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UNIVERSITY OF CAPE TOWN

Minor dissertation submitted in partial fulfillment of the requirements for the degree:
Master of Education specializing in Applied Language Studies

**FACTORS SHAPING LEARNERS' ENGAGEMENT WITH
SCIENCE TEXTS IN GRADE 8**

A study of learners' perspectives

By

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February 2003

DECLARATION

I hereby declare that this work has not been previously submitted in whole, or in part, for the award of any degree at any institution. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, and has been cited and referenced in the bibliography.

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ABSTRACT

This investigation provides a learner perspective of the factors that affected the way in which they made meaning of science texts in Grade Eight where the medium of instruction was English.

The investigation outlines the origins and objectives of the new curriculum within which the learner is located as this informs the extent to which learners have to engage independently with texts. It also describes the role of the textbook in society and education, the readability of texts and reading as factors that affect and therefore have an impact on the way learners make meaning from texts. While the aim of study was to gain a learner perspective of the factors shaping learners' engagement with texts, it also includes responses from teachers and textbook writers as these two groups have a direct influence on the way learners make meaning.

The study highlights the contextual realities of where learners are at and provides strong evidence to suggest that learners' engagement with texts are affected by their low reading levels and the choices made by teachers and textbook writers in their selection and writing of texts, and points conclusively to the role of the teacher in mediating between learner and text.

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1. INTRODUCTION

In the context of globalization and the demands being placed on learners and teachers as a result of the new educational reforms facing South African schools, this study investigated the factors that impact on learners' engagement with texts. Its aim, in particular, was to gain a learner perspective of what shaped their engagement with science texts, with a view to providing some insight of how they make meaning of texts, and what enabled them to do so.

1.1 THE CONTEXT OF THE STUDY

In February 1997, the South African government unveiled a new curriculum for the country in the form of Curriculum 2005¹ (C2005) based on the principles of outcomes-based education. Professor Sibusiso Bengu, the minister of education at the time, referred to it as "our new national curriculum for the 21st century". This new curriculum, he said, was a shift from the previous content-based one to a curriculum based on outcomes and was aimed at "equipping learners with the knowledge, competencies and orientations needed for success after they leave school or have completed their training. Its guiding vision is that of a thinking, competent future citizen"(DNE, 1997a: 1).

In 2001, high schools received their first group of Grade 8 learners that had experienced C2005 and the outcomes-based approach to teaching. For these learners, 2001 was to be their second year of exposure to C2005, having been introduced to it in Grade 7 (2000) for the first time. From very early in that year (2001), educators observed that these learners were able to debate and discuss issues with confidence, they enjoyed group work and group projects were of a high quality. However, as individuals, they were unable to complete tasks, follow instructions and seemingly lacked the reading and writing skills expected of them at that level. Initially it was thought that this phenomenon was only apparent at our school, but an article appeared in the Cape Argus on 16 March 2001, providing evidence that claimed that only 5-10% of learners starting high school (Grade

¹ During this study, C2005 was revised as a result of a decision by the Council of Education Ministers and Cabinet to strengthen and consolidate it, and became known as the Revised National Curriculum Statement. Since these changes were instituted while this study was in progress, the educational reform will still be referred to as C2005.

8) in the Western Cape met the required literary standards. The rest were only at Grade 2, 3, or 4 levels and these literacy levels have become worse every year.

For further evidence I decided to test the reading ages of twenty Grade 8 learners to see how it compared to their chronological age. I used the D Young reading test, which is classified as a reading and spelling test, and can be used with learners who have a chronological age of 7-15 years. Of the 20 learners (whose chronological age ranged from 12-15 years), the results showed that 14 learners (70%) obtained a reading age of below ten years; 4 learners (20%) obtained a reading age of ten years and one month and 2 learners (10%) obtained a reading age of beyond that. In June of that same year, the Natural Science results of the Grade 8 learners at the school revealed the following: of 222 learners in Grade 8, 103 obtained less than 40% for their Natural Science exam – in other words, 46% ‘failed’ science, so to speak.

There are many factors that may have contributed to these weak results (both in the reading test and the science exam). When learners under-achieve in learning areas like science and mathematics, educators might assume that the learner ‘cannot handle the subject’ or make learners believe that ‘they don’t have a maths brain’, without looking for the underlying causes of low attainment. As a result, learners are discouraged from taking these subjects to matric level. In this age of rapidly changing technological advancement, opportunities for jobs are increasing in the fields of science and mathematics to the extent that Kader Asmal, the present Minister of Education, has taken steps to ensure that all learners matriculate with some form of mathematical literacy, be it additional, functional or commercial mathematics.

It was the combination of the above reasons that prompted me to further investigate and examine the factors – readability factors in particular- that shape learners’ engagement with science texts in Grade 8, as this is directly related to the learners’ reading ability. For C2005 to produce and develop independent, critical thinkers – a curriculum which relies heavily on learners learning things through the process of discovery that involves doing research and collecting information (amongst other things) - learners need to be able to

read proficiently and with insight. This critical, independent thinker that C2005 is hoping to produce will not be easily achieved when it appears that learners are battling to read and understand texts written for their level, and engaging with it without the necessary insight expected of them.

1.2 STATEMENT OF THE PROBLEM

In 1996, the South African Schools Act was announced as the vehicle for the creation and management of a new national school system. Its principle aim was to provide everyone with an equal opportunity to develop his/her talents and improve the quality of education for all learners by providing them with better facilities, higher quality trained teachers and higher quality methods of teaching. It also aimed to reverse the results of unfair discrimination that is still prevalent in schools (DNE, 1997b). With regard to admission policy, the Schools Act stated that all schools must admit learners without unfair discrimination. It also called for no discrimination on the basis of race through the language policy of the school. While schools with only one medium of instruction were allowed, the Schools Act emphasizes that “you may not use language as a smoke screen or cover to keep learners out of a school on the basis of their race” (DNE, 1997b: 55). In addition to this, schools cannot refuse to admit a learner when the parents cannot pay school fees or when the parent does not agree with the objectives of the school.

As a result, many schools began enrolling learners from diverse backgrounds. A year after the Schools Act was passed, figures show that already 28% of schools had enrolled learners from more than one population group (DNE, 2000a). However, these figures only reveal the extent to which schools have moved away from racially-based segregation; it says nothing about the linguistic, religious and national diversity of the learners and teachers. Knowledge of the latter may be necessary to develop an approach to these diverse school populations based first and foremost on the value of tolerance (DNE, 2000a).

In the absence of such an approach or policy, teachers are left to their own devices in coping with the challenges that accompany multicultural and multilingual classrooms.

Every learner brings to the class their own language, culture, skills and background. Teachers are forced to take cognizance of this in order to make each child's learning experience meaningful. What might be a daily experience for one group may have no significance or relevance for another. As a result, examples and explanations used in classroom have to be well thought out and carefully chosen in an attempt to make education relevant and valuable to all. It implies a change in teaching approach and teaching methods.

Another huge challenge facing teachers is dealing with the multilingual nature of the South African classroom. It is often assumed that by using English as a medium of instruction, learners will gain access to higher education, employment and economic stability. As such, parents and to a certain extent learners, choose English to be the medium of instruction, even though it is not their mother tongue. Learning through a language, is a far cry from learning a language. It means knowing the language fluently (oral and written) before any learning can take place. Any breakdown in the language would therefore be accompanied by a breakdown in learning. When learners with different language backgrounds enter a classroom where the medium of instruction is their second or even a third language, it cannot be assumed that communication levels and reading levels in that language are on par. If learners are unable to read or are poor readers in the language of instruction, very little learning can be expected to take place.

This has major implications for teachers and their approach to language usage. Teachers would have to be knowledgeable in the language and reading abilities of all their learners, and again, carefully choose textbooks and learning support materials to accommodate every learner. These chosen texts will not only have to meet the reading abilities of the learner, they will also have to meet the desired outcomes of Curriculum 2005.

There is also a concern that low attainment in school might be due to the fact that the language in which the school curriculum is embedded is too difficult. Recent research has shown that learners whose mother tongue is an indigenous African language experience profound language difficulties when learning all their content subjects through the

medium of English (Potenza, 1993). A huge part of the problem lies in the fact that textbooks published for the purposes of learning are inappropriate on a content level as well as a readability level. Potenza (1993) points out that many analyses of the readability of textbooks show that the language of most books is overly demanding. She quotes a General Science teacher as saying:

In a majority of cases students can't use the textbook effectively...

It is a structural deficiency in that textbooks are too dense... They are not user-friendly.

In terms of content, the textbook is often incomprehensible to learners because, according to Potenza (1993), textbook writers tend to ignore the level of literacy in English of the learners they are aiming at. Not only do they fail to teach the learners anything, they have a negative effect on the learner's self-confidence.

It seems that the intention of OBE and Curriculum 2005 in developing independent, critical thinkers may be in jeopardy when one looks at what is actually happening in schools i.e. reading competence of learners and perceived readability of texts. If this gap between learners' reading competence and readability of texts is as it seems, learners will be unable to become competent in both reading and content and subsequently will not attain what the new curriculum envisages.

1.3 AIMS OF THE STUDY

This study proposes to investigate the readability factors that shape learners' engagement with science texts by examining:

- a) Readability factors that contribute to learners' ease and difficulty in engaging with science texts;
- b) Readability factors that educators and publishers take into account when selecting and writing material; and
- c) The proficiency of learners' reading versus the readability of science textbooks at Grade 8 level

1.4 FOCUS QUESTIONS

- a. What are the readability factors that:
 - I. shape learners' engagement with science texts?
 - II. contribute to learners' ease or difficulty in engaging with science texts?
- b) Is there a mismatch between learners' reading levels and the readability of science texts in Grade 8?
- c) What readability factors do educators and textbook writers take into account when selecting and writing material for Grade 8 learners?

1.5 SUMMARY OF THE CHAPTER

Chapter 1 contextualises the study by providing a rationale for undertaking this research. It concludes with the aim of the study, which is to examine the readability factors that shape learners' engagement with text.

1.6 OUTLINE OF THE DISSERTATION

Chapter 2 provides the conceptual framework in which the study is located. It reviews literature on textbooks and their use, understanding reading, readability and evaluating texts, and reports on related studies in the field.

Chapter 3 describes the research design of the study and specifies the focus of the research. It explains how the focus questions were addressed for the purposes of the study and explains the data collection process used to gather the necessary information.

Chapter 4 provides an analysis and presentation of the results of all the components of the study.

Chapter 5 provides an analysis and discussion of the results of the study.

Chapter 6 draws conclusions by relating the research findings to the research questions. It also makes speculative recommendations based on the implications of the study.

The last two sections include the:

Appendices: These include the actual tests administered to learners, the learner questionnaire, the selected passages to which discourse analysis was applied (which includes the passage from which the clozed test was formulated and the detailed results of the discourse analysis.

References: The sources were listed according to the Harvard system.

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2 LITERATURE REVIEW

In examining the readability factors that affect learners' engagement with science texts in Grade 8, four components were investigated, namely, the textbook, the learner, the teacher and those involved in the writing and publishing of textbooks, as each one of these have their own contribution to make in shaping this engagement. As such, this literature review firstly reflects the framework within which the study is located and secondly reports on related studies in the field.

Firstly, this study would not be complete without a thorough understanding of education in South Africa before and after 1994. Hence, the background to the education reform process that unfolded in South Africa during the period of transition and thereafter is provided at the outset. It highlights the need for change by looking at the educational conditions in South Africa prior to 1994, and why the reforms evolved in the way it did. It also provides details of Outcomes Based Education and Curriculum 2005 with an emphasis on the envisaged role of the learner, educator and learning support materials.

Secondly, this literature review examines textbooks and their role in society and education throughout the decades. This review has been conducted to illustrate how the textbook shapes and informs much of what is learnt in school, and as such, analyses the non-neutrality of the textbook. In relation to this, two other areas regarding textbooks have been dealt with. They are the readability of texts (as this directly affects learners' engagement with texts) and text analysis (this was conducted in the study itself to determine the readability of science texts).

Thirdly, this literature review examines reading and reading difficulties pertaining to science texts in particular. The way in which learners engage with texts is dependent on their reading abilities and as such, plays an important role in shaping learners' engagement with texts. The new roles expected of learners and educators in C2005 require learners to work independently more often than before and to learn mainly by independent engagement. Reading, on the part of the learner, must therefore be done critically and with insight in order for the learner to make meaning. Hence, it is necessary

to understand what it means to be an independent reader as a way of measuring the reading abilities of the learners in this study.

Finally, the literature review briefly looks at the use of the textbook in the classroom, especially in relation to the changed face of education in South Africa. Not only have the roles of the learner and educator changed, the outcomes-based approach to teaching brings with it changing texts, placing even more demands on learners and educators. This section sheds some light on this.

2.1 UNDERSTANDING THE CONTEXT OF EDUCATION IN SOUTH AFRICA PRIOR TO 1994

The announcement made by Professor Bengu in 1997 to go ahead with Curriculum 2005 meant that educators were now faced with a mind-blowing shift in education that required a whole new mindset. It was expected of them to implement the new curriculum almost immediately without having had sufficient time to internalize it properly and without the necessary training and retraining. No wonder it was met with confusion and anger by many educators. Not enough consultation and work-shopping about its implementation had been done with the very people responsible for 'making it work'.

Despite the multitudinous criticisms and protestations about the implementation of C2005, the education ministry was adamant that it would be the future curriculum for South Africa. This obsession with C2005 was beyond the comprehension of many and it is therefore important and necessary to explain this paradigm shift in education in terms of the historical, political and social conditions in South Africa prior to 1994.

In 1994, South Africa captured the imagination of the world when the country succeeded in achieving a peaceful transition to democracy. Prior to this, the system was such that it fostered racial and cultural segregation. What follows is an account of how the educational system was structured before 1994 and describes the conditions that led to the present education reforms.

2.1.1 The Educational Structure

The approach to educational policy by the National Party government was characterized by a lack of access or unequal access to education and training at all levels of education. It promoted a differentiated education system based on the philosophy of Christian National Education (CNE). Different schools were established for different races and ethnic groups, each preparing children differently for the positions they were expected to occupy socially, economically and politically in life under apartheid (DNE, 2001:10) that made it virtually impossible for a common South African citizenship to emerge (NEPI, 1993).

As such, a hierarchy of schooling emerged. Whites received the best education South Africa could offer, followed by Indians and coloured people, with black Africans last, all financed by “apartheid’s wicked formula of providing the best for those already privileged and the worst for those who had little” (DNE, 2000a). In 1994, the pre-democratic government was still spending R5043 per white learner compared to R1053 for every black African learner (DNE, 2000a: 16). Baxen & Soudien (1999:) aptly describe the situation by stating that a shameless facet of the system “was the extent to which schools for children other than white were the object of neglect, indifference and discrimination”.

The undemocratic and unequal nature of education and training left in its wake a country whose human resources were left untrained and unskilled to enter the labour market. Moreover, probably the most devastating effect of apartheid education, coupled with the aftermath of resistance, was that “it destroyed the culture of learning within large sections of our communities, leading to a virtual breakdown of schooling” (ANC, 1994:2).

2.1.2 The Curriculum

Under apartheid, South Africa had *19 different education departments* separated by race, geography and ideology, each with its own core syllabus. In each department the curriculum played a powerful role in reinforcing inequality. What, how and whether children were taught differed according to the expectations of their roles in the wider

society (DNE, 2001:10). There was no national core curriculum for South African schools. Instead there were core syllabuses defined in terms of content and usually overloaded, leaving no opportunity for teacher autonomy and initiative leading to the disillusionment and disempowerment of many (NEPI, 1993). The National Education Policy Initiative (NEPI) Report of 1993, pointed out that at the time the report was written, there were 1400 registered syllabi from Sub A to Std 10. The curriculum policy system put into place by the state at the time, is described by Jansen (1999b) as racist, eurocentric, sexist, authoritarian, prescriptive, context-blind and discriminatory. It aimed at entrenching “social separation and legitimizing white hegemony” (Baxen & Soudien, 1999:131).

2.1.3 The Role played by Teachers and the Community in Education

Prior to 1994, there was a complete absence of public consultation within the education and training system that meant that teachers, learners and parents were totally excluded from any decision-making processes (ANC, 1994). As such, the curriculum development process was not open to public comment. Teachers were trained separately and differently at their respective racially organized institutions whose main role it was to transmit the contents of the curriculum in such a way so as to maintain the status quo of white hegemony. They were therefore transmitters of a particular kind knowledge that allowed, and even encouraged learners to be subservient and non-critical. By implication, it meant that learners were compliant, passive, and unquestioningly accepted everything that was taught to them. They were exam-driven and relied mainly on rote learning to get from one grade to the next.

2.1.4 The Role of the Textbook in Promoting Apartheid Ideology

Textbook publishers in South Africa had little to be proud of. The textbook was used as a tool to transfer and entrench racial prejudice and injustice (Krut, 1993). To illustrate this, Masokoane (1993:64) cited the following examples:

- The Verklarende Woordeboek (1979) used as a standard dictionary in schools has as one of its entries “so dronk soos ‘n kleurling onderwyser” – a racist distortion of the idiom “so dronk soos ‘n matroos”.

- The history reader, *Primary History* (1981) defines “civilised” by saying “... many years ago these groups (African people) moved into the Cape from the North. They were completely uncivilized... they learnt to use fire and became civilized...”
- In describing the West Coast the authors of *Junior Secondary Geography for Std Seven* say “these regions are almost exclusively inhabited by whites who have a high degree of civilization.”
- In a Std Six Geography textbook, *Windows on the World*, the author says that “South Africa’s population is complex because it is made up of four distinct groups: the blacks, whites, coloureds and Asians.”

Raymond Williams (cited in Apple & Christian-Smith, 1991:4) suggests that textbooks “embody what is called selective tradition” and the examples that are cited by Masokoane (1993) above, are illustrative. Under the National Party government, school curricula and textbooks were extreme examples of this selective tradition (Reynolds, 1997). Textbooks supported the ideology of racial superiority and patriarchy and as Samuels (1993:84) pointed out, “played a major role in enabling apartheid to take root in South Africa”. Other evidence of this is presented in a study by Auerbach (1965 cited in Reynolds, 1997), which shows how Christian National Education had approached history in schools. More time seemed to be spent on South African history than world history; the role of the white Afrikaner was emphasized; and the histories of other groups were largely ignored.

According to Proctor & Monteith (1993:32), the system of text selection and provision at the time was bureaucratic, authoritarian, secret and corrupt; it essentially served the interests of the apartheid government. Officials, rather than teachers or independent experts, wrote many of the prescribed textbooks approved for school use, and little consideration was given to the literacy levels of the learners using the books. Textbooks were only written in English and Afrikaans.

In an attempt to redress the past, the NEPI Report (1993) highlighted a number of key issues that assisted in informing a democratic curriculum policy-making process after

apartheid. For example, who was to design and implement the curriculum, and by whom were these decisions to be made; were there basic learning experiences that all learners should have as part of their general education or should everyone follow the same core curriculum regardless of race, gender, ability, and social class; how were these differences in culture to be addressed and was tolerance of these differences able to be built into the curriculum.

The NEPI Report also cautioned that the curriculum had important social and political dimensions to it that was formulated by particular groups of people and therefore reflected particular views and values. It stated further that “it was anchored in the experiences of certain social groups and produced patterns of success and failure” (NEPI, 1993: 103), and as such should be understood in its social and historical context.

Because the NEPI Report provided a broad values framework for thinking about democratic education policy after apartheid, (that emphasized the establishment of a single, education and training system based on non-racism, non-sexism, democracy, and equality), it was used extensively by the ANC to inform its educational policy framework document. This is reflected in its discussion document on a policy framework for education and training where it was mentioned as one of its principles that the education policy and practice will be a democratic process that ensures the active participation of all sectors of society. It stated further that the education process aimed to develop a national democratic culture where citizens learnt respect and valued each other’s cultural and linguistic traditions, and encouraged peace, justice, tolerance and stability in the country (ANC, 1994: 4).

2.2 EDUCATION REFORM IN SOUTH AFRICA

2.2.1 Developing a New Curriculum

By the time the ANC came into power in 1994, they had already envisaged a new national curriculum aimed at addressing three issues: viz.

- the need for equity and reparation;

- the need to upgrade skills on a continuous basis in the context of the ever-changing world economy; and
- to recognize the value of prior learning and experience.

The ANC offered a vision for a reconstructed system, capable of delivering life-long learning to all citizens. Such a system would be learner-centred and achievement-led (ANC, 1994).

Hence curriculum change began immediately after the election in 1994. The White Paper on Education and Training (1995) paved the way for radical change by proposing to address the demand for equity and promoting access for all to education of quality (Kruss, 1998). It proved to be instrumental in the formation and development of the National Qualifications Framework (NQF), a co-ordinating structure that would lay the foundations for a single national core syllabus (DNE, 2001: 10). The objectives of the NQF were “to create an integrated national framework for learning achievements and to enhance access to, and mobility and quality, within education and training (DNE, 1997c: 14).

It was proposed that the curriculum framework through which the NQF operated would have an outcomes-based approach to education and training “which had as its focus the transformation of the country’s pedagogical and ideological legacy” (Baxen & Soudien, 1999: 133). In South Africa and internationally, adherents of this approach to education have claimed that “it has the potential to meet the needs of all students regardless of their environment, ethnicity, economic status, or disabling condition” (Capper & Jamison, 1993 cited in Baxen & Soudien, 1999: 133). The underlying assumptions of the outcomes-based approach were that all learners have the ability to be successful.

What may have attracted South Africa to OBE was that it represented a complete break away from the content-driven curriculum of the apartheid era to one that is based on outcomes and experience. The Department of Education (1997c: 17) describes it as “a learner-centred, results-oriented design based on the belief that all individuals can learn”.

Curriculum 2005, the vehicle chosen to drive OBE, was the first major curriculum statement of a democratic South Africa. According to the Revised National Curriculum Statement (2001:10), it was “deliberately intended to overturn the legacy of apartheid education and catapult South Africa into the 21st century.” Its symbolism and meaning ran deep: “No longer would the curriculum be shaped by narrow visions, concerns and identities; no longer would it reproduce the limited interests of any one particular grouping at the expense of another; it would bridge all and encompass all. It introduced new skills, knowledge, values and attitudes for all South Africans and “stands as the most significant educational reform in South African education of the last century” (DNE, 2001: 10).

