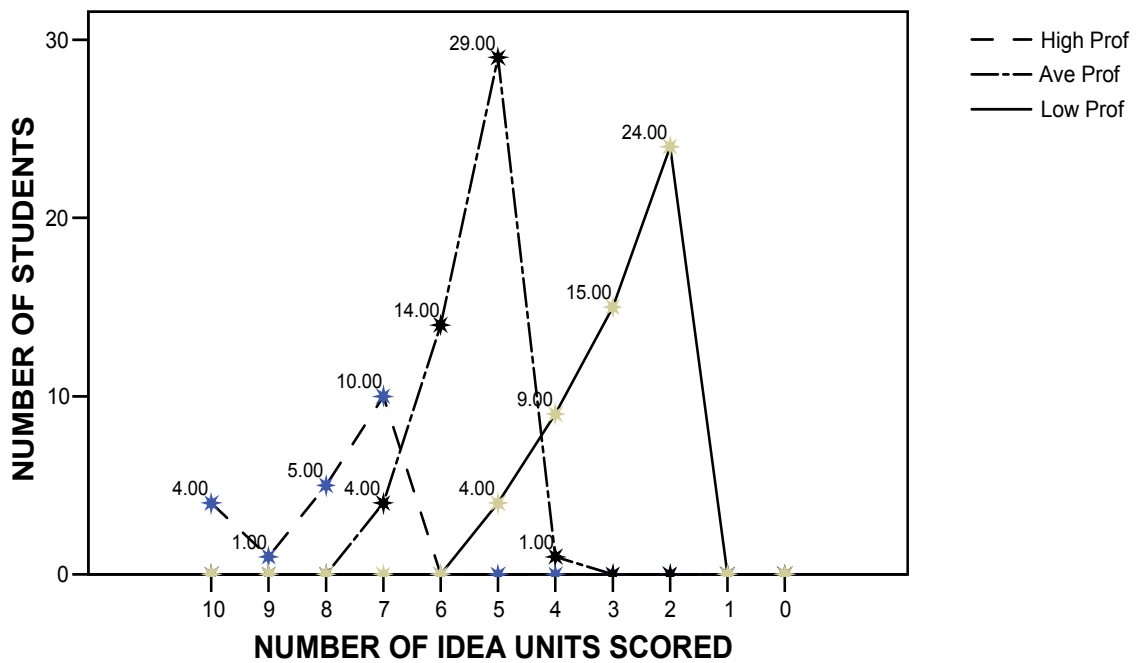


Figure 29: A frequency polygon of the distribution of marks according to proficiency levels

However, the data in Table 11 and figure 29 above do not throw light on the quality of the summaries and the extent to which the IUs of both the low- and high-proficiency students are correct or partially correct. To get to the bottom of the matter, I carefully read the representative summaries of low-, average- and high-proficiency students so that I could understand how they summarize textual material. To illustrate my point, I reproduce verbatim the summary of Mmapula, who was classified a high-proficiency student and awarded 18 out of 20 marks.

1. *One of the technologies dreamed up in recent years is the collection of (1) power in orbit and beaming it back to earth using space-based lenses (parasols) to deflect solar energy away from our atmosphere. Critics, though, argue that this is unnecessary and (2) expensive. Similarly, current technology wouldn't allow this to be accomplished. To stabilize climate, emission power generation will have to be pumped from today's 2 trillion to 30 trillion by 2050. However, nuclear power won't be sufficient. (3) Breeder reactors would give more fuel but they have been abandoned owing to their low (4) efficiency, safety concerns and the possibility of the fuel being used for making nuclear weapons.*

Vast (5) satellites can harvest power and microwaves and laser beams can distribute it over the earth. Energy can also be beamed down by (6) relay satellites from massive solar arrays carpeting the moon. Ground-based (7) biomass, solar cells and wind power would help, but 10% of the earth's surface would have to be filled with biomass crops to get to trillion watts. Even so, (8) wind and solar energy are only part-time sources and would require (9) energy-consuming super conducting cables linked to computer-controlled global power network. Turning down the (10) global thermostat by reducing solar heating would probably work, but would require great caution.

(Total mark = 18/20)

If we compare the ideas in Mmapula's summary (I numbered the IUs to show the range of ideas she included) with the IUs in the marking guide (numbered 1-6 above), we will see that Mmapula produced virtually all the required IUs. Not only did she produce the required idea units, she also gave the "gist" of the argument regarding the technologies that are likely to control climatic changes and their limitations. If, on the other hand, we compare Mmapula's summary above with Tebogo's following summary (I classified Tebogo as a low-proficiency student who was awarded 8 out of 20 marks), we will see the difference in the range and accuracy of the ideas:

- 2 *Bizarre technologies of generating energy are likely to control climate changes and meet the world's energy because if power-generating are developed its going to be possible to control gas emissions. Solar power in the (1) orbit can be beamed back to the earth using (2) space-based lenses can also reflect solar energy away from the atmosphere. Also sunlight can generate enough energy and massive solar arrays. Wind energy can also be used to generate much more energy that can meet the world's energy. The limitations of this type of energies included some unnecessary and exorbitantly (3) expensive, furthermore energies like (4) Wind and Solar power are only part-time energy sources.* (Total mark = 8/20)

A comparison of the two summaries shows that there is a vast difference not only in the quality of the IUs but also in their precision and cohesion. Tebogo's IUs are limited in scope and range, that is to say, he does not raise many points nor does he express them accurately. His summary contrasts sharply with Mmapula's summary, which has comprehensive and cohesive ideas. Tebogo's statements: "also sunlight can generate enough energy and massive solar arrays" and "wind energy can be used to generate much more energy that can meet the world's energy" are inaccurate, and his penultimate statement ("the limitations of this type of energies included some unnecessary and

exorbitantly expensive”) is incomplete and does not fully bring out the limitations of the new technologies. Taken as a representative sample, Tebogo’s summary supports the first research hypothesis that low -proficiency ESL first-year science students produce more inaccurate or partially correct IUs than high-proficiency students.

Similarly, if we compare Noni’s summary below (an average summary which was awarded 12 out of 20 marks) with Mmapula’s (high-proficiency) and Tebogo’s (low-proficiency) summary, we will see how the three summaries significantly differ in the production of IUs.

3. *The energy needs of the world is inexhaustible moving from 12 trillion watts to 30 trillion watts in year 2030, thus 18 scientist have devised new ways of obtaining energy. One way of obtaining energy is using space (1) based lenses called parasols to deflect solar energy to earth would be clean solution. Also using (2) Biomass as an alternative solution would work. However biomass crops would have to cover 10 % of earth’s surface thus only producing 10 trillion watts. Another alternative is to (3) lower the temperature of the atmosphere to curb global warming caused by CO2 emmissions. (4) Wind and solar power on earth could be viable however it is only temporary and thus an (5) expensive computer power network would have to be created in order to monitor the energy flows. So, although all these solutions seem viable all of them are (6) expensive and use technologies which the earth has not yet seen but in the long run people should wait for more proposals to solve the mystery of our energy needs with another solution. (Total mark= 12/20)*

Noni’s strength, unlike Tebogo, is that she manages to produce most of the IUs, but her main weakness is inaccurate expression, repetition and distortion. Take for instance the first sentence, “the energy needs of the world is inexhaustible...” and the last statement, “people should wait for more proposals to solve the mystery of our energy needs with another solution”. These are misrepresentations of the gist of the original text,

which suggests that current energy resources are inadequate and that we need to find alternative sources by exploring unusual technologies. Besides, the ideas generally lack clarity: “one way of obtaining energy...would be clean solution”. The use of the adjectival phrase “clean solution” is unclear. Similarly, ideas such as “lower the temperature of the atmosphere to curb global warming” and “wind and solar power...is only temporary” misrepresent the meaning of the original text.

5.4 Generalization

The second research question is whether low proficiency ESL first year-science students produce more frequently copied original IUs than high-proficiency students. A simple frequency count of students who generalized ideas and those who produced copied or run-on (rambling) ideas (see figures 30, 31 & 32 below) shows that while all high-proficiency students put across their ideas in a more generalized manner, 11 average-proficiency students produced copied or run-on ideas, and 43 low-proficiency students produced copied or rambling ideas. To illustrate the extent to which low-proficiency students produced copied or rambling ideas, I cite the following three typical extracts, all from low-proficiency students:

4. *Martin Hoffert of New York University, who is one of the teams says that satellites that collect solar power are attractive emission free idea. They also suggested that energy can also be taken down from many light rays carpeting the moon.*

5. *Bizzare technologies for generating energy that were previously ruled out as pipe dreams should be developed by nations. The 18 influential energy analysts in the US, believes that power-generation technologies if developed now will not control the effect of greenhouse gas emissions by 2050*

6. *The world must pump up emission-free power generation from today's 2 trillion watts to as much as 30 trillion watts. Nuclear power can't fill the gap. Uranium supplies are limited, they can supply 10 trillion watts for only 6-30 years.*

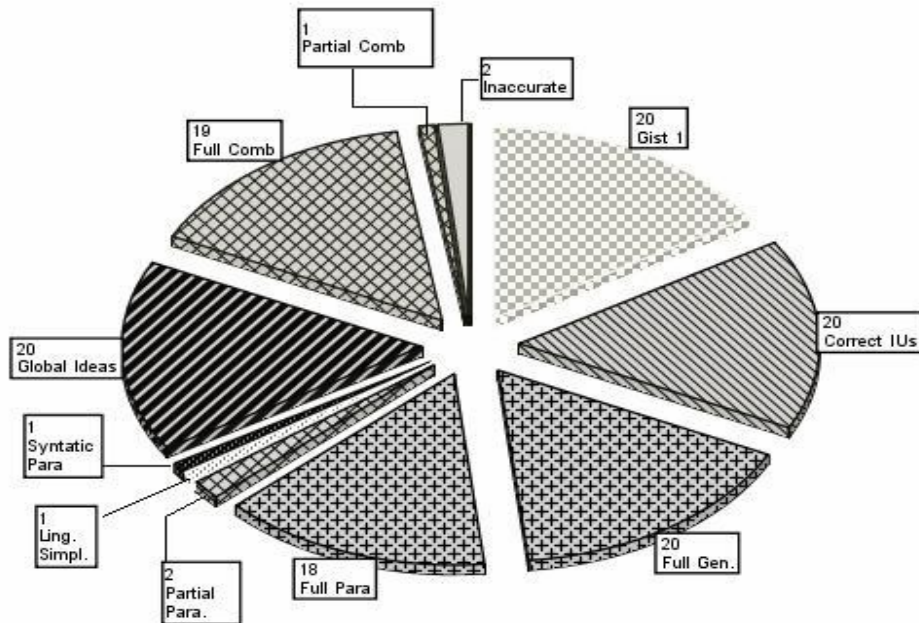


Figure 30: Pie chart showing distribution of summarizing strategies used by high-proficiency students

A closer analysis of the above three extracts shows that all of them have been copied verbatim from the original text (see Appendix 2). In some cases, the students have not even been able to copy some words correctly and the ideas simply run-on with little regard for their accuracy or fluency. In each of the extracts, the ideas could have been recast in a more generalized manner to show that the students understand what the text is saying. If we contrast the above three extracts of the low proficiency students with the following extract of a high-proficiency student, we will be able to see the qualitative difference between the extracts:

7. *Some stranger technologies thought of in recent years must be explored, such as collecting solar power in orbit and beaming it back to earth, and using space-based lenses called parasols to deflect solar energy away from the atmosphere. Emission-free generation technologies like nuclear and wind power can be tried, but the problem is that the world's energy needs are rising faster than it can be done.*

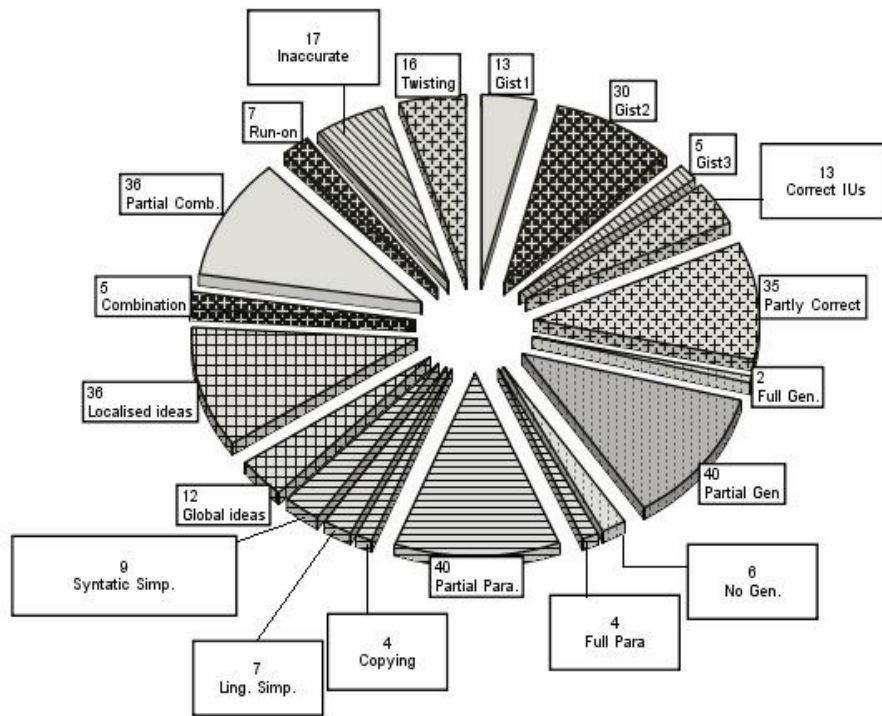


Figure 31: Pie chart showing the distribution of summarizing strategies used by average-proficiency students

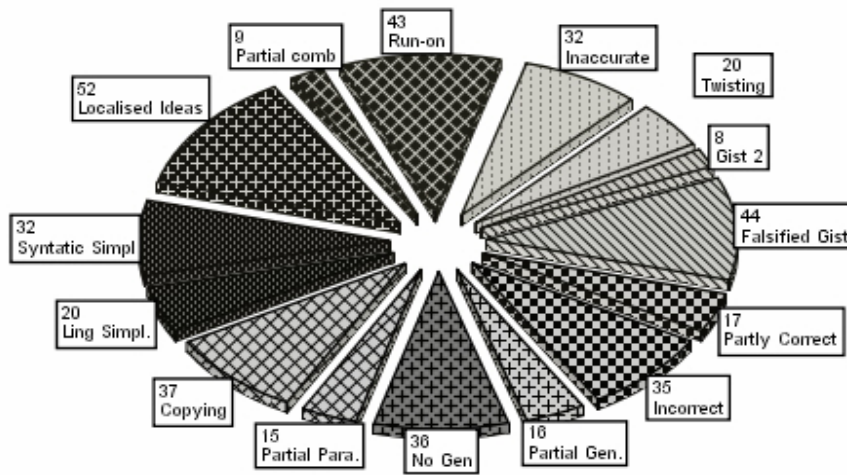


Figure 32: Pie chart showing the distribution of summarizing strategies used by low-proficiency students

The difference between the extracts of the low-proficiency students and that of the high-proficiency student is that while the three low-proficiency students have plagiarized the original ideas, the high-proficiency has synthesized the macro-proposition of the text, i.e. s/he has provided a meta-statement that distils the gist from the original text. Therefore, the second research question, as to whether low-proficiency ESL first-year science students produce more frequently copied or run-on ideas of the original idea units than high proficiency students, is supported. This finding is consistent with Johns and Mayes' earlier (1990) study which used a *t*-test to measure the difference in the manner in which low- and high-proficiency students replicated ideas at both the sentence and paragraph level.

5.5 Distortion

The third research question deals with distortions of the text: whether low-proficiency ESL first-year science students produce more distortions of the original idea

units than high-proficiency students. At the idea unit level, I considered distortion as giving inaccurate information, personal or irrelevant comments; and at the lexical level, I considered distortion as twisting the meanings of key words. Figures 30, 31 and 32 show the use of various strategies by high-, average- and low-proficiency students. A comparison of the strategies shows that low-proficiency students are the ones who mainly distorted information, with 32 students giving inaccurate ideas and 20 students twisting the meanings of key words. Average-proficiency students came second, with 17 students giving inaccurate or irrelevant comments and 16 students twisting the meanings of key words. High-proficiency students virtually did not distort the idea units, except 3 students who made irrelevant comments.

To illustrate my point about the extent to which low-proficiency students distort the original ideas and key words, I reproduce below three typical summary excerpts:

8. *Scientist can use solar power orbit, nuclear and wind power, Breeder reactors and vast satellite that harvest solar power to meet the world's energy need.... Despite that they are also costly, lack resources, temporal and sometimes not necessary for instance collecting power orbit.*

9. *They emphasized that energy stabilization sunlight as far as it can generate more power than on the ground. Wind and solar power are the only part-time energy source, so generators would be linked.... The idea passed as the scientist supported themselves with the fact that sun is not expensive and to me like any nuclear powers used.*

10. *The world's energy demands overshadows the current technologies that are far from reaching.... However climate stabilization is very crucial within reach of contemporary technology.... To curb this disastrous scenario, nuclear and wind power are on stream, conversely can't meet the*

stipulated consumption rate.... Satellites of solar energy harvestors may be employed as the are environmental friendly.

The three extracts cited above reveal a common weakness: they not only misrepresent the main IUs and meanings of key words but are also ambiguous. To illustrate this point, let me take extract number 8 as an example. In the first sentence “scientist can use solar power orbit...” the author implies that scientists are able to use solar power, which is a misrepresentation of the meaning of the text. The author also incorrectly calls solar power “solar power orbit”. At the lexical level, the author inaccurately refers to the word “costly” as “costy”.

The author of extract number 9 shows similar weaknesses. In the first line s/he misrepresents the role of sunlight, to create the impression that it stabilizes energy. And in the last sentence, the author makes another conceptual mistake by claiming that the “sun is not expensive like any nuclear powers used”. Clearly, the author is misrepresenting the gist of the text which suggests that nuclear fuel can be used, but the main problem is that it is unsafe and that there is a possibility of turning it into weapons. Besides, the author confuses nuclear power with “nuclear powers”, the latter which conveys a totally different meaning of countries that have nuclear power.

Extract 10 is even more interesting because of its extravagant verbosity. Words such as “overshadows”, “crucial”, “disastrous scenario”, “conversely”, “stipulated” and “harvestors” are not only superfluous they also misrepresent the gist of the original text. The loose control of vocabulary in this extract supports the view that there is a reciprocal relationship between textual comprehension and vocabulary knowledge (cf. Hulstjn, Hollander, & Greidanus, 1996).

5.6 Global and localized ideas

The seventh research question is concerned with the ability of ESL first-year science students to distinguish between global (major) and localized (minor) ideas. The research question is: Are there any fundamental differences between low- and high-proficiency students in the manner in which they distinguish between major and minor ideas? The data yielded (see figures 30, 31 & 32 above) indicate that while all high-proficiency students were able to select most of the global ideas, some of them were not able to ignore localized ideas such as illustrations and examples. All the low-proficiency students, in one way or the other, included many localized ideas and average-proficiency students were moderately less inclined than low-proficiency students to include minor ideas.

To support the observation that high-proficiency students include most of the global ideas but also include localized ideas and that low-proficiency students are inclined to include many unnecessary ideas, I cite below (unedited) two typical summaries: one for a high-proficiency student, Tidimalo, and another for a low-proficiency student, Tshepo. The parts underlined in both summaries contain localized ideas that could be ignored.

11. Climate change today needs to be stabilized in order to meet energy needs and if nations are serious about tackling climate change, then they have to employ bizarre technologies that were earlier on ruled out as far-fetched ideas. Stranger technologies that were dreamed up in earlier years like collecting (1) solar power in orbit and beaming it back to earth and using space-based parasols to deflect solar energy away from our atmosphere are going to have to be implemented in order to meet today's energy needs that are rising daily as well as curbing global warming.

Technologies like bringing emission free generations such as (2) nuclear and wind power on stream are some of what is needed to satisfy global power consumption for electricity which is now about 12 trillion watts, of which 85 % is from fossil fuels that will soon be exhausted since demand increases daily, but we can't depend on (3) nuclear power since uranium supplies are limited. (4) Breeder reactors could have been seen as the answer because they create more fissile material than they consume; but were ruled out because of (5) low efficiency, safety issues and the possibility of the fuel being turned into weapons. (6) Vast satellites that harvest solar power are the best emission-free idea so far, as energy from the sun may also be beamed down from massive solar arrays carpeting the moon, via (7) relay satellites. Base biomass, solar cells and wind power were also ruled out. The last outlandish option might be to (8) turn down the global thermostat by reducing solar heating by placing 2000 km wide fresnel lens in orbit 1.5 million km from earth. Their refraction would deflect about 2% of sunlight enough to offset global warming. The technology is said to be plausible to meet climate change goals but research is still being carried out on its possibility.

(Total mark = 15/20)

- 12 *Non of the power generation technologies being developed now will be able to control greenhouse gas emissions and meet the world's energy needs which may rocket by 200% by 2050. Global power consumption for electricity is now about 12 trillion watts, 85% of which comes from fossil fuels. To stabilize the climate, the world will have to pump up emission free power generation from today's 2 trillion watts to 30 trillion watts by 2050. Uranium supplies are limited and known reserves could supply 10 trillion watts for only 6-30 years. Sunlight is eight to ten times more intense in space, so arrays could generate more power than on the ground. (1)Microwaves or laser beams could get power to any point on earth, including areas without power grids. The prospects for ground base (2) biomass, solar cells and wind power are limited.*

(Total mark 4/20)

If we compare summary 11 with 12 above, we will notice that summary 11 has most of the required global idea units (8 of them); but it also contains localized features that could be left out to produce a more succinct summary. On the other hand, summary 12 has more localized than global ideas, i.e. the underlined information which could be left out is more than the last two sentences that contain two idea units. If we cut out the localized ideas, we will end up with only two sentences. The major weakness of the summary is that it mentions in passing technologies that can control climate changes and peripherally points out their limitations .

These two representative summaries support the observation that high-proficiency students, unlike low-proficiency students, are able to locate the required information; but tend to include details that can be ignored. On the other hand, low-proficiency students generally include very few global ideas. Instead, they include localized ideas that add little value to their summaries. So, the answer to the question about whether there are fundamental differences between low- and high-proficiency students in the manner in which they distinguish between global and localized ideas is not so definitive. The results show that there are fundamental differences in the selection of global ideas; but when it comes to the inclusion of unimportant ideas, there is no clear-cut difference between the two groups.

5.7 Paraphrasing

The eighth research question asks whether there are any major differences between low- and high-proficiency ESL first-year science students in the manner in which they paraphrase information. I considered paraphrasing as the students' ability to use their own words, instead of regurgitating the idea units verbatim. To determine the

extent to which the students were paraphrasing (see Appendix 7), I subdivided texts into three: full paraphrasing (here the students largely used their own words), partial paraphrasing (the students partly used their own words) and copying (the students simply copied the ideas).

A simple count of the students who paraphrased ideas shows that (see figures 30, 31 & 32) eighteen high- and four average-proficiency students fully paraphrased the main ideas; whereas most of the low-proficiency students either copied or cut and pasted the ideas (37) or partially paraphrased (15). To illustrate the extent to which students paraphrased, I cite below (unedited) two typical summaries, one by Thulaganyo (high-proficiency who got 15/20) and another by Letsile (low proficiency who got 9/20). The numbers in both summaries refer to similar ideas raised by each student so that I could see how the student paraphrased similar ideas. The numbers do not necessarily reflect the total number of idea units raised in the summary.

13. *The technologies that are likely to control climate change are collecting (1) solar power in orbit and beaming it back to earth using space-based lenses called parasols to deflect solar energy away from the atmosphere. However, this kind of technology is very expensive and climate stabilization cannot be done without today's technology. The other problem is that energy needs are continuing to rise and it will be hard to meet the demand. (2) Breeder reactors can be used because they produce more nuclear fuel but they have low efficiency, are unsafe and there is a possibility of the fuel being turned into weapons. Vast satellites that harvest solar power can also be used. (3) Microwaves or laser beams could get power to any point on earth, and energy might also be beamed down from massive solar arrays carpeting the moon via satellites. (4) Wind and solar power could also be considered, however generators would have to be linked to computer-controlled global power network based on super conducting cables which also use energy to cool*

down. Another idea could be to (5) turn down the global thermostat by reducing solar heating. However, the above could have harmful effects.

14. Technologies for generating energy that were previously ruled out as useless will have to be developed if nations are to tackle climate change. Governments have to undertake broad energy researches, explore technologies from recent years like collecting (1) solar power and beaming it to earth and using 'parasols' to deflect solar energy away from our atmosphere. The world's energy needs rise faster than bringing emission-free generation like nuclear and wind power. Global power use for electricity is about 12 trillion watts, mostly from fossil fuels. To stabilize climate, 30 trillion watts has to be pumped by 2050, from today's 2 trillion watts. Nuclear power can't fill the gap because of limited known reserves. (2) Breeder reactors have been abandoned because of low efficiency, safety issues and possibility of weapon creations from the fuel. Solar power satellites are emission-free idea, because sunlight is more intense in space, rays could generate more power than on ground. (3) Microwaves could get power to any place, including areas without power grids. Ground base biomass, (4) solar cells and wind power have limited prospects. More than 10 percent of the Earth's surface would need to be covered with crops to produce 10 trillion watts. Wind and solar power are part-time sources. Another option might be (5) turning down global thermostat, to place a 2000 kilometre wide Fresnel lense in orbit 1.5 million kilometers fro earth. Refraction would deflect some earth's sunlight to offset warming by carbon dioxide emissions.

If we compare the way the two students dealt with the idea of collecting solar power in orbit (idea number one), we will see that Thulaganyo (the high-proficiency student) has concisely used his own words to express the idea and has pointed out its limitation. On the other hand, Letsile (the low-proficiency student) has waffled before mentioning the idea unit of solar power in orbit. For instance, Letsile's first and second sentences are directly copied from the first and third paragraph of the original text. The

section that reads, “The world’s energy needs... weapon creations from the fuel” have been cut and pasted from paragraphs 6, 7 and 8 of the original text. The section, “More than 10 percent of the Earth’s surface...carbon dioxide emissions” is also reproduced from the original text with very little modification.

The second point regarding breeder reactors is clearly articulated by Thulaganyo but is, on the other hand, poorly paraphrased by Letsile who uses telegraphic language in the last part of the sentence, such as “...low efficiency, safety issues and possibility of weapon creations from the fuel”. The same is true about the third idea unit regarding micro-waves or laser beams. The low-proficiency student poorly expresses the idea, to create the wrong impression that such power could get to “any place”, whereas the idea is that the power could get to “any point on earth”.

The effect of paraphrasing comes out quite clearly when we compare how the two students put across the fourth idea unit regarding wind and solar power. The high-proficiency student paraphrases it correctly, whereas the low-proficiency student is vague about the limitations. The low-proficiency student mentions that “solar cells and wind power have limited prospects”, and immediately goes on to say that “more than 10 percent of the earth’s surface would need to be covered with crops to produce 10 trillion watts”. The problem raised in the second sentence has no connection with solar cells and wind power. Lastly, the way the two students express the idea of turning down the global thermostat clearly differentiates their ability to paraphrase. While Thulaganyo expresses the idea in a generalized manner, “another idea could be to turn down the global thermostat by reducing solar heating”, Letsile regurgitates the details of the idea, which makes the latter’s summary unnecessarily long.

5.8 Combinations of idea units

The ninth research question deals with combinations of idea units. The question posited is whether there are any significant differences between low- and high-proficiency ESL first-year science students in the manner in which they combine IUs to form a coherent summary. To understand how the students combine ideas, I considered two elements: the first is “transformation”, where the student uses coordination and subordination to form a cohesive summary and the second is “cutting and pasting”, in which the student simply appropriates portions of the text and “pieces” them together to create an incoherent summary.

An analysis of the students’ summaries shows that 19 high-proficiency and 5 average-proficiency students fully combined ideas in their summaries through coordination and subordination, while 37 low-proficiency students produced run-on summaries (see figures 30 31 & 32). The rest of the students produced half-baked combinations, which relied on the use of words and sentences from the original text. These data, like any other data-driven research, simply quantify the numbers but do not show the qualitative differences in the manner in which the students combined their ideas. To show how students differed in the way in which they combined ideas at the sentence level, I cite below and then analyze some typical extracts of different proficiency levels.

(High)

15. *Technologies for generating energy are being explored like collecting solar power in orbit and beaming it back to earth using space-based lenses called ‘parasols’ to deflect solar energy away from our atmosphere.*

(Average)

16. *Technologies that are likely to control the climate changes are collecting solar power in orbit and beaming it back to earth and using space-based lenses called “parasols” to deflect solar energy away from our atmosphere.*

(Low)

17. *Technology for generating energy have to be developed. Collecting solar power in orbit and using space-based lenses called Parasols to deflect solar energy away from our atmosphere.*

Extract 15 above illustrates how a typical high-proficiency student coordinates ideas at the sentence level. In the sentence we can see that the student has condensed the idea unit from the original text through embedding (like collecting solar power), adjunction (and beaming it back), participle phrase (using space-based lenses) and the infinitive marker (to deflect solar energy). If we contrast extract 15 with 17 (low-proficiency student), we will see the difference in the quality of coordination. The low-proficiency student has not coordinated the first and second sentences, resulting in the production of truncated sentences that lack unity, e.g. the second sentence which starts with a participle phrase “collecting” has no finite verb to make it complete. Extract 16 which belongs to an average-proficiency student only coordinates through adjunction, such as the use of “and” without exploiting other forms of coordination. These qualitative differences characterize the manner in which students with different proficiency levels coordinate their ideas.

Besides coordination, high-proficiency students were able to produce complex sentences through subordination, typified by extracts 18 & 19 below. These students coordinated their sentences by using complement clauses signaled by “which”.

(High)

18. *With the world's energy needs rising, emission-free generation technologies such as nuclear and wind power can be exploited; but they also have their limitations like nuclear power which only supplies a limited amount of energy.*
19. *Another technology is to turn down the global thermostat by reducing solar heating which is enough to offset global warming and scientists have calculated that the process could work even though it is expensive and appears to be impossible.*

On the other hand, average-proficiency students make an effort to produce complex sentences, but they tend to pack too many ideas into one sentence, resulting in the “complex sentence” being unclear. The following two extracts (20 & 21) typify subordination used by average students. In each extract, the student subordinates the ideas by using an adverbial clause signaled by “while” (extract 20) and “since” (extract 21); but the sentences lack logicity.

(Average)

20. *Sunlight is more intense in space than on earth, while the other one is the prospects for ground base biomass, solar cells and wind power are limited and lastly a 2000 kilometre wide fresnel lens need to be placed in orbit 1.5 million kilometers from earth.*
21. *Vast satellites that absorbs solar energy are an emission-free idea according to Martin Hoffert of New York University and it is far better than the prospects for ground base biomass, solar cells*

and wind power, since sunlight is eight to ten times more intense in space so satellites can produce more power than on the ground.

The summaries and sentences cited in this chapter, irrespective of whether they are produced by high-, average- or low-proficiency students, illustrate one common phenomenon: students of different proficiency levels find it difficult to combine multiple idea units from different paragraphs to form new transformations. This observation is consonant with Harris's (1990) observation that students doing science generally find it difficult to coordinate sentences cohesively from different paragraphs. Therefore, in answer to the research question on whether there is any significant difference between low and high-proficiency students in the manner in which they combine ideas, there is evidence suggesting that at the sentence level there are significant differences between low and high-proficiency students; but there appears to be no significant differences when it comes to the ability of the students to combine ideas from different paragraphs.

5.9 Summary of production strategies

Taken as a whole, the findings on the summary production strategies preferred by ESL first-year science students at the University of Botswana indicate that there are significant differences between low- and high-proficiency students. The results show that high-proficiency students produce more accurate IUs and are more capable of generalizing ideas than low-proficiency students, who prefer to "cut and paste" ideas or simply reproduce chunks of information that bear little relevance to the task. There are also marked differences between low- and high-proficiency students in the manner in which they understand the text: low-proficiency students produce more distortions in

their final summaries than high-proficiency students, who generally give accurate information. Similarly, high-proficiency students are able to sort out global ideas from a labyrinth of localized ideas, unlike average- and low-proficiency students, who include a lot of trivial information. The same trend is observed with paraphrasing and combinations: high-proficiency students are generally able to produce well-coordinated ideas, while low-proficiency students produce run-on ideas.

However, a few high-proficiency and many average- and low-proficiency students misrepresented the IUs, had problems with using their own words and could not distinguish between global and localized issues. This resulted in the production of padded-out summaries that often failed to capture the essence of the argument. The data on combinations reveal an inherent weakness: most students with different proficiency levels are unable to combine ideas from two or more paragraphs to form one coherent unit. Not surprisingly, then, there were too many long summaries produced by both high- and low-proficiency students. In the next chapter, the cognitive and meta-cognitive strategies used by the students are analyzed both quantitatively and qualitatively.

6.0 CHAPTER SIX: COGNITIVE AND META-COGNITIVE STRATEGIES

6.1 Introduction

In this chapter I discuss the cognitive and meta-cognitive strategies (see Appendix 6) used by students to produce their summaries. My definition of cognitive strategies (Also see section 1.7 of Chapter One) is that they are the formal mental processes engendered by students in order to select the main ideas from a text, and meta-cognitive strategies are the conscious steps they take to ensure that their goal is achieved, such as quizzing themselves about whether or not they have accomplished the set requirements of the task. In Sternberg's view (1986: 24), meta-cognitive strategies are responsible for "figuring out how to do a particular task or set of tasks, and then making sure that the task or set of tasks are done correctly". In this chapter, I make a distinction between cognitive and meta-cognitive strategies, but I am aware that these two mental processes are closely linked.

The cognitive strategies that I focus on are 'note-making', such as underlining or jotting down the main ideas, 'grouping', which involves the organization of ideas on the basis of "common attributes", 'resourcing' or 'recombining' to produce coherent ideas, 'contextualization' of words and phrases, 'repetition' of ideas in different words and 'inferring' meanings by using available information. The meta-cognitive strategies that I consider in this chapter are 'planning', which I regard as the students' ability to do advance preparation before producing the final summary, 'selective attention', which involves paying attention to the specific parts of a summarizing task, and 'self-evaluation', which involves checking one's final product to ensure that one has done the summary well.

6.2 Students' cognitive strategies

Figure 33 below shows how many students in each proficiency category used each of the cognitive strategies. Quantitative data based on a frequency count of the strategies reportedly used by students (see Figure 33 below) suggest that high- and average-proficiency students are able to use cognitive strategies effectively, but low-proficiency students seldom exploit these strategies. In particular, many low-proficiency students in this study failed to make notes before writing their final summaries and did not group information into common themes. Figure 33 also shows how students of different proficiency levels combine ideas. The bar graph shows that many low-proficiency students find it difficult to combine their ideas into new transformations and have problems in inferring the meanings of new words. The only strategy they used reasonably well is putting the information into its proper context, i.e. not misrepresenting the context of the information.

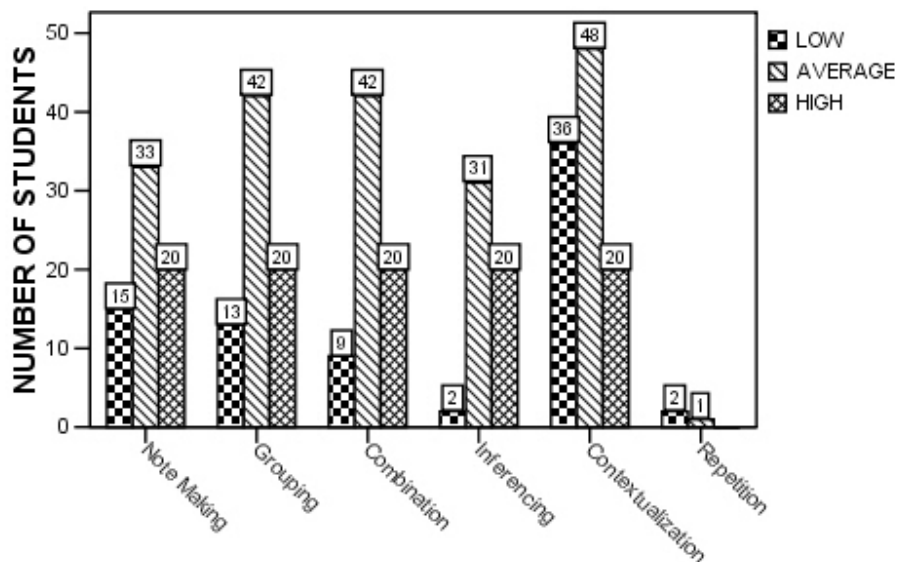


Figure 33: Cognitive strategies

6.2.1. Note-making

Figure 33 shows that all twenty high-proficiency students and 33 out of 48 average-proficiency students made notes before writing their summaries, whereas only 15 low proficiency students out of 52 did so. To show the effect of note-making on summary production, I compare and contrast below the summaries of a typical high- and average-proficiency student, who have made notes before writing their final summaries, with the summary of a typical low proficiency student who has not. The selection process of Lerato (high-proficiency student) shows that she underlines and numbers the required idea units on the original text and makes the following notes before producing the final summary:

Lerato's Notes

1. *(a) solar power in orbit and beaming it back to earth, and space-based lenses called "parasols" to deflect solar power away from our atmosphere.*
- (b) it is unnecessary and exorbitantly expensive.*
- (c) but we can't really do it with current technology*
- (d) Breeder reactors create more fissile material but developers have abandoned them because of low efficiency, safety issues and the possibility of fuel being turned into weapons.*
- (e) Vast satellites that harvest solar power are an attractive emission-free idea so arrays could generate more power than on the ground.*
- (f) Energy might also be beamed down from massive solar arrays carpeting the Moon, via relay satellites. which also eat energy to keep cool.*
- (g) turn down the global thermostat by reducing solar heating.*

Summary

There are several bizarre technologies that are likely to control climate changes and meet the world's energy needs. These include the collection of solar power in orbit and beaming it back to earth and the use of "parasols" to deflect solar energy from our atmosphere. The use of breeder

reactors is another option, even though developers have abandoned it for safety reasons and the possibility of the fuel being turned into weapons, as well as low efficiency of the method. Vast satellites that harvest solar power are a good idea, in which arrays could generate more power than on the ground. Here energy can be beamed from huge solar arrays carpeting the moon through relay satellites. Another exciting idea is the turning down of the global thermostat by reducing solar heating, whereby a 2000 kilometre wide Frensel lens in orbit 1.5 million kilometers from the earth is used to deflect 2 percent of the earth's sunlight, enough to off-set warming caused by carbon dioxide emissions.

Despite all these brilliant ideas, it is argued that some of the technologies are unnecessary and exorbitantly expensive, let alone too complicated to "really" do with current technology. The use of super conducting cables in computer controlled global power also eats energy in order to keep cool.

(Total marks =16/20)

Now compare Lerato's summary written from notes with the summary of Naledi (a typical low-proficiency student) written without first making some notes. The slash (/) indicates there is an error, while the star (*) shows repetition.

- 2 *According to the 'New Scientist' *technologies for energy generating that had since be/used would need to serious/developed or improved in order for *people/overcome climatic problems. Many *people *believe that these *technologies could easily/improved but the problem is that in improving these *technologies the world's energy needs which are increasing rapidly could be overcome. It /also *believed that when these *technologies are improved they will not distract or damage the environment like the old one did which resulted in extinction of some useful resources. Although it is *believed that improving *technologies would benefit *people, it is also *believed that they would need more of the available resources to operate.*

(Total marks =4/20)

A comparison of the two summaries shows that they differ significantly, not only in the number of idea units reproduced, but also in their focus. Lerato (high-proficiency) first outlines the required ideas and uses her notes to write a cohesive summary. In contrast, Naledi (low-proficiency) simply plunges into writing the final summary without first noting the idea units that are required, resulting in the production of a circuitous summary that has many errors and repetitions. If we consider, for instance, the range of ideas in the two summaries, we will see that Lerato has mentioned five of the six required ideas (excluding the one about biomass and wind power), while Naledi has avoided many of the unusual technologies that are likely to control climate changes and their limitations. At the discourse level, Naledi has repeated unnecessarily words such as ‘technologies’, ‘believed’, ‘improved’ and ‘people’. Perhaps these errors could have been avoided if she had first planned her work by making some notes, editing and revising her ideas.

To illustrate the importance of note-making before writing a summary, I reproduce below a typical average summary by Mpho, written from a set of numbered notes. The information in the square brackets is irrelevant.

Notes

3. (a) *solar power in orbit and beaming it back to earth.**
- (b) *Climate stabilization is important.*
- (c) *But nuclear power can't fill the gap. Uranium supplies are limited*
- (d) *Breeder reactors create more fissile material than they consume**
- (e) *low proficiency, safety issues and possibility of fuel being turned into weapons**
- (f) *Microwaves or laser beams could get power to any point on earth without power grids**
- (g) *biomass, solar cells and wind power are limited: part-time energy sources also eat energy to*
keep cool.*

Summary

[Energy analysts say none of the power generation technologies developed nowadays will control greenhouse emissions and meet the world's energy needs. They are technologies that are likely to control the climate changes and meet the energy needs though with some limitations.] Solar power can be collected and parasols can be used to deflect solar energy away from the atmosphere. Nuclear power could be used but it can't meet the energy need because of limited uranium supplies. Technology of breeder reactors could be more effective because the outcome is more than what they consume. They have the limitations of low efficiency, safety issues and the use of material in dangerous activities. Power could be taken to anywhere on earth through microwaves or laser beams. Technologies of biomass, solar cells and wind power are believed to be limited. Biomass requires large area of land for crops. A lot of energy will also be used to cool generators.

(Total marks= 11/20)

Scrutiny of the notes shows that Mpho (average-proficiency) has selected four of the required idea units, omitting the ones regarding the possibility of using vast satellites that can harvest solar power and the possibility of turning down the global thermostat by reducing heating. It would appear that by first taking down some notes, Mpho is able to select some of the required information. The only weakness is that Mpho includes irrelevant information (indicated in square brackets) and does not coordinate or integrate the ideas logically to form a coherent summary.

In this study, the ability to execute the cognitive strategy of functional planning by first noting the required idea units is one of the distinguishing factors between high- and low-proficiency students. When we compare the planned summaries of Lerato (high-proficiency) and Mpho (average-proficiency) with the unplanned summary of Naledi (low-proficiency) we can see the different levels of cognition between these three students. This, then, confirms the fifth research question that suggests high-proficiency

ESL science students are more capable of using cognitive strategies than low-proficiency students.

6.2.2 Grouping

Regarding the strategy of grouping idea units on the basis of common attributes in order to produce a coherent summary, only 13 low-proficiency students out of 52 or 25 % are able to regroup their ideas effectively, whereas all high-proficiency students and 42 out of 48 average-proficiency students or 88 % do so. This corroborates my previous finding (Chimbganda, 2003) that only 22 % of the low-proficiency students in the study were able to regroup their ideas in a cohesive manner. However, in this study there appears to be a higher percentage of high-proficiency students who are able to execute this strategy than in my previous study. This difference can be explained by three factors. The first is that different criteria are used for categorizing students in each of the two studies and the second is that the texts used for the two studies have different levels of cognitive difficulty. The third is that the students who participated in each of the studies have different abilities, which accounts for the difference in the manner in which they group information. To illustrate the different ways in which high-, average- and low-proficiency students group their ideas, I reproduce below representative extracts of three different students on the idea unit of collecting solar energy from orbit. These extracts show how these students coordinate their ideas.

High Proficiency

4. *Strange technologies capable of generating energy might have to be adopted **if** climate change is to be controlled, **which** includes the collection of solar power in orbit **and** beaming it back to earth **by** deflecting it away from the atmosphere using “parasols”. But critics argue it is very expensive to undertake.*

Average Proficiency

5. *Some scientists came up with ideas **which** were thought to be strange **like** collecting solar power in orbit **and** beaming it back to earth **and** using space-based “parasols” **to** deflect solar energy away from atmosphere. But critics argue that it is too expensive and unnecessary.*

Low Proficiency

6. *In the view of 18 influential analysts in US, **said that** non of the power generation being develops can control greenhouse gas emissions. They **said this** as they urged government to undertake strangers technology in order to deflect solar energy back away from the atmosphere.*
7. *Researchers went on explaining other technologies that could be used **and** came across the Solar System. The aim of the technology was to remove Solar energy from the atmosphere. This system was however unnecessary and extraordinary.*

There are striking differences in the grouping of ideas between extract s 4 and 5 on the one hand and 6 and 7 on the other. They mostly differ in the thematic organization of the microstructures and macrostructures of their texts. At the micro level, the high-proficiency student’s extract is well organized, with ideas that cohere syntactically, whereas the extracts of the low-proficiency students have no thematic progression. The high- and average-proficiency students’ extracts effectively use the anaphoric link “it” to establish logical relations, whereas the low-proficiency students’ extracts either do not use such linking devices, or use them inappropriately such as “they” in extract 6 which refers to “analysts” instead of the “energy analysts”.

At the macro-structural level, there are also noticeable differences such as the high-proficiency student’s ability to ‘reconstruct’ and ‘integrate’ global or main themes into the student’s knowledge base. This is not done in the extracts of the low-proficiency

students. At the ideational level, there are even more striking differences: the high-proficiency student's extract has ideas that collocate symbiotically. The ideas cohere through the use of a conditional clause "if", followed by a non-defining clause signalled by "which" and coordinated by the "open" conjunctive "and", which is modified by an adverbial phrase "by deflecting it away from the atmosphere using parasols". Extract 5, by an average-proficiency student, shows similar strengths in grouping ideas, but the student appears to operate at a uni-structural level reflected by his/her failure to 'integrate' and 'transform' the ideas in a novel manner.

On the other hand, the ideas of the low-proficiency students are presented in a succession of serialized points, which suggests the students are still operating at a pre-structural level that relies heavily on "knowledge telling" instead of "knowledge transformation" (Biggs, 1988). For instance, extract 6 starts with "In the view of 18 influential analysts in the US". But the student does not tell us the "view"; instead s/he goes on to mention what they said, which does not fulfill our expectation about the "view" of the analysts. The use of the demonstrative pronoun "this" in the second sentence has no co-reference, and the "strangers technology" does not cohere with the causative subordinator "in order to deflect solar energy back".

Extract 7 shows similar organizational weaknesses: there is no ideational link in the first sentence between "explaining" and "coming across the solar system". Also, there is a semantic antithesis in the second sentence between the "aim of the technology" and "to remove solar energy from the atmosphere", and in the last sentence there is no referent to the demonstrative pronoun "this". Altogether, the ideas in this extract are strung together incoherently, resulting in the production of a truncated text that lacks

fluency. These organizational differences not only confirm variability in the students' linguistic proficiency but also reveal differences in their cognitive knowledge of academic text genre (Francis & Hallam, 2000).

6.2.3 Resourcing/Recombination

Like note-making and grouping, there is a marked difference in the use of resourcing/recombination between high- and low-proficiency students. While all the 20 high-proficiency and 42 average-proficiency students are able to recombine the key ideas and words of the summarizing text, only 9 out of 52 low-proficiency students do so (See figure 33 above). To show the extent to which the students use this strategy, I reproduce below typical examples from high-, average- and low-proficiency students. To make a fair comparison, I first give the original ideas (8 & 9) from the text and then the resourced ideas of the students (10-15). Two idea units are used for comparing the students' resourcing strategies: the idea of using breeder reactors and collecting solar power in orbit.

Original ideas

8. *Breeder reactors create more fissile material than they consume, so you'd get more nuclear fuel but developers have abandoned them because of low efficiency, safety issues, and the possibility of the fuel being turned into weapons.*
9. *Microwaves or laser beams could get power to any point on earth, including areas without power grids. Energy might also be beamed down from massive solar arrays carpeting the Moon, via relay satellites.*

High Proficiency

10. *More nuclear fuel can be got from fissile material created by breeder reactors, but they are of low efficiency, dangerous and can be turned into weapons.*

11. *Vast satellites can harvest power which can be distributed to any point on earth by microwaves and laser beams, and energy can also be relayed by huge solar arrays carpeting the moon.*

Average Proficiency

12. *Breeder reactors create more fissile material than they consume but they have been abandoned because of low efficiency, safety issues and the possibility of fuel being turned into weapons.*
13. *Microwaves or laser beams could get power to any point on earth, including areas without power grids. Energy might also be beamed down from massive solar arrays carpeting the moon, via relay satellites.*

Low Proficiency

14. *There has been an idea of breeder reactors which creates more fissile material than they consume so one would more nuclear fuel, but developers have abandoned them because of low efficiency, safety issues and the possibility of fuel being turned into weapons.*
15. *Martin Hoffert of New York is of the idea that may satellites that harvest solar power are an attractive emission-free, eg sunlight, microwaves and the moon.*

A closer analysis of the extracts shows that those of the high-proficiency students (10 & 11) are redefined in a concise and original manner. The high-proficiency students have selected the central ideas, paraphrased them and have ignored unimportant information. They have also expressed the ideas briefly, paying attention to the cohesion of the ideas. In contrast, average-proficiency students (12 & 13) have opted for a “safety-valve approach” by plagiarizing the original ideas. Worse still, the low-proficiency students’ extracts (14 & 15) not only show that they do not fully understand the idea units, they also resort to what Ellis (1987: 184) calls “reduction strategies”, strategies that are adopted as an “end that justifies the means”, by giving up part of the intended

communication goal. This qualitative difference in the students' abilities to recombine ideas confirms the cognitive superiority of the adept learners, who are able to restructure their ideas unlike the low-proficiency students who copy whole chunks of information or leave out important idea units.