2.2.2 Outcomes –Based Education (OBE)

The introduction of OBE intended to develop a bona fide national system of education and training, provide equal opportunity and access in education and training to all citizens and provide education of quality in terms of relevance, learner-centredness, critical thinking and economic growth and development (Mahomed, 1999: 158).

The Western Cape Education Department (1997 cited in Baxen & Soudien (1999:138) strongly suggested that OBE would address issues of social change. The WCED believed that it is built on the principles of equity, redress, non-discrimination etc. and further claim that for “the first time high quality education will be made available to everyone in South Africa regardless of age, gender, race, colour, religion, ability or language”.

The approach to the curriculum was to be guided by the certain key concepts such as the active involvement of the learner, an emphasis on critical thinking, reasoning skills, reflection and action, skills-based rather than content-based activities and learner-centred rather than teacher centred.

The Role of the Learner within OBE

Through the new educational reform, it was hoped that the type of learner to emerge from this system would be able to:

- Have sufficient linguistic skills and be culturally sensitive to survive in a multilingual, multicultural society.
- Recognise that there is nothing as constant as change and therefore develop their ability to adapt to an ever-changing world.
- Use a variety of problem-solving techniques effectively when faced with different situations.
- Collect, organize and analyse data.
- Make informed decisions and act as a responsible citizen by being accountable.
- Be a team player and have the ability to manage oneself, one's own activities and one's leisure time responsibly.
- Understand and show respect for the basic principles of human rights.

(DNE, 2001)

Through OBE and Curriculum 2005, the learner would have the freedom to work through problems at his/her own pace so that s/he can gain an ability to deal with immediate problems as well as those that may arise in the future (Rasool, 1999). Learners would discover content, construct knowledge and learn how to relate the content of one learning area to another, in the hope that they would be able to use it to make connections with the world in which they live. It was hoped that by being more involved in the learning process learners would become responsible for their own learning, and as such, lead to learners who were highly motivated (Rasool, 1999: 178).

The Role of the Teacher within OBE

The revised curriculum also presupposed new roles for teachers. Because learners would supposedly be more actively involved in the education process, the teacher's task

changed from one who transmitted knowledge to one who *facilitated* the learning process. According to Rasool (1999:177) the teacher's role was to be non-directive, supportive and non-judgemental; s/he was to create a climate conducive to learning and change, and not impose personal views on the learners. The teacher's main task was to focus constantly on the needs of the learner. By acting as facilitator and mediator, it was thought that learners would be given the freedom to make informed choices after considering all options and evaluating the consequence of each.

Another new role of the teacher that seemed to emerge was that of curriculum developer. Gray (1998:132) is of the opinion that policy-makers see Curriculum 2005 acting as a springboard for teachers to become curriculum developers, responsible for developing their own learning programmes and materials. A study by Baxen & Green (1998) show that teachers were frequently being called upon to evaluate and select from curriculum materials the appropriate outcomes that would suit the needs of learners without having had sufficient training and competency to do so.

Potenza & Monyokulu (1999:237) state "OBE requires a major paradigm shift on the part of the teachers". Hence, they feel that a huge emphasis should be placed on the retraining and development of teachers, because they are ultimately responsible for the success of OBE and C2005. According to Potenza & Monyokulu (1993), teachers have to be trained to understand the new curriculum and its challenges such as how to plan learning programmes in an integrated way, how to facilitate learning using new methodologies and how to use a variety of methods to assess whether outcomes have been achieved. Muller (1997) cited in Jansen (1999a:237) warns that if teacher development is not prioritized, the current inequalities in the education system will be perpetuated and if the education authorities do not invest enough resources in ongoing teacher-training, C2005 will not have the "transformative effect it is intended to have in the majority of schools in the country". Given the culturally diverse classroom that epitomizes South African schools today, and on a level that relates more specifically to this study, teachers will have to think carefully about their approach to language usage and will have to be knowledgeable in the language and reading abilities of all their learners in order to make

textbook choices, plan lessons and develop activities and learning materials, as well as meet the desired outcomes for C2005.

The Role of Learning Support Materials (LSM's) within OBE

The Department of Education regards LSM's as an integral part of curriculum development and a way of promoting good teaching and learning (DNE, 1998). In accordance with this, Curriculum 2005 demanded well-resourced classrooms that ideally should include textbooks for each learning area and other print based materials such as readers, atlases and dictionaries. Education policy required that teachers not only use new textbooks effectively, but also prepare learning materials themselves as well as make use of old material in new and appropriate ways (DNE, 2000b: 62). It was therefore suggested that learning materials encompass more than merely textbooks. However, teachers who traditionally viewed the curriculum as a set of textbooks to be used to get through the syllabus, may not easily shift to taking responsibility for structuring learning opportunities through the flexible use of learning materials (Baxen & Green, 1998).

In the light of the role that textbooks played under apartheid, it goes without saying that "texts and other educational resources would have to be thoroughly revised and reconceptualised, if not entirely replaced" (Krut, 1993:3). Hence, National Education policy documents indicate they would like as much thought to go into the development of such materials. For example, learning support materials should be unbiased, and sensitive to cultural experiences as well as issues of race, gender, disability and free from discrimination. It should contain enough knowledge, understanding and skills for the intended outcomes to be achieved. The texts and examples used should be linked with the everyday life and experience of the learner. It should therefore be relevant, accurate and up to date, and should be used in such a way so as to promote peaceful coexistence. It should cater for different groups of learners according to their attainment (DNE, 1998).

In considering the new roles for learners, teachers and texts as envisaged by C2005, it is clear that each comes with its own set of demands. C2005 is proposing that learners take more responsibility for their learning by relying less on the teacher and working

independently more often. This means, for example, that learners need to acquire the necessary reading, writing and research skills to carry out the tasks expected of them. Not only do they have to acquire these skills, they have to use them critically and with insight - How else are they meant to 'make informed decisions', 'critically analyse', and 'problem-solve'? The acquiring of these skills becomes critical in beginning to address the needs and expectations of learners. As such, if what is outlined in Chapter 1 is some reflection of the current state of learners, then it seems that C2005 is a long way from achieving its goal of producing that socially responsible, independent-thinking young citizen it envisages, unless a strong foundation is laid as early as possible, one which amongst other things, pays close attention to the reading and writing skills of its children.

There is no denying that textbooks and learning support materials form an integral part of curriculum planning, and as the next part of this review will show, Potenza & Monyokulu (1999: 243) point out that "in developing contexts such as ours, textbooks tend to be the most cost-effective and accessible vehicles for supporting the curriculum". As such, they feel that the quality of textbooks being produced is a critical consideration since the current teachers, who lack confidence in their abilities due to lack of training, are still relying heavily on them to guide their teaching approach and methods of assessment in implementing the new curriculum. Improving the quality of the textbook may mean taking into consideration accessibility of text, language structure and use, readability and writing at the appropriate level in terms of content. In the light of this and given the multilingual nature of the classroom, textbook writers need to have a very good idea of what their intended readers bring to the text in terms of vocabulary, prior knowledge and experience.

Potenza & Monyokulu (1999:231) feel strongly that the three pillars of curriculum transformation – curriculum development, teacher development and the development, selection and supply of learning materials- need to be in place and in alignment for the successful translation of C2005 into practice. These factors in themselves will not ensure successful implementation without the assistance from teachers who play a critical role in mediating the text. At the same time though, texts in themselves need to be able to 'stand

independently' of the teacher, hence the importance of this study, which hopes to shed some light on the factors that shape learners' engagement with texts, thereby providing teachers and writers with some insight into the matter of selecting and writing material for their respective target audiences.

There are many barriers to learning, some of which includes a lack of access to basic services, poverty, underdevelopment and discrimination, to mention a few, that we as educators have no control over, but nonetheless have to be overcome. Bearing this in mind and given that C2005 is here to stay, perhaps what Potenza & Monyokulu suggest is a starting point in allowing C2005 to realize its potential.

2.3 TEXTBOOKS IN EDUCATION

Taking into account the role that textbooks and learning support materials are expected to play within OBE, and the role of the textbook during the apartheid era, not only does the quality of textbooks seek improvement, it does seem as Krut (1993) suggests, that textbooks (in terms of content) have to be entirely replaced. While I recognize and understand that textbooks have value in and of themselves, they are problematic in that they have always been used to further the aims and policies of the ruling class. It is this role that I wish to briefly examine in this section in an attempt to show how value-laden textbooks are. While this is not a key consideration for this study, it is worth noting that valuable as they are, an over-reliance of textbooks can be potentially dangerous.

2.3.1 Understanding the Role of Textbooks

In his criticism of the textbook, Graham Down of the Council for Basic Education described it as follows:

“ Textbooks, for better or worse, dominate what students learn. They set the curriculum, and often the facts learned, in most subjects. For many students, textbooks are their first and sometimes only early exposure to books and reading. The public regards textbooks as authoritative, accurate, and necessary. And teachers rely on them to organize lessons and structure subject matter...” (Apple & Christian-Smith, 1991:5)

Proctor & Monteith (1993) substantiate this statement by providing evidence that this *is* so and add that in many cases, teachers end up evaluating learners only on knowledge contained in the texts. In many countries, textbooks are written in a way that coincides with the school curriculum. In fact, the curriculum *is* the textbook. For the learner, educator and public at large, the content of books in general and the textbook in particular, is regarded with respect and in most cases, unquestioning reserve.

The danger of textbooks not only lies in their use in schools but in the very nature of their purpose and content. Apple & Christian-Smith (1991: 1) argues that “texts are not simply delivery systems of facts” and to view them with such unquestioning reserve is both dangerous and narrow-minded. He contends that textbooks are not produced in a vacuum; they are conceptualized, designed and authored by real people with their own agenda, be it for political or economic gain! Throughout the decades, the content of textbooks has always been influenced by the prevailing political ideology in a country. It has been used to convey and promote the overarching policy of the state- and what better way to do so than via the textbook. It stands at the heart of the educational enterprise, is directly related to the school curriculum and every school needs them in one-way or another.

At the end of the day, what is allowed to be published depends on who is in power, and this raises serious questions about the neutrality of the school curriculum. Raymond William in Apple & Christian-Smith (1991:4) suggests “textbooks embody what is called ‘selective tradition’ – someone’s selection, someone’s vision of legitimate knowledge and culture- one that in the process of enfranchising one group’s cultural capital disenfranchises another.” This view is also reiterated by Biraimah (1988:115), who states “textbooks by their very nature, tend to control knowledge, as well as transmit selected values and role models to students”; so to consider the textbook to be neutral and value-free becomes problematic. This means that even in a so-called democratic society, issues about ‘whose knowledge, what knowledge, who writes’ are all tension-filled negotiated spaces and will always include some and exclude others. Recognition of this is critical, even in the ‘new look’ textbook.

Studies undertaken in this field provide evidence of just how non-neutral, political and value-laden school curricula and textbooks can be, and how they transmit messages to promote the policies of the ruling class and in so doing maintain the status quo.

Most Third World countries, for example, have been so bogged down with problems of providing schooling at primary and secondary level that they have paid almost no attention to the content of school textbooks (Altbach & Kelly, 1988). In providing textbooks to their learners, some countries have continued to use colonial languages like English and French as its medium of instruction and have imported books from the United States, Great Britain and France. This reliance on foreign texts has meant that the content of school textbooks has remained outside the control of national policy makers, thus making the curriculum ineffective and irrelevant to the local needs of the people (Altbach & Kelly, 1988: 10). Biraimah (1988:15) postulates that this dependency on western nations “for the delineation and production of knowledge often transfers new roles and values to the recipient country”, a dangerous position for these countries to be in, as studies of textbooks have shown that books produced and printed in Europe and the United States inadvertently transmit messages about daily life that are not entirely in sync with Third World realities and government policies (Altbach & Kelly, 1988). For example, a Togolese secondary textbook, published in France for an African market, portray women in roles contrary to the roles they would ordinarily perform in that they are encouraged to become housewives and mothers and deny the economic contribution the Togolese women make to the upkeep of the family and to national economic development.

Countries such as Nigeria, Kenya and Tanzania, who have realized the problems that are built into using westernized publications, both politically and educationally, have already developed texts specifically for their schools written in indigenous languages. However, studies have shown that while textbooks in these countries are becoming more nationalized in terms of pictures and references to local names and places, they do not

bring home the values that would support its government's initiatives towards economic development or nation-building (Altbach & Kelly 1988).

The South African example also provides clear evidence of the non-neutrality of the textbook. Here, prior to 1994, the think-tank for educational policies was the domain of the state, while “the production and distribution of the educational resources which sustained education was left to the wisdom of the private sector” (Krut, 1993:3). The South African Broadcasting Corporation (SABC) and publishers worked closely together to give form to Christian National Education that contributed to “stultifying critical and creative thought throughout the country, ghettoized African languages and provided poor quality materials to black schools (Samuels, 1993:9). Hence, when the new ANC-led government was elected, they were given the arduous responsibility of rebuilding the divided nation, and they wasted no time in making use of the textbook as one of its vehicles to do so. Today, if one took a look at the textbooks being produced for South African schools, the message is completely different. Authors of school textbooks have gone to great lengths to promote patriotism and embrace cultural diversity and cultural tolerance, however simplistically and unproblematically.

Masokoane (1993:65), seeing the need to change the way in which textbooks and other educational material are written, recommended that a moral and ethical framework be drawn up to ensure democracy, quality and transparency of materials. This framework would not necessarily act as another form of censorship, but rather guide authors, readers, publishers and education officials. One of its key considerations would be to ensure that the language levels in textbooks and other learning support materials recognize the multilingual nature of South African society. If this recommendation is taken seriously, it will have major implications for current language and reading levels in schools as well as for the readability levels of textbooks.

Educators and learners are the ultimate users of textbooks, and educators are particularly dependent on ‘good books’. Yet, they are often ignored in the preparation of textbooks. Altbach & Kelly (1988) feel strongly that educators have an important input to make into

textbook development in terms of providing guidelines on innovative, yet practical approaches to a topic. They also have more insight than most, into learners' interests and effective learning strategies. Learners too, can be of assistance in textbook creation, particularly with regard to how texts impact on learners, as very little evidence of this exists (Altbach & Kelly, 1988), a gap that this study hopes to partially fill.

The studies outlined above raise serious questions about the honorable intentions of Curriculum 2005. With the aid of textbooks as one of its means, C2005 intends to produce independent, critical thinkers, and as such demands critical engagement with texts. This critical engagement requires learners that can *read*, and independently at that. Using texts that are unrelated to the contextual realities and experiences of learners will disenable learners from making meaning and finding connections between their experience and new knowledge, a critical feature of what independent readers do, as the next section will show.

2.4 READING AND READING DIFFICULTIES

The one thing that learners bring to the text, apart from their prior knowledge, is their reading competencies and abilities. Hence, reading has a major role to play in shaping learners' engagement with texts. This section examines the process involved in reading and what it means to be an independent reader, especially in the light of the new demands placed on the learner as a result of C2005. It also briefly mentions a few cases of reading difficulties in science textbooks.

Reading is so much part of our daily lives that much of the time we hardly consider either the purposes or processes involved in it (Wallace, 1992). While there are poor readers, and even non-readers, in communities that are literate, urban technological societies operate on the presumption that everyone can read. For example, withdrawing money from an autobank; reading names of political parties and their candidates in order to exercise the right to vote; understanding the words that follow "caution" on medications and household products. In education, reading is the one area that has received more attention than any other (Gibson & Levin, 1976). In society today, it is imperative to read

with understanding and the ability to read well is regarded as the basis for success in school and thereafter.

Most definitions of reading refer to it as a process. Ruddell (1994) defines reading as a meaning-construction process that enables us to create carefully reasoned as well as imaginary worlds filled with new concepts, creatures and characters.

Fiveash (1995) defines it as a message-gaining, problem-solving activity that involves a combination of both physiological and psychological functions. She identifies four sequential steps in the process of reading:

- **Seeing:** a physiological process of looking at the page. Light is picked up by the nerves in the eyes and transmitted to the brain.
- **Perceiving:** a psychological process where the reader becomes aware of words and their sequence on the page. The reader associates words with meanings.
- **Understanding:** when sequences are translated into meanings. This is arrived at through categorizing, comparing and forming visual impressions.
- **Interpretation, evaluation, application, appreciation:** when the reader comprehends the meaning and reacts to the material. S/he then relates the content to his/her own background and experience. These steps are inter-related and overlap.

Goodman, Watson & Burke (1996) define reading as a problem-solving, meaning-making process and explain it as follows: As readers, we consider the meaning the author is making, while at the same time, we are building meaning for ourselves. We use our own language, our own thoughts and our own view of the world to understand the author's meaning. Because the language, thoughts and world-views of the author and reader are influenced by personal and social histories, reading can never be an exact process.

Gibson & Levin (1976:5) view reading as extracting information from texts. For these authors, texts not only refers to the printed page, it is a combination of text, pictures,

diagrams, graphs, illustrated instructions. They describe reading as “not simply the decoding of written symbols to sound, neither is it passive acquisition of an image somewhere in the head that a written word can be matched to. It is an active process, self-directed by the reader in many ways and for many purposes”.

Because it so difficult to pinpoint exactly what reading is, an examination of what good readers do when reading, may give better insight into the matter.

First and foremost the motivation, interest and conditions for reading must exist before the reader can make any meaning of what is being read.

Good readers **activate and use prior knowledge** [my emphasis] (French, Ellsworth & Amoruso, 1995 and Gibson & Levin, 1976). Both these researchers agree that successful comprehension requires having the necessary background as well as the ability to retrieve information when needed. In his attempt to understand an article on electronics, Manolakes' (1988 cited in French et al.,1995) concluded that his inability to understand the article was not due to his lack of comprehension skills, but rather his lack of prior knowledge. Herber & Herber (1993 also cited in French et al.,1995) confirms that limited background knowledge to link to new information hinders comprehension. However, French et al. (1995) also points out that prior knowledge cannot compensate for other difficulties in the reading experience such as a poorly written text. The results of research done McKeown, Beck, Sinatra, & Loxterman (1992 cited in French et al., 1995:179) suggest that “background knowledge is only useful when if the text is coherent enough to allow the reader to see the connections between text information and previous knowledge”.

Good readers “**employ self-questioning strategies to aid in attending to and comprehending text** [my emphasis] (French et al., 1995). Marzola (1988 cited in French et al., 1995:182) mentions that in order to make meaning “good readers actively interrogate the text, monitoring their understanding by asking themselves questions and clarifying their comprehension before, during and after reading”.

A good reader is characterized by French et al (1995) as someone who can **read critically and make inferences; summarize texts** [my emphasis] –this involves the ability to extract the main idea; and **actively monitor their comprehension** [my emphasis] when difficulty is experienced. Readers may be alerted to difficulty when they realize that their reading does not make sense or when they do not recognize what they perceive to be valid language patterns. According to Garner, Alexander & Hare (1991 cited in French et al., 1995:184), this “active, meta-cognitive, monitoring of comprehension has come to be recognised as a requirement of a good reader.

Pearson (1993) calls the reader a “builder,” constructing meaning by taking the raw stuff of the printed page, comparing, contrasting, and filling it with knowledge, and creating a personal understanding. In making these inferences and restructuring material in the text with material already in the memory, readers learn with texts.

Sometimes, readers capable of employing these strategies may still be confronted with reading difficulties when reading and learning from texts. Allington & Strange (1980) divided difficulties in learning into two groups: problems based in the learner and problems based in the texts. They listed difficulty of textual material that exceeded the reading level of the learner as one of the top four problems that was encountered in their analysis of reading difficulties.

With specific reference to science textbooks, the Mallinson studies (cited in Wegerhoff, 1981) dealing with reading difficulties in science textbooks concluded the following:

- The reading levels of many science textbooks are too advanced for whom they are written;
- The differences between the levels of reading difficulty of the easiest and the most difficult textbooks in any area of science are significant;
- In some science books, while the average levels of reading difficulty seem satisfactory, there are passages that would be difficult even for college students;

- Many science textbooks contain non-technical words that could be replaced with easier synonyms;
- The levels of reading difficulty within textbooks vary greatly

Gillard (1975) also notes that often illustrations such as diagrams, tables or graphs can increase the problem of comprehension in that most science texts assume that learners can use them.

Langhan (1993), in his study with Grade 3's concluded that the most significant finding was that learners were unable to read the textbooks intended for them because the language of the textbook was too difficult, and textbook tasks and exercises were beyond the learners' ability because they were expressed in incomprehensible language and were conceptually too difficult.

The ability to be a good reader is an assumption that underpins C2005 and the new role it proposes for learners. In the light of this and given the language and reading situation in South African schools (as outlined in Chapter 1), it places even greater demands on learners, unless reading instruction and reading skills are taught with the seriousness it deserves. Apart from that, it seems that educators need to make a concerted effort to choose their texts with care and textbook writers need to write with more insight, as much of the evidence provided points to learners experiencing reading and learning difficulties because of poorly written texts, difficult language and texts that are above the reading level of the learner. From the literature it seems that these three reasons are but a few of the factors that affect and shape the way learners engage with texts.

The next section focuses on the readability of texts and discusses how this aspect impacts on learners' engagement with texts.

2.5 READABILITY OF TEXTS AND RELATED STUDIES

A factor more directly involved in learners' engagement with science texts in particular (which is also the focus of this study), is readability and as such, demands a place in this review.

Readability refers to all the factors that affect the success in reading and understanding a text, such as interest and motivation of the reader, legibility of print and the complexity of words and sentences in relation to the reading ability of the reader (Johnson, 1979 cited in Wegerhoff, 1981)). In essence readability describes the ease with which a text can be read and understood.

Research into the readability of textbooks in USA began during the 1920s. This research emerged from two main sources:

- **Vocabulary Control Studies:** which focused on vocabularies that would be most effective for learning to read from reading textbooks. In particular, researchers studied “new words” in each book, the amount of times they were repeated, and their difficulty. These studies concentrated more on primary level textbooks.
- **Readability Measurement:** surfaced out of a concern for the comprehension difficulty of content area textbooks. Research in this area focused on the readability and “comprehensibility” of texts and materials for middle (Grades 4 – 7) and upper grade (Grade 8 – 12) students.