6.2.4 Contextualization

An interesting outcome of the study is that students of all proficiency levels are able to contextualize the information by using key idea units and words within the field of discourse. Figure 33 shows that all the high- and average-proficiency students and 36 of the 52 low-proficiency students are able to use the information relevantly, perhaps because the task has a familiar content background (Swales, 1990). The overall outcome of the students' use of this cognitive strategy is that there are no significant differences between high- and low-proficiency students, although in general high-proficiency students tend to be more coherent than the low-proficiency.

To show how students with different proficiency levels are able to contextualize information, I reproduce below three extracts on the idea unit of ground-based biomass, solar cells and wind power. This idea could have been left out if the students had wanted to mention only the unusual technologies that are likely to control climate changes, but could still have been included, depending on how they contextualized it.

High Proficiency

16. *Ground based biomass, solar cells and wind power could be used, but 10% of the earth's surface would have to be filled with biomass crops to get to trillion watts and the others are limited.*

Average Proficiency

17. *The prospects of ground base biomass, solar cells and wind power are limited-it will need to cover more than 10% of the earth's surface with biomass crops to generate 10 trillion watts.*

Low Proficiency

18. *Finally but one more the use of ground base biomass, solar cells and wind power even though a very large surface land would be required for growing biomass crops and also wind and solar power are part-time fuel sources.*

All three extracts have put the idea unit in its proper context, i.e., these forms of energy can be used, but they are limited because they cannot meet the rising global energy requirements. The only difference between the high- and low-proficiency students is the precision of the information: the high-proficiency student is more economical with words than the low-proficiency student who is repetitive and ungrammatical. The average-proficiency student captures the gist of the idea, but does not express the idea as precisely as the high-proficiency student.

6.2.5 Repetition

The strategy of using repetition belongs to the group of strategies which Ellis (1987: 184) calls “achievement strategies” that are used when the L2 learner has a problem in articulating the required information, but decides to persevere by repeating the same information in different words. Ellis (1987) calls them “achievement” because the L2 learner uses them as a compensatory mechanism in order to achieve the intended communicative goal. In trying to accomplish the communicative goal, the learner recycles the same information. The learner may or may not succeed in achieving the desired communicative goal, but s/he will have made an effort to convey the intended message. The data yielded on this aspect show that virtually all the high-, average- and low proficiency students (see Figure 33 above) avoid repeating the main idea units.

However, summary number 19 below of a low proficiency student reveals interesting information about how the student tries to achieve her intended communicative goal:

19. *Bizzare technologies for generating energy have to be developed if nations are serious about tackling climate change. Government should undertake broad energy programmes like collecting solar power in orbit, use of breeder reactors, vast satellites that harvest solar power. And to turn down the global thermostat by reducing solar heating.*

Collection of solar power in orbit and beaming it back is one of the methods to be employed to reduce green-house gases. Breeder reactors can be used but their problem is that they bring in the issue of safety and the possibility of fuel being turned into weapons. Vast satellites that harvest solar power are an attractive emission free idea, microwaves or laser beams could be used generate energy. Where energy might be beamed from massive solar arrays carpeting the moon.

(Total marks = 4/20)

The summary shows that there are in fact two summaries in one: the first paragraph acts as an introduction and the second expands the ideas. In the second paragraph, the same ideas are recycled in a slightly different way to try to give it a semblance of completeness. It is clear that Queen, a low-proficiency student, is using the strategy of repetition to try to retrieve the required information. However, she does not completely succeed in conveying the intended message as she fails to explain the limitations of many of the suggested technologies, except the one on nuclear power.

6.2.6 Inferring

This is a critical strategy that involves using available information within the text to interpret the meaning of unfamiliar words. The data yielded show that all the high-

proficiency students and 31 out of 42 average-proficiency students are able to infer the meanings of unknown words from the text correctly, but they hardly paraphrase the unfamiliar words or use other words with similar meanings. On the other hand, only 2 low proficiency students are able to infer the meanings of unfamiliar words, while the rest of them completely avoid inferring meanings. To be consistent in what I was measuring, I looked at how the students contextually inferred the meanings of six non-technical words for which substitutes can be found, and these words are: ‘bizarre’, ‘exorbitantly expensive’, ‘abandoned’, ‘vast’/ ‘massive’, ‘part-time’ and ‘outlandish’.

A sample of six typical extracts (two high-, two average- and two low proficiency students) shows variability in the manner in which they infer the meanings of these words. In most cases the students find it convenient to use the same words as those used in the original text. This is perfectly legitimate, provided they show that they understand the meanings of the words. Below I reproduce sentences in which typical students in each proficiency category infer the meanings of unfamiliar words. The underlined information is the student’s version of the information in the brackets.

High Proficiency

20. - One of the technologies dreamed up (bizarre) in recent years.
 - Critics, though, argue that this is unnecessary and expensive (exorbitant).
 - Breeder reactors would give more fuel but have been abandoned (abandoned).
 - Vast (vast) satellites can harvest power.
 - Even so, wind and solar energy are only part-time (part-time).
 - Turning down (word ‘outlandish’ is embedded) the global thermostat by reducing solar heating would probably work.
21. - There are several bizarre (bizarre) technologies that are likely to control climate.

- *The technologies are unnecessary and exorbitantly expensive (exorbitantly expensive).*
- *Developers have abandoned (abandoned) it for safety reasons.*
- *Energy can be beamed from huge (vast) solar arrays*
- *Another exciting idea (outlandish) is the turning down of the global thermostat.*

Average proficiency

22. - *Developers have abandoned (abandoned) them.*
- *Energy might also be beamed down from massive (massive) solar arrays.*
 - *Wind and solar power are only part-time (part-time).*
23. - *Climate stabilization is vital and is unnecessary and exorbitantly expensive (exorbitantly expensive).*
- *They have been abandoned (abandoned).*
 - *Wind and solar power are part-time (part-time) energy sources.*
 - *Another option (bizarre) might be to turn down the global thermostat.*

Low Proficiency

24. - *Bizarre (bizarre) technologies for generating energy will have to be developed.*
- *Technologies like collecting solar power in orbit and beaming it to earth, and using lenses to deflect solar energy away from the atmosphere (exorbitantly expensive).*
 - *Vast (vast) satellites are attractive emission-free idea. 10 percent of the earth's surface must be filled with biomass crops.*
 - *Generators must be linked to computer-controlled global power net-work. Turn down the global thermostat (No inference of 'bizarre').*
25. - *Collection of solar power in orbit and beaming it back to earth and using space based lenses called "parasols" to deflect solar energy away from our atmosphere (No reference to 'exorbitantly expensive').*

The sentence extracts for the high- and average-proficiency students show that they are able to infer correctly the meanings of unfamiliar words, but are reluctant to express the same information using other similar words. The extracts show that nearly all the words for which alternative meanings could be given are appropriated wholesale. The students could have given synonyms such as 'strange' or 'unusual' for 'bizarre', 'too costly' or 'beyond our means' for 'exorbitantly expensive', 'discarded' or 'given up the idea' for 'abandoned', 'very large' or 'huge' for 'vast'/'massive', 'temporary' for 'part-time' and 'unusual' or 'unconventional' for 'outlandish'. The students' reluctance to give alternative meanings can be explained by the fact that many students at this level, even those whom Bachman (1990) considers to have higher organizational competence (e.g. grammatical and textual competence) avoid paraphrasing the original words.

The summaries of the low proficiency students, on the other hand, show that on the whole the students are unable to infer the meanings of unfamiliar words. The author of extract 24 correctly deduces the meaning of 'bizarre'; but other than this word, the student avoids reproducing other words. Extract 25 not only leaves out the strategic words, i.e. 'exorbitantly expensive', but also omits many key idea units. The lack of 'self-judgment' is perhaps caused by insufficient training in the use of meta-cognitive skills that enable one to take stock of the completeness of one's work. In order to deal with the problem, both students resort to message reduction strategies that involve giving up some of the idea units which they cannot easily extract. The students' inability to infer meanings confirms previous studies on the role of vocabulary in text processing, which found that a large repertoire of vocabulary facilitates the comprehension of a text (Gass,

1999; Gass & Selinker, 2001; Lee & VanPatten, 2003; Paulido, 2004; VanPatten, 1996, 2003).

6.3 Meta -cognitive strategies

The students' use of meta-cognitive strategies shows a similar pattern to their use of cognitive strategies. High-proficiency students make drafts before writing their final summaries, direct their information to the specific requirements of the summarizing task and evaluate the correctness of their information. In contrast, low-proficiency students generally do not use meta-cognitive strategies, especially self-evaluation (see Figure 34 below) to check whether the information is correct or not. Average-proficiency students, like their high-proficiency counterparts, are relatively more successful in their use of meta-cognitive strategies than low-proficiency students, with the exception of the strategy of self-evaluation, which is used by fewer students. The data yielded confirm the null hypothesis in the sixth research question, which suggests that high-proficiency ESL first year science students are more capable of using meta-cognitive strategies than low-proficiency students.

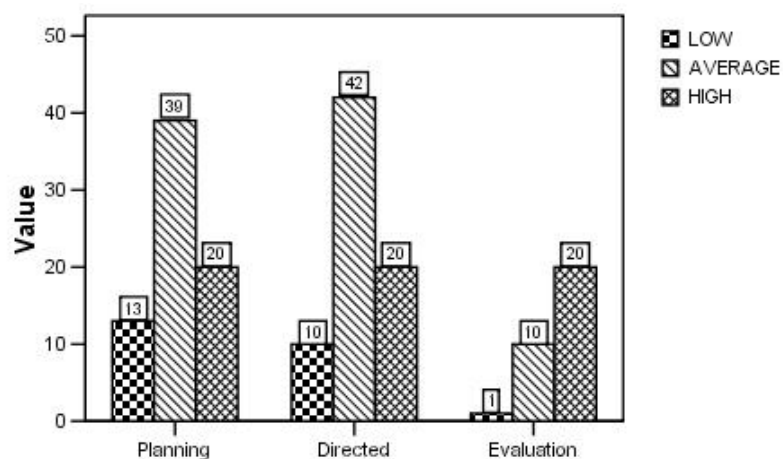


Figure 34 : Meta-cognitive strategies

To illustrate my point regarding the contrasting ways in which high-proficiency and low-proficiency students use meta-cognitive strategies, I reproduce below typical summaries for comparison. Distortions in the summary of the low-proficiency student are marked by an asterisk *

High-proficiency

26. *The technologies that are likely to control climate change are strange but promising. One of the suggestions made by energy analysts is that of collecting solar power in orbit and beaming it back to earth, and using space based lenses called parasols to deflect solar energy away from our atmosphere. Also, vast satellites that harvest solar power are an attractive emission free idea. Microwaves or laser beams could get power to any point on earth, including areas without power grids. Energy might also be beamed down from massive solar arrays carpeting the moon, via relay satellites. Generators would have to be linked to a computer-controlled global power network based on super conducting cables, which also eat up energy to keep cool. Also turning down the global thermostat by reducing solar heating might be an option as retraction would deflect about 2% of the earth's sunlight, enough to offset warming caused by further carbon dioxide emissions. However, the limitations of these technologies are that they are quite expensive, unsafe, dangerous, too complicated to be undertaken and may require even more energy than existing ones.*
- (Total marks= 15/20)

Low-proficiency

27. *Technologies that are likely to *control climate changes include uranium, wind, biomass, solar cells, turning down the global thermostat. But these technologies can *not be used because they have some limitations. Nuclear power is not *possible because, Uranium supplies are limited and known reserves are small. Biomass need a large space for its generation to be able to meet the world demands. Turning down the global thermostat, it is not known about its effects, it may have*

harmful effects. Breeder reactors are inefficient, are not safe, and fuel can be turned into weapons. (Total marks =5/20)

The summary of the high-proficiency student (26) is written after drafting and revising as shown by the notes the student originally made, which have several markings. The summary is directed to the demands of the task and answers the second part of the summary task, which requires the student to point out the limitations of the new technologies. The student has addressed five of the six idea units and has not made any distortions or added information not in the original text. Like most high-proficiency students in the research sample, this student is operating at a higher meta-cognitive level and hence establishes a network of thematic and semantic relations to create a coherent summary. Most importantly, the student 'integrates' the ideas into his/her knowledge base and 'transforms' the original ideas in a novel manner.

The ideas are coherently written and the student presents the material at an appropriate academic level. In addition, the student is able to select information at a level suitable to the task, and competently uses appropriate writing conventions, such as logical sequencing of macro-propositions and semantic cohesion between successive sentences. The fact that distortions and irrelevant information have been crossed out in the draft before writing the final summary suggests that the student uses the meta-cognitive strategy of self-evaluation.

In contrast, the summary of the low-proficiency student (27) shows the student has not applied meta-cognitive strategies. The student does not have a rough draft of the summary, which would have allowed her/him to check whether the required information is included. As a result, the student's summary (27) addresses only two of the six main idea units, has three distortions marked by an asterisk (*) and has not adequately

responded to the demands of the task. The student's production problems, among other factors, can be attributed to a lack of planning and self-assessment.

From the summary of the low-proficiency student, we can further infer that s/he has problems with comprehending the original text, which is confirmed by the number of misrepresentations of the original text. It would appear that, like most of the low-proficiency students in this study, the student does not have the appropriate content-based and text-based schemata (Kintsch, 1998) that can help her/him retrieve the desired information. The data yielded on the students' use of cognitive and meta-cognitive strategies confirm research questions 5 and 6 which ask whether there are any differences between high-proficiency and low-proficiency ESL first year science students in their use of cognitive and meta-cognitive strategies. The data show that, in general terms, high-proficiency students are more capable of using cognitive and meta-cognitive strategies than low-proficiency students.

6.4 Summary

The overall findings suggest that high-proficiency ESL first year science students at the University of Botswana are generally more capable of using both cognitive and meta-cognitive strategies than low-proficiency students when they summarize a text. In particular, high- and average-proficiency students make notes before summarizing, and are able to reorganize the main ideas and deduce the contextual meanings of unfamiliar words.

In contrast, very few low-proficiency students are able to apply pre-summary cognitive strategies such as discriminating, selecting, note-making and grouping of points. Also, low-proficiency students are ostensibly unable to semantically network the

micro-structures of sentences, as well as to infer, group and combine the main ideas. In general, the data suggest that they have limited schemata that enable them to process a text. Although there are these marked differences, the data show that students with different proficiency levels are, nevertheless, able to contextualize the material they are supposed to summarize and generally avoid repetition as a strategy for retrieving the desired information.

However, when it comes to the use of meta-cognitive strategies, there are major differences between high- and low-proficiency students. Unlike low-proficiency students who do little planning of their work, do not fully direct their answers to the specific requirements of the task and do not necessarily check the accuracy of their final summaries against the original text, high-proficiency students are distinguished by the manner in which they focus and reflect on their plans for the task. Above all, they are characterized by their ability to ‘transform’ and ‘integrate’ the information into their existing schemata and their ability to write fluently. In the next chapter, I discuss the summarizing strategies preferred by nine purposively selected students.

7.0 CHAPTER SEVEN: STRATEGIES USED BY PURPOSIVELY SELECTED STUDENTS

7.1 Introduction

In this chapter, I discuss the summarizing strategies used by nine purposively selected students who summarized a second text taken from the *New Scientist* of 9 November 2002 titled: “Ozone damages lungs at low concentrations” (see Appendix 4). I chose the text because of its (a) familiar background, (b) appropriate scientific content and (c) the cognitive challenge it posed. I also selected the nine students (3 high-, 3 average- and 3 low-proficiency students) based on the typicality of their performance in the first summarizing task, which was judged using a scoring scheme shown in appendices 5 and 6. The purpose of administering the second summarizing task was to triangulate the data, as well as to observe at close range how the students summarize a text with complex ideas.

My main objective in this chapter is to examine how the purposively chosen students select correct idea units or macro-propositions, as well as to look at the kinds of distortions they make at the idea unit and sentence levels. The flow chart in figure 36 below shows how I treat my material in this chapter. Under this classification, I show that productions are at two levels: paraphrased or copied. These two general categories are further divided into more specific categories consisting of combinations, which can be either within or across paragraphs; and macro-propositions that provide a generalization about the paragraph, those that provide a meta-statement about the reading or those that provide syntactic and linguistic simplification. Later in the final part of this chapter, I discuss the kinds of distortions made by the students in their summaries.

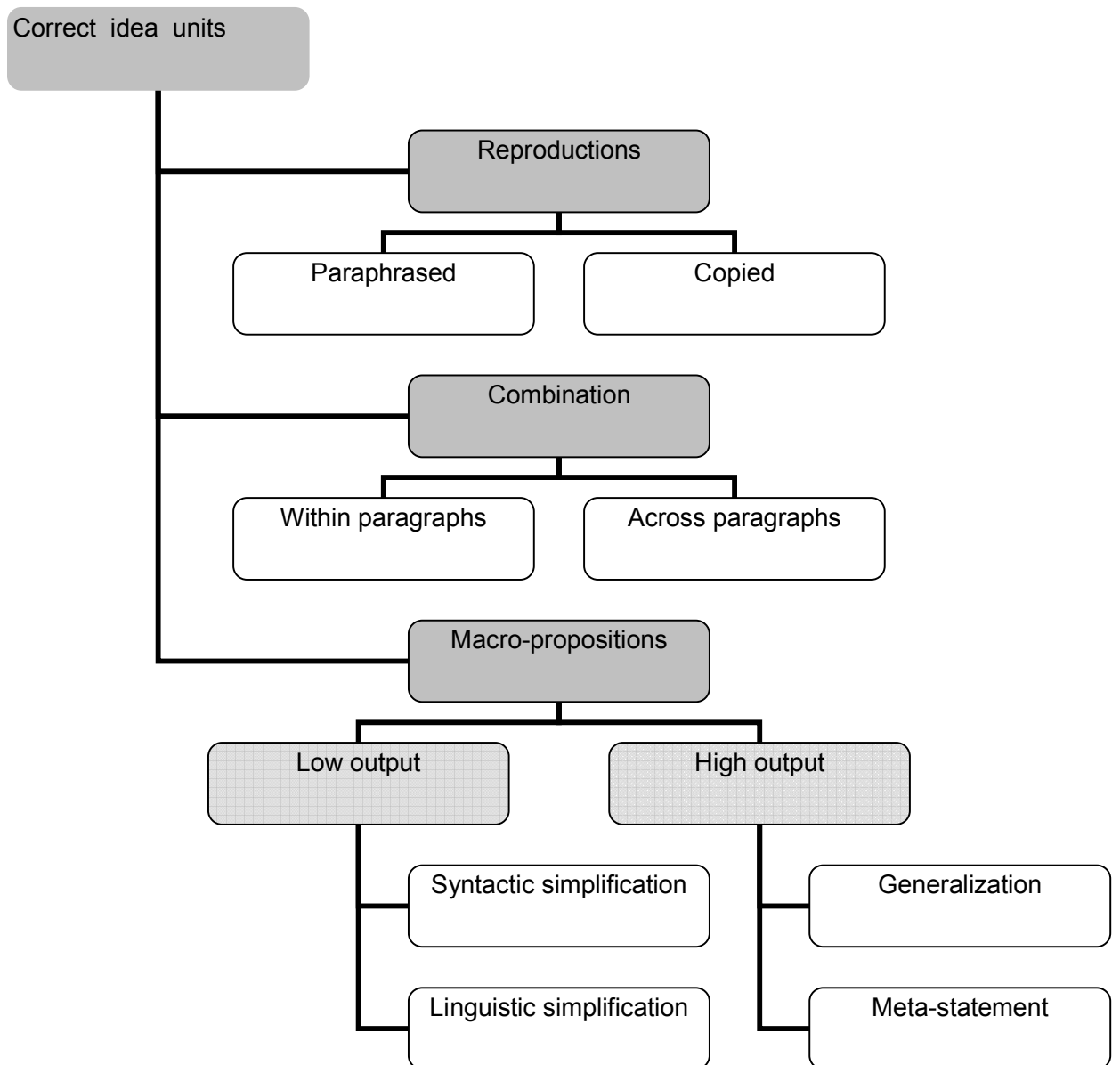


Figure 35 Flow chart classifying students' idea units

7.2 Production of idea units

An analysis of the seven main idea units produced by nine purposively selected students (see Appendix 9 for full transcripts) suggests there are no significant differences between students with different proficiency levels in the manner in which they replicate ideas. A breakdown of the idea units shows that ideas 1, 2, 3, 4 and 7 are prone to being copied wholesale, while at the same time they can also be paraphrased. The data (See tables 12a, b & c below) suggest that students with different proficiency levels prefer to 'lift' the idea units without having to recast them. This finding is consistent with Chimbganda's (2000) findings, which reported that science students preferred to reproduce ideas in their original form because scientific language often uses specific registers with no alternative meanings.

However, when it comes to paraphrasing, there are significant differences between high- and low-proficiency students in terms of how they recast the main ideas, with high-proficiency students generally preferring to use their own words and low-proficiency students resorting to plagiarizing the original ideas. A simple frequency count of paraphrased idea units shows that high-proficiency students paraphrased 8 idea units whereas average- and low-proficiency students paraphrased 7 and 1 idea units respectively (see Tables 12 a, b & c below). Note that where the numbers in the tables do not add up to three, one or two students did not produce the idea units at all.

Table 12a: Production of idea units by 3 purposively chosen high-proficiency students

High Proficiency Students		
Idea units	Number of occurrences	
	Paraphrased	Copied
1. Ozone causes lung inflammation even at low levels.	1	2
2. An increase in macrophage chemicals and prostaglandin causes lung inflammation.	2	1
3. Research suggests people become tolerant to prolonged exposure to ozone.	1	1
4. Long term exposure to ozone induces lung fibrosis.	2	1
5. High concentration of sulphuric acid damages lungs.	1	-
6. Sulphuric acid combined with other pollutants is more harmful.	1	-
7. Air pollution causes coughs and respiratory tract infections	-	2
TOTALS	8	7

Table 12b: Production of idea units by 3 purposively chosen average-proficiency students

Average Proficiency Students		
Number of idea units	Number of occurrences	
	Paraphrased	Copied
1. Ozone causes lung inflammation even at low levels.	-	3
2. An increase in macrophage chemicals and prostaglandin causes lung inflammation.	3	-
3. Research suggests people become tolerant to prolonged exposure to ozone.	1	2
4. Long term exposure to ozone induces lung fibrosis.	2	-
5. High concentration of sulphuric acid damages lungs.	-	-
6. Sulphuric acid combined with other pollutants is more harmful.	-	-
7. Air pollution causes coughs and respiratory tract infections.	1	-
TOTALS	7	5

Table 12c: Production of idea units by 3 purposively chosen low-proficiency students

Low Proficiency students		
Number of idea units	Number of occurrences	
	Paraphrased	Copied
1. Ozone causes lung inflammation at low levels.	-	2
2. An increase in macrophage chemicals and prostaglandin causes lung inflammation.	1	2
3. Research suggests people become tolerant to prolonged exposure to ozone.	-	-
4. Long term exposure to ozone induces lung fibrosis.	-	1
5. High concentration of sulphuric acid damages lungs.	-	-
6. Sulphuric acid combined with other pollutants is more harmful.	-	-

7. Air pollution causes coughs and respiratory tract infections.	-	1
TOTALS	1	6

To illustrate the extent to which high- and low-proficiency students paraphrase or copy the main ideas, I reproduce below summaries of a high- and low-proficiency student, with numbers in the text reflecting each idea unit.