Investigations in both the above areas were concerned with the fact that primary readers and content texts were too difficult for the students for whom they were intended (Zakaluk & Samuels, 1988: 3). Chall (in Zakaluk et al., 1988) is of the opinion that the impetus for the first readability studies came from teachers who reported an unusual number of technical terms in junior high school science textbooks. They intimated that the study of the subject necessitated acquiring a scientific vocabulary, rather than the learning of scientific facts. She hypothesized that readability research began when it did (1920's) as a result of the changing high school population. More and more students who would ordinarily have only completed elementary schooling were now starting to further their education by attending secondary school. The academic backgrounds of these “new students” may have differed from the earlier secondary school population in that they were probably the first of their generation to attend secondary school, as opposed to the earlier student population who came from homes where a culture of institutionalised learning prevailed. Seemingly, research into readability was grounded in the changing

social conditions where researchers felt that learning would be more effective if students had easier textbooks. Their aim as researchers was to see that the education philosophy at the time, which was to “*provide education to all*”, was being adhered to (Zakaluk et al., 1988: 4).

Over the last twenty years, American and European studies have highlighted mismatches between primary school content-subject textbooks and the linguistic and cognitive competencies of the children for whom they were intended (Langhan, 1993: 2).

As early as the 1920's, the readability of science textbooks has been tested in the United Kingdom. Harrison (1980) in a study of readability in specific subject areas, stated that there is no curricula area in which materials received more scrutiny from readability formula as that of science (Harrison, 1980: 125). Klare (1963) summarized over twenty research studies that were reported before 1960. The findings have been fairly consistent: Science textbooks are “to dull, too difficult and too unstable in their difficulty level from one section of the book to another” (Harrison, 1980: 125).

Studies by Rader and Powers in the mid-1920's already sang the song that would still be relevant years later: science books had an unwarranted level of vocabulary difficulty, and biology was the biggest culprit (Harrison, 1980). This claim has been echoed by William Graham (1978 cited in Harrison, 1980), writing in the *School Science Review*, and it was supported in the Effective Use of Reading Project's research. The team found that the science materials collected at the first year of high school level (11,5 – 12,5 years) had a mean reading level of 13,5 years. Some teachers who were interviewed by the team reported that children had great difficulty in coping with science texts and as a result the teacher placed less emphasis on independent learning.

In USA, Chall, Conard and Harris (1991) did extensive research based on the study of textbooks from 1980 to 1989. They were particularly interested in aspects of texts that contributed to the ease or difficulty of understanding what is read. Their investigation included surveys of publishers' views about suitable reading level, teachers' views about

suitable reading level, an analysis of content textbooks, uses of textbook in classrooms and student and their textbooks.

Leading textbook publishers were surveyed in an attempt to gain insight into how decisions about text difficulty were made. Eighty-four individuals representing 34 publishing companies responded to a mailed questionnaire. Publishers rated suitable reading level as central in the development of elementary and high school textbooks. This factor was more important than cost, choice of personnel and physical features of the book. It was rated as less important than content and the treatment of issues such as ethnic and minority representation and topics of a sensitive nature. Publishers reported using readability formulas and vocabulary lists as measures of reading level difficulty as well as relying on their subjective judgements and on the judgements of school personnel, subject matter experts and those responsible for marketing. Field-testing of books on the student population was reported on by only a few. It was found that publishers' ideas about suitable reading level were influenced by both the book's content and by student reading achievement levels. Another finding was that high school textbooks tended to be relatively easier for the grades for which they were intended and also easier according to the students' tested comprehension and subjective judgements of difficulty.

In the same study, 227 teachers and curriculum specialists were surveyed in the same way. The questions asked of them paralleled those asked of publishers and revealed similar results. Both groups considered suitable reading levels to be very important and used objective and qualitative measures as the means of evaluating it. One-third of secondary teachers and two-thirds of elementary teachers mentioned testing a book's difficulty with learners. Overall, both publishers and teachers expressed similar views on suitable reading levels of books for different subjects and different student reading achievement levels. The researchers suggest that this strong similarity may be an indication that publishers are indeed aware of teachers' views and model their products to fit them.

Of the various books analyzed (reading, social science, science), the science textbooks tended to be the most difficult. This, according to the researchers (Chall et al., 1991) stemmed from the use of a high load of specialized and technical vocabularies found in it. They suggested that perhaps this was due to the fact that as the grades progress, textbooks contain more worldly knowledge and more abstract, literary and technical words and ideas. It is also assumed that in the earlier grades, reading as a skill was sufficiently taught for it to become a tool for learning, and posed a question that summed it all up: "Are schools and publishers putting too much emphasis on the immediate learning of content and too little on developing the higher levels of reading needed for a post-secondary education and for life in a high-technology, high-information age?" (Chall et al., 1991)

The same study revealed that while publishers claim that their books are being developed for a wide audience, or for more able or less able readers, in actual fact they were mainly suitable for the middle range of achievement within each grade. Hardly any of the content textbooks seemed to be the written for the learners in the lowest quartile in reading. Also, books that were labeled for less able readers were found to be more difficult than those labeled for a wide audience or for more able readers. Hence, the suggestion to use easier textbooks on the same topic for below-average readers proved to be invalid, as they seemingly did not exist. While it is also suggested that teachers rewrite sections of the required texts on a lower reading level, these researchers were of the opinion that apart from this being a time-consuming exercise, it is unrealistic as it is extremely difficult to simplify texts, while at the same time keeping the content similar and accurate.

Very little research in the area of readability has been undertaken in South Africa. In the early 1980's, Wegerhoff conducted a readability evaluation of junior secondary physical science textbooks in what was previously referred to as Cape Education Department Schools. By using the Fry Readability Graph and the Flesch Reading Ease Formula, he measured the readability of 11 physical science textbooks (4 -Grade 8 level; 4- Grade 9 level; 3-Grade 10 level) and tested 2837 learners from 13 English medium high school with cloze tests which were drawn up from selected pages of the same physical science

textbooks referred to above. He concluded that while the aim of the textbook is to contribute to independent learning or unsupported study as a way of consolidating or preparing, it most certainly is not fulfilling its role. As such, this needs to be seriously examined: their language demands were too great and the study skills of learners too inadequate; authors appeared to be inconsistent in the level of language used in the textbooks.

Ronald Good (1977 cited in Wegerhoff, 1981) expresses the most pressing problem:

“Many textbooks and materials that have been developed for science instruction assume a level of thinking that is not available to many or, in some cases, to all children in a given classroom.”

Wegerhoff suggested that learners experience difficulty in reading and understanding because the jump from primary school to high school is a big one, and assumed that the task of bridging the gap was given to young, inexperienced and/or insufficiently qualified teachers. Hence he emphasized the need for suitably written and well presented textbooks at this level. He further stated that since it was the teacher who should bridge the gap between the language of the textbook and the learners' personal language experiences, the aim of the science syllabus should contain a reference to the need for instruction in the language of science and be incorporated into the teacher-training programme. He suggested also that teachers reappraise the way in which they use textbooks and recognize the weaknesses in the link between reader and book. He made a strong case for science teachers to be teachers of reading. Today we find, that learners are still experiencing difficulty in reading and understanding science texts. The scope of this study is hoping to illuminate particularly learners' perceptions of what makes reading engagement a meaningful experience for them. If this is the case, however, then teachers (who are ill-prepared for OBE) and expectations and demands made of learners with C2005, makes the educational arena both tension-filled and challenging for both learners and teachers.

Macdonald (1986 cited in Langan, 1993) was among the first South African researchers to draw attention to the particular problems facing black higher primary education. Most

of her research was at the level of the then Std 3, now known as Grade 5 and focussed on learners whose mother tongue was not English. From Grade 5 on, these learners receive instruction in English only for all subjects. After three years of formal English instruction, it is assumed that learners have received sufficient instruction in English for them to cope in an English-only medium classroom. Her research showed that the performance of Grade 5 learners in content subjects is inhibited in part by an inability to deal with English texts, and instruction through the medium of English. In her study of General Science textbooks for Std 3 learners, McDonald reported that the quality of textbook that learners are expected to use is likely to cause learning difficulties in that it is the first time these learners are exposed to expository texts. Apart from the fact they have not yet mastered the language, they are faced with “chunks of unfamiliar vocabulary in textbooks that are badly constructed” (Langhan, 1993; 3).

Langhan (1993) conducted an extensive investigation over a three-year period in the Transkei, Ciskei and Eastern Cape schools. His evidence suggested that teaching and learning difficulties with geography in Grade 5, experienced by teachers and learners whose first language is not English, were largely due to inappropriate prescribed textbooks that are difficult to read and comprehend.

Part of his motivation for this study stemmed from South African research findings that reflected a great deal of consensus about the fact that “if linguistic and cognitive foundations are not adequately laid and properly developed in primary school, there will be a mismatch between learners’ competence and the demands of English medium secondary schooling (Langhan, 1993: 1). This would also have serious implications for the use of textbooks as a tool for independent learning.

The findings highlighted the following:

- the absence of continuity in the transition from mother tongue to English medium instruction,
- learners’ low level of English competence,
- the mismatch between content subject textbooks and the users, and

- a heavy reliance on rote learning.

Interviews with the teachers revealed that textbooks were a major source of difficulty due to the fact that in the junior primary phase learners were not expected to use textbooks, nor were they supplied with them. Hence, learners entering grade 5 were overwhelmed when for the first time in their experience they received a separate textbook for each content subject. As a result, learners were unable:

- to locate pages in textbooks when asked to do so,
- to find exercises or sections referred to by the teacher,
- to understand subject-specific vocabulary and most importantly,
- unable to read the English of the textbooks with understanding.

Langhan's investigation also provided evidence that a further source of difficulty was that the teachers themselves experienced reading and comprehension problems with textbooks.

In the same study, it was revealed that many of the curriculum and syllabus designers were out of touch with the child's reality and were ignorant of and insensitive to the need to prepare the child linguistically and cognitively for the transition from junior primary to higher primary. Textbooks, for example, lacked the readability necessary to enable learners to engage meaningfully with texts. This was due to a variety of reasons, of which the following are but a few:

- Textbook writers were either unaware or incapable of creating readable texts for ESL primary school children,
- They produced texts giving no insight as to whether they recognized or understood the nature of the language problem facing learners and teachers,
- Publishers showed little or no concern for the usability of their product; and
- Subject specialists (who approve or reject publishers submissions) were guilty of not acquainting themselves with the situation so as to ensure that reader and text are compatible,

- Seemingly, inspectors, subject advisors and those with knowledge of the classroom were ignoring the realities of the primary school situation by approving inappropriate textbooks.

The evidence shows that a mismatch between the readability of textbooks and the reading levels of learners has always existed. One reason for this mismatch can be attributed to the fact that textbook writers and publishers are unaware of the prevailing conditions in the classroom. One of the gaps in the research that this study proposes to address is particularly the learners' perspective on what enables them to engage meaningfully with texts. While some of the literature alludes to the fact that there are many factors that affect the readability of texts, the evidence shows that they have failed to take into account perhaps two of the more important aspects that shape learners' engagement with texts, namely, vocabulary and prior knowledge (Langhan, 1993). Two other role players that are also directly responsible for the way in which learners engage with texts are teachers and the learners themselves. Teachers need to be careful of the way in which they select texts and engage with them in the classroom. Learners, on the other hand, rely on their reading abilities to comprehend texts, and a lack thereof, will result in misunderstandings and misinterpretations. From the evidence provided on readability studies and given the nature of a subject like science, which is riddled with subject-specific terminology, it seems that there will seldom be a perfect match between the readability of texts and the reading level of the learner. However, teachers and writers should be wary of this and should be duty-bound to select and produce texts that fall within the realm of the learner's cognitive level and life experience as far as possible.

2.6 EVALUATION OF TEXTS AND RELATED STUDIES

The discussion on readability above, implies that teachers and those involved in the writing of textbooks become more sensitive to the factors most likely to affect the readability of texts in particular and the reading process in general. While teachers may not be expected to undertake such elaborated evaluations, they need to develop ways and means of evaluating and analyzing texts appropriately. The discussion below on various ways of analyzing texts, which include the use of readability formula and discourse

analysis, is useful in that these forms of evaluation can form a basis from which textbook writers and teachers operate.

Texts can and have been evaluated both subjectively and objectively. A subjective evaluation would involve a reliance on the judgement of teachers and what they think the students require. Objective evaluations may involve the use of readability formulas. They can assess the material and generally assign a grade level to denote the reading level of the text. Much controversy exists about the validity and correct use of the readability formulas. Young and Riegeluth (1988) criticized readability formulas as being instruments which writers use to create texts with “short, choppy sentences... often monotonous and boring”, but at the same time acknowledge that they are better than nothing. Chall, Conard and Harris (1991) confirm this by saying that using readability formulas to rewrite text was a practice that had been discouraged by readability researchers as early as the 1920's. To apply formulas in this way may have produced texts that lack organization and cohesion. Chall et al., (1991: 107) warn that it is important for users of formulas to understand that they were developed to measure text difficulty, not act as guides for writing.

Young and Riegeluth (1988) are amongst many who feel that it's not the formula itself which is inaccurate, but rather the misuse of it that causes problems and they promoted an analysis termed “discourse analysis” which is a subjective, but rather lengthy analysis of textual material.

In defence of readability formulas, Klare (1963) explains a formula as a “means of rating a piece of writing after it has been written”. Fry (1989) gives testimony to the validity of readability formulas by listing some of the predictive measures of the formulas which include: comprehension assessed by multiple choice questions and cloze passages, oral eye reading errors and eye-voice span. Fielding (1990) goes further to say that choosing a formula can be an issue since they vary from the quick and easy Fry to the less traditional nomograph. In validation research, the Dale-Chall formula “has been found to be the best in studies on both sides of the Atlantic (Harrison, 1980: 60), probably because it is

supported by the argument that vocabulary is the most important factor in reading difficulty (Fielding, 1990), but is the most complex and time-consuming to work out.

Klare (1974-75, in Fry 1989), on the other hand, has stated “unless the user is interested in doing research, there is little to be gained from choosing a highly complex formula”. While it is acknowledged that these evaluation procedures may have been misused, they do provide an indication of the levels of difficulty of and within texts.

Chall, Conard & Harris (1991) evaluated texts using a variety of indicators to see how difficult they actually were and whether they offered a range of reading levels appropriate for the differences in abilities of learners in each grade. The indicators were:

- Readability level (using the Dale-Chall readability formula, 1948);
- Complexity of questions asked, based on 4 levels of questions for judging the difficulty of questions in textbooks. (Level 1 = recalling of facts; level 2 = summarizing main ideas and describing processes; Level 3 = making comparisons of different points of view; and Level 4 = justifying and supporting answers);
- The extent and kinds of illustrations (type of illustration, how often they appear and for what purposes; and
- An estimate of overall cognitive demands (estimated by the stage of reading development required to read and comprehend a sample of the text).

The Grade Eight sample evaluated by Chall et al. (1991) consisted of seven science books: They included two for a wide audience, two for below average readers and three for above average readers. The results of the readability analysis showed that five of the seven science books scored one band above grade level (9-10) and one book scored two grade bands higher (11-12). One book was on grade level (7-8). A shocking discovery was that the books scoring the lowest and the highest were the two designated for below-average readers. Overall, these books offered a range of reading difficulty from 7th to 12th grade. All of these textbooks averaged at least one illustration per page. Charts and diagrams were the most common type of illustration, with some photographs in between. The questions in the books designated for wide audiences and below average readers

were factual, while the science books for above-average readers shifted towards more inferential type questions. There was also a tendency for books meant for above-average readers to have more illustrations than books meant for below-average readers.

Walpole (1999: 366) suggested that a quick way to examine the challenges of text format, in particular, is to ask learners to write a summary of a small section of the text. If learners were able to provide a logically structured summary, it would be an indicator that they were making sense of the text, either because they were “excellent comprehenders of information or because they have a well-structured store of background knowledge about the subject of the text”. Another method suggested by Walpole (1999: 366) to assess children’s needs and their understanding of the text was to interview them by asking 3 simple questions: What is that? Why did the author put it there? And how can you use it? She evaluated children’s knowledge about features in textbooks based on 3 categories: strategic (they knew what the thing was and when and how to use it); emergent (they know what the thing was and had partial knowledge of how to use it) or none (they knew neither what the feature was nor how to use it). She reported to have found a strong relationship between this contextual knowledge and measures of reading comprehension and also mentioned that while this method provides a richer source of data on the knowledge and skills that children bring to the text, the interviews were more time-consuming.

In his evaluation of physical science textbooks (mentioned earlier), Wegerhoff (1981) made use of the Fry Graph for estimating readability. In his study, he found that the Grade 8 science books were written at the appropriate level of language. However, the range of reading level from one book to the next, as well as reading levels from one part of a book to another part of the same book were between 9 and 19 years, meaning that learners were expected to deal with a wide range of language expectations.

The Grade 9 readability formula results also displayed an acceptable level of readability, as long as the books were “teacher-supported”. Again, as was the case with Grade 8, some books exhibited a wide range of reading levels (up to 20 yrs in some cases). While

the Grade 10 readability formula results also demonstrated an acceptable readability level, it disguises intra-book variations in readability. Because these learners were more able intellectually, reading and comprehension skills would not have been as problematic as it would have been for the Grade 8 and 9 learners.

Langhan (1993) on the other hand, was not in favour of using traditional readability formula for assessing the readability of texts intended for young ESL readers, because they do not, according to him, take into account what he considers to be the most significant factors affecting the reading process. He lists the following points as examples of the kinds of factors readability formula exclude:

- Syntax and complexity of sentences, unusual positioning of sentence components and number of dependent clauses.
- Word frequency, inference, cohesion devices, coherence and logical presentation of ideas, author's style, inherent difficulty of subject matter.
- Complex socio-psychological factors such reading purpose and background knowledge, and the cognitive processes at work when students read texts.

He pointed out that readability formulae were developed for the assessment of first language texts and were not in fact designed to be used on second language English texts. Young and Nuttall (1989 in Langhan 1993) report that South African publishers tend to use the Fry Readability graph (if they use any readability formula) in the grading of their texts. He states further that in an informal interview with members of the editorial staff of two of South Africa's main textbook producers, they mention that they do not use such sophisticated techniques, instead they rely heavily on an "intuitive sense" of readability levels.

He therefore chose to analyze his texts using another form of assessment – discourse analysis- to assess the readability of expository texts. He looked at text-based factors most likely to affect the reading process: vocabulary, syntax, cohesion, coherence and text structure, based on the discourse properties proposed by Lanham (1990 cited in Langhan 1993). These discourse properties included important aspects such as

accessibility of background knowledge and supporting information, thematic coherence, informational fullness and explicitness, avoiding obscure reference, establishing concepts before applying them, such as subject-specific terms, and providing semantic support for unknown vocabulary, and overall coherence and logical relations.

By using these properties, the textbooks analyzed by Langhan (1993) revealed that they were incomprehensible mainly because they failed to account for the intended readers' linguistic and conceptual threshold levels, and because they failed as well-constructed expository discourse.

While I understand the limitations surrounding readability formulae, for example, that it only focuses on the text and does not take the reader into account, they serve a useful purpose in providing some evidence of the discontinuity between learners' reading levels and readability of texts. And when used in conjunction with another form of text evaluation such as discourse analysis, allows for more conclusive evidence on the readability of texts.

2.7 MAKING USE OF TESTS TO DETERMINE READING AND COMPREHENSION LEVELS

In addition to analysing the readability of texts and in attempting to examine the discontinuity between texts and clients (learners), a number of researchers also proceeded to test learners' comprehension by using cloze procedure testing. They were then able to find a correlation between the readability of texts and the comprehension levels of learners on that same text. I will discuss two such studies below, after providing a short explanation of cloze tests and their origin.

Cloze procedure testing was first introduced by W.L. Taylor in 1953, to describe a new method of testing comprehension (Harrison, 1980: 84) and is based on the concept of closure in Gestalt psychology. The Bullock Report (1975 cited in Rye, 1982: 1) describes Cloze Procedure as *the use of a piece of writing in which certain words have been deleted and the learner has to make maximum possible use of context clues available in*

predicting the missing word. The scores for cloze tests were derived at in the following way: In three studies involving 300 children, Bormuth and Rankin (1969 in Rye, 1982) tested learners using a multiple-choice test and a cloze test based on the same passage to assess learners' understanding of that passage. The results of these two tests were compared and they concluded that:

- If a learner answered 90% of the multiple-choice questions correctly, the learner was said to be able to read and comprehend the passage without help, classifying them at the **Independent Level**. In a cloze test, this would be equivalent to 61 – 100%
- If the learner obtained 75%-89% of the multiple choice questions correctly, the learner was said to be able to cope with the language, but needed teacher or adult guidance to understand the passage more fully. Such learners were classified at the **Instructional Level**. In a close test, this would be equivalent to 41 –60%.
- If the learner obtained less than 75%, s/he was said to read at the **Frustration Level**. It meant that the language was too difficult for the learners to cope with and would fail to make satisfactory progress even with the help of a teacher. This would be equivalent to less than 40% (Rye, 1982:19).

What such tests examine is the “extent to which the reader can predict from the surrounding context the words which the author wrote (Harrison, 1980:85). In other words, a cloze test measures what a reader brings to the passage in terms of prior content knowledge. Wegerhoff (1981) pointed out that some of the advantages of cloze tests were that the learner was being tested with material used in the classroom, and hence unlike readability formulae, cloze tests had the capacity to measure more than just sentence length and number of words. They drew on the comprehension process in action, by not delaying questions until after the fact and provided a way of examining the readers' ability to process the author's language.

The results of the cloze tests in Wegerhoff's study for Grade 8 and 9 showed that none of the learners, when using any of the four books, fell into the “independent” level of instruction. They all fell into the instructional and frustrational levels of reading.

Of significance is the fact that the Grade 8 and 9 textbooks from which these tests were adapted were found to be at an appropriate language level. Grade 10 learners showed a marked improvement in reading abilities, probably because of the select nature of the learners involved (all learners chose to do physics on the higher grade, whereas in Grade 8 and 9, learners had no choice of subjects because they followed a generic curriculum which included science). For what its worth, 3 of the 13 schools in his study exhibited an overall independent level of reading. Wegerhoff (1981) did not specify whether these were first or second language speakers of English which could be a contributing factor for them having fared so poorly.

As part of their research reported on earlier, Chall, Conard & Harris (1991) conducted tests on learners (elementary and high school) to see how well they understood the books they used and what they thought about the way they are written. Two hundred and thirteen learners participated in this part of the study- 162 elementary students and 51 high school students. The main concern of the researchers was to see whether learners could read and comprehend the books they were using. To assess comprehension, cloze tests were administered, developed from their reading, social science and science textbooks. The construction of the cloze tests involved the deletion of every tenth word from passages taken from various books. The results of the close tests indicated that for most grades and subjects, the better the readers (on standardized tests), the better they understood their books (on cloze tests). The 4th, 6th and 8th grade findings were similar: the higher their reading ability, the better learners comprehended their textbooks. Learners were also asked to judge the difficulty of their textbooks (too hard, too easy, just about right) and to describe their preferences. Overall, it was found that learners were reasonably astute about the textbooks they read. They knew with a fairly high degree of accuracy, which were too easy, too hard, and which were just about right. These judgements seemed to be influenced by the readability of their books as well as by their ability to understand them.

The tests of students' understanding of their texts revealed that the text's difficulty was related to what they learned from the text.

The evidence reveals that it is perhaps not good enough to test only readability of texts without having an idea of what the learner brings to the text. The South African Schools Act (1996) has afforded everyone the opportunity to attend the school of their choice. Thus, at any given school in South Africa today, one class may consist of learners from diverse cultural and language backgrounds. As such, every learner brings to the text their own mother tongue, culture and life experience. Whereas previously, if a learner was in a class where the medium of instruction was English, teachers confidently assumed that English was the home language and mother-tongue of those learners. Today, this is no longer the case and teachers need to take cognizance of this. While learners may choose to be in an 'English class', it does not necessarily mean that that is their first language. As far as texts go, it therefore becomes important for the language of the text as well as the level of the language of instruction to be informed by the learners' mother-tongue, amongst other things, given the changing classroom profile. If the diversity of cultures and languages prevalent in one classroom is not going to be taken into account, it places even more limitations on things like readability evaluations and cloze procedure tests.

2.8 THE USE OF TEXTBOOKS WITHIN A CHANGING CONTEXT

The new role of the textbooks and learning support materials under C2005 discussed earlier highlights the fact that textbooks on the whole are in need of a makeover in order to accommodate the new curriculum and to promote the over-arching policy of the state. This section briefly examines how changing times brings with it changing texts and the implications thereof for learners and teachers.

Although not much research has been done to show how educators make use of the textbook in the classroom, the extensive investigation by Chall et al. (1990) sheds some light on the subject. They found that textbooks served as the primary tool of instruction in the majority of classrooms observed. In their observations, they also identified three approaches to textbook-use that are outlined below:

Directed –Lesson Approach. The teacher guided learners' reading throughout the lesson. Before reading, the teacher explained new or unfamiliar words. During reading,

the teacher asked questions and elicited explanations from learners about information and concepts presented in the book. After reading, the teacher helped the learners to summarize their reading and asked more questions to review what had been learned.

Study-Skills Approach. The teacher assisted the learners to gather and organize information from the textbook. The teacher did not guide the reading as such, but asked leading questions before the book is read. After the reading, the teacher explained to learners how to order the information they had read by outlining and summarizing etc. Most times the lesson was discussed in class, but completed as homework, with the textbook being the major learning resource.

Multiple-Resource Approach. Teachers using this approach did not rely on the textbook as the principle instructional tool. They used a variety of resources in addition to the textbook – lectures, audio-visual material, hands-on experience. Selected pieces from the textbook were assigned as homework and then discussed in class. The teachers' questions were designed to check on what had been learned, rather than to guide the learning.

In the same study, the tendency to use one, single textbook was evident in both elementary and high schools, although secondary teachers were more likely to use supplementary materials as well as texts. The most glaring differences between elementary and secondary classes were the way in which textbooks were used. Most teachers used the direct-lesson approach where they spent a considerable amount of time instructing learners how to read and gather information from textbooks. Elementary teachers used the textbook to develop reading skills as well as teach content. Teachers of eighth-grade classes and of more able readers in the lower grades (4th and 6th) followed a study-skills approach for teaching science, encouraging learners to extract information by identifying the organizational features of the textbook. Some science teachers emphasized the learning of content and followed a multiple- resource approach in which films, lectures and textbooks were considered important. Learners who found the textbook too difficult were expected to learn the material through these other means (Chall et.al, 1991).

These researchers concluded that the publishers, teachers and learners that were surveyed all considered suitable reading level to be of utmost importance when it came to students learning from texts. They added that these views are in line with the accumulated research findings on text difficulty of the past 70 years. While this research was conducted more than 10 years ago, all of these approaches are still being used in one way or another in most South African schools.

For South Africans, what *has* changed though, is the entire education system. The birth of C2005 has brought with it changing roles for learners and educators, which in turn means changes in teaching approaches. The most visible of these changes has been the new-look textbook. According to Walpole (1999), content area textbooks have changed over the years from dull, boring texts to books that are visually attractive and appealing, with a wide variety of text type, illustrations and diagrams which complement and extend the text. She feels that changes in texts should be coupled with thinking about how learners comprehend these texts, and as such, it perhaps becomes necessary for teachers to change the way they give instruction in the content areas. Comprehension she said, no longer constitutes finding, answering and recognizing. It is more about building understanding, both of a particular text and of the more global concepts around which it is built. It is an “active and demanding process, especially when children are reading to learn new and difficult concepts” (Walpole, 1999:358). In her article on comprehension demands of new science textbooks, Walpole (1999) states that it therefore becomes necessary to examine texts in the way they are used in the instructional context, so that teachers can design comprehension instruction that bridges the gap between the demands of the texts and the needs of the learner. She examined changes in the “Addison-Wesley” science series for the third grade by selecting a textbook published in 1992 (a good traditional textbook) and one published in 1995 (a good new textbook) by the same authors. Several fourth grade learners assisted her and they compared and contrasted two chapters.

The new (1995) type of textbook offered children more choices. Should they look at the pictures before or after reading the captions? before or after reading the running texts? In what order should they navigate the page? The fourth graders involved in this study took

full advantage of these choices, however, each child omitted something very important that the page offered. For example, some never read the chapter or lesson titles; some skipped some of the pictures; one of the children started at the end and made good use of pictures and captions, but missed the running text. The fact that the children took advantage of these choices may be a good thing, but it may require specific instruction as children begin reading informational materials in order to learn new things. Choice, she said, may increase interest and attention, lead to more active thinking during reading and help children to meet new ideas more flexibly and interactively. She points out that these changing texts have serious implications for instruction in view of the fact that the order and structure of ideas in the text affect the understanding that children build. Children have a difficult time restructuring new ideas, and that new science textbooks rely on integration of information presented in print and pictures. Hegerty, Carpenter and Just (1991 cited in Walpole, 1999:365) examined the demands of interpreting diagrams in the comprehension of science texts and found that interpreting the illustration and the text together was more complex than interpreting text alone. With this in mind, Walpole points out that it is more important now than ever before for teachers who teach science also teach the page, and in that way build the bridge between the child and the text. This then, has major implications for educators as well as learners. Not only do they have to deal with their new roles and different teaching strategies, they are forced to acquire new skills to stay abreast of the comprehension demands of the new textbook. Some of these skills may involve assimilating others' ideas, reasoning with expository print, learning to study independently and applying specific skills in specific situations that differ from subject to subject (Bishop, 1982).

Over and above the demands placed on teachers and learners in fulfilling their new roles as envisaged by C2005, changing texts will place even more demands on them. In the words of Potenza & Monyokulu (1993: 244), the challenge facing policy makers, curriculum and teacher developers, and producers of learning materials is to co-ordinate their work and provide accessible ways of translating C2005 into practice. To return to the main focus of this study, if what Potenza (1993) says is taken seriously, it may begin to iron out some of the problems encountered by learners in engaging with texts.

Summary

This chapter has provided evidence to show:

- that as a result of the South African Schools' Act (1996), classrooms have become culturally and linguistically diverse. As such there is a tension-filled space between learners' home language or mother-tongue and the medium of instruction which needs to be bridged for the Schools' Act to realize its goal of equal opportunity for all.
- that OBE and C2005 face enormous challenges, given the new role expectations of learners and teachers as opposed to their roles under the previous education system.
- that the use of readability formula, alone, as a means of evaluating the readability of texts is not sufficient, and perhaps should be done in conjunction with another form of text evaluation, such as discourse analysis, so that the strength of the one method can be supported by the weaknesses of the other.

Very little evidence exists that investigates how the multilingual and multicultural nature of the classroom may affect the language of texts. Nor is there much evidence to show how teachers bridge the gap between the demands of texts and the needs of the learner. While much of the evidence points to the use of testing and text evaluations as a way of matching learner to text, there is very little evidence surrounding learners' perspectives on how they make meaning from texts.

My main contribution to this study is to provide that learner perspective by obtaining personal contributions from learners themselves on how they make meaning of texts, a critical component missing from the literature. This will be done together with an analysis of texts using both readability formula and discourse analysis, as well as testing learners' reading and comprehension level to gain a holistic picture of the factors affecting learners' engagement with texts

3 RESEARCH DESIGN

This chapter reviews the procedures used in the study to investigate the readability factors that shape learners' engagement with science texts in Grade 8.

The aim of the research design was to shed some light on the way in which the investigation was conducted and the procedures undertaken during the course of the study. It intended to investigate the readability factors that shape learners' engagement with science texts by examining:

- The proficiency of learners' reading versus the readability science textbooks in Grade 8;
- Factors that contribute to learners' ease or difficulty in engaging with science texts;
- Factors that educators and publishers take into account when selecting and writing material.

3.1 METHODOLOGY

This study drew on both qualitative and quantitative approaches.

Quantitative research implies the application of measurement or a statistical approach to the issue under investigation (Brannen, 1995:85). It explores situations from which numerical data can be obtained and is associated with the process of enumerative induction. One of its main purposes is to discover how many and what kinds of people have a particular characteristic which has been found to exist in the sample population (Brannen, 1995: 5).

In contrast, qualitative research is often viewed as the micro-perspective that relies on evidence gleaned from individuals or particular situations and explores characteristics of individuals and/or settings that cannot be easily described numerically (Brannen, 1995). Information is largely verbal and collected through observation, description or recording (Charles, 1995:21). Qualitative methods have been associated with analytic induction

meaning that categories, themes and patterns come from the data (Janesick cited in Denzin & Lincoln, 1994). With the inductive approach to data analysis, observations are made and recorded in no order of importance (Scott & Usher, 1999). The collected data is not grouped into predetermined categories, but rather “what becomes important to analyze emerges from the data itself, out of a process of inductive reasoning” (Maykut & Morehouse, 1994:127).

Rossmann and Wilson (1991 cited in Miles & Huberman, 1994) suggest three reasons for linking qualitative and quantitative data:

- to enable confirmation or corroboration of each other via triangulation;
- to elaborate or develop analysis, providing richer detail; and
- to initiate new lines of thinking, “turning ideas around”, providing fresh insight.

Denzin & Lincoln (1994) uses the term “triangulation” to describe the combining of research strategies and views it as a means of enhancing the validity of conclusions that could be realised about the data. This study utilizes *methodological triangulation*, which is the use of multiple methods to study a single problem, in that it drew on both qualitative and quantitative methodologies. It also falls within the realm of *data triangulation* that Denzin in earlier studies describes as “the use of a variety of data sources in a study” (Janesick cited in Denzin & Lincoln, 1994), in that it drew on data collected from learners, teachers and publishers.

The use of multiple methods are also endorsed by Cohen & Manion (1994: 233) who refer to it as the multi-method approach and are of the opinion that the use of two or more methods of data collection explains more fully the complexity and richness of a situation by studying it from more than one standpoint. They add that exclusive reliance on one methodology may distort or bias the researcher’s picture of the particular phenomenon under investigation. This approach to research is also approved by Flick (1998:259) who suggests that the different methodological approaches complement each other in the study of an issue in that the weaknesses and blindspots of one method can be compensated for by another. He adds further that while qualitative and quantitative methods are viewed as

complementary, both methodologies remain autonomous as they operate side by side; their meeting point being the issue under study.

In this study the two methods complemented each other in that the quantitative approach provided the statistical data necessary for me to determine where learners were at in terms of reading proficiency, while the qualitative approach helped me to determine what *contributed* to their present reading levels and as such, provided a deeper understanding of the factors that influence learners' engagement with texts. Hence, the weaknesses of the one method were supported by the strengths of the other.

3.2 SITE AND SAMPLE SELECTED FOR THE STUDY

3.2.1 Site

This investigation was conducted at a high school located in one of the older, more settled areas of Mitchell's Plain situated on the Cape Flats. The school has a population of 1350 learners and a staff of 42 teachers. Being a teacher at the school made it possible for me to gain easy access to the number of learners needed to qualify for the study, and made it convenient to conduct interviews with teachers. The school itself is surrounded by four to five primary schools that serve as feeder schools to the high school. Every year the school enrolls approximately 300 new Grade 8 learners. At the time of the study, it was the first year that secondary school teachers were exposed to the outcomes-based method of teaching. Primary schools had also only just recently adopted outcomes-based education a year earlier. As such, both primary and high school teachers were not quite familiar or comfortable with this new approach to teaching. With just a few workshops to guide the way, many teachers felt ill-equipped to take on the task. This led to many interpretations of the concept and at times lots of confusion. As the year reached its close, many teachers felt that they had still not mastered the OBE style, but were able to understand part of the process.

3.2.2 Sample

At the school, there were seven Grade 8 classes. Because this study sought to examine English speakers' engagement with texts, only the English medium classes were selected

for inclusion in the sample. While it may be true that some second language speakers of English may have been present in these classes, teachers made the overriding assumption that their first language and home language was English. The total sample at the beginning of the investigation was 214, but due to learners missing one of the four tests given as a result of absenteeism, the sample was reduced to 196.

This particular group of Grade 8's used in the investigation was the first to experience the outcomes-based approach to teaching as a group of Grade 8's, but were in their second year of exposure to OBE on the whole, having been introduced to it in Grade 7.

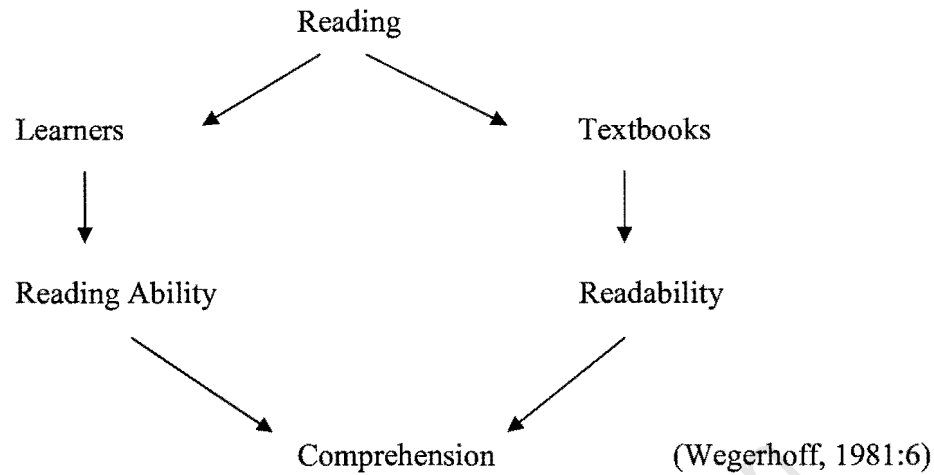
At the time of the investigation, learners were not in possession of any textbooks because the school was unable to provide them with any due to a lack of financial resources. Teachers drew on resources from a number of textbooks, library books, newspaper and magazine articles and passages from these sources for the purpose of designing a note (handout) for the learner to use independently as a point of reference in the absence of a textbook or a teacher.

3.3 DATA COLLECTION TECHNIQUES

It was obtained from five sources:

- standardized reading tests
- cloze procedure tests
- text analysis
- learner questionnaires
- interviews with educators and publishers.

The investigation aimed to analyze both sides of the readability equation:



3.3.1 Standardised Reading Tests

Three standardized reading tests were employed to ascertain the reading ages of the learners. All three tests were used to give validity and reliability to the investigation and used as a comparative measure to ensure that there were no major discrepancies with regard to the outcomes of the tests. While I acknowledge the flaws regarding testing as described later in the limitations of the study, the tests were used as a basis for understanding the context and learner population in which the study was located. These included the D Young, GAP and Macmillan reading tests.

D. Young Reading Test:

This is described as a group-reading test that can be used on learners with a chronological age of between 7 years to 15 years 11 months as a group-reading test. It was devised by D Young in 1969, and is classified as a spelling and reading test.

[See Appendix A]

The test itself is divided into two parts each with their own preliminary practice examples. The first section consists of 15 picture-word matching items and learners are expected to complete this in 4 minutes. The second section consists of 30 sentence-completion items. Choices are provided for the completion of the sentence. Learners are expected to complete this section in 9 minutes. The marking of the test ignores the

division between the pictures and the sentences and only one mark or score is assigned to each complete test. The raw score is obtained by marking items that are incorrect, stopping at the tenth incorrect item. Ten is then subtracted from the last number crossed to obtain the learners' score. Once the raw scores have been obtained, they can be converted to reading ages from the table provided.

217 learners participated in this test that was carried out during the English period. The entire process was administered by a teacher/facilitator who provided the learners with the necessary instructions. All the participants completed the test within the allocated time.

GAP Reading Test:

The GAP test is an example of comprehension test. The common practice with this type of test has been to offer the learner a number of alternative words. The learner is then required to choose the one that makes sense in context very similar to the second part of the D Young test. [See Appendix B]

The GAP test arose out research into the readability of books and was based on cloze procedure tests in which words from a passage are struck out at random. It was devised by Dr John Mcleod, Deputy Director of the University of Queensland, Remedial Education Centre. The readability of the test was defined by the ease with which a reader can supply the missing word. The GAP test however differs from this style in that it leaves a blank for the learner to construct his/her own response. It was described in the U.S. Journal of Reading (April 1966 cited in Unwin, 1970) as the first published test using a modified cloze procedure technique in a standardised instrument for measuring reading comprehension. Bormuth (1967 cited in Rye, 1982) states that cloze procedure tests "have proven to be valid measures of comprehension and are decidedly more reliable when compared to conventional multiple choice tests. The test itself presents a series of seven short passage of writing with certain words omitted and as mentioned above, learners have to construct their own response. A response is considered correct based on the criterion of the response of "good readers" (Pumfrey, 1977). The test is

suitable for learners with a chronological age of 8 years – 12 years. A marking key based on a comparison between the learner and the expert reader accompanies it. There are a few items where alternatives to those included in the marking key appear to be reasonable, however it is emphasized that unless a word is included on the marking key as correct, it should not be credited. The context of the text were ones that these learners could identify with, hence there was no need for adaptation. Once the test has been marked and the raw score obtained, a table is provided to establish the learners reading age.

210 learners participated in this test. As with the D Young Test, it was administered by a teacher/facilitator during the English period, who explained the procedure to the learners at the start. Although a time limit of 15 minutes is given, more than 80% of the learners completed the test well within the time.

Macmillan Group Reading Test

This test assesses a learner's ability to use contextual clues to complete a sentence. It also tests a learner's vocabulary and functional reading level. The test is similar to the D Young reading test in that it consists of 48 sentence-completion items, 7 of which are picture-matching items. [See Appendix C]

The difference however lies in the fact that this test is recommended for use on Grade 7 and 8 learners. One mark is allocated for every correct answer. As with the GAP test, after the raw score has been obtained a table is provided which enables one to convert that score to a reading age.

213 learners participated in this test, which was administered in the same way as the previous two tests and learners were expected to complete it in 30 minutes. Two forms, A and B were used to prevent copying. The teacher/facilitator read through the instructions and practice examples with each class. The practice examples are included in the final score. Learners completed within the allocated time.

3.3.2 Cloze Procedure Testing

A cloze test was conducted to gain insight into the way learners read and understand (i.e. comprehend). Learners received a note (hand-out) adapted from a page in a textbook from the teacher that was used to carry out the cloze test. A copy of the cloze test and the handout is provided to show how the teacher adapted the passage for classroom use. [See Appendix D and E]. As described in the previous chapter it involves completing sentences in the selected passage. Every 10th word was deleted and learners had to replace it with the exact word that was removed. In scoring, only exact word replacement was counted as correct.

Prior to the test, the teacher/ facilitator together with each class read through the instructions with explanations given where necessary. There was no time limit to the test, however, most learners completed within 20 minutes.

For the purpose of this research, once the learners' work was marked, scores were converted to percentages; the following criterion bands below were used, based on the works of Bormuth (1968) and Rankin and Culhane (1969 cited in Fry, 1982). Learners were not provided with choices. A score of:

- below 40 placed learners at the frustrational level
- between 41 -60% placed learners at the instructional level
- between 61 – 100% placed learners at the independent level.

[These levels are defined in Chapter 2]

3.3.3 Learner Questionnaires

Immediately after completion of the cloze test, learners were asked to fill in a questionnaire concerning the passage they had just worked with. The aim of the questionnaire was to find out how the learners made sense of the texts that they receive in class. The first three questions were based on the actual text. They were: What important thing did you learn from reading the passage; How easy or hard was this passage for you to understand; What makes you say that? The questions that followed were based on notes/hand-outs received in class in general. They were: What do you like or dislike

about the hand-outs you receive in class; What makes you say that; What would you do to make it better for you to learn from. [See Appendix E] These questions were asked to get some idea of how learners perceived texts, and what factors shaped their engagement with texts.