High proficiency

1. *Ozone causes dramatic changes in the biochemistry of the lungs of people exposed to polluted air. From research, it has been established that it causes (1) inflammation in the lungs even at low levels. From examination of cells, it was found (2) that the amount of cells and chemicals in the body increase when in contact with the ozone, causing inflammation. Exposure at a level of 100 ppb (3) increased levels of protein and prostaglandin E2, which promotes inflammation in the lungs. It was also found (4) that macrophages, which produce the prostaglandin, produce increasing amounts of it as the ozone concentration increases. From research, it was established that at 260 ppb, even with exercise, the amount of air forcibly expelled from the lungs per second by men exposed to the ozone was lower than normal. Experiments show (5) that prostaglandin E2 suppresses the immune response in the lungs, making people more susceptible to lung infections. Records obtained between April and August, months when pollution is worst, show (6) that lower respiratory tract infections and coughs are associated with higher ozone levels, as symptoms of these were obtained a day or two after peaks of exposure to ozone.*

(Total marks =16/20)

Now, contrast the summary of the high-proficiency student (1) above in terms of how the ideas are paraphrased or copied with that of the low-proficiency student (2) below.

Low proficiency

2. *Scientist like Hillel Koren, found (1) that ozone caus inflammation of the lungs at low levels. Koren proved this by exposing non-smokers (male) to air containing ozone at 100ppb and to air*

containing ozone at 80 ppb. He believes that this is a useful way of studying pollutions. In both levels of ozone he found that cells that scavenge the lungs were capable of consuming and disturbing bacteria than normal. There was increase in cells and chemical in the body (2) that produce inflammation such as white blood cells. Exposure to ozone at levels of 100ppb increased levels of protein and hence called prostaglandin.

Further studies by Koren has shown (3) that macrophages produce the prostaglandin in the alveoli. Macrophages from alveole was cultured. Test containing E2 at the end of experiment showed that cells produced increasing amounts as the concentration of ozone went up.

(Total marks =6/20)

The high-proficiency student manages to give 6 of the 7 idea units, except the one regarding sulphuric acid. In contrast, the low-proficiency student raises only three points (one in the first sentence, the second in the last two sentences of the first paragraph and the third in the last paragraph). An analysis of the summaries shows that although the high-proficiency student copies many of the macro-propositions (themes), s/he nevertheless paraphrases five of the main idea units and does not make any distortions; unlike the low-proficiency student, who distorts ideas in the last two sentences of the first paragraph and in the penultimate sentence.

The distinguishing factor between the two students is that while the high-proficiency student is operating at a relational level by ‘transforming’ and ‘integrating’ ideas expressed in the original text, the low-proficiency student appears to operate at an elementary level at which s/he simply copies ‘accidental properties’ or ‘redundant microstructures’ of the main ideas without networking the ‘necessary’ properties. This limitation is shown by the student’s inability to address many of the required idea units embedded inside complex structures, except the one on the “inflammation of lungs”

(which appears at the beginning of the text). The failure by the low-proficiency student to identify idea units that appear in the second half of the original text supports Winograd's (1984) view that poor readers often concentrate on the early paragraphs in a passage when summarizing, including more main ideas from these paragraphs than from those which appear later.

7.2.1C combinations

7.2.1.1 Anaphoric and semantic links

Another distinguishing factor is how students with varying proficiency levels link ideas at the micro-structural level, such as at the inter-sentential and thematic levels. To illustrate this point, let me compare and contrast how the first three sentences are linked in the summaries of the high- (1) and low-proficiency (2) students. The high-proficiency student achieves greater syntactic unity than the low-proficiency student by employing anaphoric and semantic linking devices. In the second sentence, s/he uses the anaphora "it" appropriately to refer to "polluted air" and the semantic linking device of contrast "even" to create a subordinating phrase "even at low levels". In the third sentence s/he uses a familiar time link, "when", to provide a chronological link to the inflammation of the lungs. The low-proficiency student uses similar linking devices, such as the anaphora "this" to refer to "inflammation" and the semantic cohesive device "even"; but provides no thematic progression at the micro-structural level, and fails to create a link between one sentence and the other. The student merely appropriates the original sentences without transforming or integrating them into a coherent whole, a weakness observed by Campbell, Smith, & Brooker's, (1998) of unskilled writers who churn out incoherent ideas.

7.2.1.2 Prepositional links

The high-proficiency student also achieves intra- and inter-sentential cohesion by using prepositional phrases that establish relationships between nouns and verbs. The student's use of prepositional phrases such as "in the biochemistry", "in the lungs", "in the body", "in contact with" and many other predicatively used prepositional phrases help to achieve cohesion in the sentences. By comparison, the low-proficiency student uses these intra-sentential linking devices sparingly, except those that s/he locates from the original text.

In addition, the high-proficiency student effectively uses the prepositional phrase associated with a variety of possessive or 'genitive' constructions, such as "of the lungs of people", "levels of protein", "increasing amounts of it", "amount of air" and so forth. These genitive prepositions establish intra-sentential relationships. The low-proficiency student, on the other hand, does not use such phrases. Furthermore, the high-proficiency student uses a variety of prepositions of the 'dative case' signalled by "to", and the preposition indicating agency signaled by "by". The use of a variety of prepositional phrases helps to bring about the cohesion of complex ideas in the summary, unlike the low proficiency student who restricts her/himself to the use of rudimentary sentences, resulting in the production of less coherent ideas.

7.2.1.3 Coordination and subordination

The way the purposively selected students join two or more sentences (Appendix 9) shows relatively different sentence construction abilities. High- and average-proficiency students (Appendices 9a & 9b) are generally able to coordinate sentences by using the parallel coordinator "and". On the other hand, while low- proficiency students

(Appendices 9c1 and 9c2) use the same coordinator with reasonable accuracy, they strike no balance between under- and over-using “and”, with summary 9c2 using “and” six times, suggesting limited knowledge of the range of alternative linking words. The summary of the high-proficiency student (Appendix 9a1) shows its relative superiority by using other forms of coordination such as “but” to link contrasting ideas.

Differences are more pronounced when it comes to the use of subordination, in which some clauses are embedded in others to produce more complex sentences. The summary of the high-proficiency student (Appendix 9a1) uses relative clauses introduced by “as”, “if”, “who” and “which”. Appendix 9a2 (also high- proficiency), although somewhat less competent, manages to use non-defining subordinate clauses of complementation signalled by “that”. The summaries of the average-proficiency students (Appendices 9b1 and 9b2) and low-proficiency (Appendix 9c1) manage to use these forms of subordination, but at a much less sophisticated level. The lack of coordination in the summaries of the low-proficiency students (Appendices 9c1 & 9c2) underscores the gap that exists between skilled and less skilled learners, the latter being content with stringing together a number of ideas without transforming them to produce a semantically coherent text.

7.2.1.4 Combination of idea units within and across paragraphs

A frequency count of the idea units that the 9 purposively selected students combined within one paragraph and across two or more paragraphs shows that there is little difference between high-, average- and low-proficiency students (Tables 13a, b & c below). In these tables, where the numbers do not add up to three, it means the students did not produce the required idea unit. The results show that students with different

proficiency levels are generally able to combine ideas they can find in one paragraph, but find it difficult to combine ideas that span two or more paragraphs. This finding partly supports earlier studies (Johns 1985b; Sherrad 1986), which found that high-proficiency students, even native-speaking students, are able to combine more idea units when they are from the same paragraph, but make relatively rare combinations across paragraphs.

Table 13a: Combination of ideas across paragraphs

High-proficiency students			
Idea units	Within one paragraph	Across two paragraphs	Across three or more paragraphs
1	2	1	-
2	1	1	1
3	2	1	-
4	1	2	-
5	-	1	-
6	-	-	1
7	2	-	-
Totals	8	6	2

Table 13b: Combination of idea units across paragraphs

Average-proficiency students			
Idea units	Within one paragraph	Across two paragraphs	Across three or more paragraphs
1	3	-	-
2	3	-	-
3	3	-	-
4	1	2	-
5	-	-	-
6	-	-	-
7	1	-	-
Totals	11	2	0

Table 13c: Combination of idea units across paragraphs

Low-proficiency students			
Idea units	Within one paragraph	Across two paragraphs	Across three or more paragraphs
1	3	-	-
2	2	-	-
3	2	-	-
4	1	-	-
5	-	-	-
6	-	-	-
7	1	-	-
Totals	9	0	0

While the summaries written by purposively selected students with different proficiency levels suggest that students mainly combine ideas they find in one paragraph, it seems that the ability to combine ideas depends on whether the ideas straddle other

paragraphs. In the text (Appendix 4), many of the ideas are located in specific paragraphs, and the students therefore found it convenient to reproduce them without having to combine them with related ideas found in other paragraphs. To give an example, idea units 1, 2, 3 and 7 are found in the same paragraphs in the original text; and the students therefore preferred not to combine them with other ideas in different paragraphs. In contrast, the idea of sulphuric acid combining with other pollutants is found in three different paragraphs, which makes it possible to link it with other related ideas. The point to note about the combination of idea units in a summary is that it depends on the discourse organization of the text, how the episodes are sequenced and how the text is semantically linked.

Although the data on the students' ability to combine ideas across paragraphs suggests that students with different proficiency levels prefer to combine the ideas they can locate from the same paragraph, there is, however, a discernible pattern that points to the fact that high-proficiency students link them with similar ideas from other paragraphs in a more enterprising fashion. The data (Table 13a) show that one out of three high-proficiency students links ideas across more than one paragraph (as is shown in idea units 1, 2, 3, 4 and 5), whereas low-proficiency students (Table 13c) seldom combine idea units beyond one paragraph. As pointed out above, the ability to combine ideas from different paragraphs seems to depend on how the ideas are thematically linked.

7.2.1.5 High output macro-propositions

For purposes of understanding how students organize written summaries semantically, I define macro-propositions as the main themes of the summary, which contain specific idea units. In this context, high output macro-propositions refer to the

production of discourse at a global level, which is done through meta-statements and general statements. I call them “high output” because they facilitate the production of a coherent text. A meta-statement in the context of summarization means a key word or phrase with a definite truth value that specifies in broad terms the properties of subsequent statements, and generalization means the recasting of ideas in a manner that captures the gist or spirit of the original text without including specific details. These writing skills are crucial for the production of a coherent summary.

A quick scan of the summaries of the purposively selected students (Appendix 9 and summaries 1 & 2 above) shows that all the three high-proficiency students write meta-statements at the beginning of their summaries:

1. “Ozone causes dramatic changes in the biochemistry of the lungs of people exposed to polluted air” (Summary 1).
2. “Ozone can cause dramatic changes in the biochemistry of the lungs of people exposed to polluted air” (Appendix 9a1).
3. “Ozone can cause dramatic changes in the lungs for people exposed to polluted air” (Appendix 9a2).

These meta-statements have the effect of ‘preparing’ the reader for what to expect in the rest of the summary, which is a good strategy for structuring a text. If we compare how these high-proficiency students signal the theme of their summaries with the following meta-statements of average-proficiency students, we will see the difference in the manner in which they organize their texts.

1. “Hillen Koren, a scientist, found that ozone causes inflammation even at low levels” (Appendix 9b1).
2. “A scientist, Killel Koren, of the University of North Carolina showed that even low levels of ozone caused inflammation” (Appendix 9b2).

3. “The ozone damage the lungs even down below 120” (Appendix 9b3).

The average-proficiency students make an effort to spell out what they are going to say in their summaries, but the major difference is that unlike the high-proficiency students who state the issues clearly and in broad terms, the average-proficiency students are imprecise and do not highlight the issues globally. The low-proficiency students below show similar weaknesses to those of the average-proficiency students: they start by making specific statements instead of making kaleidoscopic statements that highlight what is contained in the rest of the text.

1. “Scientist like Hillel Koren, found that ozone caus inflammation of the lungs even at low levels” (Summary 2).
2. “Scientist have researched by experimenting how ozone damages the lungs. (Summary Appendix 9c1)
3. “Ozone causes changes in biochemistry of the lungs” (Summary Appendix 9c2).

What these differences show is that there is variability not only in the students’ writing abilities but also in the way summary writing is taught by different lecturers who teach Communication and Study Skills at the University of Botswana. Also, the differences highlight the varying levels of language proficiency: high-proficiency students appear to have a greater control over complex vocabulary and syntactic structures than low-proficiency students.

7.2.1.6 Low output macro-propositions

This aspect of summarization refers to low level production strategies, such as linguistic and syntactic simplification. I call them “low output” because they are an indication of the student’s failure to comprehend the “gist” of the text, resulting in the omission of important macro-propositions in the final summary. Linguistic simplification

as a strategy of summarization emanates from the student's failure to understand the rhetorical organization of the text, and hence the student decides to produce simplified sentences that gloss over the macro-propositions of the text. Syntactic simplification, on the other hand, is the deletion, omission or alteration of an important macro-proposition due to a failure to decode the original text or, more likely, due to a breakdown in the summary production process. Linguistic and syntactic simplification strategies are part of what Ellis (1987: 184) calls "reduction strategies" that involve the L2 learners giving up part of their original communicative goal.

7.2.16.1 Linguistic simplification

An analysis of the sentence patterns of the summaries of the nine purposively selected students suggests they do not write simplified sentences. Instead, they prefer to produce copied sentences that are in many ways long-winded. What is observable is that all low-proficiency students and two of the average-proficiency students seem not to understand the original text fully, resulting in the production of fewer and distorted idea units, whereas all the high-proficiency students are able to produce accurate idea units. What is also noticeable is that both low-and average-proficiency students tend to gloss over important ideas or reproduce them vaguely.

To illustrate the fact that low- and average-proficiency students write long and ambiguous sentences, part of the summary of an average-proficiency (Appendix 9b3) is reproduced as an example:

"According to Koren's text that Ozone causes inflammation of the lungs it seems to be true because the more the accumulation of polluted air in the lungs such as

smoke, seem to close the Air spaces and thus resulting in inflammation of the lungs as the patient/client is no-longer able to breath out and in easily”.

This sentence is not only too long and unclear, but it also has ideas that do not complement each other. For instance, the section that reads “the more the accumulation of polluted air in the lungs” should have parallel complementation “the more...” Also, some of the subordinate clauses do not establish logical relationships, such as “because the more the accumulation...” and “as the patient is no longer able to breath in and out easily”. The summary of the low-proficiency student (Appendix 9c2) shows similar weaknesses with many sentences that are circumlocutory and unclear. For example, the second sentence of the summary: “ozone exposure is associated with macrophages which consume and destroy bacteria than normal”, is unclear.

On the whole, the summaries of the purposively selected students show that they do not use linguistic simplification as a strategy for summarization. Instead, they produce sentences that are circuitous, hoping that in the process they will somehow convey the intended message. The exceptions to this observation are high-proficiency students, whose summaries have accurate statements that are well coordinated.

7.2.1.6.2 Syntactic simplification

As pointed out earlier, syntactic simplification is the deletion of a macro-proposition or main idea as a result of a failure to understand the original text, or due to a break-down in the summary production process. The summaries of the purposively selected students suggest that high-proficiency students understand the original text fully, as shown by the number of idea units they produce in their summaries (Refer back to tables 12a, b, & c). On average, the high-proficiency students produced six of the

expected seven idea units, and some of the idea units they appear to have missed out are embedded in other structures. What seems to be the problem, however, is that during the production process, some idea units are not so well articulated (such as the one on the effect of sulphuric acid combined with other pollutants).

But the same cannot be said about average- and low-proficiency students, who seem to have problems both with understanding the original text as well as producing the required information. On average, each of the average-proficiency students is able to produce four of the seven idea units, whereas each of the low-proficiency students at best produces three idea units.

7.3 Distortions

In this final part, I discuss distortions at three levels: the idea unit, macro proposition and sentence level (see Figure 36 below). At the idea unit level, I look at two possible types of distortions: those that arise from deleting essential ideas and those that are due to the inclusion of additional information that is not found in the original text. At the macro-propositional level, I consider distortions as general statements that disguise the facts in the original, inaccurate statements embedded in general statements or inaccurate meta-statements. And the last forms of distortion that I look at are those that appear at the sentence level, which arise when a noun or verb phrase is inaccurate, resulting in the alteration of the meaning of the original text.

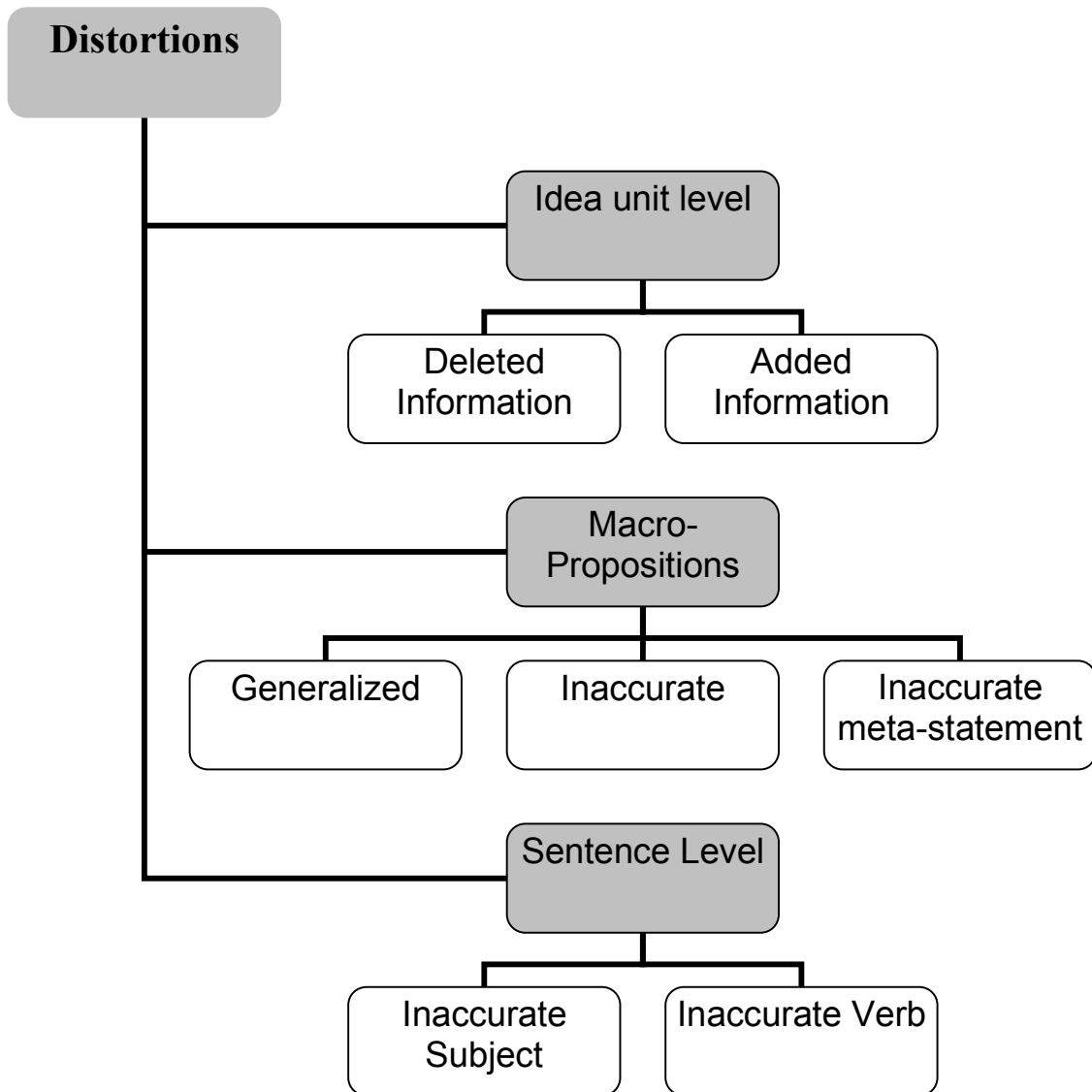


Figure 36: Flow chart classifying students' distortions

7.3.1 Added and deleted information

The summaries of the nine purposively selected students show that all students, irrespective of their proficiency levels, do not distort information by adding information not in the original text, which is consistent with earlier observations under 'distortions' (sub-section 5.5). The types of distortions they make are those that arise from the deletion or omission of information. A perusal of each of the nine summaries (see summaries 1 &

2 above and those in Appendix 9) reveals that high-proficiency students have omitted one or two main ideas, whereas average- and low-proficiency students have omitted three and four ideas respectively. The high-proficiency students generally fail to include the idea unit concerning the effect of a high concentration of sulphuric acid on lungs or its effect in combination with other pollutants.

The idea unit on sulphuric acid appears more or less at the middle of the original text, and its omission may be because it lies beyond the “efficacy of the text-base” (Carrell, 1992; Horiba, 1996; Horiba, 2000; Taillefer, 1996; Zwaan & Brown, 1996), which means it lies out of the range of where students expect it to be. It is also possible that the omission may have been caused by a failure to apply a basic lower-level recognition process (Goodman, 1996; Smith, 1994), which facilitates the identification of the required information.

The purposively selected average- and low-proficiency students are able to replicate the first three or four ideas which are found in the first half of the original text, such as “ozone causes lung inflammation at low levels”, “an increase in macrophage chemicals and prostaglandin causes lung inflammation”, “research suggests people become tolerant to prolonged ozone exposure” and “long term exposure to ozone induces lung fibrosis”. The students, however, fail to identify other pieces of evidence in the second half of the text. The idea unit about the danger of sulphuric acid in combination with other pollutants is generally ignored, while the one on air pollution being associated with lower respiratory infections and coughs shows a considerably higher rate of inclusion (see Appendices 9b1, 9b2, 9b3, 9c1 & 9c2).

The fact that average- and low-proficiency students find it easier to produce ideas

that they find in the first half of the passage is consistent with previous studies (e.g. Johns, 1984; Johns & Mayes, 1990; Winograd, 1984), which observed that “under-prepared” students concentrate on the first half of the reading, thereby ensuring that the preponderance of idea units included are from the first section. The ability to replicate idea units found in the first part of a passage is also consistent with Wallace’s (1992:330) observation: “the first part of a text activates a schema...which is either confirmed or disconfirmed by what follows”.

7.3.2 Distortion of macro-propositions

An examination of the summaries of the nine purposively selected students shows that in general they do not misrepresent the main ideas by recasting them in vague terms. All the three groups appear to state the main ideas in a fairly clear manner, except for a few average- and low-proficiency students. For instance, the summary of an average-proficiency student (Appendix 9b3) says, “air in the lungs such as *smoke* seem to close the air spaces”. The student appears to mistake “smog” for “smoke”, the two fumes whose bio-chemistry is quite different. The student also generalizes “research subjects” to mean “patient/client”. The cause of this distortion may be that the ESL student has a problem with the transfer of knowledge from one discipline to another, and therefore decides to employ reduction strategies by replacing unknown concepts with those s/he already knows.

While the students’ summaries have few distortions in so far as generalization of macro-propositions is concerned, distortion by giving inaccurate ideas is more prevalent among low and average-proficiency students than high-proficiency students. The summaries of low-proficiency students (Appendices 9c1 and 9c2) are good examples of

misrepresented idea units. The low-proficiency student's summary (9c1) states that "Koren examined the cells from the men's body for *analysis of alveoli*". This idea is misrepresented, as it gives the impression that the scientist analyzed the alveoli, whereas it was the cells and fluid from the alveoli that were analyzed. The same student further claims that "at both levels macrophages produced prostaglandin". This idea is perverted because macrophages are cells that scavenge in the lungs, whereas prostaglandin is associated with hormones.

Similarly, the low-proficiency student's summary (Appendix 9c2) distorts a number of ideas. S/he says "ozone exposure is associated with macrophages", which is a misrepresentation of the true facts, because macrophages are cells that are found in the human body, whereas the ozone is a harmful gas from fumes that settle in the atmosphere. In the penultimate sentence of the same summary, the student says "people tend to develop symptoms after a day to two of exposure to ozone". The 'symptoms' that the student is referring to are 'coughs' and 'respiratory tract infections' that develop after a prolonged period and only start to be noticed after the peak period of ozone concentration. The student misrepresents the time factor of the infection because the text talks about the period between April and August when air pollution is at its worst.