3.3.4 Text Analysis

Two forms of texts analysis were employed:

- The use of readability formula, and
- The use of discourse analysis to analyze texts

Application of readability formula

Five Natural Science textbooks and the passage used in the cloze test were analyzed for readability using the Fry Readability Graph. The textbooks were:

- *Journeying into Science Natural Science Grade 8, 2000, Roedurico Trust, Goodwood*
- *Science Matters Grade 8, 2000, Cambridge University Press, Cape Town*
- *Science Spectrum, Grade 8, 2001, Maskew Miller Longman, Pinelands*
- *Steps into Science, Learner's Book Grade 8, 2000, Nasou, CapeTown*
- *Natural Science, Grade 8 Learner's Book, 2000, Shuter & Shooter, Pietermarizburg*

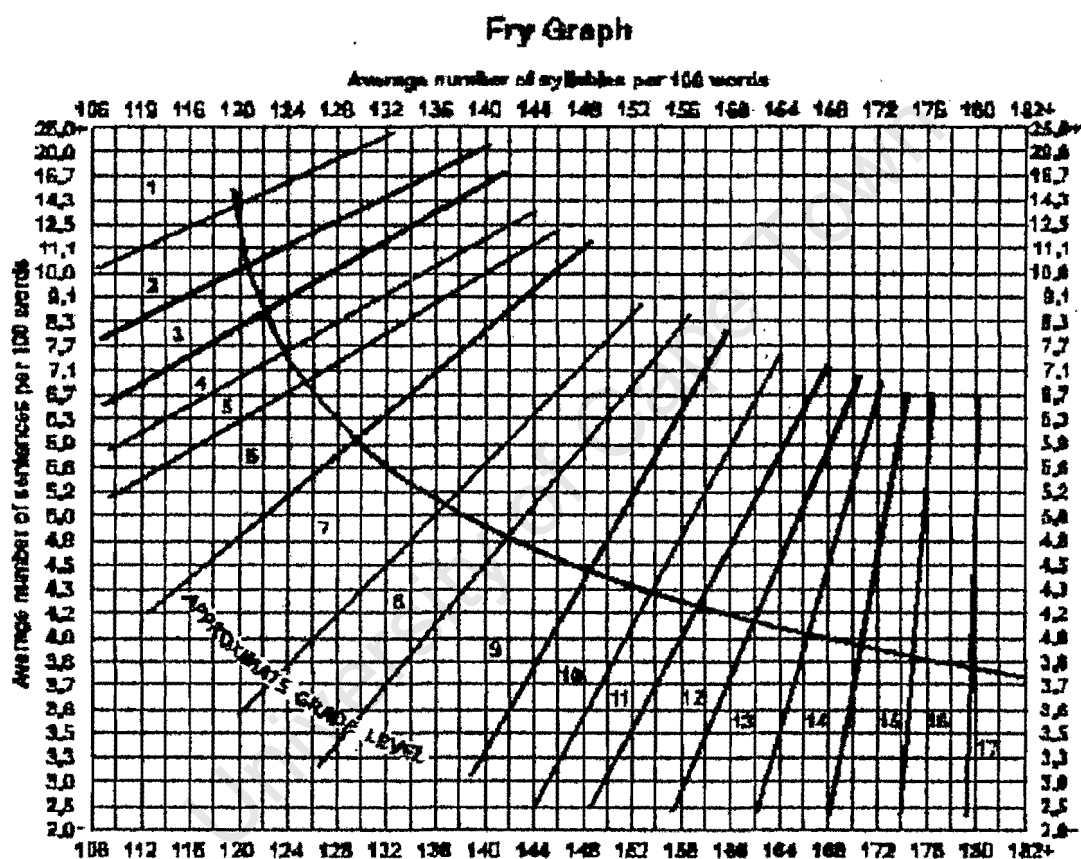
These textbooks are but five of the many textbooks and other resources used by the interviewed teachers to develop their own material and worksheets. Occasionally, teachers would change the wording of the text they intended to give to the learners or add something extra to the text such as a diagram, but generally it was used as is. Three passages per textbook, including the passage used for the cloze test were assessed using the Fry method, making it a total of 16 passages altogether. The passages were 100 words long.

Directions for using the Fry Readability Graph:

Three 100-word passages were selected from each book (beginning, middle, end).

For each passage, the number of sentences were counted, calculating the length of the last sentence to the nearest tenth. The number of syllables per 100-word sample were counted. These two values were plotted on the Fry graph where sentence length represents the y-axis and number of syllables represents the x-axis. The point at which the two lines intersect, gives the appropriate grade level, to which 5 must be added to give the approximate reading age level.

An example of the calculations carried out for a 100-word sample is as follows:



If the sample of 100 words consists of 156 syllables and 5,2 sentences, the grade score from the graph = 10. An amount of 5 is added to the grade score, giving the passage a reading level of 15 years. Because South African learners start school at the age of 7, the average age of a Grade 10 learner is 16 years. As a result an extra year needs to be added onto this amount to make it suitable for our purposes.

Analysis of texts using various discourse properties

In addition, besides the sixteen textbook passages evaluated by means of the readability formula, six were selected and examined according to the discourse properties. Because of the difficulty involved in analyzing the discourse of a 100-word passage, I chose to analyze the whole page of which the 100-word passage formed a part. What counted in my favour was that in the textbooks used for this purpose, one topic was conveniently covered on one page. Where the topic spilled over to the next page, this was taken into account. As such, I examined everything the writer brought to the topic and the page in terms of. expository text, diagrams glossaries etc.

This discourse analysis was based largely on the work of Langhan (1993). He analyzed textbook passages in terms of the properties of expository discourse affecting readability and comprehensibility based on the work of Lanham (1990 cited in Langhan, 1993) mentioned in Chapter 2. The following discourse properties were used in order to guide and inform my analysis:

- Accessibility of background knowledge
- Logical relations
- Informational fullness and explicitness
- Establishing concepts before applying them
- Providing semantic support for unknown vocabulary
- Diagrams and its purpose
- Interest and relevance to the learner

Any other observations dealing with readability and comprehensibility that I have not mentioned here, but which impact on readability, will also be reported on. The selected passages are included in Appendix F.

3.3.5 Interviews

The three teachers of Natural Science that were responsible for teaching the participants in the study were interviewed concerning their selection of texts and their methods of dealing with texts in the classroom.

Four people involved in the writing process (three authors and one publisher) were interviewed about the readability factors that they take into account when writing.

I had a set of questions that I wanted to use for the interview. Fontana & Frey (cited in Denzin & Lincoln, 1994) call this 'structured interviewing' and refer to "a situation in which the interviewer asks each respondent a series of pre-established questions". It was important for me to ask the interviewees the same questions in order to get a sense of their considerations in selecting and writing texts, but in the process other interesting points were raised pertaining to the study that I chose to explore. As such, I did not strictly adhere to the original questions.

Structured interviews are regarded by Scott & Usher (1999: 109) as an alternative to the use of questionnaires in that "scope is provided for the elucidation of responses" and adds flexibility to the process by allowing the interviewer to "frame and reframe questions", thereby ensuring that the interviewees interpret the questions in the same way, and be more certain that respondents do in fact understand what they are being asked.

As such, the interview technique was used over a questionnaire because "interviews make it possible to explore in greater detail and in depth some important aspects" (Verma & Mallick, 1999: 122) that questionnaires are not able to do. The aims of the interviews were to:

- describe existing conditions with regard to learning support materials in the classroom and how it was used in the classroom.
- reveal any evidence relating to science texts and textbooks as a likely cause of difficulty for learners.
- ascertain what factors get taken into account in the selection and writing of materials for learners at a particular level,
- how text difficulty was determined with regard to reading levels of texts, and
- whether or not any particular criteria was adhered to when writing and choosing materials.

3.4 CONFIDENTIALITY AND ETHICS

A professional code of ethics is beneficial as a guideline that alerts researchers to the ethical dimension of their work, particularly prior to entry (Punch in Denzin & Lincoln, 1994). The basic ethical principle governing data collection is that no harm should come to the respondents as a result of their participation in the study (Oppenheim, 1992). This view is reiterated by Verma & Mallick (1999: 146), who feel that because children and schools play a large part in the lives of educational researchers, their obligations begin with them, and it is important that children especially, be “protected from any ill-effects that might result from a proposed study”. All data must be treated as confidential, in that only the researchers will have access to them and steps must be taken to ensure that no information will be published without permission (Oppenheim, 1992: 104).

As such, the name of the school in which the study was based was withheld. In addition, the results of the reading tests were recorded in such a way that the participants remained anonymous. Responses involving interviews undertaken were recorded in such a way that the interviewees remained unidentified. If a participant’s response placed him/her at risk for whatever reason, that response was not included in the final analysis.

This research was being conducted to shed light on a particular aspect of the educational process at play in South African schools with the aim of advancing education in general. It was therefore not written in a way that could harm, cast blame or find fault with the participants.

This researcher was committed to reporting truthfully and openly on the emerging trends or outcomes of the investigation and as such did not manipulate data. All data was reported on exactly as obtained and no data was withheld or changed.

The teachers who assisted with testing, learners and writers involved in this research were accurately informed of the task at hand and were given the assurance that their names would be kept confidential.

3.5 DATA ANALYSIS PROCEDURE

Overall, the data analysis procedure intended to:

- describe data clearly;
- bring to light differences, relationships, patterns;
- answer research questions

Once the three standardized reading tests were administered and marked, learners were placed into reading-age group categories based on the results on these tests. The results of the three tests were tabulated and compared.

For the cloze test, once the results were obtained, learners were classified and grouped into the frustrational, instructional and independent level of reading. A comparison was made between these results and the reading test results to see how they correlated.

Two forms of text evaluation were conducted, namely, a readability text analysis using the Fry Graph for estimating readability, and discourse analysis, using certain aspects of discourse analysis mentioned earlier. The results of the readability formula and discourse analysis were matched with learners' chronological age for that grade and their reading age as obtained from the reading tests.

Learners' responses to the questionnaire were analyzed in terms of their perception of texts and factors affecting their engagement with texts. These responses were recorded and emerging trends, themes and patterns were identified.

The interview data was transcribed and exact responses were preserved as far as possible. Common responses of both educators and publisher/writers were identified and then compared for similarities and differences. Emerging trends and patterns were identified and reported on.

3.6 LIMITATIONS OF THE STUDY

Only one school was used in the study, therefore the sample size, while adequate, was not sufficiently varied. As such, the sample size allowed for no generalizations to be made.

While the study was conducted with classes where the medium of instruction was English, the home language of the sample is an unknown factor.

No structured interviews were conducted with learners; only questionnaires were used to obtain responses.

No observations were undertaken to actually see how learners engage in class and what teachers do in the classroom to mediate between text and learner.

While readability formulae, like the one used in the study, are quick and easy to use in determining the levels of difficulty of a book, it fails to take into account the learner. Nor does it consider meaning, semantics and syntax of the passage. As such it cannot be the only factor in deciding whether a book is readable or not.

While it is recognised that testing children's reading ability serves as a diagnostic tool, Rye (1982:30) cautions that even the most complex of reading tests sample only a limited range of reading skills and types of reading material. He points out that tests only measure how a particular person does at a particular time and place under particular conditions. Given the fact that some people are better at doing tests than others, and that the same person's performance on the same test may vary dramatically according to time and place, claims that "Mary has a reading age of 10years 6months" should be treated with extreme caution (Rye, 1982).

The shortcoming of cloze tests is that they essentially measure the learner's ability to make an educated guess. If the learner is a poor guesser his/her ineffectiveness to complete the blanks may be due to other possible problems such as lack of comprehension or an inability to decode. In addition to comprehending a passage,

learners must still be able to produce a language and Wegerhoff (1981) makes the point that language production is not comprehension.

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4 RESULTS

While the main focus of this research was to investigate the readability factors shaping learners' engagement with science texts at Grade 8 level, I also found it necessary to investigate the reading and comprehension abilities of the learners in this study. The results of this smaller investigation within the bigger investigation served as a backdrop against which the readability of science texts could be better understood and analyzed. It seemed the logical route to take as both of these factors (learners' reading abilities and readability of texts) play a significant role in shaping learners' engagement with texts. Taking this into consideration, the aim of the investigation was thus twofold.

Firstly, it intended to determine the proficiency of learners' reading and the readability of selected passages from certain Grade 8 science textbooks with the view to gaining an understanding of how wide a gap might exist between learners' reading proficiency and the readability of science textbooks in Grade 8. Proficiency of learners' reading was obtained via a series of standardized reading tests as outlined in Chapter 3, while the readability of science texts was evaluated using a readability formula and certain aspects of discourse analysis, also outlined in Chapter 3.

Secondly, and more importantly, the main study attempted to ascertain which readability factors shaped learners' engagement with science texts and contributed to learners' ease or difficulty in engaging with these texts. It also attempted to ascertain which readability factors educators and those involved in textbook writing take into consideration when selecting and writing material.

The results are presented in two parts. Part A reports on the results obtained from three tests that tested the reading ages of the learners, the cloze procedure test, and the text analysis (readability formula and discourse analysis).

Part B reports the findings of the main study and lays emphasis on the interrelationship between text evaluation, learners' perceptions of texts and factors that shape their engagement with science texts in general as well as the responses of educators and

publishers/writers to questions of processes and procedures involved in selecting and writing material.

4.1 PART A: TESTS

This section gives an account of the quantitative component of the investigation, viz.

1. results obtained from the 3 standardised reading tests viz.
D Young, GAP, Macmillan;
2. results of the cloze procedure test
3. application of the readability formula to selected passages, and
4. discourse analysis of selected passages.

4.1.1 Reading Tests Results (D. Young, GAP, Macmillan)

The aim of the three reading tests was to find out the estimated reading ages of the learners and to compare it to the readability of Grade 8 science textbooks used by the educators in this study. The average ages of these learners were between 12 and 15 years.

It must be emphasized that these results indicate the *estimated reading ages* of the learners participating in the study. Unwin (1970) cautions that once-off, isolated reading tests can only give limited information and for it to be of any value, regular testing needs to be done. Rye (1982) echoes these sentiments in stating that many teachers tend to treat the results obtained in reading tests as being an accurate measurement of a child's reading ability, however he warns that one must understand the potential weakness of any test for it to be of value. This researcher recognizes and acknowledges the limitations surrounding such testing. However, its aim was to provide an approximate indicator of where learners are at in terms of their reading levels at the time of the study and was not intended to disadvantage the learner in any way. To this end, it serves its purpose well.

Table 1 below indicates that learners' results for the first two tests were consistent, in that the majority of learners obtained a reading age of 10years-10years 11months for both tests. For the third test the evidence shows that their reading age dropped one notch to 9years – 9years 11months, reflecting a weaker outcome. It would seem, from the results that the chronological age of most of these learners far exceeds their estimated reading

ages in these particular tests, given that the chronological age of these learners ranged from 12 – 15 years.

Table 1: Results of 3 Reading tests taken by Grade 8 learners in classes where English was the medium of instruction

Reading Age Obtained	TEST 1 (D Young)		TEST 2 (Gap)		TEST 3 (Macmillan)	
	No. of learners	%	No. of Learners	%	No. of Learners	%
7 - 7.11	19	9%			17	8%
8 - 8.11	43	20%	13	6%	43	20%
9 - 9.11	59	27%	65	31%	67	31%
10 – 10.11	96	44%	88	42%	44	21%
11 – 11.11			30	14%	18	9%
12 – 12.11			14	7%	19	9%
13 – 13.11					3	1%
14 – 14.11					2	1%
No. of participants	217		210		213	

What is striking about these tests is that only 11% of the learners were reading at the appropriate level expected of them in Grade 8. This figure was obtained from Test 3 (Macmillan) where the percentages for the last three reading-age categories were added, as the ages of the participants of the study fell in this range.

4.1.2 Results of the Cloze Test

For the purpose of this research, scores were converted to percentages. The results were graded into three levels of reading based on the works of Bormuth (1968) and Rankin and

Culhane (1969) cited in Rye (1982). The levels are explained in Table 2 outlined below and at the same time cautions that scores obtained by learners are not absolute.

Table 2: Definition of reading levels

<u>% obtained</u>	<u>Level</u>	<u>Explanation</u>
Less than 40%	Frustrational	Language was too difficult for the learners to cope with and would fail to make satisfactory progress even with the help of a teacher.
41 – 60%	Instructional	Learner was able to cope with the language, but needed a teacher or adult guidance to understand the passage more fully.
61 – 100%	Independent	Learner was able to read and comprehend the passage without help.

(Rye, 1982:19)

The cloze test had 18 answers. The percentages were obtained by converting the learners' mark out of 18 into a percentage. For example, if the learner obtained 9 out of 18, it would be the equivalent of 50%

196 learners participated in this activity and the results are represented in Table 3 below.

Table 3: Results obtained by learners in the cloze procedure test

No. of learners	% obtained by learners	Level of reading
3	11%	
17	17%	
22	22%	
28	29%	
37	33%	
* 34	39%	
Total: 142		Frustrational level of reading = 72,5%
26	44%	
12	50%	
Total: 48		Instructional level of reading = 24,5%
5	61%	
1	67%	
Total: 6		Independent level of reading = 3%

With specific reference to the 34 learners who obtained 39%, Rye (1982) is of the opinion that because a learner obtained 39% (indicated with an asterisk in the table), it does not mean that the particular passage was too difficult for them to read. This might be more the case with a score of 33%, however, “a score of 39% should be used to alert the teacher to possible difficulty, rather than use it as a means of eliminating that choice of book altogether” (Rye, 1982:20).

Notwithstanding, it would seem that the majority (72,5%) of these learners fell within the frustrational level of reading. These results seem consistent with the reading tests results, which revealed that approximately 89% of the learners in the study seemed to be operating within a reading age of between 9 years and 10 years 11 months. These results provide an interesting and useful backdrop in understanding the main study where learners expressed what factors enabled meaningful engagement with texts.

4.1.3 Results of the Readability Formula

Passages from the following books were used to complete the readability tests.

Book 1: *Journeying into Science, Natural Sciences, Grade 8, 2000, Roedurico, Somerset West*

Book 2: *Science Matters: Senior Phase, Natural Sciences Learner's Book Grade 8, 2000, Cambridge University Press, Cape Town*

Book 3: *Science Spectrum, Grade 8, 2001, Maskew Miller Longman, Cape Town*

Book 4: *Steps in Science, Learner's Book Grade 8, 2000, Nasou, Cape Town*

Book 5: *Natural Science, Grade 8 Learner's Book, 2000, Shuter & Shooter, Pietermaritzburg*

Table 4: Application of the Fry Readability Graph to selected passages
from Gr 8 science textbooks listed above

Bk 1	Passage	Sentences	Syllables	Grade Score	Reading Level
	A – p.31	7,5	163	10	16yrs
	B – p.122	6,2	139	11	17yrs
	C – p.219	6,6	154	9	15yrs
	Cloze Activity passage	7,6	147	7	13yrs
Bk 2	A – p.25	6,8	165	11	17yrs
	B – p.67	7,3	141	7	13yrs
	C – p.120	7	183	17	23yrs
Bk 3	A – p.20	5,4	159	11	17yrs
	B – p.113	6,8	141	7	13yrs
	C – p.129	8,4	143	7	13yrs
Bk 4	A – p.10	5	157	11	17yrs
	B – p.89	8,2	146	7	13yrs
	C – p.150	7,5	150	8	14yrs
Bk 5	A – p.19	8,5	134	6	12yrs
	B – p.58	8	157	9	15yrs
	C – p.106	9,7	155	8	14yrs

From the data displayed above, two trends are evident. Firstly, it seems that each book displays a wide range of readability levels, which implies that learners are often faced

with a wide range of linguistic expectations. Secondly, only 50% of the selected passages were appropriate for Grade 8 learners. While I understand that certain passages may have a high grade score due to the use of many multi-syllabic words, this raises a few pertinent questions. For example, how do learners who are operating primarily at the frustrational level of reading, engage meaningfully with texts beyond their perceived 'ability' to cope? And, what linguistic and other abilities do learners require to engage meaningfully with texts? None of the texts go below the chronological age of the learners, which seems to suggest that textbook writers are making two assumptions. Firstly they are assuming that very few learners are reading below their expected reading level, and secondly, that most the learners for whom they write are first language speakers of English (as these learners reading ages and chronological ages are more or less the same). It also raises the question (while this is not the focus of this study) of how home language and the language of instruction might impact on learners' engagement with texts.

4.1.4 Results of Discourse Analysis of Selected Passages

Of the sixteen texts used in the readability test, six were selected for discourse analysis.

The following criteria were used in the analysis:

- Accessibility of background knowledge and supporting information;
- Establishing concepts before applying them especially with regard to subject-specific terms;
- Providing semantic support for unknown vocabulary
- Logical connections
- Informational fullness and explicitness
- Diagrams and its purpose
- Interest and relevance to the learner

The books and passages were:

BOOK	PASSAGE
<i>Journeying into Science</i>	The Water Cycle: p.31
<i>Science Matters</i>	Food around the world: p.67
<i>Science Spectrum</i>	What causes tides: p 113
<i>Steps into Science:</i>	Forces between particles: p.10
<i>Natural Science</i>	HIV infection: p.58
Cloze Procedure Passage from Book 1	Rainfall: p.22

A detailed analysis of each passage is included in Appendix G. The general trends emanating from this suggest that four of the six passages were appropriate for learners in Grade 8 in terms of the criteria used.

While all the passages required learners to draw on background knowledge in one way or another, three of them (2,4,5) provided enough supporting information in terms of diagrams and explanations for learners to engage with the passage meaningfully. Two of the passages (1,7) assumed a great deal of prior knowledge in that concepts crucial to the understanding of the topic, and accompanying diagrams were not sufficiently clarified. One passage, while it demanded background knowledge to a lesser extent, is accompanied by a visual explanation that complemented the expository text, thus providing a clearer understanding of the topic under discussion.

In three of the passages (2,4,5), terms and concepts that the writer thought might be problematic to the learners' understanding of the topic were immediately explained before or after use. Apart from the explanation, one passage also provides a glossary for new terms on the same page, thereby reinforcing their meaning. The other three passages (1,3,6) provided very little in the way of establishing concepts before or after their use in the text.

In four of the six passages, the language of the text appeared to be manageable for most learners at the age. The writers provided concise explanations that are to the point written

in an easy, conversational style. Words (not subject –specific terms) that writers thought may be unfamiliar to learners were semantically supported by explanations in the text, glossaries, or explanations in brackets after use. In two of the passages (1,6), the language of the text appeared to be problematic for learners in Grade 8, depending of course on the extent of the reader’s vocabulary. No semantic support was provided in the text for words such as ‘intervention, aloft, humid’ that I thought might be outside learners scope of vocabulary.

In four of the passages, the writers tended to assume very little about what the learner brings to the text. As such, these texts appear to be explicit and logically connected giving them the necessary informational fullness for the reader, thus enabling a more meaningful engagement.

Five of the six passages provided diagrams as supporting information to the main text. Of the five, only one seems to be problematic in that it contains two terms (percolation and transpiration) whose meanings do not appear in the text or on the diagram, and yet are two of the answers in an activity that followed.

Only two passages (2,5) were written in a way that made it relevant for learners. In one passage (3), the topic dealing with how tides occur is an interesting source of information for learners because the majority of them (in the Western Cape, anyway) are familiar with the phenomena of tides.

Apart from the two passages (1,6) from the same textbook, the analysis of the other four passages suggests that in some cases, writers are making an effort to make texts more meaningful for learners to engage with. This is evident from their use of diagrams as supporting information, glossaries either on the page or at the back of the textbook, interesting facts in ‘did you know’ boxes, the use of simple language to clarify concepts and providing relevance where possible. However, it seems that writers are not consistent in their consideration of their target audience and therefore raises questions about how writers consider learners in the writing process. They seem to be moving from the

premise that learners are able to read for meaning and that their chronological age is equivalent to their reading age. A major consideration would have to be the linguistic diversity of learners who find themselves in classes where the medium of instruction is English. Very little evidence exists with regard to this and very little evidence points to factors that assist learners in their engagement with texts. By getting responses from the learners themselves, the main part of this study proposes to identify a few of the factors that help learners to engage with texts in a more meaningful way.

4.2 PART B: MAKING MEANING OF TEXT: VIEWS OF LEARNERS, TEACHERS AND TEXTBOOK WRITERS

This section gives an account of the findings of the qualitative component of the study viz. the factors shaping learners' engagement with texts, and the responses of teachers and publishers/writers concerning the selection and writing of material.

In particular, from the learners, I was interested in what features or characteristics of texts made it easy or difficult for them to make meaning. From the teachers and publishers/writers, I wanted to know how they decided on the suitability of science texts in general and how teachers assisted learners in engaging with these texts in the classroom.

The results are reported on in two sections. Firstly an analysis of the factors shaping learners' engagement with text is presented and secondly, the recommendations made by learners to improve texts are reported on.

4.2.1 Factors Shaping Learners Engagement with Texts

What follows is an analysis of the responses from all three groups (learners, teachers, publishers/writers). These are reported on under the themes that emerged as factors shaping learners' engagement with texts.

Regarding the responses from learners, they were asked to comment on how they made meaning of the cloze procedure passage by describing it in terms of "too hard, too easy and just about right". In grading the passage in this way it was revealed that 84% grade it

as “just about right” to understand. What is instructive is that while 84% thought it was “just about right”, 72% obtained less than 40% for the cloze test activity. What this suggests is that a discrepancy exists between learners’ perceived reading levels and their actual reading levels, an interesting result that led me to examine their responses regarding what made it “too easy, just about right or too hard” and why most of them perceived it as “just about right”. Learners were therefore also asked to explain why they described it in that way – what about the text made them choose “too easy, too hard or just about right” and it was from these responses that the themes emanated.

Upon close examination of the data themes emerged that include language, perceptions of ease and difficulty, prior knowledge, role of the significant other, interest and enjoyment, relevance and utility of knowledge, prediction and technical considerations.

Language

By far the most significant factor shaping learners engagement with texts was language. 71% of the participants referred to language as a factor that either helped them in understanding the text or made it difficult for them to engage with it. When discussing language, the following categories emerged: terminology and vocabulary, language usage, interesting features that supported expository texts and technical aspects to language. Each of these categories is reported on separately.

- **Terminology and Vocabulary**

With regards to terminology, some respondents (11%) stated that *“the passage did not contain too many big word which I didn’t understand”* and *“most of the answers were not big words”*, making it easy to engage with the text. On the other hand, learners also expressed difficulty in coping with texts due to terminology used in the text. For example, learners remarked, *“there are a lot of terms I do not understand”* and *“sometimes the terms they use is a little difficult.”*

Many learners (60%) mentioned that *“there are a few big words I cannot understand”*; *“I don’t really know what the big words means”*; *“there are a lot of big words I can’t*

pronounce"; *"It always has big words in it"* and *"It's just that the words are very different to the way we speak"*, which contributed to them finding the text difficult to cope with. When learners referred to these 'big words' they did not specify whether they were subject-specific terms or ordinary English words, hence the category: terminology and vocabulary.

- **Language Usage**

An aspect that seemed to help learners engage better with texts was the way in which language was used to provide them sound explanations. Respondents indicated that they found it easier to cope when *"It gives simple explanations"*; *"the way it explains what's going on, the instructions are well written"* and *"the work is not just given, they explain it as well"* This appears to have helped learners to engage more meaningfully with texts.

At the same time, learners were also affected by the lack of effective language utility. For example, learners mentioned that some of the texts which they received were *"...not clear to understand"*; *"... sometimes it's not easy to understand"*; *"in some notes it's really hard to understand what they trying to tell you"* and *"The handouts are quite difficult until someone explains it to you."* suggesting that clarity and conciseness is key in assisting learners to engage more meaningfully with texts.

- **Interesting features on the page that supported the expository text**

Learners liked it when the page contained interesting features such "did you know" boxes, glossaries and diagrams. Their remarks such as *"What I like is that in the corners of the hand-outs there are 'did you knows' which makes it interesting"* and with reference to glossaries, one learners stated *"...It explains things to you, like if there is a big word on the page, it will tell you what it means"* seems to indicate that they saw it as an interesting diversion, while at the some time it enhanced their understanding.

Teachers and publisher/writers made no mention of either glossaries or 'did you, know' boxes.

Another interesting feature that appeared to be quite popular was diagrams. Many respondents (48%) suggested that texts accompanied by pictures and diagrams proved to be extremely useful in assisting them to engage meaningfully with texts. Not only did it bring some life to the page, it helped with understanding in that *“Sometimes a drawing shown on there makes me understand it better”*; *“...the illustrated diagrams and pictures help you to understand what is being taught”*; *“...it also shows pictures in case you don’t understand”*

What was interesting is that only one teacher respondent referred to the use of diagrams as a criterion for text selection. He said, *“I like a variety of diagrams and pictures to clarify information.”*

The interviews with the publisher/writers revealed that they were very much in favour of using diagrams *“as long as they served a purpose.”* One writer felt that *“the learner must be able to learn through it.”* Another writer respondent was particularly concerned with the scale of the drawings used and said *“It must as far as possible represent the real thing or close to it. If not, I indicate that this particular drawing has been magnified so many times.”*

It appears that all three groups (learners, teachers and publisher/writers) are of the same opinion regarding diagrams – an encouraging finding.

- **Technical aspects to language usage**

In this category three points emerge as aspects that affect learners engagement with text in a negative way. They are *clarity of instruction, information overload and too many concepts on one page.*

When discussing clarity of instruction, 40% of learners meant the way in which language was used to give instructions. With regard to this, learners mentioned *“sometimes the instructions are not clear”*; *“There are no clues for me to understand”*; *“When receiving notes without a clear explanation to what you should do.”*

With regard to information overload, some respondents (6%) complained that *“there’s just too much information”*; *“It’s too much to handle”*.

With regard to overcrowded, cramped pages one learner said *“Most of the time there are too many new things on it and I can’t take it in all at once.”* This suggests that the number of new concepts that appears on one page create a challenge for learners and seems to work against them making meaning.

Writers too, seemed aware of the technical aspects of language usage. For example, *“the introduction of a new term should be immediately followed or preceded by an explanation thereof”*; *“keep sentences short and explanations concise as far as possible”*, providing *“clear instructions”* were some of the considerations mentioned by them when writings texts.

The interviews with publisher/writers also revealed that language was one of the factors that guided their writing. All of them stated that they followed basic grammar and language rules that they thought would make it easier for learners to engage with texts. For example, *“writing in the active voice, not making use of conditional clauses, avoiding idioms, using uncomplicated language.”* were a few of the guidelines used by them to make it easier for learners to understand texts.

Strangely enough, only one teacher mentioned language as a consideration in selecting texts and said that he *“tried to examine the pieces of extracts for length of sentences and how difficult words were dealt with in the text.”*

What is significant is that while learners seem to regard language a major factor shaping their engagement with texts, publishers talked about it very briefly, and teachers hardly make mention of it at all.

Apart from the difficulty and ease experienced as a result of language, many learners complained about the amount of reading they have to do. The following comments are

illustrative: *"we have to do too much reading"; "...the long reading"; "...to much to read"* and *"It is a lot to read."*

These comments seem to suggest that learners are either unable or unwilling to persevere when the 'going gets tough' in order to make meaning for themselves. This may be due to a variety of reasons, one being the perceived culture of non-reading amongst the learner population. One of the reasons for this may be as a result of previous learning experiences where the teacher played a more authoritative role and the learners were allowed to be recipients rather than active engagers. In such environments, the teacher took over a lot of the tasks that learners should have done independently. For example, instead of allowing the learner to read through a text silently, the teacher would read it aloud to the class. As such, the skill of independent reading was never really encouraged. Now that learners are required to work independently more often, with the teacher acting as facilitator, this lack of reading skills becomes pronounced.

Perception of ease and difficulty

One of the more common responses that seemed to make the text easy to deal with was *"because it wasn't too easy and it wasn't too hard."* Sixty percent of the participants, all of whom were either at the frustrational and instructional level of reading responded in this way. Somehow this perception of a combination of ease and difficulty in filling in the missing words, regardless of whether the answer was right or wrong, made learners feel they could cope with the text. Learners, for example stated, *"It's because some are easy and some are difficult"* and *"both easy and difficult in a way."*

When learners felt they were coping, they seemed to continue engaging with the task, whether or not responses were correct as these learners stated *"There were some answers I knew and some I didn't know, so it was okay"; "I found it okay even if I didn't fill in all the spaces, I could do most of it"; "... because I didn't struggle to fill in the answers and I didn't breeze through it either"; "Certain things I could do and certain things I couldn't"* and *"There were things I knew and things I had to think hard for, so I will say it was fair"*.

The perception of 'coping' and not being overwhelmed seemed to enable learners to complete the task irrespective of whether the responses were correct. What this implies is that a combination of familiar and unfamiliar is important. The problematic and therefore the challenge is that it propelled learners into a state of false 'confidence' in that this balance between ease and difficulty made them believe that they are doing okay, when the results reveal differently.

Learners seemed keenly aware of the challenge of the task. Learners seemed to feel that, while they knew something about the content, "*some of the questions were little bit too hard and you had to think*" They seemed to realize that they had to apply their minds because the task required more than recalling information. Learners did not view this as limitation, but rather saw it as a challenge they needed to take up and work through as these comments suggest: "*It requires a bit of thinking and some general knowledge*"; "*All the answers didn't come to mind that easy*"; "*There were two or more times where I really had to think hard*"; "*...because you must use your thinking skills which I used and I know there are still a few incorrect answers*"; "*It made you think a bit*" and "*...a few were a bit difficult where I had to think hard and logically*". Presenting learners with a combination of familiar and new knowledge on the one hand, and the need for them to work in their 'zone of proximal development' as Vygotsky (1962) suggests, seemed to be viewed in a positive manner by learners. What it seemed to do was make learners *think*, as one learner suggests, "*think hard and logically*". It required that learners "*use their thinking skills*", an aspect that suggests active engagement beyond merely reading the words on the page.

So, while for some, the familiarity of the text propelled them into assuming that they knew what the texts were about, for others the unfamiliarity of aspects of the text provided the challenge they needed to meaningfully engage. Interestingly, it was those learners who operated at the independent level who perceived the unfamiliar components as those providing the opportunity for more meaningful engagement.

Prior knowledge

Of the factors shaping their engagement with text, prior knowledge was deemed key by all six learners found to be at the independent level of reading, 8% of learners at the frustrational level and 15% of learners at the instructional level.

Two categories within this theme emerged. They are *familiarity and prior exposure and general knowledge*.

With regard to familiarity, comments such as *"I knew most of what was going on"*; *"I heard most of the terms before"*; *"We done this last and this year"*; *"We did this things before in NS [Natural Science]..."* and *"We did this things with rain already"* suggest that familiarity and prior exposure helped learners to engage meaningfully with texts.

General knowledge, the other emerging category that seemed to influence learners' perception of their engagement, was whether the topic was part of their general knowledge repertoire as the responses suggest: *"because it was things we learnt about and it was general knowledge"* and *"it was work that has been done with us, but also general knowledge."*

Some learners (24%) were also keenly aware that the *lack* of prior or general knowledge or unfamiliarity would make it difficult for them to make meaning of the text. For example, one learner responded *"We did it before and some things I knew, but someone who saw this for the first time, it would be very hard"*. One response provides proof that prior knowledge and life experience exposure play an important role in helping learners to engage meaningfully with texts as the learners states *"It things I did not learn about in my life"* intimating a difficulty in this engagement.

It seemed that because they could make some sort of connection with what they already knew, it made the passage 'just about right'. It also seemed that learners' perceptions were influenced by the fact that they could recall and perceive certain things as familiar knowledge. For example, some said, *"some of the questions I can remember from*

primary school”; “because we did the work and could just think back” and “I did not have to think hard, all I had to do was think back”

What is interesting is that they did not need to ‘know much’ about the topic to engage and perceive it as ‘just right’. According to them, what seemed to be important was that it had a certain sense of familiarity, which put them at ease, and gave them the impression that they understood what they were doing.

When examining the teacher responses, one teacher in particular felt strongly that text should provide learners with enough prior knowledge to understand the concept under discussion. Her comment was *“I focus on the content that I want to bring across because they don’t have that information necessarily and in a lot of cases they need the background information in order to complete the activities that may follow later on.”*

The publisher/writers on the other hand do not make much comment with regard to prior knowledge, except to say they found it difficult *“to make the relevant connections between old and new knowledge.”* Some of the reasons for this might be that textbook writers are slightly removed from the contextual realities of learners such as home language, mother tongue, access to libraries and reading culture, to mention a few, and as such find it a challenge to make those connections.

Role of the Significant Other

The role of a more knowledgeable other in enabling meaningful engagement seemed an important consideration. As one learner commented, *““It was okay because my sir explains it well, but if you don’t have a sir like that I don’t think you’ll understand it that much because usually it’s the same work or words you used in primary school but its formed in all the big words” and “most of the words I did not understand till he explained”*

This response suggests that the role played by the significant other, be it the educator, another adult, or a peer, as well as the way in which texts are dealt with in the class are all influential in helping learners to engage meaningfully with texts.

It would seem that teachers did consider their own role as a significant contributing factor a teacher's response was *"When learners struggle with concepts, this is normally an indication that they have a problem understanding what they've read. When this happens, I don't change the text, rather I provide assistance through extra explanation."*

Enjoyment and interest

Another type of response revealed that learners wanted texts to provide them with a sense of enjoyment. Seemingly, this helped them to engage with it in a more meaningful way, especially when it contained interesting, practical activities. Texts were more preferred when: *"They always have activities which I really enjoy"; "There's always interesting activities to do, I really enjoy it whether I'm working alone or in a group"; "We get a lot of group-work activities, it's fun and we are still learning" and "the facts are interesting to read"*.

From the interviews with teachers, it was revealed that they too were of the opinion that texts should be fun-filled and interesting. One teacher said that he always tried to look for exciting material or activity, especially when introducing a new topic. He said he looked for *"... something interesting and enjoyable about the topic that will capture the attention of the learners. For example, I introduced the solar system and planets by having a discussion on zodiac signs and horoscopes. Once they were interested, it was easier for me to explain the normal, traditional content about that topic, which we thought learners were expected to know."*

Publisher/writers also agreed that material should be interesting, but it appeared that they had the notion that there was a fine line between interesting and relevance. As such, I have chosen to discuss their views on this under 'relevance' in the next theme.

Relevance and utility of new knowledge

Learners' responses also indicated that they seemed to engage better with texts when it taught them new phenomena, but more importantly, when they could see the utility of the new knowledge and its connection to their daily lives. This is illustrated in comments such as *"We learn about things that we did not know..."*; *"The new things we learn makes it fun and exciting"*; *"It teaches us a lot about what happens in science and why the reasons for what happens"*; *"I learn a lot when I read the notes"*; *"We always learn something new and its very interesting"*; *" ... contain vital information"*; and *"I like the fact that you can apply it in everyday life"*. It would seem then that interest in the new knowledge made it possible for meaningful engagement.

The interviews with the teachers and publishers/writers also reveal that relevance to learners' lives plays a major role in their selection of materials. Their responses suggested that some of them try as far as possible to choose relevant material.

One teacher, for example, felt that choice of material should include as much situations as possible that learners could relate to. In his choice of texts he considered the following: *"Is it localized or eurocentric? I like to see a balance and as much relevance to our situation as possible."*

All the publishers/writers interviewed were very concerned about what learners do with the knowledge and information obtained in the texts and how they utilized it. For the most part, they tried to keep the content relevant, interesting and modern, but at the same time challenging. As such they tried to use situations and examples that their target audience could relate to because *"Kids have got to make meaning from it in some way. It can't be chunks of texts that they can do nothing with."*

One interviewee expressed the viewpoint that the most learners see science as a difficult, boring subject and felt that it was important for authors of science books to gain the learner's interest and make it relevant to their lives. The most difficult part of writing, she added, was finding the relevant connections to combine the new with the old because

“... it would be unwise to presume no knowledge as there’s a lot of science out there, people are using science all the time, they just don’t realize it, so it’s like trying to awaken skills that are already there and teaching new skills, but also teaching what’s wonderful about science.”

The general feeling was that if learners were unable to interact with the text and actually apply it, then churning out reams and reams of content was pointless.

Prediction

Critical to making meaning (as discussed in chapter 2:29) is the ability to use cues from the text to make an informed guess. A few respondents seemed able to do so, as the following quotes illustrate: *certain answers I knew and other I just guessed*” and *“I didn’t know everything, I also took a guess now and then”*. It is not clear whether these learners did this by using cues in the text. However, assuming they were, this ability to use what you know to predict what you don’t suggested that some learners were able to make meaning, thereby reading independently. Because only six learners were found to be at the independent level of reading, it suggests that this factor, while it was an option for some, was not used by the majority of the learners in this study, as most of them were found to be at the instructional or frustrational levels of reading.

Ensuring that the material enables prediction through the use of cues in the text, was not mentioned by neither teachers nor publisher/writers, even though it is a critical characteristic of the reading development process.

Technical layout of the page

Technical layout refers to font size, type setting, and general page layout. Learners’ responses suggested that page layout is a factor that affects the way in which they engage with texts.

Positive comments about page lay-out were: *“It’s always set out in an exciting way”*, *“Everything is clear and written nice and big”*; *“The way its set out makes it easier for*

me to understand and study"; *"The layout is easy for us to understand, I don't have to ask my teacher or a friend the whole time."* On the other hand, a number of learners differed in their opinion by remarking that "... the ink is light and the letters are small."; "... the words are not legible."; *"The words are too small."*; *"Sometimes it doesn't come out properly."*

Only one of the interviewed teachers mentioned that the technical layout of the page plays an important role in helping learners to engage with texts. As such, he felt that one should look at format: *"Is it one long text or is it broken up into smaller sections with diagrams or graphs or pictures? "*; *"Does it have headings and sub-headings?"* and Font: *"Is it eye-catching? Does it enhance the text?"*

Two of the writers made mention of three technical aspects to writing and page-layout viz. headings, font size and type setting.

With regard to headings, one writer preferred headings to be structured and logical and was not in favour of using catchy titles as headings because: *"A title like 'flower power' to introduce the structure of the flower won't be understood by learners if they are not familiar with the phrase. Often it's meaning is lost on learners."*

In contrast to this, another writer was of the opinion that there was no harm in exposing learners to ambiguous headings or phrases with double-sided meanings. This writer felt that essentially it is a play on words and so *"if it's lost on them, that's okay, as long as the words are not critical to their understanding."* If they did pick up on the play on words or the double-sided meaning, she felt it might actually help them to understand it better.

Type-setting refers to the number of words on a line. With regard to this, one writer thought it was particularly crucial, especially with reference to the readability of texts. She explained, *"if there are too many words on a line, your eye somehow starts to shift resulting in you losing your place and almost forgetting what you've read. If a line is too*

long, it sometimes becomes difficult to understand and register what was read. As a result, you have to go back to the beginning and reread". Bearing this in mind, she felt that lines should be limited to 10 or 11 words, or approximately 72 characters.

This same writer considered font size to play an equally important role when considering the readability of texts. Letters in various fonts are written differently and according to her, it's not just a matter of choosing a font that looks nice. For example, she pointed out "*certain fonts appear easier to read than others. Other types of fonts slow down one's reading and it was necessary to know which one to use where*". She referred to a page in one of her publications to illustrate her point. The opening paragraph introducing a topic was written in a font that could be read quite quickly. The activity part was written in a font that actually slowed the reader down because "... *when reading instructions you want them to go through it slowly.*" She also pointed out that fonts are especially important in the foundation phase. For example, she explained that "*fonts have open A's or closed A's and its better to use the closed one which is the way the learners [in the foundation phase] will be learning how to write in print.*" As such, choosing fonts should not be taken lightly.

Intuition

From the interviews with the teachers and publishers/writers, it emerged that their decisions concerning text appropriacy, especially in terms of suitable reading level, was based largely on *instinct*.

All the publishers/writers shared the feeling that "*having a sense of what's readable or not comes with experience.*"

This sentiment was shared by one teacher who said "*I decide by feel or instinct whether learners will be able to cope with the language.*" One other teacher explained "*most of the time to my mind, they're able to cope with the material, although there are a few exceptions. I use what I think is manageable for their level and test it on one class. If I find that it's too difficult I change it for the next class, so it's like trial and error.*" Yet

another teacher added, *"Sometimes I purposefully give them something that I know for a fact they won't be able to master, to challenge them and to see what they do with it. Other times I think they would be able to master it."*

In discussing reading and the reading ability of learners, one teacher said that he gauged reading ability of his learners with written work such as tests and assignments. He said, *"this gives me an indication of their reading level, it's easy to see who knows what they're writing or whether they understand what they writing."* Another teacher remarked that he judged good or bad readers by the following: *"Learners who immediately volunteer to read are normally the better readers. Hesitancy to read is normally an indication for me that the learner has a low reading level."* Some may argue that volunteering to read aloud is no indication of whether a learner can read independently and boils down to an understanding of what reading is, that is, – Is it a meaning-making activity or merely an articulation of words?

It is evident from the data that both teachers and publishers/writers have no specific set of criteria for gauging the reading ability of their learners; neither do they have specific criteria for the selection and writing of material. With none of this information available, how can they plan meaningful learning experiences for learners? The fact that so few learners were able to engage meaningfully with the passage in the cloze test (in the first part of the study) is an indication the reading abilities of learners is one of the factors that should guide these choices. Given the multilingual nature of South African classrooms today, writers and teachers are no longer able to assume that because learners are in a class where the language of instruction is English, that the learners' home language is English. They cannot also make assumptions about what background information learners bring to the text, thus they need to make choices about the suitability of texts using a more rigorous process that takes into account a range of factors.

Classroom support

Besides text selection, teachers also helped learners to engage meaningfully with texts in the way they engaged with learners in the class. The interviews revealed that the

techniques employed by teachers when working with texts varied from lesson to lesson, but essentially all of them worked with it in more or less the same way. Sometimes they read it with the class, stressing and explaining certain points. Sometimes they asked individuals to read aloud, while other times learners read on their own. This all depended on how teachers perceived the difficulty of the text. One respondent's comment was *"If it's a short passage they can do on their own I don't worry to read with them. If it's little more difficult, I'll read it with them, explaining the words they don't understand."* All three teachers also indicated that the activities based on the text normally began by them asking questions on what was read to check learners' comprehension. After that they gave instructions and the learners used the text to complete any activities given.