Besides the low-proficiency students, average-proficiency students distort some of the main ideas. For example, the average-proficiency student's summary (Appendix 9b3) erroneously states that "macrophages multiply rapidly if lungs are infected". This is a misrepresentation of macrophages that destroy bacteria. What increases are cells and chemicals that produce inflammation, such as white blood cells, fibronectin and lactate dehydrogenase. What one can infer from the way these students process information, is

that low and some average-proficiency students generally have problems in understanding the original text and lack meta-cognitive skills that enable them to assess the accuracy of their information.

The summaries of the nine purposively selected students show that high-proficiency students generally use meta-statements correctly, while average- and low-proficiency students tend to misrepresent them. The incorrect use of meta-statements appears to arise from the lack of concord between the subject and the verb. The meta-statement of the average-proficiency student's summary (Appendix 9b) that acts as a thesis statement at the beginning, "The Azone damage the lungs even down below 120", is vague. It is not clear whether the student wants to say "ozone" or "Azone," the latter [a zone] which may mean a particular zone. Even if we are to interpret the context of the student's statement to mean "ozone", it is still not clear what the student means by "down below 120".

The same student makes another ambiguous statement in the middle of her/his summary: "Koren also came to a point that if a person fails to tolerate after being exposed to ozone, which means people are in danger of their health". This statement does not express clearly the intended message. Other than these isolated cases, the majority of the purposively selected students articulate their meta-statements accurately.

7.3.3 Distortion of subject and verb

The distortion of the subject in this study refers to the incorrect use of the noun or noun phrase and the lack of agreement between the noun and verb. A close analysis of the summaries of the purposively selected students shows that high-proficiency students do not distort nouns and verbs, whereas low and some average-proficiency students

distort the subject and break the rules of concord. The summary of the average-proficiency student (Appendix 9b1) refers to the scientist, Hillel Koren, as “Hillen Koren”. This is not simply a question of miscopying the name: it is a reflection of the student’s inability to check the accuracy of her/his work.

Similar inaccuracies relating to the subject appear in the summary of the average-proficiency student (Appendix 9b3) who refers to ozone as “azone”. The same student refers to prostaglandin as “prostaglandian” and ends her/his summary by saying: “he found that ‘human’ can tolerate the ozone...” The summary of the low-proficiency student (Appendix 9c1) has similar inaccuracies in the subject. For instance, it starts with “scientist have researched by experimenting how the ozone damages the lungs”. Later in the summary the student writes: “Koren also took microphages from the aveoli and exposed ‘it’ to different concentration of ozone”. In the last sentence s/he writes: “he found that ‘human’ can tolerate the ozone”. Since these mistakes in the subject appear to be systemic, they indicate that the rules of concord between the noun/noun phrase and main verb have not yet been mastered.

Besides inaccuracies in the subject of a sentence, there are also more verb errors in the summaries of average- and low-proficiency students than high-proficiency. Once again, Appendix 9b3 reveals typical verb errors: “the azone damage the lungs”, “air in the lungs such as smoke, seem to close the air spaces”, “the patient/client is no longer able to breath out and in”, “prostaglandian E2 results which also aggraviates inflammation”. The summary of the low-proficiency student (Appendix 9c2) shows similar verb errors: “levels of protein and prostaglandin E2 in the lungs increases”, “large amounts of prostaglandin suppresses immune response”, “resent research also show that damage

occur even at lower levels". The point to note about concord inaccuracies in summarizing is that they not only distort the idea units and the semantic network of the macrostructure, they also misrepresent the student's intended meaning.

7.4 Summary

A pattern emerges of the strategies purposively selected students prefer to use in their summaries. The summaries show that high-proficiency students are more inclined to paraphrase the main ideas than low proficiency students, who prefer to reproduce the ideas without transforming or integrating them into their own schemata. Similarly, high-proficiency students link their ideas more cohesively, using anaphoric, semantic and prepositional phrases more often than low-proficiency students, who churn out ideas in a cut-and-paste manner.

The difference between low- and high-proficiency students is more pronounced when it comes to the use of coordination and subordination of ideas, in which some clauses are joined or embedded in others to produce syntactically coherent structures. The evidence from the summaries suggests that high-proficiency students are far superior to low proficiency students in the manner in which they coordinate ideas. However, there is no clear-cut difference between high- and average-proficiency students in the manner in which they use linking devices. The summaries further show that high-proficiency students are more efficient in their use of meta-statements and tend to state the main ideas in a generalized manner, than low and average-proficiency students. In addition, the summaries show that high- and average-proficiency students generally do not oversimplify the ideas and are more capable of identifying the required idea units than low-proficiency students. Above all, the summaries of the purposively selected students

confirm that high-proficiency students, unlike low proficiency students, do not distort ideas of the original text.

However, contrary to previous studies (e.g. Johns & Mayes, 1990; Nassaji, 2003) which have reported a clear distinction between the strategies preferred by skilled and less skilled learners, there is no significant difference observed in the manner in which the students 'lift' idea units when they are summarizing. Students of all proficiency levels tend to replicate the original ideas apparently. Also, there is very little difference between high-, average- and low-proficiency students in the manner in which they combine idea units within one paragraph, across two or more paragraphs. The summaries reveal that students with different proficiency levels are only able to combine ideas they can find in one paragraph; but find it difficult to link ideas that span two or more paragraphs. The summaries further show that students with varying proficiency levels write long and circuitous sentences, but generally do not add personal opinions that do not appear in the original text. In the next chapter, I consider the strategies emanating from taped interviews of the purposively selected students. The strategies are grouped in themes emerging from an analysis of the transcribed texts.

8.0 CHAPTER EIGHT: SUMMARIZING STRATEGIES OF INTERVIEWEES

8.1 Introduction

In this chapter I describe the summarizing strategies reported by nine interviewees (3 high-, 3 average- and 3 low-proficiency). The nine students were purposively chosen because of their performance as “typical cases” (Patton, 1989: 100-107) in the first summarizing task on the technologies that are likely to control climate changes and meet the world’s energy needs. The typicality was measured in terms of how they (a) selected the required information, (b) wrote the summary, and (3) evaluated the correctness of their final summaries. The other criterion taken into account was the gender representativeness of the participants in relation to the sample. Three females and six males were interviewed (the same students who wrote the second summary, the results of which are discussed in the previous chapter).

The nine students were interviewed on separate days in March and April of 2005. Before each interview, I explained the purpose of the interview to the participants. Each semi-structured interview (see Appendix 10) lasted between 20-30 minutes, and it centered on the strategies the students had used for reading, producing and evaluating their final summary products. After each interview, there was a short period of ‘debriefing’, during which time I thanked the student, chatted with him/her about how the interview had gone, played back the tape, explained how it would be transcribed and how the student could get a copy of the interview. To conceal the identity of the interviewees, *nom de plumes* are used in reporting the conversations.

8.2 Context of the interview

The interview was conducted in a relaxed atmosphere in one of the committee rooms of the Communication and Study Skills Unit, instead of the researcher's office, since this office carries too much 'authority', which would have intimidated the interviewees. In conducting the interviews, I was guided by the philosophy that "the objects studied are in fact subjects, and such subjects produce accounts of the world" (Goodson, 1992: 211). This means that knowledge is not a monopoly of the interviewer, but that there is an inextricably reciprocal interaction between the interlocutors that produce shared communicative outcomes. The ethical principle I tried to adhere to is that interviewees are not mere shadowy figures, but autonomous beings whose voices fully express the tone, language, feelings and ideas of the individual participants.

However, in trying to allow the individual voice to resonate, I was cognizant of the fact that in an interview of this nature, any disclosure of one's inabilities can undermine the student's self-esteem. To minimize this, I first tried to build mutual trust with the students by informally discussing with them their academic progress and sharing ideas about how they could overcome some of their learning problems. I did this so that they could trust me and be frank in the interview. I assured the students that the interviews were confidential and that I would not reveal their names in any way. They were also informed that in the event of the results of the interview being published, anonymity would be maintained.

8.3 Data analysis

In analyzing the interview data, I was influenced by Bogdan and Biklen's (1998: 7) approach: "The process of data analysis is like a funnel: things are open at the

beginning (or top) and more directed and specific at the bottom. The qualitative researcher plans to use part of the study to learn what the important questions are. He or she does not assume that enough is known to recognize important concerns before undertaking the research”.

In following Bogdan and Biklen’s (1998) approach, I first started by revisiting the purpose of my study (the top of the funnel), which is to study the summarizing strategies used by ESL first year science students at the University of Botswana. I then re-directed myself to the strategies the students told me they had used during the interview (bottom of the funnel). I first read the transcribed interviews once, without trying to categorize or develop themes (see section 3.5.1). I then read the transcriptions for a second time, and made notes in the margins. My third reading involved the development of a systematic coding of the strategies I had identified during my second reading, i.e. reading, summary production and self-assessment strategies. At this stage of qualitative data analysis, “the researcher does not search for the exhaustive and mutually exclusive categories of the statistician but, instead, identifies the salient, grounded categories of meaning held by participants in the setting” (Marshall & Rossman, 1999:154).

I continued re-reading the transcriptions and developed what Marshall & Rossman (1999: 154) call “analyst-constructed typologies which are those created by the researcher that are grounded in the data but not necessarily used explicitly by the participants”. I also highlighted quotes that illustrated the strategies the students said they had used, noted some of the key words used, changes in opinions, the passion of certain responses, and vague or devious responses. The identification of the strategies the students reported to have used was influenced by the strategy classifications used in

previous studies (Chamot, 1987 & 1996; Nassaji, 2003; Oxford, 1990 & 1999; Phakiti, 2003; Purpura, 1999), which are shown in Appendix 6.

From the data, I was able to identify a number of broad categories of the strategies the students claimed to have used. The predominant ‘reading strategies’ the students reported using are: title and sub-heading noting, scanning and skimming, underlining, identifying and selecting main points, inferring the meaning of new words and translating difficult ideas into one’s first language. The ‘summary production strategies’ the students mentioned are: drafting a rough summary, using own words or those from the text, generalizing and re-ordering the ideas. Concerning the ‘evaluation of the summary product’, the students mentioned that they used proof-reading, checked their summaries against the original text, made corrections and refrained from adding their own information or making personal comments.

8.4 Discussion of results

8.4.1 Reading strategies

The interview data suggest that students of different proficiency levels are ‘conscious’, to varying degrees, of the strategies they use in order to identify the required information. The running theme is that they ‘scan and skim’ the text in order to extract the required information. Nonofu, one of the high-proficiency students, has this to say about scanning and skimming:

Yes, I find it’s important to scan and skim because you have to read through the whole text to identify what it is you really want. As I read, if I identify a point as one of those required, I underline it so that when I come back to read again before writing a draft, I am able just to pick the point.

The same point is echoed by Kitso, an average-proficiency student:

At first I have to understand what the question wants and then underline it to show exactly what it wants, and then scanning into the passage and highlighting the main points. After that I lay the highlighted points down but I don't write them down here because they are already in the passage. Then after that I use joining words to make it more cohesive.

The two extracts above show that the students are 'aware' of the reading strategies they are supposed to use to foster their understanding of the text, perhaps because these skills had been taught in CSS when they were dealing with summary writing. Both of them talk about the importance of "underlining" the main points; and to support their claims they use phrases such as "I find it important", "you have to read through the whole text", "I have to understand", and "highlighting the main points". Even one of the low-proficiency students, Tiny, appears to be 'aware' of the necessity to 'scan and skim' through the text in order to identify the required information:

How do I get information, the essential information? I summarize. I pick the most important information. I pick the key words.

Tiny's response, "I pick the most important information...the key words", suggests she scans and skims the text in order to pick the most important points.

Related to the strategy of scanning and skimming, is the use of the title and sub-headings to figure out the meaning of the text. Six of the nine students interviewed reported that they use this strategy. Two students, one high- (Kealeboga) and another average-proficiency (Rapula), provide insightful information on the way they utilize headings in order to get a general feel of the text.

Kealeboga:

First of all, I try to understand the topic so that as I read through I try to relate what I am reading with the topic to see its significance and to identify what I am supposed to get from the passage. I find it's very important to use the titles and the subtitles because a summary is meant to reduce the

content of what the whole passage is talking about. You are supposed to identify a few facts. So, using the titles and subtitles basically helps me to identify the small factors that I am supposed to select.

Rapula:

Yes, first of all we have to look at the title. The title can guide you on what this text is about. Like this text, for example, is about ozone pollution. It shows me that I have to look for things that talks about ozone pollution and concentrate much on things that cause it or ozone pollution like the topic says.

From what the students claim they do, it appears they find clues about what the text is saying from the wording of the title and sub-headings, and utilize the information to understand the macro-propositions of the text. This is a useful strategy of reading a text, which derives its theoretical basis from cognitive psychology (discussed in the literature review under ‘interactive reading’, section 2.5.9). What often appears to be the problem, however, is a breakdown in the summarizing process due to the lack of both “formal schemata” (i.e. lack of background knowledge about the rhetorical organization of the text) and “content schemata” (i.e. poor background knowledge of the subject matter) (Johns & Mayes, 1990: 254).

An aspect of reading that shows variability is the manner in which students with different proficiency levels deal with unfamiliar words. Generally all the three high-proficiency students whom I interviewed appear to apply correct strategies on how to infer the meanings of strange words. They seem to be aware that words carry different meanings in different contexts. In order to infer the meanings of unfamiliar words, they reported that they look for clues in the sentence or deduce the meaning from the context in which the words are used. The following high-proficiency students indicate the strategies they use for dealing with unfamiliar words:

Nonofo:

If I come across words I am not sure of, I just put a star on them and read the whole sentence and may be try to grasp what they are trying to say. If I fail to get the meaning immediately, I check for the meanings of surrounding words. These can give me an idea of what the new words mean. But if I still can't get the meanings I pass on to try to understand the overall meaning of the text.

Kopano:

If I come across such words, I try to understand the sentence instead of the word itself because different words mean differently in different sentences, so I try to find the meaning in the sentences.

Kealeboga:

I try to get the meaning from the context by reading the sentences around the particular sentence with the words that I don't know. It's easier to get the meaning of a word this way, if you don't know its meaning. If that can't work, I pass on to get the main meaning of the passage.

These extracts indicate that high-proficiency students use appropriate strategies in order to predict the meanings of unfamiliar words. They try to figure out the meanings of new words by looking for clues from “surrounding words” in the sentence and “the context” in which the words are used. And if that does not work, they try to focus on the “overall meaning of the text”, “the meaning of the sentences” or “the main meaning of the passage”. Nonofo makes it clear that “if I come across any words I am not sure of, I just put a star on them and read the whole sentence and may be try to grasp what they are trying to say”. Kopano echoes the same sentiment: “If I come across such words, I try to understand the sentence instead of the word”, and Kealeboga caps it all: “I try to get the meaning from the context by reading the sentences around the particular sentence with

the words that I don't know". The claims of the high-proficiency students are confirmed by the markings which they made on the original texts.

If we contrast the strategies reported by the high-proficiency students above with those of the following low-proficiency students, we will see the degree to which high-and low proficiency students differ in the manner in which they process information:

Mmabana:

I skip the parts with words I don't know. There is no how I can just guess meanings if I have never seen the words before. Sometimes it's frustrating to read something you don't understand. What can I do?

Tiny:

I try by all means to tell myself that it is not difficult. I just pass the difficult part and say maybe they are just trying to trick us by putting such difficult words and go to the next bits. Usually I tend to become truthful to myself and say leave those things you do not know and do those you know.

The reports of the low proficiency students, unlike those of the high-proficiency, suggest that they use 'avoidance' strategies by skipping the words that lie outside their content schemata. This is not an efficient way of processing information because it ignores the semantic meanings that lead to an understanding of the themes of the text. Mmabana, a low proficiency student, justifies her use of avoidance strategies by claiming: "There is no how I can just guess meanings if I have never seen the words before". Tiny adopts a similar strategy: "I just pass the difficult part and say maybe they are just trying to trick us by putting such difficult words".

The crescendo is reached when Mmabana declares: "it's frustrating to read something you don't understand. What can I do?" The rhetorical question pleads for help, which can come only when the student begins to realize that her information processing

skills can greatly improve if she pays attention to the overall organization of the text. This starts from paying attention to ‘local’ semantic networks or microstructures to ‘global’ meanings or macrostructures that form a coherent whole. The conclusion that can be drawn from the extracts of the low-proficiency students is that there appears to be a wide gap between high-and low-proficiency students: high-proficiency students are able to figure out the semantic networks of words, whereas low-proficiency students avoid lexical items they do not understand.

Another reading strategy reported by the interviewees that deserves comment is translating information or words from English into the students’ heritage language or mother tongue (namely Setswana). The majority of the students reported that they use this strategy in order to increase their understanding of the text. They also mentioned that they try to translate unfamiliar words into their mother tongue or first language. The scale of translation, however, appears to differ according to the proficiency level of the student. Kopano, a high-proficiency student, whose use of English appears to be close to that of a first language speaker maintains:

Actually I find it easier to understand things in English more than in my own language. It serves no purpose to translate the ideas or words because one will spend a lot of time doing that. In science it’s difficult to translate some of the words. Like in this case, how could one translate ozone? I don’t think I know a Setswana word for it.

On the other hand, Koziba, an average-proficiency student, agrees that he sometimes uses this strategy:

I don’t usually do it but sometimes I do translate it. Sometimes, for example, if I find that this word is difficult or I don’t understand it in English, I translate it to Setswana. It depends on the subject. For instance, we discuss science and mathematics solution in Setwana.

An interesting observation is that Koziba uses translation as a strategy for integrating knowledge in most of his science subjects: “For instance, we discuss science and mathematics solution in Setswana”. The use of translation also appears to be frequently used by low-proficiency students, as suggested by Mothibedi, a low proficiency student:

Ja, that's what we always do. Like if we try to think about it in Setswana, and say oh this means this in Setswana, which means we do try to think about it in our language. Gape (Setswana word for 'again') it makes it easy to understand.

His repeated use of “we” connotes he is not the only one who translates material from English into their mother tongue, and the phrase “always do” testifies to the frequency of translation. Current approaches to ESL teaching (Widdowson, 1996) suggest that the use of the mother tongue is a good starting point for helping ESL/EFL students “authenticate” the language for themselves. Widdowson (1996) argues that the judicious use of the mother tongue can act as a cultural capital to help boost the students’ confidence, build on the classroom culture as well as that of the wider community. Kramsch (1998) supports the idea of using the mother tongue as part of a wider activation of the diversity of cultures that any classroom contains. She argues that using the mother tongue in a lesson conducted in English allows the ESL learners to journey back and forth within their culture in search of a “third place”

The effect of using the mother tongue in a lesson conducted in English is, however, unclear because we are not sure that students who do not understand information in the second language are able to translate accurately the same information into their native languages. It also defies the influential theory of ‘immersion’, which suggests that an L2 speaker learns the second language better by being plunged into the target language. However, neo-liberal applied linguists such as Widdowson (1996) are

convinced that using the mother tongue in an English lesson holds the key to the ESL students' problem of transforming and integrating knowledge into their knowledge base, because it facilitates the processing of information.

8.4.2 Summary production strategies

Turning to the strategies the students reported they use for producing a summary, most of them mentioned that they first draft their ideas, which means they first write a rough summary, which they then revise and edit in order to come up with a final version. Kopano, a high-proficiency student, provides insightful information on the strategies he uses for producing a summary:

Well, first of all, I write a draft to ensure that I have included all the required points. I then correct my draft to make sure that I have not made some mistakes and then I go on to write my final summary.

The steps that Kopano follows are “writing a draft”, followed by “correcting” the draft “to make sure that I have not made some mistakes” and “then I go on to write my final summary”. When I verified the steps he had followed to produce summaries on the strange technologies that can be used to curb global warming and the effects of the ozone on the lungs, I found that what he said in the interview was exactly what he had done to summarize the texts.

Kopano's strategies, however, differ significantly from those employed by Kitso, an average-proficiency student. When I asked Kitso whether she makes a draft first before writing her final summary, she retorted: “No I only did a little bit because it wastes my time”. When I checked the summaries she had written, there was no evidence of having done “a little bit” of a draft, and perhaps this is why she claimed that it

“wastes” her time. What Kitso is probably unaware of is that writing a summary is a process of several activities, such as scanning and skimming, reading, identifying and selecting the required information, drafting, revising, editing, and so forth. Her short-circuiting these processes does not pay dividends, as evidenced by her poorly organized summary (see Appendix 9c1).

Mothibedi, a low-proficiency student, uses diametrically different strategies to those used by Kopano and Kitso. When I asked him to explain the steps he follows when writing a summary, this is what he says:

It's a problem to me. I just do drafts. You know I have a problem with it. I don't know whether I was doing the right thing. Ithata. (Setswana word for difficult)

Mothibedi's response illustrates a basic shortcoming: his admission that he has a problem with summarizing implies that he has not yet developed the skills required for successful information processing. His statement “I just do drafts” suggests he has no clear strategy for summarizing a text. The use of “just” connotes some accidental way of drafting a summary. The haphazard approach is confirmed by his admission: “I don't know whether I was doing the right thing”. To solicit sympathy from the interviewer, he makes a direct appeal: “You know I have a problem with it”. He makes an overt request for assistance in order to overcome his inability to summarize. The use of the Setswana word “ithata”, which means it (the summary) is difficult, is intended to emphasize his dilemma, (i.e. his inability to condense information) and possibly is a ploy to create solidarity with the interviewer. What Kopano, Kitso and Mothibedi's discourses reveal is that there are differences between high-, average- and low-proficiency students in the manner in which they summarize a text, i.e. it appears high-proficiency students use an assortment of

cognitive strategies to produce a summary, whereas average and low-proficiency students use a limited range of strategies.

Another summary production strategy the students mentioned is using their own words to express the ideas, which shows the extent to which they integrate the information. Like many other summarizing strategies reported in this study, there are observable differences in the manner in which the students use their own words or those from the original text. Nonofu, a high-proficiency student, maintains: “I try as much as possible to use my own words rather than those used in the text because it shows how I understand the text”. Her use of the words “try as much as possible” suggests that she uses her own words where it is possible, but otherwise uses some of the words she finds in the text. She shows her awareness of the potential of using her own words when she states that it “shows how I understand the text”. Her summary (Appendix 9a1) confirms that she tries as much as possible to use her own words.

Koziba, an average-proficiency student, holds a different view to Nonofu’s. He claims that “usually I use the words which I find in the text, and in the final version I change the words that have been used but not changing the meaning of the sentences, at least for the marker to see that I tried to use my own style of writing”. Koziba relies on the words he finds in the text (“usually I use the words which I find in the text”), but tinkers with some of the words while “not changing the meaning of the sentences”. The use of the word “usually” implies that he frequently uses the words he finds in the text, but does not “always” do so. However, it is disturbing that Koziba’s shuffling of some of the words seems to be extrinsically motivated: “at least for the marker to see that I tried

to use my own words”. He appears not to see the intrinsic value of paraphrasing words, which is a skill that helps the processing of information.

Mmabana, a low-proficiency student, holds a totally different view on whether she should use her own words to summarize a text, i.e. she thinks it is not necessary and there is no time for thinking about finding other words or phrases to substitute those already in the text. “I use the words from the text. I find that there is no time for other words because summary, it’s not easy thing to do”. When I asked her whether she would use her own words if she was given more time, she cautiously answered: “it depends, I can use my words but referring only to the text”. It is apparent that Mmabana’s strategy is to use the words she can locate from the text. The question of the time factor seems to be a lame excuse because she places a condition on the use of her own words: “it depends...but referring only to the text”. Her statements imply that she relies mostly on words from the text.

What is clear from the different strategies used by the students is that the high-proficiency students try as much as possible to use their own words, whereas average and low proficiency students tend to rely on the words they find from the text. This conclusion is consistent with earlier observations in Chapter Five (section 5.7 that high-proficiency students are more inclined to paraphrase idea units than low-proficiency students.

One of the strategies the students consistently mentioned in the interviews is the reordering of ideas, to suit the way they want to present them in the summary. In general, the students reported that they rearrange the ideas, but others mentioned that they sequence them more or less the same way as the ideas appear in the original text.

Kealeboga, who typifies the three high-proficiency students in the purposively selected group, insists: “I rearrange the ideas to suit the way I am going to write the summary. You see, sometimes the ideas are mixed up or repeated in the original text and you need to sort them out so that you can have a sensible summary”. Kealeboga’s strategy is correct because he tries to transform the ideas to suit the way he is going to write the summary. This is necessitated by the fact that “sometimes the ideas are mixed up or repeated in the original text” and so there is “need to sort them out so that you can have a sensible summary”.