The assumptions teachers are making, seems to suggest that short passages are easy and reading aloud means understanding, while an explanation of the new words, indicates that learners can apply themselves meaningfully, immediately.

4.2.2 Recommendations by learners to improve texts

Learners seemed very clear on what would facilitate engagement in a meaningful way. They made a number of suggestions and recommendations in this regard. Most of the changes they suggest dealt with the language of the text that could be grouped into two categories viz. language changes and technical changes.

With reference to language changes, learners proposed a simplification of terms. Many of the comments suggested that they would improve the texts by *"...by using easier word"*; *"...I will take out the big words and make it easier to understand"*; *"...put in simpler terms"*; *"I would have the original words in, but I would put in the simple meaning in brackets next to the words"*; *"I would make the words I didn't understand more clearer"*; *"Take out the high vocabulary words and use other words to make it easier for us to understand"* and *"...to put it in understandable word"*.

Also with reference to language changes, they wanted to be provided with definitions. For example, they suggested *"Whenever I use a word like 'condensation', I would write the meaning of the word"*; *"Have an explanation of the words"*; *"...state the meaning of*

the difficult words"; "I will make it better by saying what the words mean" and "I would put the complicated words' meaning in brackets".

Where explanations were unclear, learners asked for "...better explanations"; "...first explain things more thoroughly"; and "Write in a way that children can relate to."

The technical language changes that learners proposed were for the purposes of improving understanding and for clarity. This is illustrated in the following responses: "I would print the difficult words in bold and then look for the meaning in the dictionary"; "make less notes on the page to say what the words mean" and "I would put the meaning of the word on the side of the page". Other technical changes referred to features on the page that improved understanding such as diagrams. Learners suggested, "I would draw a sketch of it so that you would understand it better"; "...include some pictures with explanation" and "the notes should have small illustrations, so that we can understand the text better."

Learners also recommended practical work as a way of engaging meaningfully with texts. While this has little to do with the text itself, I feel it could be a factor that shapes learners' engagement with future texts. Experience has shown that this is one of the more successful ways of making abstract phenomena more concrete. Once a concept or process has been concretized via practical means, reading about it later will enable learners to engage more meaningfully with texts. Learners' responses revealed an eagerness to be involved in practical work. Some of their requests were: "Put in more practicals, simple words and less writing work"; "To show us the stuff instead of us using our imagination"; "He [referring to the teacher] should read less and give us more experiments in class and for homework as well"; "We could have fun activities like make a rain-gauge and test it in the rain. Instead we used a glass of water."

While for learners it might mean fun-filled activities, it could be used as a learning tool to help learners engage more meaningfully with text.

Where texts did little to provide the necessary entertainment to capture their imagination, learners recommended: *“Make it more interesting by using jokes or pictures”*; *“Make it more exciting and enjoyable”*; *“I would make it more interesting because then you will be in the mood to learn”*; *“Make learning fun.”*

The fact that learners were able to make these recommendations seems to indicate that they knew where the gaps were in their understanding, what was causing these gaps and this made it possible for them to suggest ways to fill it. Again this shows that the biggest problem encountered by learners is the language of the text, and as such needs to be addressed by teachers and those involved in the textbook writing process.

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5 ANALYSIS AND DISCUSSION

An analysis of the results cannot be discussed without returning to a discussion on Curriculum 2005, as the overall outcome of the study seems to suggest that its aims and objectives may be at risk for the present moment.

Curriculum 2005 is described as the curriculum that would “catapult South Africa into the 21st century. The key concepts guiding the curriculum are the *active involvement of the learner, an emphasis on critical thinking, reasoning skills, skill-based rather than content-based and learner-centered rather than teacher-centered*. One of its primary aims is to produce independent, critical thinkers. Given the undemocratic and unequal nature of South African education in the past, in which learners were encouraged to be passive, compliant, and non-critical, it seems that C2005 is faced with a myriad of challenges in realizing its aims.

Bearing the goals of the curriculum in mind, this study illuminates the contextual realities of where some learners are presently at, a discussion of which, will provide a perspective of the challenges underpinning C2005.

A few glaring shortcomings were accentuated by the study.

Firstly, it revealed a discontinuity between learners’ perceptions of their abilities and what they could actually do. For example, the results of the reading tests show that only 11% of the learners were reading at the appropriate level expected of them in Grade 8, which is consistent with the results of the cloze test, which show that 72,5% of the participants fell into the frustrational level reading (i.e. they obtained below 40% for the test). Yet, when asked to describe the passage in terms of “too easy, too hard and just about right”, 84% of the learners thought the passage was “just about right”. This suggests that learners’ perceptions of texts were at variance with their reading and comprehension abilities. That they thought the text was “just about right” convinced them that they were coping when in actual fact they were not.

Learners' perceptions of coping may have advantages in that they were not debilitated and therefore unable to complete the task. They confidently went on to complete the task because they perceived it to be manageable. The challenge, however, is that it obscured the real problem, which seemed to be the inability to read for meaning. Marzola (1988) cited in French (1995) characterizes an independent reader as someone who actively interrogates the text, integrating ideas from other parts of the text, and monitors their understanding by asking themselves questions in order to make meaning- which is what the learners in this study appeared *not* to be doing, hence their results.

Another illuminating factor revealed by the study is the tension between the expectations of the role of the new learner as proposed by C2005, and the role of the old learner under apartheid. In their old role, learners were allowed to be recipients, rather than active engagers. They were encouraged to be submissive and questioning critically was not part of their classroom repertoire. Now, with C2005, these same learners are expected to take a more active role in their learning process by working independently more often. The curriculum envisages learners, who will be able to think critically and independently, make informed decisions and survive in a multilingual, multicultural, globally challenging society. Producing critical, independent thinkers demands, amongst other things, a critical engagement with texts- a type of engagement that goes beyond merely articulating words on a page. The results of the tests show that most of the learners in the study were unable to do this. How then, are they expected to fit into their new role without being given the necessary tools?

The study has also provided evidence to suggest that learners' engagement with texts is not at a level where teachers and textbook writers perceive it to be, as the tests show. The results of the reading tests revealed that 11% of the learners in the study were reading at the appropriate level expected of them. The results of the cloze test revealed that 72,5% of the learners fell into the frustrational level of reading, suggesting that they were not understanding the texts, and as such, not making meaning. These learners were "barely reading", let alone thinking critically about what they were reading.

This seems to suggest that the choice of teachers and textbook writers are misaligned to the needs of the learners, and (in the light of the reading test results), it seems that learners are not yet ready to take on the new role expected of them.

One other factor that the study illuminated was the comparison between the way in which teachers and textbook writers made choices with regard to text selection and what learners say made meaning for them.

The data revealed that teacher and textbook writers made choices of text appropriacy based largely on instinct and intuition. It is evident from the data that both groups have no specific set of criteria for selecting and writing texts. Yet, the emphatic way in which learners made recommendations for improving texts indicated that they seemed to know *exactly* what the enabling and disabling factors were in shaping their engagement with texts – a very striking observation. This intuitiveness (from teachers and writers) and their ad-hoc considerations with regard to text selection versus the exactitude (from learners) of what makes a text meaningful to engage with is also a gap revealed by the study.

Yet another factor illuminated by the study is the misalignment of the learners' chronological ages, reading ages and the readability levels of the passages selected for text evaluation.

With regard to the discourse analysis, in terms of the criteria used, 66% of the passages were appropriate for learners in Grade 8. The chronological ages of the learners in the study (and in Grade 8 in general) were between 12 – 15 years. Close inspection of the data revealed that learners' reading ages ranged from 7 – 14 years, while the readability levels of the passages to which the readability formula were applied ranged from 12 – 23 years. From the data it appears that learners were reading approximately three years lower than was expected of them in this grade. Hence, while authors were writing at the appropriate level some of the time, an interesting finding was that none of the passages were appropriate for the majority of the learners in this study because of their low reading

levels. This mismatch between the readability of texts and reading levels is revelatory since, an assumption can be made about many learners in other contexts similar to the one in this study. For example, it is assumed that learners who are in classes where the medium of instruction is English, are all first language English speakers, as books seemed to be targeted at first language speakers, whose reading ages are more or less on par with their chronological ages.

The study also illuminated the role and purpose of the textbook in the classroom. From the data, it is evident that the majority of the learners in the study had difficulty in engaging meaningfully with text because of low reading levels on the one hand, and because teachers and writers choices were unaware of the needs of the learner, on the other. Learners understood that a significant other was necessary to mediate the text, while teachers seemed to not fully grasp the magnitude of this role. They made learners 'read aloud', checking for fluency and pronunciation, rather than making meaning, or 'explained difficult words', assuming that learners understood this explanation the first time round. This seems to be a far cry from what mediation is.

Another implication of the results of the study seems to indicate that mediation is required more often if learners are to make meaning, suggesting that the textbook is unable to stand on its own. This leans towards a confirmation of what Wegerhoff (1981) suggests, and that is, that the aim of the textbook is to contribute towards independent learning or unsupported study. The recommendations made by learners, however, (and the categorical way in which they made it) seemed to indicate that they were aware of what *they* needed for the texts to stand independently, suggesting that they knew what the gaps in their understanding were.

Overall the analysis provides some insight into the reading abilities of the learners, and the methods used by teachers to mediate between learner and text, and seems to suggest that neither learners nor teachers are quite ready for the demands of Curriculum 2005

6 CONCLUSIONS AND RECOMMENDATIONS

The aim of the study was to provide a learner perspective of the factors shaping learners' engagement with science texts in Grade 8 by investigating:

- the readability factors that shaped learners' engagement with science texts and what contributed to learners' ease or difficulty in engaging with these texts,
- the match between learners' reading levels and the readability of science texts, and
- the decisions made by teachers and textbook writers with regard to text appropriacy and text difficulty.

The outcome of the study revealed that the factors shaping learners' engagement with science texts were language, learners' perception of ease and difficulty, prior knowledge, the role of the significant other, enjoyment and interest, relevance, prediction, technical aspects to page lay-out, intuition and classroom support.

The findings provided evidence that by far, the most important contributing factor contributing to learners' ease and difficulty with science texts was language. When discussing language, learners referred to terminology and vocabulary, language usage (the way language was used to for clarification and instruction), the interesting features on the page that supported the language of the text (such as glossaries and diagrams). They seemed to know exactly what enabled or disabled them in making meaning from science texts.

Further findings revealed a mismatch between learners' reading levels and the readability of science texts. While the learners in the study were between the age of 12 and 15 years, their reading ages ranged from 7 to 14 years. Only 11% appeared to be reading at the appropriate level for Grade 8. Seventy two percent of the learners were found to be at the frustrational level of reading, while only 3% were reading at an independent level. The readability levels of the selected passages ranged from 12 to 23 years, while 66% of the passages to which certain aspects of discourse analysis were applied, were appropriate for learners in Grade 8. None of the passages were below the chronological age of the

learners in the study, yet their reading ages were sometimes well below this, which signifies an mismatch between readability levels and reading ages.

Of great significance was the finding that while teachers and textbook writers took other factors into account, they based their selection of texts largely on intuition and instinct and applied criteria for text selection in a haphazard way. In contrast to this, learners' knowledge of what enabled them to engage meaningfully with texts was voiced with precision and a 'sense of knowing'.

It seems, therefore that the underlying causes for learners' under-achievement in this study, are as a result of poor reading levels, skewed perceptions of their abilities, their struggle to fit into their new roles due to an inability to work independently, the lack of awareness from teachers and textbook writers regarding the needs of learners, and textbooks being written at a level where learners are unable to engage.

An analysis of the data drew attention to the discontinuity between learners' perceptions of themselves and what they are actually capable of and the new role expectations of the learner as proposed by C2005, given their previous role under apartheid. In answering the research questions, the study raises an awareness of the contextual reality of where learners are presently at, which must be understood against the backdrop of C2005 (its aims and objectives), as this is the curriculum within which these learners are located.

Arising out of the investigation are the following recommendations:

- Teachers and textbook writers should pay special attention to linguistic and cultural diversity in the classroom when considering language levels of textbook and other learning materials, and not make assumptions about prior knowledge.
- Teachers and textbook writers should take into account the learners' voice when the selection and writing of texts. The testing of texts on learners is one way to do this.

- Teachers should take cognisance of the fact that learners will still rely heavily on their expertise to bridge the gaps between learner and text, learners' perceptions and their actual capabilities, and C2005's new role expectations and the old role
- Teachers should develop strategies to teach learners the art of reading independently by scaffolding tasks.
- Curriculum advisors and developers should devise strategies to assist teachers in bridging the gap between the new and old roles of the learners and teachers as proposed by C2005, so that the obstacles facing learners can be overcome, thereby bringing them closer to becoming critical, independent thinkers.

University of Cape Town

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8 LIST OF APPENDICES

University of Cape Town

GROUP READING TEST

Form B *D. Young*

TODAY'S DATE


DATE OF BIRTH

➡ NAME


AGE: yr..... mth.....

SCHOOL

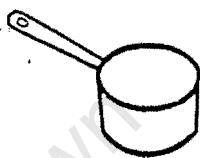
SCORE..... QUOT.....



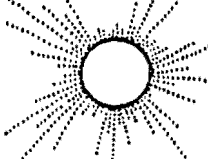
in
went
cat




fun
egg
sit




pan
will
him




top
did
sun



of
jug
ten



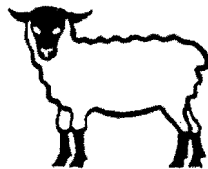
hen
me
dog



stick
rock
clock
nest




spoon
kill
mend
bring




she
saw
sheep
so




upon
tell
hand
milk




ship
was
there
day




game
girl
give
green



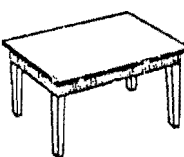
much
pass
duck
crab




swim
glass
push
pink




swing
out
after
camel



take
time
two
too
table



want
what
were
white
wheel



story
sleep
snake
start
snow

- 1 A cat can get in a — red ten six box run
 2 We read — up books the is can
 3 Small means — and come little see sing

Cats and dogs are —	can	did	pets	get	it	ants	16
Ships sail on the —	said	sea	stay	set	six	shoe	17
A pen needs —	if	ill	in	not	ink	its	18
A horse lives in a —	sold	spot	stool	stable	spin	sang	19
Buttercups are —	yell	yelp	yesterday	yolk	yellow	yet	20
Milk is —	weight	white	wagon	waggle	witness	wedding	21
The sun —	showers	shelling	shines	shunting	soot	soldier	22
An oak is a —	try	trick	trot	trip	tree	taxi	23
Spades are for —	dear	dare	digging	dart	domino	dry	24
Jack ate his fish and —	chums	dish	chips	taps	cheap	chaps	25
A carrot is a —	vegetable	vacuum	valuable	vehicle	visitor	vaseline	26
Dishes have to be —	wicket	winter	waves	water	washed	watch	27
Fast means —	quack	quick	quake	quart	quiz	quiet	28
Eggs are eaten with —	bar	bear	bacon	boat	bank	better	29
The throat is part of the —	none	never	night	near	neck	noise	30
To mend means to —	reckon	reach	repair	retreat	refer	reply	31
Nearly means —	almost	always	alert	alter	allowed	active	32
Arrest means —	caper	capture	cape	carnation	camera	carriage	33
Cameras produce —	phrases	fogs	pheasants	phones	force	photographs	34
Rich means —	wreck	worst	word	wealthy	worry	wring	35
We read a —	majesty	magazine	maggot	magic	major	magnet	36
Rage means —	anger	absent	airgun	amen	ample	against	37
A chain has —	lips	lint	list	lisp	links	loaf	38
Certain means —	shear	surgery	sugar	sure	suet	shred	39
A good chance is an —	orbit	optimist	option	opportunity	orchid	oppress	40
To control means to —	mammoth	manful	manage	mangle	manner	manicure	41
To slumber means to —	slam	slash	slaves	slope	slip	sleep	42
Empty means —	vagabond	vacant	valet	vague	vanity	varied	43
Enemy means —	opponent	ointment	orchard	otherwise	ostrich	offer	44
Ability means —	skip	skunk	skeleton	score	skittle	skill	45

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APPENDIX B GAP READING COMPREHENSION TEST

DO NOT TURN THE PAGE TILL YOU ARE TOLD

NAME: _____

GRADE: _____

SCORE: _____

A big dog sat by the kennel. He has _____ bog bone in his mouth. A little
_____ sat by his kennel. He had _____ bone in his mouth.

1

¹ The GAP Reading Comprehension Form B Test developed by J Mcleod has been used and is hereby acknowledged.

The car was going too quickly down the hill. It could not when it got to the traffic light. went straight across in front a bus. There was nearly a crash, the driver pulled up just in The people on the bus were fortunate have avoided serious injury.

Ann had a bedroom all to herself. There was chair to put her clothes on when she to bed. There was a chest of and a cupboard to put things By her bed there was a little table to put a book or toy

Tom lived in a little cottage with a thatched He had an alarm clock to wake in the morning. When the right time, the alarm clock rang its bell very, like a fire-engine. But this morning, Tom not hear it, he was so fast asleep.

The castle stood on a hill, its crumbling towers pointing up to the grey winter sky. For hundreds years it had stood there. people had lived in it. Many things happened between its walls. But today nobody in castles and the big rooms silent and the gardens are overgrown with

Imagine what it would be like if we had such things as books, Books help us learn and increase our knowledge; they giveenjoyment and pleasure; they help us all sorts of practical ways everyday. the wonderful printed books we have to-day, our modern world be a very poor place.

Twelve hundred miles to the east of Australia lie the islands of New Zealand. Here, long before were discovered by Europeans, a Polynesian warrior race, the Maoris, had sailed across the Pacific from north-west and established a civilization notable ofthe brilliance of its art and the strength of military system.

It is one of the characteristics of popular, as distinct learned ,history that once a legend become embedded in it, it is extraordinarily difficult get it out. Such, for example, ismyth that William Wilberforce was excited over the woes of the Negro slaves that exhibited a bland indifference to the miseries the victims of the Industrial Revolution in own country.

LOOK OVER YOUR WORK TILL TIME IS UP

MACMILLAN GROUP READING TEST

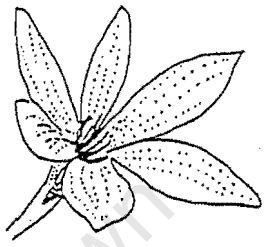
Form B

PUPIL
 Pupil's Name _____
 Class _____ School _____
 Today's Date _____
 Date of Birth _____
 Age _____ Years _____ Months _____

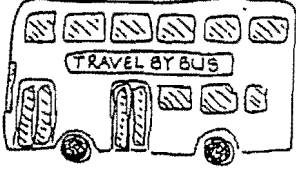
TEST RESULTS
 Raw Score _____
 Standardised Score _____
 Other Test Score _____
 Attitude A - B - C - D - E
 Comment _____

Look at each list of 5 words.
 Find the word that fits the picture.
 Draw a ring round this word.
 Look at the example below to see
 how you do it. If you make a mistake
 put a line through the word you have
 ringed like this, cat.

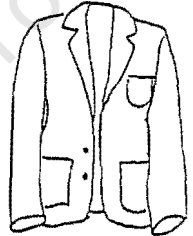
4
 flower
 leaf
 crown
 fan
 road




bicycle
 train
 bush
 car
bus



5
 coat
 man
 letter
 shoe
 woman

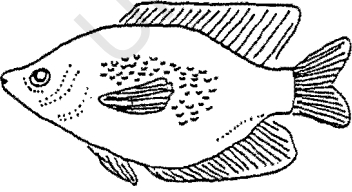


1
 saucer
 bucket
 house
 jug
 tub



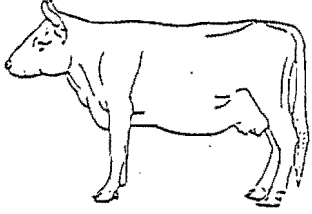
Look at the sentence in question 6.
 Find the word that best fits in the gap.
 Draw a ring round this word.
 Look at the example below to see
 how you do it.
 Do not write the word in the gap.

4
 wand
 pram
 pig
 fish
 stick



She put a hat on her _____
 home
head
 down
 big
 hot

3
 milk
 ship
 girl
 dog
 cow



6 There are _____ days in the week.
 seven
 even
 more
 seventy
 ten

7 Fred tried to _____ out of the tree.
skip
pull
rise
branch
jump

13 The sums were too _____ for the class.
three
nice
hard
numbers
slow

8 If today is Monday, it was Sunday _____.
after
today
tomorrow
before
yesterday

14 She said she would soon be _____.
able
heavy
hurt
breakfast
ready

9 He climbed on to the _____ as
the sea came in.
water
rock
clothes
wave
spray

15 They left the match _____ it started to
rain.
because
inside
if
until
still

10 She hid _____ the table.
outside
about
inside
from
under

16 They _____ next door to each other.
forget
climb
live
spend
say

11 The dentist pulled out the bad _____.
tooth
brush
tongue
toot
hoot

17 The _____ fell slowly off the tree.
dusk
oak
leaf
root
scene

12 He stayed to _____ the game.
read
watch
drive
wait
stand

18 They ate jam with the new bread and _____.
batter
tea
tomatoes
putter
butter

19 The dishes were stacked away in the _____.
drawer
window
table
cupboard
stool

25 A pair of _____ has two blades.
scissors
trousers
twins
braces
forks

20 One and two make _____.
there
four
free
their
three

26 The flower was _____ and not made of plastic.
real
bluebell
green
reliable
clear

21 The liner sailed _____ the ocean.
ship
under
sea
across
along

27 He had _____ left after his wallet was stolen.
everything
pounds
right
nothing
dinner

22 The _____ had grown very tall and needed cutting.
edge
herd
hedge
headgear
headache

28 He ran over a piece of glass and had a _____.
puncture
tincture
punchball
picture
practice

23 Something asked is a _____.
talk
question
bequest
quest
speech

29 The car skidded in the _____.
post
church
snow
wheel
sunshine

24 She _____ as she climbed out of the pool.
dived
shoved
shivered
raced
wondered

30 The children were asked not to _____ in their seats.
figure
ticket
wicket
trinket
fidget

31 He liked his eggs to be _____.
rambled
scratched
snatched
assembled
scrambled

37 She played the _____ on her recorder.
meddle
medal
melody
mellow
memory

32 He was lost and did not _____ the way home.
knot
now
thick
know
miss

38 The shop sold _____ flavours of ice-cream
varicose
various
vary
vivid
vicious

33 They could not go in as it was a _____ park.
private
privet
pirate
possible
public

39 No _____ was allowed to enter the country.
foreigner
frontier
forester
furrow
focus

34 The _____ of his jacket was torn.
hole
button
shirt
colour
collar

40 A group of people is often called a _____.
herd
force
commerce
convention
community

35 They could not answer the _____.
muddle
bridle
risible
riddle
ripple

41 The flowers were arranged in an _____ way.
artisan
artefact
antic
antiseptic
artistic

36 The missing letter was very _____.
impotent
impenitent
import
important
impossible

42 Another word for "a time of rest and play" is _____.
happiness
holiday
pleasure
enjoyment
childhood

43 People who only think of themselves
are said to be _____.
selfless
shellfish
unkind
thoughtless
selfish

44 They put socks over their shoes to _____
their footsteps.
muffle
muzzle
baffle
ruffle
buffer

45 A partly rounded shape like the new
moon is called a _____.
convalescent
crescendo
crescent
confluence
congruent

46 The puppets were _____ with great skill.
radiated
manipulated
eradicated
laminated
elated

47 The dancer finished with a _____.
pirouette
pierrot
pendulum
pincer
pinnacle

48 She was _____ by the picture in the
gallery.
involved
intrigued
instituted
impelled
installed

APPENDIX D: CLOZE PROCEDURE TEST

INSTRUCTIONS FOR CLOZE TEST

(Read aloud with students following along)

The following is a reading passage taken from one of your handouts for Natural Science. Words have been left out and have been replaced with blank spaces. You must complete the sentences by replacing the words that has been left out. Write the word in the space provided.