But Rapula, an average-proficiency student, uses a different strategy: “I tried to write it more or less the same way it was written. In this passage, it started off by defining the ozone, then into the damages of the ozone and finished with what should be done. I wrote my summary like that. I first took a little bit from the defining part and wrote it down, then took out the facts (what the question wants) and put it in the body and at the end I wrote the recommendations”. From Rapula’s narrative, one can infer that he tries to summarize the ideas following the order in which they appear in the original text. The difference between Kealeboga (high-proficiency) and Rapula (average-proficiency student), is that the high-proficiency student is aware that ideas in a text are not always chronological, and there is therefore need to impose an order which suits one’s style, whereas Rapula gives the impression that he simply follows the original order of ideas, regardless of their logicity.

The same strategy is also adopted by Tiny, a low-proficiency student (the reader may well recall her), who reports: “I try to reorganize the ideas, but sometimes I just write them according to the way they are”. Tiny’s approach is that she “tries” to

reorganize the ideas, but “sometimes I just write them” in the order in which they appear in the text. The point about Tiny’s approach is that she is aware of the need to reorganize ideas, but resorts to the “safety valve” measure of presenting ideas according to the way they appear in the original text.

The last summary production strategy which the students frequently reported they use is generalization, which is the recasting of information in a way that captures only the main points without including specific details. As expected, the students’ reports suggest that the level of generalization varies according to the proficiency level of the student. For instance, Kopano, a high-proficiency student, has this to say about whether he generalizes information or not:

Yes, I generalize my information. What I do is that I pick the main ideas and express them concisely in my own words to show that I understand what I am talking about. But if there are some details that are really important which relate to the question, I include them in my summary because they will make clear what I am saying.

Kopano’s statement: “I pick the main ideas and express them concisely in my own words”, encapsulates his summarizing strategy. He shows that he understands the process of generalization: that it is not simply a matter of stating the generic ideas but the inclusion of “main ideas” in a “concise” manner. His response is consistent with the findings on generalization in Chapter Five (section 5.4), which show that high-proficiency students tend to generalize ideas more effectively than average- or low-proficiency students.

Kopano’s technique, however, sharply contrasts with the strategy used by Kitso (an average-proficiency student), who says: “I just take the points as they are **and join**

them to form a summary”. This statement suggests that Kitso does not ‘transform’ the ideas, a strategy which is adopted by many average- and low-proficiency students who “cut and paste” information (see Appendices 9b & c).

Mothibedi, a low-proficiency student, illustrates the problems faced by low-proficiency students when they try to recast ideas: “When we are now writing the summary, I have to generalize; it’s difficult. Mostly I use the words from the text. My English is not so good so it’s hard to find my own words”. It appears Mothibedi is “aware” of the need to recast the original ideas; but seems to lack confidence in his approach. His declaration: “it’s difficult” and “my English is not so good” is self-defeating. The point to note about these accounts is that they show how students of different proficiency levels process information.

8.4.3 Summary evaluation strategies

In the last part of this chapter, I discuss the strategies the students reported they use to ensure that their summaries contain the required information and are fine-tuned. The interviewees’ accounts suggest that they are ‘aware’ of the self-assessment strategies they are supposed to use, i.e. editing and proof-reading the summaries to ensure that they carry the required information and do not distort the original ideas. However, a close analysis of the responses of the interviewees suggests that they evaluate their final summaries differently, depending on their proficiency levels. As in Chapter Six (section 6.2.2) where it was found that low-proficiency students, unlike the high-proficiency, do not necessarily verify the accuracy of their final summaries, the interviews confirmed that there are sharp differences.

When I asked Nonofo, one of the high-proficiency students, what she does to ensure that her final summary carries the required information, this is what she had to say:

I read again the question, and then I ask myself, have I done what is being required by the question? I then read the summary that I have written and if by any chance I happen to doubt what I have written, I make the necessary changes until I am satisfied the summary reflects what is required. I usually do this at the drafting stage, and once I am convinced my summary is fine, I then write the final version.

Nonofo's account is illuminating: she reflects on her information: "I ask myself, have I done what is being required by the question?" This is an effective self-evaluative strategy, which falls in line with Schraw's (1998) "stop, read and think" technique intended to foster the summarizer's meta-cognitive awareness by monitoring the production processes. Nonofo's other strategy is to effect "the necessary changes" to her summary until she is "satisfied the summary reflects what is required". The amendments she made to her first draft confirm that she, indeed, uses these strategies.

Koziba, an average-proficiency student, has a somewhat different approach to Nonofo's, i.e. his self-assessment strategy appears to focus on localized rather than global issues. "After finishing the summary, I read again and after reading and I find that some words are not where they are supposed to be, I just correct it by cancelling and writing the correct word above". Koziba represents those students who are usually 'aware' that proof-reading and editing is essential in summary writing, but is not quite sure what to focus on. His focus on words is laudable, but perhaps his starting point should be to check whether the required information is included and then later on check whether he has used appropriate words or the ideas are properly sequenced of ideas and so forth.

Koziba's strategy of focusing on discourse issues confirms Adamson's (1990, 1992) observation that summarizing strategies are often tied to the rhetorical organization of a text.

Mmabana, a low-proficiency student, is a typical example of those students who find it difficult to monitor their own work. When I asked her to explain what she does to ensure that her final summary meets the requirements of the task, this is what she had to say: "I am not so sure. In fact I didn't check because there was no time". When I pressed her to explain what she would have done if she had had more time, she reported: "I would read my summary, then I go back to see if the words are underlined". Her response shows some ambivalence, i.e. on one hand she says, "I am not so sure" and on the other, "In fact I didn't check because there was no time". Her claim that she did not verify the accuracy of her summary "because there was no time" is evasive because the one hour allocated for doing the summary was probably more than enough. Her subsequent response reveals the true nature of the strategies she uses: "I would read my summary and then go back to see if the words are underlined".

It is unclear what she would focus on in her re-reading of the summary and why she would refer to words underlined. What can be deduced from her statements, however, is that she seems to be unaware of the value of self-evaluation and of what ought to be checked in a summary. Her failure to assess her work supports Schraw's (1994) observation that college students with poor monitoring skills are less able to manage their learning, and usually perform worse than good monitors.

The last issue that I wanted to find out from the interviewees is how they deal with distortions. To explore this issue, I asked the students whether they make personal

comments or whether they sometimes add extra information and what they do to detect misrepresentations in their summaries. Like the other issues on self-evaluation, such as proof-reading and verifying the accuracy of the information, the students' responses showed variability depending on their level of proficiency. Kopano, a high-proficiency student, explains the strategy he uses to ensure that his summary has no distortions:

I find it's important not to include personal opinions in my summary because differing with the text can result in a different meaning of the message being portrayed in the text. To ensure that the meaning is the same as the original and that there are no distortions, I compare my summary with the original text. At some stage I may have written something that is not in the original text, and so I find it's very important to read through both of them and compare what they are saying.

Kopano uses correct strategies to ensure that there are no distortions in his summary: "it's important not to include personal opinions"; and to ensure that his summary and the original text convey the same meaning, "I compare my summary with the original". These are the strategies that are likely to ensure that there are no misrepresentations in the final summary.

Rapula, an average-proficiency student, typifies average students in how he deals with distortions: "No, I don't add my own information. It's not advisable to add your own comments". When I asked him whether he compares his final summary with the original to ensure that the meaning is the same, he makes this revealing statement: "I don't compare them. What I think I do is that I highlighted the main point from the passage and transferred them into my summary". What is intriguing about his response is that his reason for not wanting to add his own information is externally motivated: "it's not advisable to add your own comments". The use of the phrase "not advisable" suggests there is someone else (most likely a lecturer) who advises that personal information

should not be added. This, then, begs the question: Would Rapula add his own information if the external factor were removed? The second part of his statement, “I don’t compare them” shows exactly what he does. His subsequent statement: “What I think I do is that I highlighted the main points from the passage and transferred them into my summary”, expresses uncertainty and appears to be an afterthought which is intended to placate the interviewer.

In response to the same question about whether he adds his own information and whether he compares his final summary with the original, Mothibedi, a low-proficiency student, maintains: “No, I don’t add my own information, but sometimes I comment. On this summary I didn’t go back and compare because I thought my summary is ok”. Like most students in the interview, Mothibedi is aware that he should not add his own information. His admission: “but sometimes I comment” suggests, however, that now and then he gives his own opinions. The second part of his response, “I didn’t go back and compare because I thought my summary is ok” confirms the empirical observation that low proficiency students do not generally have the ability to assess their own cognition (Flavell, Miller, & Miller, 1993).

8.4.3 Summary

The outcome of the interviews suggests that students of different proficiency levels are generally ‘aware’ of the strategies they are supposed to use for reading, producing and evaluating their summaries, possibly because of the teacher’s input. However, the awareness is not confirmed by what they do, except in the case of high-proficiency students who stand out in the manner in which they read, produce and evaluate their summaries. Interviews with the average- and low-proficiency students, in

spite of some of their claims, suggest that they hardly use meta-cognitive strategies of self-assessment. What I was able to establish from the reports of the average- and low-proficiency students is that they are generally unable to monitor their work, which is consistent with the findings reported in Chapters 4, 5 and 6, which deal with the larger sampled population. The overall results of the interviews corroborate previous studies (e.g. Block, 1992; Johns & Mayes, 1990; Vann & Abraham, 1990) which suggest there are differences between high- and low-proficiency students in the manner in which they use cognitive and meta-cognitive strategies.

In my next and last chapter, I discuss the implications of the findings of this study, especially with regard to the learning, teaching and syllabus design of English for Academic Development. I also point out the limitations of the study and make recommendations for possible areas for future research.

9.0 CHAPTER NINE: IMPLICATIONS AND RECOMMENDATIONS

9.1 Implications for summary teaching

Several implications follow from the findings of this study, which focuses on the summarizing strategies used by ESL first year science students at the University of Botswana. The study derives its theoretical foundation from psycholinguistic views of reading, especially Kintsch & van Dijk's schema theory (discussed in the literature review, sections 2.5.2 - 2.5.5), which states that background knowledge plays an important role in understanding a text. The instructional implication, which logically follows from this theory, is that the L2 learners' existing schemata in relation to the new information need to be activated, in order for the learners to be able to process information effectively. For example, the readers' prior knowledge can be stimulated by scanning and skimming through the text, looking at visuals, figuring out the meaning of the title and new words, and making analogies and comparisons with materials previously read.

Schema theory also claims that the structure of discourse is interpreted through a set of surface and deep-level propositions stored in the long-term memory. The theory further suggests that the reader's macro-rules (i.e. short term and working memory) enable the reader to delete unnecessary information, construct and generalize global ideas. The implication of this theory is that instruction on reading needs to focus on understanding both surface and below the surface meanings. It also implies that appropriate teaching materials ought to be used in order to activate the student's macro-rules.

Despite the fact that schema theory has potential for classroom application, there are limits to its application in ESL reading and comprehension. The major strength of the model is that it offers us a theoretical description of the processes of comprehension and summary production and possible explanations for errors and omissions. For example, a failure to delete information that is irrelevant produces distortion in the final summary; a failure to generalize ideas disrupts the process of cohesion; and a failure to construct the main ideas obscures the gist. But this is as far as the schema theory explains. Beyond the theoretical description of the processes of comprehension and summary production, the theory is vague on problems relating to simultaneous interpretations, such as the level of processing which is necessary for surface and deep-level interpretation. Similarly, the theory does not explain why or how bi- and multilingual speakers have comprehension problems, because the model focuses on discourse comprehension in general and not the peculiar ways used by ESL students to decode a text.

The most obvious limitation of the schema theory is that it assumes that a reader has both types of schemata, i.e. 'content schemata' (background knowledge) and 'formal schemata' (background knowledge of rhetorical organization of the text). There is no proof that every reader possesses both schemata; and even if we were to argue that every reader has both schemata, there is no guarantee that content schemata will be activated, if the reading material is not within the range of the reader's cognitive and cultural experience. Thus, in basing summary teaching on the assumptions of schema theory, we need to realize that the theory is not omniscient.

An important implication of this study is the part that summarization plays in fostering academic literacy which is conceptualized as a socially situated discourse

practice ideologically inscribed within the context of the students' social identity, power relations between them and their lecturers and institutional practices. From this study, it is evident that the students' ability to apply cognitive and meta-cognitive strategies for selecting and evaluating information is closely linked with their level of academic literacy. The dialectical processes of 'synthesis', in which the students were engaged during summarization, indicate their struggle to acquire the required discourses. Critical language awareness (CLA), coined by Clark *et al.* (1990) to refer to consciousness-raising amongst learners, informs us that power and identity are inextricably involved in language use in higher education. In assessing the students' summaries in this study, the power fulcrum appeared to be omnipresent: I could not divorce myself from what Reynolds in Lather (1991: 59) calls an "interpreter of the world", i.e. a judge and gate-keeper of the students' construction of knowledge.

On this issue there is a growing body of literature, which suggests that explanations for students' writing problems can be seen as gaps between the expectations of the faculty/department/lecturer and students' interpretations of what is involved in their writing and in terms of the institutional rather than an individual student's expectations (Cohen, 1993; Lea and Stierer, 2000; Russel, 1991; Jones, Turner & Street, 2000). Viewed from a cultural and social practice perspective, rather than in terms of educational judgements about good and bad writing (including summarizing), the students' strategies for summarizing in this study, give us insights into the nature of academic literacy at this university and possibly at similar institutions of higher learning.

In terms of the results of this study, it has been revealed that there are three aspects of summarization which students of various proficiency levels find difficult to handle: paraphrasing (Section 5.7), combining sentences within as well as across paragraphs (Section 7.2.1.4) and applying Kintsch & van Dijk's (1978) rules for generalization (Section 5.4). To tackle the problem of paraphrasing, there is need to provide sufficient practice first at the sentence level and then later at the paragraph level. This is because students need to know that for any given sentence, there is a central idea and the rest can be modification. Since at the University of Botswana we deal with students who are pursuing specific disciplines, it may be wise to practise summarizing sentences in discourse domains which are well known to students such as biology, chemistry, economics, law, literature, history, *et cetera* so that students can see the practical value of the skill. By using subject-specific materials, students will learn to make decisions about what can be paraphrased and which terms are central to the discipline and therefore need to be retained in the summary.

The results suggest that ESL first year science students at the University of Botswana have problems in combining ideas within and across paragraphs. The students therefore need to practise grouping ideas from different paragraphs, while retaining the rhetorical relationships established in the original. This can be done by giving them practice in selecting ideas from different paragraphs in content areas within their subject domain and then making them write coordinated and subordinated sentences. In the case of a passage which students are to summarize, e.g. a text in Biology, a teacher can ask the students to list all the main ideas first, and to combine the ideas using semantic devices

that the class will have suggested. This can be followed by a discussion of whether the students' summaries reflect the gist of the original text.

Similarly, the problem of combining ideas from different parts of a text can be tackled by training students to recognize micro and macrostructures of texts (see section 7.2.1.5). Students can be made aware that microstructures represent relations between sequences of sentences in a text, whereas macrostructures are relations between blocks of sentences and the global organization of texts. They need to know that relations at both levels may be thematic or semantic: thematic relations in a text include those of anaphora, backward and forward reference, and topicalization; while semantic relations involve those of cause-effect, time, and logical relations. To enable students to link ideas from different parts of a text, it is important for them to select first the main theme(s) and then decide how the themes can be linked thematically and semantically.

Beyond the problem of combining sentences, it was observed in this study that first-year science students at this university, especially average- and low-proficiency students, find it difficult to recast information in a generalized manner. Students across all linguistic and proficiency boundaries can benefit from further practice in applying Kintsch & van Dijk's (1978) rules for generalizing information, i.e. recasting main ideas in a generalized form. They can benefit from training in creating theses or topic statements for paragraphs and longer expository texts, in order to understand the commonly-accepted structure of written discourse (Harris, 1990). If students successfully acquire the ability to: (1) reproduce the gist of a text through appropriate paraphrase, (2) combine idea units, and (3) formulate theses for longer units of discourse, they will have accomplished a great deal in acquiring the strategies which are transferable to other

learning situations requiring the reduction of texts in a manner which retains the main ideas and the gist of the original.

Furthermore, the results of this study indicate that while high-proficiency students show a greater understanding of the original texts, average- and low-proficiency students have problems in decoding the original text, resulting in the production of distorted summaries. The results on distortions (discussed in section 5.5 of Chapter Five) suggest that low-proficiency students find it difficult to select the required information, and in most cases leave out important ideas. Considering the fact that in this study the majority of the students are average- and low-proficiency students, their failure to select the required information has grave consequences for the accomplishment of their learning outcomes. This problem is caused by the fact that the students do not necessarily integrate what they read with what they already know so that they can improve their chances of comprehending the new material. To tackle this problem, pre-reading strategies can be taught, which activate relevant prior knowledge, so that the learning of new information can be facilitated by relating it to existing knowledge structures (Schraw, 1998; also section 2.5.2). During the reading process, students can be asked to monitor their understanding of the text by using, for example, the strategy suggested by Schraw (1998) of “stop, read and think”.

To facilitate greater understanding, text analysis involving ‘concept mapping’ can be used to help the students identify the main themes in a text. Here, the students can be asked to identify the main ideas, and to show their relationship by creating a hierarchical order of the ideas and then evaluating the completeness of their ideas. A particularly useful strategy for fostering a deeper understanding of content is to use a form of

reciprocal or peer mediated teaching (McKeachie, 1994; Biggs, 1999). Students in pairs can articulate their understanding of the main ideas expressed in the text to each other. What this means is that EAD teaching and learning requires greater decentralization, i.e. students need to work in pairs or groups so that they can help each other internalize what they read.

Regarding the use of cognitive and meta-cognitive strategies, the results (see Chapter Six) suggest that, for the most part, high- and average-proficiency students are able to invoke a number of strategies, such as selecting, planning, noting, combining, deducing, contextualizing, monitoring and evaluating their final summary products. In contrast, low-proficiency students seldom use cognitive strategies efficiently and generally find it difficult to assess the accuracy of their summary outcomes. The fact that some of the low proficiency students in this study could use their cognitive strategies fairly well, implies that intervention by both content and EAD lecturers could help the less able students to sharpen their cognitive skills. Even the high-proficiency students can be given an opportunity to refine their strategies so that they can become better learners. This could be done by giving students tasks that require them to use specific cognitive skills, such as selecting key points and deleting unimportant information.

Another implication is that since ESL students of various proficiency levels use a variety of strategies, lecturers should attempt to find out what strategies their ESL students use in different learning situations. This could be achieved by asking them to record and classify their problem-solving techniques according to the deliberate strategies they prefer. Lecturers could also conduct personal interviews with individual students who might be having learning problems in order to establish exactly the strategies they

prefer for processing information. This lecturer-generated interest in the strategies the students prefer could help ESL students become more meta-linguistically sophisticated as they would carry out retrospective analyses of themselves as language learners. It is also possible that lecturers could be more sensitive to students' problems, and may be able to appreciate the factors affecting the students' learning problems.

In this study, which focused on the strategies that ESL students use for summarizing a text, students were not asked to think about who wrote the article, what the motive was, its effect on the reader, how credible the text was, etc. This was avoided because summarizing, by nature, focuses on the selection of the main points and avoids making personal comments or introducing other extraneous issues. However, to foster 'critical thinking' in the classroom, these issues can be raised since they foster classroom discussion. The primary objective is to stimulate the interrogation of texts so that students can 'read between the lines' about the author's purpose, intended audience, implied messages, ideological inclinations, and so forth. Du Toit (1997) sees the major strength of this approach as the lecturer's ability to set up learning tasks for students to interact directly with the reading material.

In some cases 'team' and 'cooperative' teaching, can be used as an interventionist strategy for enhancing the students' schematic conception of some aspects of the learning tasks. The idea is to enable students to transfer learning skills from one subject area to the other. These strategies are in line with Paltridge's (1995:43) description of a language programme development in Australia using "a pedagogy which harnesses the power of literacy and learning skills along with a critical consciousness of the discourse practices of the speech community our learners are wishing to enter". Some of the critical skills

students need to learn are planning, self-monitoring and performance evaluation. Of course, these teaching strategies can be arduous and time-consuming especially where there are large numbers of students involved and teaching time is limited. However, they may be pragmatic alternatives to a situation in which both content and EAD lecturers do not bother about knowing the strategies their students use because they assume that university or college students apply appropriate information processing strategies.

What makes this study worthwhile is that the students were observed to vary their strategies in unique ways that were influenced by their cognitive and meta-cognitive styles and the nature of the summarizing task. The influence of the summarizing task on the choice of strategies confirms Adamson's (1990, 1992) findings which showed that academic writing strategies do not exist independently but are tied to the demands of the tasks. The fact that the students varied their strategies according to how well they understood the material implies that ESL students in fact need to be encouraged to use different strategies in order to cope with the specific demands of a task.

The most obvious implication of this study is that virtually all the cognitive and meta-cognitive strategies used by the students can be practised in situations where learners wish to gain maximum comprehensive input. To this end, Carrell (1989) suggests that effective second language pedagogy should include not only training and practice in the use of task-specific strategies such as orchestrating, overseeing, and monitoring, but more importantly, information about the significance and outcome of these strategies and the range of their utility. This means that teachers need to encourage students to use different strategies for accomplishing a task, and to ask them to justify why they prefer such strategies.

The results further indicate that the level of copying ideas verbatim from the original text is high for all proficiency levels. This weakness implies that many ESL first-year students at this university and possibly at other comparable institutions in the Southern Africa Development Community and the Commonwealth have not yet fully developed their English language abilities to be able to recast ideas in their own words. To deal with this problem, Carrell (1988b:244) suggests the use of a “parallel” approach in which vocabulary and schemata are developed by “pre-teaching vocabulary and background knowledge concurrently for sets of passages to be read at some later time”. As part of the solution to this problem, Aebersold & Field (1997:139) suggest that since ESL learners “need to see a word many times in different contexts before it is learned”, they may need to read more texts than is usually the case in many ESP, EAP or EAD courses.

Encouraging ESL students to read widely in order to develop their language abilities is advocated by several authors (e.g. Bamford & Day, 1997; Carrell & Eisterhold, 1983: 85-6; Wallace, 1992:68-9). These linguists suggest that extensive reading leads to ‘automaticity’ in the students’ word and phrase recognition abilities. As Bamford & Day (1997:7) state, “until students read in quantity, they will not become fluent readers”. I might also add that unless the students are motivated to read extensively, they will have diminished chances of being able to interpret the “intertextuality” of texts where “texts contain traces of other texts” (Wallace, 1992:47).

Extensive reading may not only extend the students’ reading experience (Mason & Krashen, 1997) but also improve their general language proficiency (Coady, 1997; Nation, 1997). It may also enhance the development of various sub-component processes

involved in word recognition, such as providing a context in which the reader makes simultaneous and integrative use of sub-skills in the process of understanding connected discourse. The only problem, especially for science students, is finding appropriate and stimulating materials.

9.2 Implications for syllabus design and methodology

This study has shown that most ESL students, regardless of their proficiency levels, seem to be 'aware' of the strategies they are supposed to use in order to summarize a text, i.e. they are conscious of the strategies they are supposed to apply for selecting the required information, producing and evaluating the accuracy of their information. However, what seems to be the problem is that they find it difficult to comprehend the materials because they are written in a complex language which is beyond their language experience.

This problem has implications for designing EAD syllabuses, and by extension designing instructional materials. In order to develop the students' academic literacy skills such as summarizing, we need to design syllabuses that respond to the known needs of our students, such as teaching them how to orchestrate cognitive, meta-cognitive and affective strategies. These are the skills that enable the students to select and synthesize the gist of a text, and to discriminate between important and unimportant information. Van Dyk & Weideman (2004: 9) suggest that the academic literacy skills we need to include in our EAD courses are interpretation, making inferences, hierarchical ordering, classifying, contextualizing, paraphrasing, comparing and contrasting, making logical arguments, rebuttal, and so forth.

Van Dyk & Weidman (2004) also suggest that the syllabuses need to incorporate affective skills that enable students to interrogate a text, agree or disagree with it, infer and extrapolate hidden meanings, interpret information in the light of their known experiences and be able to distinguish between fact and opinion, evidence and conjecture. I agree with Van Dyk & Weidman (2004) because a distinct advantage of designing an EAD syllabus that emphasizes these skills is that students are likely to be more critical, interactive and reflective in their learning. To deal with the problem of scientific discourse, which is impersonal and specialized, it may be necessary to write simplified materials which ESL science students can understand.

In order to build appropriate functional problem-solving skills, reading materials should be familiar to the students so that they can build upon their “resident schemata” (Scott, 2005:4), i.e. improve on what they already know. The focus of instruction should be to explain fully the learning materials by giving familiar examples that make learning concrete. It has been noted in the literature review under section 2.5.4 that cultural experience plays a crucial role in facilitating the understanding of learning materials. EAD syllabuses should therefore pay attention to the cultural relevance of the reading materials by including local materials, so that students can create authentic dialogue with the materials.

So far, traditional ESP/EAP/EAD syllabuses have attempted to develop at least three competencies: general competency, cognitive academic language competency, and discipline-specific language skills. They normally do not emphasize information processing skills, and as a result many college and university students find it difficult to understand learning materials. For example, it has been realized at the University of Kwa

Zulu Natal and at many other South African universities (Craig & Bradley, 1994) that being articulate in social situations does not necessarily ensure the ability to participate in academic discussions in which cognitive academic language proficiency is required. The language problems experienced by students at South African universities, as suggested by Craig & Bradley (1994), and the inability of students in this study to infer and paraphrase unfamiliar words and ideas suggests there is need to consider seriously Sewlall's (2002:170) advice that there should be "a paradigm shift in the learning philosophy from content-based to an emphasis on the acquisition of skills". This paradigm shift should consider the cultural relevance of the learning materials, as well as fostering critical thinking skills that enable students to deal with complex issues in their learning process.

In sections 7.3.3, it was noted that average- and low-proficiency students have problems with grammatical concord, i.e. their summaries have many sentences with nouns or noun phrases that do not agree with the verbs. This problem can be attributed to how the students have learned English at primary and secondary school. In Botswana and perhaps in other countries that teach English as a second language, the students go through the communicative language teaching (CLT) approach, which emphasizes "fluency" more than "accuracy" and the "creation of a text" over "form". The problem is that over the years, the communicative approach has been accepted with unquestioning obedience like a holy cow which, "like the King of England in Byron's Vision of Judgement, slips into heaven in the confusion" (Kroes, 1997).

The consequence of this 'unquestioning obedience' to communicative methodology is that some teachers have, in the process, used it as an escape route for not teaching grammar. The result of neglecting grammar is that many students who now

enroll for degree or diploma programmes at college or university have little idea about grammatical rules. It is therefore not surprising, as is shown in a number of summaries in this study, that many students are unable to communicate their ideas accurately. In this regard, it is perhaps prudent to take counsel from Dubin & Olshtain (1986), who insist that the communicative approach is not a system which replaces older ones but rather alters and expands the components of existing ones in terms of language content, course products and learning products.

Because there are concerns about the effectiveness of the communicative approach, there are calls for a shift in our focus on language skills. Kroes (1997) thinks that such a re-evaluation is necessary because functional literacy in many countries after students have spent ten or more years at school has dropped to alarming levels in both the mother tongue and in the second languages needed for communicative purposes at work. Here, the “functional literacy” skills Kroes is presumably referring to are, among others, speaking, reading, comprehension, information processing and the ability to write ideas accurately. Ellis (1994) now considers a “formal intervention” in combination with “language in context”, which suggests that grammar should be taught formally in context. Kilfoil (1997) talks of ‘scaffolding’ the language abilities of ESL learners at university, which means offering language bridging courses to first year university students, so that they can improve their academic literacy skills. Based on my teaching experience at the University of Botswana, I agree with Kilfoil that we need to improve the overall academic literacy skills of first year students; but as Blanton (1994:231) points out, language classes that foster academic literacy skills are classes where language “is not the

subject of the class". They are classes which focus on the contextualized use of language in the performance of specific language tasks.

These voices point to the need for change or at least for a commitment to eclecticism in our ESL teaching methodology so that we can focus on those skills that foster the overall language competence of our learners, especially the ability to comprehend textual material and be able to select important points. My reaction to the calls for pedagogic innovation is that changing techniques while maintaining the same attitudes amounts essentially to the same thing and that the quantum leap we search for in our ability to facilitate more effective ESL learning lies in a shift at the level of our attitudes, awareness and attention to the language skills that matter the most for academic literacy, such as the ability to select salient points from a maze of intricate ideas.

Perhaps the most fundamental change should occur at the philosophical and ideological levels regarding EAP/EAD syllabus design and teaching. Currently this university (and possibly many other universities) appears to have the notion that academic literacy should encompass a set of atomized skills, which emphasize 'surface' features such as subject-based knowledge, reading, writing conventional essays, summaries, grammar, spelling, cohesion/coherence and others. Our focus still appears to 'fix' problems with students' academic literacy, which are conceptualized as technical and instrumental. Our EAP/EAD courses are, thus, designed to include composition and remedial classes in 'study skills' (including summarization). This approach appears to miss the broader picture of critical literacy, which is situated in discourses that promote the interrogation of texts and power relations as social practices.

Even where we appear to promote academic support/development programmes, which attempt to socialize first year students into the discourses of the institution by emphasizing constructivist learning, such as the use of meta-cognitive skills, critical thinking, reflection and evaluation, there is often the assumption that the institution is one 'culture', whose norms and practices have simply to be learned to provide access to the whole academy. This assumption is based on a monologic (Bakhtin 1981, 1984, 1986) conception of higher education as having one community, which is broadly homogeneous. Such an approach encourages the offering of common EAP courses as if the students have a similar educational background, and the reproduction of uncritical discourses that are centripetal. This negates the dialogic notion of a university which sees it as a heterogeneous community with participants who have centrifugal voices, identities, hybridity and internally persuasive discourses (Lillis, 2003). These ideological tensions need to be reconciled so that we can begin to approach academic literacy as a social force that views students' writing and learning as issues of epistemology and identities, rather than a systemic way of acquiring skills or a procedural way of socializing students into university discourses (Barton, 1994; Gee, 1991; Street, 1984, 1995).

9.3 Limitations

In an introspective study such as this one which attempts to examine the summarizing strategies of ESL students, the analysis and interpretation of data are problematic partly because there is an overwhelmingly large volume of data, and also because written work of this nature often defies being strictly categorized. Therefore, the data always remain open to alternative interpretations. In this study, I limited the number

of subjects to 120 or 20% of the 600 students doing natural sciences in first year, precisely because I wanted to manage the amount of textual material for analysis. To extend the number of subjects would have rendered the process of data analysis almost impossible to undertake.

The other problematic issue is that the study was confined to a specific number of strategies for reading, summary production and assessment. This was done to limit the scope of the study; but it did not mean that the actual strategies used by the students were confined only to the partial set of strategies included in the taxonomy. In fact, there were many other observable strategies which occur in any normal written communication, such as syntactical arrangement, morphological forms, modality markers, imagery, transfer, delayed production, organization and so forth. Perhaps another study on these strategies could give a more complete picture of the complex nature of the strategies used by ESL science students.

Another sticky problem experienced in this study is the attempt to make a distinction between cognitive and meta-cognitive strategies. The critical question that remains unanswered (and which has not been fully addressed in previous studies, e.g. O'Malley & Chamot, 1990; Oxford, 1990; Hsiao, 1995) is the point at which the two strategies converge and diverge from each other. Right from the beginning, Oxford (1990) cautions from the first publication of her strategy taxonomy that particular strategies could be viewed as related to more than one strategy category. This observation is borne out by empirical research (Oxford & Ehrman, 1995) that shows the existence of strong to moderate inter-correlations among different strategies, e.g. grouping versus recombination and planning versus directed attention. From these earlier observations, it

might be argued that there will never be a strategy taxonomy in which inter-correlations are completely eliminated, because such a classification would not reflect reality. Considering the fact that cognitive and meta-cognitive strategies strongly interface, my categorization of these strategies was, therefore, a matter of research convenience, so that I could study the students' summarizing strategies more systematically. In this study I do not claim to provide a completely water-tight or a comprehensive categorization of all the strategies the ESL students used for summarizing the research texts. Perhaps the humble contribution this study makes is its attempt to analyze systematically the strategies ESL first year science students at the University of Botswana use when summarizing scientific information, based on theoretical and methodological considerations.

Another problematic issue encountered in this study is the data yielded through the use of a questionnaire. I observed that the students tended to tick items which they knew were correct summarizing strategies, but which did not necessarily reflect the strategy they actually used when summarizing. This concern is also raised by Gall et al. (1996), who note that respondents to a questionnaire often put on a "front", i.e. give information which does not necessarily reflect their best practice, but which they think pleases the researcher. This is evident in Chapter Four when I crossed-checked the students' responses to the Likert-type of questionnaire against the strategies the students reported that they used after they had summarized the first text. I found that some of the claims in the questionnaire responses (especially some of the low-proficiency students) did not support what they reported to have done when summarizing the text. To avoid relying too heavily on data that is "fronted" through a questionnaire, it is advisable that any researcher who conducts a similar study should use "multiple data collection

methods” or “pluralistic research” (Burns & Bush, 2000: 231), which combines both quantitative and qualitative methods. Better still, the researcher should focus more on what is observable from the ‘practice’ than ‘premeditated’ information.

What concerns me in this study, which probably influenced my findings, is the motivation of the students in doing the summary. The students voluntarily participated in the study: in other words the summary task was not an official test to make high-stakes decisions regarding the students’ strategies. Given the low-stakes nature of the task, were the students sufficiently motivated to do the task? My suspicion is that the students’ summary products probably did not provide an ideal condition for studying the summarizing strategies they use. Perhaps future research needs to pay attention to the status of the task.

Another methodological issue that requires close attention is the timing of interviews. In this study, the interviews were staggered over a period of three teaching weeks, i.e. stretching over fifteen days. The longer period was necessitated by the fact that the nine purposively selected students were only available when they did not have other academic commitments and were not attending lectures. What this means is that the interviews which focused on the strategies the students had used for reading, producing and assessing their final summary products (see Appendix 10) were conducted long after they had written the summaries. While every effort was made to give students time to re-read the text and their summaries, it is likely that the extended time would have contributed to the ‘decay’ of episodic memory. Had the interviews been conducted when the summarizing processes were still fresh in their mind, it is likely that the participants

would have remembered more details than they presumably did, and would have been more discursive during the interview than they were.

A further issue of concern is the amount of monitoring required for the summarizing task. In this study the task was piloted (see students' comments in Appendix 1). However, what I did not establish in advance were the reader's expectations, including those of the co-rater. Hamp-Lyons (1991) suggests that the readers' expectations influence the categorizations they make of the students' level of proficiency. To overcome this problem, the readers' expectations were compensated for, by agreeing on a scoring taxonomy with the co-rater and the classification of students into high-average- and low-proficiency.

The other issue is about the appropriateness of the summary task. Although it was piloted in order to gauge its suitability, the unresolved question is whether it was cognitively and culturally suitable, because these factors are known to influence the way ESL students interact with the text. Previous studies by Hamayan & Tucker (1980) have shown that the nature of the task influences the choice of the strategies. Also of critical concern in this study is whether the choice of strategies was affected by the controlled writing atmosphere. For instance, did the learners use fewer strategies in the restrictive atmosphere of the classroom, and would they have used more or different strategies in a natural environment? These and other influential variables beg for closer attention in focused descriptive studies of this nature.

9.4 Recommendations

The point has already been made in Chapter One, which defines the research problem, that work on strategies is hampered by lack of a coherent theory of exactly how strategies work, how they are selected, invented and discarded in favour of better ones, how they help to enlarge the student's linguistic repertoire, and how they relate to what the L2 learner can already do in the first language. These questions are beyond the scope of this thesis, which focuses on what ESL science students at first year university level "do" when they summarize a text. The focus on what students do when they summarize information is intended to yield data that inform both ESL and content subject lecturers about "how" the students process information, so that we can better understand the ESL students' strategies. So, there is urgent need for research to address some of these unresolved questions.

The specific issues that require further investigation are the relationship of strategies to language proficiency, how strategies are orchestrated in various subject areas (or do we assume that the processes are ubiquitous?), the role of different kinds of strategies in different learners, and the relationship between strategies and accomplishing one kind of skill in a test situation where the student is supposed to demonstrate that s/he can perform the skill. These are critical issues we need to understand so that we can have a broader picture of how ESL/EFL students learn.

There is also a need to investigate the strategies employed for vocabulary learning and use in a bi/multilingual situation, because we know that a large vocabulary facilitates reading (Wharton, 2000). Moreover, we need to extend research to the strategies used by ESL students in areas that have so far received little attention, such as listening and

talking, because these skills contribute significantly to the overall communicative competence of the L2 learner. Although not as urgent as the grey areas I have mentioned above, we need to carry out comparative studies of what strategies ESL students employ in different skill areas, so that teachers can know what to expect in those skill areas in which the students show more or less proficiency.

The present study has shown that average- and low-proficiency students have problems in reproducing the gist of a text. This problem is related to the reading and comprehension skills of the students, exacerbated by lack of background knowledge and the limited efficiency of their higher- and lower-level comprehension processes. Pedagogically, this suggests that ESL instruction needs to pay greater attention to ways of incorporating activities that enhance the efficiency of information processing skills, even when the L2 learners are skilled.

Reference has already been made above to the problems of trying to differentiate cognitive from meta-cognitive strategies. On this issue, perhaps the real agenda of strategy research should not be to concentrate on the differences between the two, but to understand the students' underlying motives for using a particular strategy. For example, checking for accuracy (a meta-cognitive strategy) can involve the use of a cognitive strategy such as students translating a difficult question into their first or mother tongue because they think that they will understand the gist of the original text. Understanding the goals of different strategies and the 'context' in which they are used could therefore be an area in which future research should focus on.

More generally, we need to investigate what the concept of "high", "skilled" or "adept" learner precisely means in our institutions of higher learning, as opposed to

“low”, “unskilled”, “under-prepared”, “impoverished” and “disadvantaged” learner. These shibboleths are vague and rough on the edges, and appear to mask the social forces that give rise to these terms. For instance, we do not have a universally agreed upon definition for these terms. In this study, perhaps my ranking of students into high-average- and low-proficiency could have been guilty of the same arbitrary classification. More specifically, we need to know how flexible skilled learners are in applying and discarding strategies and how strongly they develop monitoring mechanisms, which give them a competitive edge over their unskilled counterparts. Also, we need to establish exactly how skilled, adept or high-proficiency learners of a language correspond to autonomous learners, which enables them to navigate their learning more successfully. Clearly, research in these areas is likely to inform us of the substantive issues regarding the whole question of information processing strategies.

9.5 Summary and conclusion

The findings of this study indicate, notwithstanding their limitations, that there are significant differences between high- and low-proficiency ESL first-year science students at the University of Botswana in terms of how accurately they reproduce the main ideas from the original text. The results suggest that low-proficiency students tend to copy or reproduce chunks of information that have little relevance to the set task. The results also show that, unlike the low-proficiency students who find it difficult to understand the original text, high-proficiency students are able to decode the macro-propositions (themes) of the original text and the meanings of new words. Because low-proficiency students have problems in comprehending the original text, their summaries contain more misrepresentations of the original text than average- and high-proficiency students.

Concerning the use of cognitive strategies, the results indicate that there are no major differences between students of different proficiency levels: the students were generally able to orchestrate cognitive strategies, such as selecting, note-making, grouping and contextualization. However, when it comes to the use of cognitive strategies such as deducing the meanings of unfamiliar words, recombining, coordinating and subordinating ideas, high-proficiency students are ahead of average- and low-proficiency students. Similarly, high-proficiency students are conspicuously superior to low proficiency students in their use of meta-cognitive strategies, such as directing their attention to the specific demands of the task and assessing their own final summary products. Low-proficiency students hardly evaluated their completed summaries and this is evidenced by the presence of basic errors and distortions that could have been eliminated if they had reflected more carefully on their work.

The other strategies that show variability are paraphrasing, generalizing and the selection of global ideas from a maze of minute details. In general, high-proficiency and some of the average-proficiency students were able to recast their ideas, which is not the case with low-proficiency students who mostly preferred to use structures taken directly from the original text. Also, high-proficiency students attempted to transform and integrate the information, whereas low-proficiency students tended to use words and ideas directly copied from the original. Similarly, high-proficiency students were more successful in discriminating between global and localized ideas than low-proficiency students who reproduced unnecessary details.

Although the findings of this study indicate that there are fairly unsurprising differences between high- and low-proficiency students in the manner in which they use

summarizing strategies (research questions 1-9 under section 1.4 in Chapter One are generally confirmed) there are, however, some exceptions. The study shows that there are no significant differences among the students in their preference for words already used in the text and their ability to combine ideas from different paragraphs. Regardless of their proficiency levels or gender, the students tended to use the exact words found in the original text: there was little attempt to find synonyms or equivalent phrases that could be substituted for those in the original text. Also, students found it difficult to combine ideas that straddled different paragraphs, and as a result left out some of the ideas that could have improved the quality of their summaries.

In making final conclusions, the study provides substantial information about the idiosyncratic preferences in the use of summarizing strategies, depending on the proficiency level of the student. The findings suggest (contrary to many studies previously conducted in other parts of the world, e.g. Phakiti, 2003 that reported differences in the strategies preferred by each gender) that there are no gender-related summarizing strategies preferred, probably because students in this study were fairly homogeneous as they had been selected for studying science courses using the same criteria. The findings echo the empirical observation that second language learners are not mere sponges who solve learning tasks through the osmotic process: they are thinking and reflective beings who use strategic processes in order to deal with a learning problem. The study confirms Kinsella's (1996) view that ESL learners have different cognitive styles, which give them access to verbal, sequential, and analytical ways; as well as global, holistic and relational styles that are crucial for problem solving. Teachers should, therefore, try to help students discover their learning preferences and provide

constructive feedback about the merits of using various strategies. Holec (1995: 265) hits the nail on the head when he says that the use of 'strategopedia' or training in learner strategies "teaches the learner to learn, that is, enables him to carry out the various steps which make up the learning process, and ensures that learning takes place in the best way".

In this regard, both content and ESL teachers need to train their students in the explicit use of summarizing strategies, and to plan carefully integrated lessons and learning activities which develop the learners' intellectual ways of dealing with different learning problems. Here, I propose that our future research agenda in applied linguistics should be to find ways in which ESL students in our institutions of higher learning can be helped to recognize the power of consciously using strategies in order to make learning quicker, easier, more efficient, more personal and more exciting.

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APPENDIX 1: STUDENTS' COMMENTS ON PILOT STUDY

Students' comments on pilot study

- I liked filling the section on personal information
- No problem, the questions are clear
- The questions are fair
- I learn something about new technology for controlling global warming
- The passage is interesting and challenging
- I enjoyed the questions on the strategies for summarizing
- It was like a game. I liked just circling what I feel like
- Some of the words are difficult e.g. scan, skim, version, draft. I didn't have a dictionary.
- There are big words I can't understand example: determine, version, verify, reflect.
- There was no time.
- The summary was difficult. I need more time

APPENDIX 2: QUESTIONNAIRE & SUMMARY ON GLOBAL WARMING INTRODUCTION

I am very pleased to introduce myself to you. My name is Ambrose B. Chimbanga, one of the lecturers in Communication and Study Skills. I am conducting a study on the strategies that you use when you summarize information. This study is important in that it is likely to give us some idea about how you read and digest information for your academic work, and how we can help you to navigate your learning more successfully.

Note: A strategy is a technique you use or the steps you take to accomplish a summarizing task.

.....

PERSONAL INFORMATION

1. Surname: _____ First name(s) _____

2. Age: _____

3. Sex: Female _____ Male _____

4. Which language did you speak first as a child? _____

5. Which language do you use at home? _____

6. Which language(s) do you use in your community? _____

7. How old were you when you first started learning English? _____

8. For how many years have you been learning English at school? _____

9. How often have you been required to perform summarizing tasks as part of your learning experience? (Tick **one** most appropriate)

Often _____ Sometimes _____ Seldom _____

10. For whom did you do the summarizing task? _____

11. Why are you learning English? (Tick **one** most appropriate)

- Interested in the language _____
- For use with friends _____
- Required in order to graduate _____
- I need it for my future _____
- For communicating with people from other parts of the world _____
- Other (Please specify) _____

12. Do you enjoy learning English? (Tick most appropriate) Yes _____ No _____

13. Name **two** aspects about learning English that you enjoy.

(a) _____ (b) _____

14. Name **two** aspects about learning English that you don't enjoy.

(a) _____ (b) _____

15. How do you rate your ability to use English? (Tick **one** most appropriate)

Very Good _____ Good _____ Average _____ Below Average _____

16. What **grade** did you get in **English** in your last high school examination, such as BGCSE/IGCSE/GCSE/S. A. Matric/HIGCSE/ "A" Level? _____

SECTION A: SUMMARY TASK

Now read the following text, which talks about strange and unusual technologies. Write a summary of the text in which you mention the technologies that are likely to control climate changes and meet the world's energy needs as well as pointing out the limitations of these technologies.

Far-out ideas may be last hope for curbing global warming

Jeff Hecht, Boston

Bizarre technologies for generating energy that were previously ruled out as pipe dreams will have to be developed if nations are serious about tackling climate change.

That's the view of 18 influential energy analysts in the US, who argue their case this week in the journal *Science* (vol. 298, p 981). They say none of the power-generation technologies being developed now will be able to control greenhouse gas emissions and meet the world's energy needs-which may rocket by 200 per cent by 2050.

They urge governments to undertake broad energy research programmes, exploring some of the stranger technologies dreamed up in recent years, like collecting solar power in orbit and beaming it back to earth, and using space-based lenses called "parasols" to deflect solar energy away from our atmosphere.

The 18 scientists hope to open up the bitterly polarized debate on global warming: while advocates of the Kyoto Protocol say climate stabilization is vital and within reach of today's technology, critics argue that it is unnecessary and exorbitantly expensive.

"We stake out a third position," says atmospheric scientist Ken Caldeira of the US government's Lawrence Livermore National Laboratory in California. "Climate stabilization is important, but we can't really do it with current technology, even if we wanted to."

The world's energy needs are rising far faster than we can bring emission-free generation such as nuclear and wind power on stream. Global power consumption for

electricity is now about 12 trillion watts, 85 percent of which comes from fossil fuels. To stabilize the climate, the energy analysts estimate that the world will have to pump up emission-free power generation from today's 2 trillion watts to as much as 30 trillion watts by 2050.

But nuclear power can't fill the gap. Uranium supplies are limited and known reserves could supply 10 trillion watts for only 6 to 30 years. "That's hardly a basis for energy policy," the scientists write.

Breeder reactors create more fissile material than they consume, so you'd get more nuclear fuel, but developers have abandoned them because of low efficiency, safety issues, and the possibility of fuel being turned into weapons. And fuel reactors are still a distant prospect, despite decades of research.

Vast satellites that harvest solar power are an attractive emission-free idea, says Martin Hoffert of New York University, one of the team. Sunlight is eight to ten times more intense in space, so arrays could generate more power than on the ground. Microwaves or laser beams could get power to any point on earth, including areas without power grids. Energy might also be beamed down from massive solar arrays carpeting the Moon, via relay satellites.

The prospects for ground base biomass, solar cells and wind power are limited, the team believes. You'd need to cover more than 10 percent of the Earth's land surface with biomass crops to generate 10 trillion watts, Caldeira says. Wind and solar power are only part-time energy sources, so generators would have to be linked to computer-controlled global power network based on super conducting cables, which also eat energy to keep cool.

Another outlandish option might be to turn down the global thermostat by reducing solar heating. To do this, you'd place a 2000-kilometre wide Fresnel lens in orbit 1.5 million kilometers from Earth. Refraction would deflect about 2 percent of Earth's sunlight, enough to offset warming caused by further carbon dioxide emissions. Caldeira has calculated that the process should work.

But Alan Noguee urges caution. As head of the Union of Concerned Scientists' clean energy programme, he says today's energy-efficient and renewable energy technologies can meet climate change goals. "It's critical that we do not defer immediate action in the hope that more research and development can produce some exotic technologies that may not be needed – and which may have other harmful effects."

New Scientist, 9 November 2002

Reflect on the strategies or techniques that you used in doing the summary above on the technologies that are likely to control climate change. Now answer the following questions:

1. What are the main **four strategies** you used to help you understand the text?

a _____

b _____

c _____

d _____

2. What are the major **four steps** you followed in writing the summary?

a _____

b _____

c _____

d _____

3. What are the main **four techniques** you used to ensure that your final summary is fine-tuned or well polished?

a _____

b _____

c _____

d _____

APPENDIX 3: QUESTIONNAIRE 2

SUMMARIZING STRATEGIES USED BY FIRST YEAR SCIENCE STUDENTS OF THE UNIVERSITY OF BOTSWANA

I am very pleased to introduce myself to you. My name is Ambrose B. Chimbanga, one of the lecturers in Communication and Study Skills. I am conducting a study on the strategies that you use when you summarize information. This study is important in that it is likely to give us some idea about how you read and digest information for your academic work, and how we can help you to navigate your learning more successfully.

Kindly complete this questionnaire.

Section B: Information Processing Strategies

N. B. A strategy is a technique you use or the steps you take to accomplish a summarizing task.

Read the following items, and **circle** your response in terms of how best the statement describes what you do when processing information.

When I am asked to write a summary of a text, such as a newspaper article, passage, handout or book:

<u>What you do</u>	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I try to understand first what I am supposed to summarize.	1	2	3	4
2. I first look at the title.	1	2	3	4
3. I look for the key words and phrases that allow me to follow the general sense of the text.	1	2	3	4
4. I scan and skim through the whole text in order to get a general idea of what it is all about.	1	2	3	4
5. I look at the first sentence of each paragraph to find out what the text is saying.	1	2	3	4
6. I note and underline the key points and ideas.	1	2	3	4
7. I focus on examples and details.	1	2	3	4
8. I focus on the meaning of new words.	1	2	3	4
9. I focus on words surrounding an unknown word in order to determine its meaning.	1	2	3	4
10. I focus on the meaning of sentences.	1	2	3	4
11. I try to understand the whole text before writing anything.	1	2	3	4
12. I think about “under-the-surface” or hidden meanings of new words.	1	2	3	4

- | | | | | |
|---|---|---|---|---|
| 13. I try to relate the information to my experiences or to what I already know. | 1 | 2 | 3 | 4 |
| 14. I determine which parts are more important than others before starting. | 1 | 2 | 3 | 4 |
| 15. I translate the main ideas into my own language in order to understand them better. | 1 | 2 | 3 | 4 |

Section C: Summary Production Strategies

Read the following items, and **circle** your response in terms of how best each of the statements describes how you produce a summary.

When I am asked to write a summary:

- | <u>What you do</u> | Strongly Disagree | Disagree | Agree | Strongly Agree |
|--|--------------------------|-----------------|--------------|-----------------------|
| 16. I plan on a course of action. | 1 | 2 | 3 | 4 |
| 17. I identify first the required information | 1 | 2 | 3 | 4 |
| 18. I first make some notes. | 1 | 2 | 3 | 4 |
| 19. I straight away write the final version from the ideas underlined as notes waste time. | 1 | 2 | 3 | 4 |
| 20. I first make a draft and then write the final version. | 1 | 2 | 3 | 4 |
| 21. I try to use my own words. | 1 | 2 | 3 | 4 |
| 22. I tend to rely on the words that I find in the text. | 1 | 2 | 3 | 4 |
| 23. I try to generalize the main ideas. | 1 | 2 | 3 | 4 |
| 24. I try to combine two or more ideas into one, which were not combined in the original. | 1 | 2 | 3 | 4 |
| 25. I try to reproduce the ideas exactly as | 1 | 2 | 3 | 4 |

they are in the original text.

26. I aim to reproduce the ideas in the order in which they are in the original text.	1	2	3	4
27. I often regroup or rearrange the ideas.	1	2	3	4
28. I expand the main ideas	1	2	3	4
29. I sometimes add relevant information of my own.	1	2	3	4
30. I often make personal comments.	1	2	3	4

Section D: Self-Assessment Strategies for final summary

Read the following items, and **circle** your response in terms of how best the statement describes how you make sure that you have done what is required for your final summary.

When I have completed drafting my summary:

<u>Your actions</u>	Strongly Disagree	Disagree	Agree	Strongly Agree
31. I check that my summary is directed to the set task.	1	2	3	4
32. I verify that I have not omitted the main ideas.	1	2	3	4
33. I check that my summary reads fluently.	1	2	3	4
34. I correct mistakes that I notice.	1	2	3	4
35. I ensure that I have used appropriate language.	1	2	3	4
36. I ensure that I have included interesting information, which may not have been in the original.	1	2	3	4
37. I double-check that the facts are not distorted.	1	2	3	4

38. I reflect on the quality of my summary.	1	2	3	4
39. I compare my final version with the original.	1	2	3	4
40. I revise the final version before submitting it.	1	2	3	4

Thank you for sparing your time to answer the questions

APPENDIX 4: SUMMARY ON OZONE

TEXT FOR FURTHER SUMMARY

1. The following text you are going to summarize talks about how the OZONE damages our lungs.

2. Read the text carefully. As you work on it, I would like you to think about the

(a) strategies you used to help you understand the text.

(b) steps you followed in writing the summary.

(c) techniques you used to ensure that your summary is well-polished.

3. After you have completed the summary, I am going to arrange with you about the date and place where we are going to discuss further the strategies you will have used.

Now read the following text and then summarize the different pieces of evidence, which show that the ozone harms the lungs.

Ozone damages lungs at low concentrations

Fred Pearce

OZONE, a component of photo-chemical smog and summer haze, can cause dramatic changes in the biochemistry of the lungs in people exposed to polluted air. The changes, which may lead to a long-term damage, are occurring at levels that are well below international limits for the maximum amount of ozone that should be present in the clean air.

Ozone forms at street level when nitrogen oxides and hydrogen and hydrocarbons from vehicle exhausts interact in the presence of sunlight. The US Environmental Protection Agency (EPA) recommends that levels of ozone in the air should not exceed 120 parts per billion (ppb), averaged over one hour. The World Health Organization's Air Quality Guidelines for Europe say that ozone levels should not exceed the band between 76 and 100 ppb, also over one hour.

Research published at a joint meeting of the American Thoracic Society and the American Lung Association, held earlier this year in Cincinnati, suggests that the EPA may have to revise its limit. Hillel Koren, a scientist at the University of North Carolina who works for the EPA, has found that ozone causes inflammation in the lung even at low levels.

Koren exposed 10 non-smoking males to air containing ozone at 100 ppb and to air containing ozone at 80 ppb. Each exposure lasted more than six hours, during which the men carried out moderate exercise. Eighteen hours later, Koren's team retrieved from the 10 men cells and fluid for analysis from the alveoli, the small air sacs of the lungs.

Koren believes that this is a useful way to study the effects of pollution. "We are going to examine cells in the body which are in direct contact with the pollutant", he says.

At both levels of ozone exposure, he found that macrophages – cells that scavenge in the lungs – were capable of consuming and destroying bacteria than normal. In addition, there was a significant increase in cells and chemicals in the body that produce inflammation, such as white blood cells, fibronectin and lactate dehydrogenase. Exposure to ozone at a level of 100 ppb also increased levels of protein and a hormone-like substance, called prostaglandin E2, in the lung.

Prostaglandin E2 is a potent regulator of the immune system. It also promotes inflammation. Further work by Koren has shown that macrophages produce the prostaglandin in the alveoli. Koren collected and cultured macrophages from the alveoli. He exposed the cells for two hours to air containing ozone at concentrations of 100 ppb, 300 ppb and 1000 ppb. Tests for prostaglandin E2 at the end of the experiment showed that the cells produced increasing amounts as the concentration of ozone went up. Koren says that he will need to carry out further tests to see if these dramatic changes persist in the long term.

Research into the effect of ozone on the lungs suggests that people become tolerant to the chemical after several days of exposure. A second group of scientists, working for the EPA at Research Triangle Park in North Carolina, reached this conclusion when they studied a group of healthy young men.

The researchers exposed the men to ozone at 260 ppb for eight hours on five successive days, while the men did moderate exercise. Tests to measure the function of the lungs showed a clear fall in the amount of air that the men could forcibly expel from the lungs within one second, a value known as the FEV1, after the first day's exposure. The results gradually returned to normal over successive days, reaching normal three days after the last exposure to ozone.

Koren now intends to investigate whether the biochemical changes in the lung show a similar pattern. If so, he wants to know whether long-term exposure to other pollutants also causes the inflammatory response to tail off. If an exposed person fails to become tolerant after repeated exposure, the effects of ozone on health could be much worse than scientists currently believe.

One concern is that long-term exposure could induce fibrosis of the lung, in which inflexible, non-functioning tissue replaces normal, flexible tissue. Fibronectin, one of the substances that accumulate in response to ozone, helps fibrosis to develop. It attracts fibroblasts, the cells that make the insoluble protein, fibrin. Fibronectin also helps cells to grow and attach themselves to the tissue of the lungs.

Prostaglandin E2 could also be dangerous if the body continues to produce large amounts of it. It suppresses the immune response in the lungs and could make people more susceptible to lung infections. Koren says that even if the lungs adapt to ozone, this could still be harmful. He asks whether the mechanism by which compensation occurs may be the result of the damage.

Ozone is just one of many damaging agents in polluted air. Sulphur dioxide, a product of combustion, becomes naturally oxidized in air to form sulphuric acid. Ammonia in the air usually neutralises the acid to ammonium bisulphate and ammonium sulphate. But, under certain weather conditions, high concentrations of sulphuric acid may form. As a result, the EPA is considering making sulphuric acid a "criteria pollutant" – that is, a pollutant that it monitors in order to assess air quality.

Research also suggests that sulphuric acid, combined with other pollutants such as ozone, may be more harmful than either sulphuric acid or ozone alone. To investigate this kind of effect, Richard Schlesinger and his colleagues at the department of environmental medicine at New York University Medical Center are exposing rabbits to mixtures of pollutants.

The researchers expose the rabbits to low levels of sulphuric acid or ozone, or both, for two hours a day, five days a week for up to a year. Macrophages taken from rabbits that have been exposed to the combination of chemicals were less capable of destroying bacteria, a finding in keeping with Koren's work. Levels of substances that cause inflammation also changed, but Schlesinger says it is too early to interpret these findings.

Douglas Dockery of the department of environmental science and physiology at the Harvard School of Public Health in Boston has just completed a large epidemiological study of the effects of air pollution on health. He examined the link of 300 children in six American cities and kept a diary of each child's respiratory symptoms for one year. During the study, scientists measured local concentrations of ozone, sulphuric acid, nitrogen dioxide and smoke particles, as well as acidity.

Between April and August, the months when air pollution tends to be worst, the records showed that coughs and infections of the lower respiratory tract were associated

with higher levels of ozone and particulate matter in the air. People tended to develop symptoms one to two days after peaks of exposure to either ozone or smoke.

Dockery says that this and other evidence should persuade the EPA to lower its ozone limit. Ten years ago, when the American government allowed the limit to rise from 80 ppb to 120 ppb, there was little evidence that levels of ozone below 250 ppb could damage our health. “Since then, many studies have suggested that damage occurs even below 120 ppb,” says Dockery.

How far the limit comes down will depend on what risk people are prepared to take, says Dockery. “I believe there are effects down to the lowest levels you can detect.... At the moment, we’re probably seeing effects down to 60 ppb. With more sensitive tests, you’d probably see an effect down to 20 ppb”.

New Scientist, 8 June, 2002

APPENDIX 5: SCORING TAXONOMY

Written Summary Scoring Taxonomy

(Based on a synthesis of Carrell’s 1989; Johns’ 1985; Johns & Mayes’ 1990; Kintsch & van Dijk’s 1978; Winograd’s 1984 classification schemes)

1. Gist

1.1 FG1: Reproducing the full gist of the original text

1.2 PG2: Reproducing part of the gist of the original text

1.3 LG3: Reproducing very little or falsified gist of the original text

2. Idea Units

2.1 C1: Correct ideas units

2.2 C2: Partially correct idea units

2.3 C3: Incorrect idea units

3. Generalization: Recasting ideas in a self-inventive manner without copying the main ideas verbatim

3.1 FG: Full generalization (recasting) of the main ideas using one's meta-language

3.2 PG: Partial generalization involving little recasting

2.3 NG: No generalization or very little of it

4. Paraphrasing

4.1 FP: The student's use of own words

4.2 PP: Partial paraphrasing of ideas

4.3 NP: No paraphrasing: Simply copying the original information without innovation

5. Simplification

4.1 LS: Linguistic simplification: Production of simplified sentences that glossed over macro-propositions embedded in complex rhetorical organization

4.2 SS: Syntactic simplification: Deletion, omission or alteration of an important macro-proposition

6. Globalization

GL1: Global ideas: The student's ability to select important points

GL2: Inclusion of localized ideas, such as illustrations, examples or expansions, which ought to be left out.

7. Combinations

7.1 C1: Transformation: Using coordination and subordination to form a cohesive summary

7.2 C2: Half-baked combinations relying more on original words & sentences

7.3 C3: Completely run-on material, which is disorganized with several sentences appropriated verbatim

8. Distortions

8.1 D1: Giving inaccurate information

8.2 D2: Making personal or irrelevant comments

8.3 D3: Twisting the meanings of key words to produce slanted meanings

APPENDIX 6: SCORING COGNITIVE AND META-COGNITIVE STRATEGIES

Scoring Cognitive and Meta-cognitive Strategies

(Refined from Chamot's 1987 & 1996; Nassaji's 2003; Oxford's 1990 & 1999 Phakiti's 2003; Purpura's 1999 taxonomies)

1 Cognitive Strategies

- 1.1 *Note-making* (Nm): Underlining, jotting down main ideas, writing down main ideas in an outline or draft form.
- 1.2 *Grouping* (Grp): Reordering of the main ideas into a conceptually related unit
- 1.3 *Resourcing/Recombination* (RR): Redefining a concept or word to achieve the desired meaning.
- 1.4 *Deduction/Inferencing* (DI): The use of available information from the original text to guess the meaning of unfamiliar expressions, phrases and words
- 1.5 *Contextualization*: Reproducing relevant information
- 1.6 *Repetition*: Reproducing the same ideas in different words

2 Meta-cognitive Strategies

- 2.1 *Planning* (P): Directing one's attention to the specific demands of the summarizing task measured by the relevance of the information
- 2.2 *Selective/Directed Attention* (SA): Paying attention to specific part of the summarizing task.
- 2.3 *Self monitoring/Evaluation* (SME): Checking, verifying or correcting one's mistakes and checking whether required points are included

APPENDIX 7: WRITTEN SUMMARY SCORING SHEET**Written Summary Scoring Sheet**

Student's Code No _____ Proficiency Rating _____ (High, Average, Low)

Score Sheet 1**1. Gist**

G1

G2

G3

8. Distortions

D1

D2

D3

2. Idea Units

C1

PC

INC

3. Generalization

FG

PG

NG

4. Paraphrasing

FP

PP

C

5 Simplification

LS

SS

6 Globalization

G1

G2

7 Combinations

C1

C2

C3

Score Sheet 2

1. Cognitive Strategies

1.1 Note making

1.2 Grouping

1.3 Resourcing/ Combination

1.4 Deduction/Inferencing

1.5 Contextualization

1.6 Repetition

2. Meta-cognitive Strategies

2.1 Planning

2.2 Selective/Directed attention

2.3 Self-monitoring/ Evaluation

3. Comments

APPENDIX 8 STUDENTS' SELF-REPORTED SUMMARY STRATEGIES

1. **Reading Strategies**
 - a. Understanding
 - b. Scanning & Skimming
 - c. Noting
 - d. Meaning
2. **Summary Production Strategies**
 - b. Planning
 - c. Drafting
 - d. Recasting
 - e. Ordering
2. **Self-assessment Strategies**
 - a. Directed attention
 - b. Verification
 - c. Correction
 - d. Evaluation

APPENDIX 9: SUMMARY SAMPLES

High proficiency

9a1

Ozone damages the lungs at low concentrations

Ozone can cause climatic changes in the biochemistry of the lungs of people exposed to polluted air. It forms when (1) oxides of nitrogen and hydrocarbons from car exhausts mix in the presence of sunlight. Research has shown that as people are exposed to air containing 100 parts per billion ppb of ozone at 80 ppb, high levels of proteins and prostaglandin which promote (2) inflammation is found as well as an increase in cells and chemicals which also promote inflammation. It was also found that as the amount of

exposure increases, high amounts of these (3) proteins, chemicals and cells are found. Other researches also found that people become (4) tolerant to the chemicals after several days of exposure. Another research also found that long term exposure could induce (5) fibrosis of the lungs which will cause inflammatory response to fail. Further research found evidence that air pollution has an effect on health, whereby (6) coughs and infections of the lower respiratory tract were deduced from children in six American cities which were exposed to air pollution yearly. So it is suggested that the US Environmental Protection Agency (EPA) should lower its ozone limit as it was found that even up to 60 ppb exposure to ozone can bring about drastic effects in the lungs of a person.

9a2

How the ozone harms our lungs

Ozone can cause dramatic changes in the lungs of people exposed to polluted air. Published research shows that the ozone causes (1) inflammation of the lungs even at low levels. From an experiment carried out, ten men were exposed to ozone at 80 ppb; and at 100 ppb it showed that macrophages (cells that scavenge in the lungs) were more capable of capturing and destroying bacteria than normal. It was also found that (2) cells and chemicals of the body that produce inflammations e.g. white blood cells increased significantly. Exposure to 100 ppb increased levels of protein and a hormone-like substance called (3) prostaglandin E2 in the lung, which promotes inflammation. In another experiment it showed that exposure to 260 ppb of ozone leads to a fall in the amount of air that a man can forcibly expel from the lungs in one second. Another concern is that long term exposure could induce (4) fibrosis. If prostaglandin is produced

in huge amounts, it suppresses the (5) immune response in the lungs making people more susceptible to lung diseases.

Average Proficiency

9b1

How the ozone damages our lungs

Hillen Koren, a scientist, found that ozone causes (1) inflammation even at low levels, he found that macrophages-cells that scavenge in the lungs- were capable of consuming and destroying bacteria than normal. There was a significant increase (2) in cells and chemicals in the body that produce inflammation. Exposure to ozone also increased levels of protein and a hormone-like substance called prostaglandin E2, in the lung. Research suggests that people become (3) tolerant to the chemical after several days of exposure. Long term exposure could induce fibrosis of the lung, in which inflexible, non-functioning tissue replaces normal flexible tissue. Prostaglandin E2 which results from ozone exposure could also be dangerous' it suppresses the (4) immune response in the lungs and could make people more susceptible to lung infections.

9b2

Effects of ozone on lungs

A scientist, Hillen Koren, of the University of North Carolina showed that even low levels of ozone caused (1) inflammation in the lungs. Koren showed this by exposing 10 men to air containing ozone containing ozone concentration of 100 ppb and 80 ppb. Extraction of cells and fluids from the 10 men was done. The result showed that (2) macrophages were capable of consuming and destroying bacteria than normal. Koren performed another

experiment involving collection and culturing of macrophages, they were then exposed to air at 100 ppb 300 ppb and 1000 ppb concentration of ozone. Analysis of this experiment showed an increase in prostaglandin E2 with an increase in concentration. Another group of researchers from EPA at the research triangle park in North Carolina proved that repeated exposure to ozone resulted in a decrease in expelled air and after a while the expelled air quantity rose back to normal, their results proved that it a sense of (3) tolerance to the ozone by the lungs. The experiment was done by exposing men to levels of 260 ppb ozone concentration for eight hours over five days. It has also been observed that between the months of April and August, (4) coughs and infections of the lower respiratory tract were associated with increase in ozone level since air pollution was high or worst.

9b3

Pollution

The Azone damage the lungs even down below 120. According to Koren's text that Ozone causes (1) inflammation of the lungs it seems to be true because the more the accumulation of polluted air in the lungs such as smoke, seem to close the Air spaces and thus resulting in inflammation of the lungs as the patient/client is no-longer able to breath out and in easily because of air congestion. Also macrophages multiply rapidly if lungs are affected and they cause a lot of (2) damage to other body parts. The immune system due to (3) prostaglandian E2 results which also aggraviates inflammation as shown per test carried out by Koren. Koren also came to a point that if a person fails to tolerate after being exposed to ozone, which means people are in danger of their health. Even though other scientist suggested or raised a point that people become tolerant after some days of

exposure, Koren emphasizes on that despite how tolerable a person can be, the damage has already occurred as the lungs were exposed. Despite his comments, (4) coughs and infections of the lower respiratory tract were associated with higher levels of ozone and particulate matter in the air. People developed symptoms one or two days after peak of exposure to either ozone or smoke.

Low Proficiency

9c1

How ozone harms the lungs

Scientists have researched by experimenting how the ozone damages the lungs. Hillel Koren and his team exposed 10 non-smoking males to air containing ozone at 100 ppb and 80 ppb. Koren examined the cells from the men's body for analysis of alveoli. At both levels macrophages produced (1) prostaglandin E2. Koren also took macrophages from the alveoli and exposed it to different concentrations of ozone. And he found that as the level of ozone increased, the production of prostaglandin E2, which causes (2) inflammation in the lungs, is increased. Koren also investigated whether the long-term exposure to other pollutants also causes the inflammation response to tail off. He found that humans can (3) tolerate the ozone as it goes on, but large amounts of prostaglandin are dangerous to our body.

9c2

Ozone damage to lungs

Ozone causes changes to the biochemistry of the lungs in people exposed to polluted air. It also causes (1) inflammation in the lungs even at low levels. Ozone exposure is associated with macrophages which consume and destroy bacteria more than normal, and increase in cells and chemicals that produce inflammation in the body. At ozone 100

ppb, levels of protein and prostaglandin E2 in the lungs increases. The prostaglandin E2 is a potent regulator of the immune system, also promotes (2) inflammation. Ozone at 260 ppb shows lowered roles of respiration. Long term exposure can increase fibrosis of the lungs. Fibronectin accumulating due to ozone helps fibrous to develop and cells to grow and attach themselves to the tissue of the lungs. Large amounts of (3) prostaglandin suppresses immune response in lungs making people prone to infections. Effects of combination of ozone and (4) sulphuric acid shows increase in coughs and infections. People tend to develop symptoms after a day to two of exposure to ozone. Recent research also shows that damage occurs even at lower levels of ozone exposure.

APPENDIX 10: SEMI-STRUCTURED INTERVIEW SCHEDULE GUIDE

1.0 Introduction

Interviewer (Researcher): Good morning/afternoon (name of interviewee). Before we start, let me take this opportunity to thank you in advance for sparing your time so that we can talk about the summarizing strategies that you use. I know that at this time of the year students are busy preparing for their end of semester examinations. Thank you for coming. Before we start, let me assure you that whatever we are going to discuss will be used solely for my research purposes. All the information will be kept confidential and I will not mention your name in reporting the results of this conversation, except that the results may be read throughout the world if they get published. As we talk, I want you to feel free to express your views. (Pause to allow for mental preparation)

2.0 Reading strategies

To start off, can you tell me the strategies (by strategy I mean the techniques or steps) that you use in order to pick the main points in a text: it may be a newspaper, passage or book. What do you do in order to select the major points?

Follow-up points:

- Use of title, subheadings, topic sentence
- Scanning and skimming
- Identifying/Underlining the key points
- How to deal with unfamiliar words
- Whether the student attempts to translate the ideas into her/ his native language

3.0 Summary production strategies

Now that you have selected your main points, how then do you write your summary?

What are the steps that you take?

Follow-up on:

- Planning/Note-making
- Drafting
- Use of own words/Use of words found in the text
- Generalizing ideas
- Ordering
- Adding own information/Making personal comments
- Editing

4.0 Self-assessment strategies

The last thing that I want you to share with me, are the measures you take to ensure that your final summary reads smoothly. Here, I want you to explain what you do to ensure that your summary is fine-tuned.

Major prompts:

- Ensuring that the summary is directed to the task
- Omissions/additions
- Correcting language mistakes
- Checking facts/comparing with the original
- Revision of final
- Strategy for checking distortions

Thank you so much for participating in this interview

APPENDIX 11: PSEUDONYMS USED IN THE STUDY

A. High-proficiency students

- | | |
|---------------|--------------|
| 1. Mmapula | 5. Kopano |
| 2. Tidimalo | 6. Kealeboga |
| 3. Thulaganyo | 7. Nonofu |
| 4. Lerato | |

B. Average-proficiency students

- | | |
|---------|-----------|
| 1. Noni | 4. Rapula |
|---------|-----------|
-

2. Mpho

5. Koziba

3. Kitso

C. Low-proficiency students

1. Tebogo

5. Queen

2. Tshupo

6. Mmabana

3. Litsile

7. Mothibedi

4. Naledi

8. Tiny