Remember:

1. Write only ONE word in each blank.
2. Try to fill in every blank.
3. Do not worry about spelling.
4. You may have to skip the more difficult ones and go back to them when you have finished.

RAINFALL

Rainfall is formed after clouds have formed. If condensation after the clouds have been formed more droplets develop. They larger until they can no longer float on and begin to fall down as rain. Different processes cause the humid air to rise and cool. Three types of rain are recognised.

1. **Relief** or orographic rain as a result of air rising to pass over
2. **Convictional** rain is produced when one small part of earth's surface becomes warmer than its surroundings.
3. **Cyclonic** rain occurs when the air flows into a low pressure Rain, snow, hail are collected in a rain gauge in millimeters.

Investigating the effects of rainfall

Rainfall is a vital element of weather, in terms long and short effect. The two key elements towards rainfall are the **intensity** and **duration**. If the is too high and the duration too long, floods occur.

Acidic rain-water dangerous to our health. The acidity of rain-water being increased by the amount of exhaust gases of and smoke of factories today.

PLATFORM 2:

Rainfall

AC During your time spent at this platform, or at the end, when you leave for another platform, you should be able to:

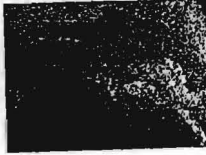
- Acknowledge that science is but one way of looking at and exploring phenomena.
- Use scientific knowledge to inform actions.
- Collect data using various forms of technology and sources of information for collecting, measuring, analysing data.
- Show evidence of working with temperature and time.
- Communicate findings and conclusions.

AS

Self-assessment
Peer-assessment
Educator-assessment
using rubrics

Towards attaining SO 1, 2, 3, 4 and 6

Rainfall is formed after clouds have formed. If condensation continues after clouds have been formed more droplets develop. They grow larger until they can no longer float in the air and begin to fall down as rain. Different processes (may) cause the humid air to rise and cool. Three different types of rain are recognised.



- Relief or orographic rain forms as a result of air rising to pass over mountains.
- Convictional rain is produced when one small part of the earth's surface becomes warmer than its surroundings.
- Cyclonic or frontal rain occurs when air flows into a low pressure cell. Rain, snow, hail are collected in a rain-gauge (expressed) in millimetres.

What do you need?

- Two-litre cold drink bottle
- Pair of scissors
- A tin or glass beaker
- Ruler

EDUCATOR'S NOTES: How can rainfall be measured? Rain is measured using a rain-gauge. The amount of rain which falls must be recorded daily. When measuring rainfall it is important to consider several conditions, such as wind, temperature and the size of the droplets.

- Why is it important to measure rainfall?
- Discuss this question with a partner.
- Share the information among the groups.

Make a rain-gauge

When measuring rainfall, it is important to consider several factors such as wind, temperature and size of the droplets. These could affect the amount of rainfall measured. When you measure, dip the ruler into the glass beaker to count the millimetres. Record rain over a period of one week during the rainy season.



EDUCATOR'S NOTES: It is important to test learners that the rain-gauge must be placed out of the way — there must be no obstructions.

Test how acidic rain water in your area is

What do you need?

- Rain water from the gauge
- Litmus paper

TESTING:
Dip the end of a strip of blue litmus paper into the rain-water

- Does it change colour?
- If so, what colour does it turn to?

Record your observation.

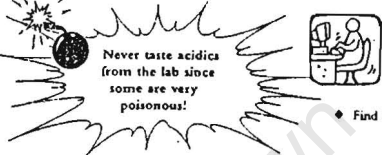
Did you know?

When rain falls it dissolves some of the carbon dioxide in the atmosphere to form a weak acid known as carbonic acid.

$$\text{Water} + \text{carbon dioxide} \rightarrow \text{carbonic acid}$$

$$\text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{H}_2\text{CO}_3$$

Acidic rain-water is dangerous to our health. The acidity of rain-water is being increased by the amount of exhaust gases of vehicles and smoke of factories today.



- Take water from a neighbouring rural or countryside and water from your urban area and compare which one is more acidic.
- Find out the reason for this.

Investigating the Effects of Rainfall as an Element of Weather on the Environment

Rainfall is a vital element of weather, in terms of long and short term effect. The two key elements contributing towards rainfall are the intensity and duration.

- Intensity** — the rate of rainfall
- duration** — the period that rainfall lasts

If the intensity is too high and the duration too long, floods (may) occur. The opposite is true if we receive too little rainfall and drought may also occur.

- Conduct research to find out when were the last floods experienced in South Africa.
- What was the extent of the damage on the environment?

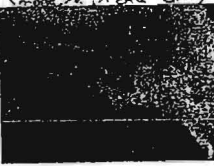
Did you know?

Fish floods occur within 6 hours of the rain event. Flooding is a longer term event and may last a week or more.

- Write a summary of one page of your findings and communicate it to the rest of your group.
- Keep all your research data in a well-organised and presentable portfolio.

RAINFALL

Rainfall is formed after clouds have formed. If condensation continues after clouds have been formed more droplets develop. They grow larger until they can no longer float in the air and begin to fall down as rain. Different processes may cause the humid air to rise and cool. Three different types of rain are recognised.



- Relief or orographic rain forms as a result of air rising to pass over mountains.
- Convictional rain is produced when one small part of the earth's surface becomes warmer than its surroundings.
- Cyclonic or frontal rain occurs when air flows into a low pressure cell. Rain, snow, hail are collected in a rain-gauge expressed in millimetres.

Investigating the Effects of Rainfall as an Element of Weather on the Environment

Rainfall is a vital element of weather, in terms of long and short term effect. The two key elements contributing towards rainfall are the intensity and duration.

If the intensity is too high and the duration too long, floods may occur. The opposite is true if we receive too little rainfall and drought may also occur.

- Intensity** — the rate of rainfall
- duration** — the period that rainfall lasts

Did you know?

When rain falls it dissolves some of the carbon dioxide in the atmosphere to form a weak acid known as carbonic acid.

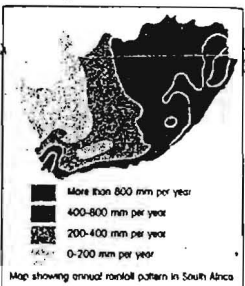
$$\text{Water} + \text{carbon dioxide} \rightarrow \text{carbonic acid}$$

$$\text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{H}_2\text{CO}_3$$

Acidic rain-water is dangerous to our health. The acidity of rain-water is being increased by the amount of exhaust gases of vehicles and smoke of factories today.

Study the rainfall map and answer the following questions:

- Which area receives the highest rainfall?
- Which area receives the lowest rainfall?
- Find out reasons for the low/high rainfall in certain areas.



Considering rainfall when settling down
Specific weather conditions play an important role when choosing a site to settle. If an area is considered to be threatened by floods during rainy seasons, it will not be chosen as a place to settle. Such a site will be known as a dry-
year settlement. In such areas the distribution of the population will be scattered. the people who do live there will be in high-
ground

Study the rainfall map



- Looking at the rainfall map, which regions will be more densely populated?
- Trace the outlines of the map on the left.
- Use the population statistics below and plot this information on a dot map.

N.B. Let one dot = 100 000 people

PROVINCE	POPULATION SIZE (to the nearest 100 000)
Gauteng	7 300 000
Western Cape	5 200 000
Free State	3 100 000
North West	2 900 000
Eastern Cape	2 800 000
Mpumalanga	2 700 000
Northern Cape	1 200 000
Limpopo	4 500 000

APPENDIX F LEARNER QUESTIONNAIRE

Answer the questions about the passage you have just worked with

1. Without looking at the passage, what important things did you learn from reading it?
.....
.....
.....

2. How easy or hard did you think this passage was for you to understand.? Circle your choice.
A) Much too easy B) Too easy C) Just about right D) Too hard E) Much too hard

3. What makes you say that?
.....
.....
.....

4. What do you like about the hand-outs (notes) you receive in science?
.....
.....
.....

5. What makes you say that?
.....
.....
.....

6. What do you dislike about the hand-outs (notes) you receive in science?
.....
.....
.....

7. How would you change the passage to make it better for you to learn from?
.....
.....
.....



8. What should your teacher do to make the text better to learn from?
.....
.....
.....

**APPENDIX G PASSAGES SELECTED FOR DISCOURSE ANALYSIS
ACCOMPANIED BY THE DETAILED RESULTS OF THE
ANALYSIS**

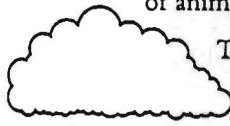
University of Cape Town

PLATFORM 1:

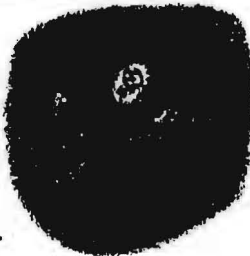
The Water Cycle

 <p>AC</p>	<p>During your time spent at this platform, or at the end, when you leave for another platform, you should be able to:</p> <ul style="list-style-type: none"> ◆ Collect, analyse, evaluate and interpret data. ◆ Use scientific knowledge, concepts and principles to inform actions. ◆ Gather and prepare scientific information from a variety of sources. ◆ Select relevant scientific and mathematical skills. ◆ Communicate possible plan of action. 	 <p>AS</p>
		<ul style="list-style-type: none"> Self-assessment Peer-assessment Educator-assessment using rubrics
<p>Towards attaining SO 1, 2 and 3</p>		

All life depends on water. The movement of water through the physical environment and ecosystem is cyclic. Water is always on the move and this movement forms the basis for the water cycle. Cold and warm ocean currents, clouds, rainfall and winds are all part of the global water cycle. Most water is recycled without intervention of animals and plants.

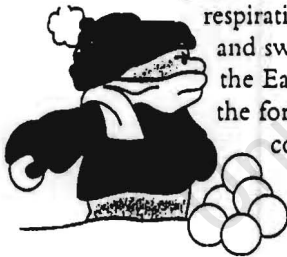


The sun shining and the wind blowing over the oceans and rivers evaporate water from their vast exposed surfaces. The water vapour produced in this way, moves into the atmosphere by evaporation followed by condensation. In the atmosphere the water remains aloft as vapour, clouds and ice crystals.

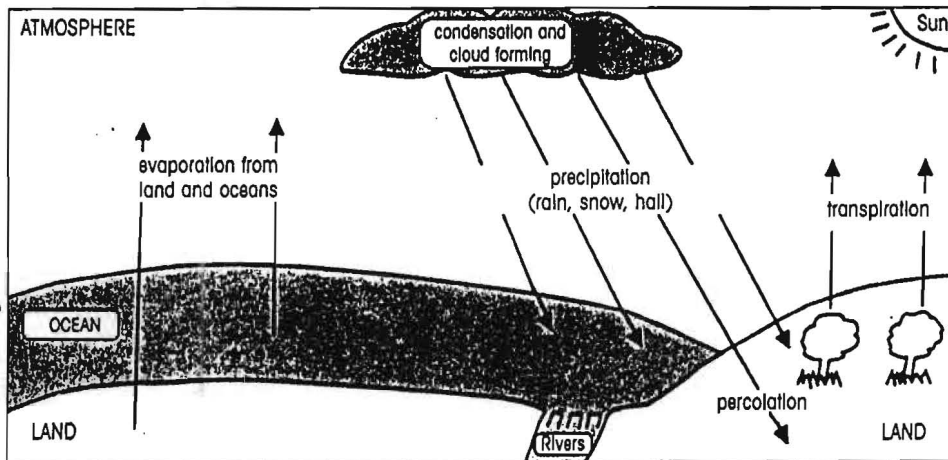


It falls back as precipitation, mostly in the form of rain and snow. This is the short water cycle.

The long cycle involves the indirect return of water to the atmosphere by transpiration of plants, respiration of living organisms, evaporation from lakes and swamps and from snow and ice. It is returned to the Earth as various forms of precipitation, mostly in the form of rain, hail, snow and dew. This cycle of condensation, precipitation and evaporation is so balanced that the amount of moisture available at any given place on Earth is almost constant, year after year.



- **condensation** - change from a vapour form into a liquid form; condensation is the opposite of evaporation
- **precipitation** - movement of water from the atmosphere to the Earth



The water cycle.

DISCOURSE ANALYSIS RESULTS: PASSAGE 1: THE WATER CYCLE:

In this passage, the writer assumes a great deal of background knowledge on the part of the reader. This is evident in the way in which terms that are key to the understanding of the topic such as 'cyclic, evaporation and water vapour' are not established in the mind of the learner in the text before or after use. This may be attributed to the fact that this particular topic is dealt with from as early as Grade 3, but in a less complex way. The meanings of two subject-specific terms viz. 'condensation and precipitation' are given briefly in a glossary on the page. In spite of this, learners may still experience comprehension difficulties because these explanations are not incorporated into the main text. The flow of reading is thus interrupted, as the eye has to focus elsewhere on the meaning of the concept, and then return to the sentence again. Expressions like "transpiration of plants and respiration of living organisms" are used without any reference to its meaning. This once again makes it difficult for the reader to make sense of the content, unless they are familiar with these terms and phrases. This lack of clarity concerning concepts and terms that are crucial to the understanding of the topic is problematic. Although it is dealt with at primary school level, it must be borne in mind that because these terms are so subject-specific, learners' contact with them are minimal. They are not terms used on a daily basis. As such, a brief explanation would perhaps have made it possible for learners to access their prior knowledge.

On the whole the sentences are short and to the point. However, the use of words such as 'intervention, aloft, physical environment' may present some difficulty as no semantic support for them is provided in the main text and they may be words that Grade 8 learners are unfamiliar with. Of course this is all dependent on the extent of the reader's vocabulary.

The text is accompanied by an illustration of the water cycle which showed the movement of water from the earth to the atmosphere and back, but is not cyclically represented. Learners may wonder why it's called the water cycle. The diagram contains the labels 'percolation and transpiration', the meaning of which does not appear in the

text at all, nor in the diagram itself. Subsequently, these terms are two of the answers in an activity that followed.

The passage is not entirely explicit in that it 'did not tell the reader all'. A Grade 8 learner reading this would require a reasonable amount of prior knowledge to make meaning of its content. Despite the diagrams and glossary, it still lacks the information necessary for a complete understanding of the topic, and as such, seemingly requires the guidance of an educator or adult for more clarity.

When the Fry Graph for estimating readability was applied to this particular passage, it was found to have a reading level of 16 years. The general age of learners in Grade 8 range from 13-14years. Both the readability formula and discourse analysis show that the text might be too difficult for a learner in Grade 8 to handle.

University of Cape Town

Food around the world



Different countries around the world have different foods as their main source of energy. A food that is the main energy source in a diet is called a staple food. In almost all cultures, the staple diet consists of plants that store large amounts of energy in the form of starch.

In South Africa the staple diet of most people is maize. Mealie meal, samp and corn all come from the maize plant. Bread, potatoes and rice are also important staple foods here. Maize is the staple food in Mexico, where it is called corn. Mexicans grind it into fine powder and use it as flour to make a flat, bread-like pancake which they call tortilla. In China, Japan, South East Asia and parts of India, rice is the staple food. In central Africa, cassava and yams, which are similar to sweet potatoes, are eaten as the main source of energy.

Religion and culture are both important influences on food traditions. Some religions have strict rules about which foods can be eaten and how they must be prepared. Muslims may only eat halal food. This contains no pork and is prepared according to the rules laid down in their holy book, the Qur'an. Jews also follow rules laid down in their holy scriptures. They eat kosher food. In order to be kosher, the food has to be prepared and stored in certain ways. Hindu people eat no beef, as the cow is a sacred animal in their religion. Some people may choose not to eat any meat at all, for reasons not based on their religion but on personal choice. These people are called vegetarians.

- Do some RESEARCH on the eating practices of people in different countries. You may get this information from books or from talking to people in your community.
- Copy and complete the TABLE shown in Figure 3. Try to find five different examples.
- Talk to someone whose cultural or religious background is different from yours. Find out what kind of food they eat every day and what foods they eat on special occasions.

PRESENT what you have found out in a short article that could be put into your school magazine or local newspaper.

You should be able to:

- explain the process of photosynthesis
- explain why green plants are so important as a food source for life on Earth
- give examples of different traditions involving food in other cultures and religions.

Eating practices around the world		
Country	Where they sit	Eating utensils/practices

FIGURE 3 Complete this table for Activity 2.

DISCOURSE ANALYSIS RESULTS: PASSAGE 2: FOOD AROUND THE WORLD

In this passage, readers rarely had to rely on their background knowledge to understand what they were reading. As soon as a new term relating to the topic is introduced, for example, 'tortilla, cassava, yams, halaal, kosher, vegetarian', it is immediately followed by an explanation which adequately explained it and is relatively simple and easy to understand.

The text provides examples of food traditions in different parts of the world including South Africa that learners may not have been aware of and would have found interesting to read about. It also brings relevance to the text for the reader.

The words chosen by the writer are simple and used often in everyday conversations, making the text relatively readable. Explanations of words that the writer thought may have been problematic to the learner's understanding are semantically supported. As such, the text reads logically and provides all the information the reader needs to make it explicit.

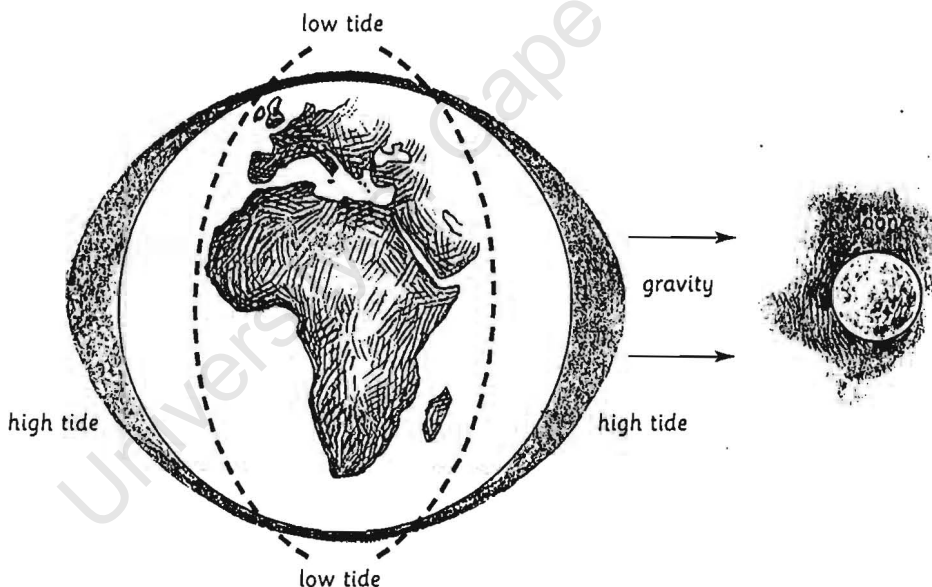
On the Fry Graph for estimating readability, this passage was found to have a reading level of 13 years. The results of the readability formula and an analysis of the discourse of the passage, indicate that the writing is at the correct level for learners in Grade 8 in terms of age and language usage.

What causes tides?

The Moon's gravity pulls on the Earth and draws the oceans into two bulges – one facing the Moon and the other on the opposite side. These bulges are the high tides. Between the bulges the sea is lower. These are the low tides.

As the Earth rotates, the bulges shift so that the tides change from high to low and back again approximately every six hours. If you looked down at the Earth from the Moon, it would always be high tide.

Since the Earth rotates on its axis once every 24 hours, you might expect that there would be two high tides and two low tides every day, with exactly six hours between each one. There are, in fact, about six hours and twenty-six minutes between each tide. This is because the Moon also revolves around the Earth once a month. So at the same time each day, the Moon is not where you saw it the day before, but slightly behind that position.



SPRING TIDES AND NEAP TIDES

At certain times of the month the Moon is in line with the Sun and the Earth, so there is an additional gravitational pull from the Sun in the same direction as the Moon's gravitational pull. This additional gravitational pull causes higher high tides and lower low tides. These are called 'Spring tides'. When the Moon and the Sun are at right angles to each other, they tend to weaken each other's effect on the tides, so we get lower high tides and higher low tides. We call these 'Neap tides'.

DISCOURSE ANALYSIS RESULTS: PASSAGE 3: WHAT CAUSES TIDES?

In this passage, learners are required to know terms and phrases such as 'gravity, rotates on its own axis, revolves around Earth, at right angles to each other' in order to make sense of the passage. The writer assumes that the target audience is familiar with these phrases as no explanations for them are provided in the passage.

The text is accompanied by a diagram to assist in the understanding of the content. The diagram on its own does not make much sense, but read together with the text put things into perspective. This visual explanation combined with the expository text leaves the reader with a sound understanding of the topic under discussion.

The language used in the text on the whole is relatively simple and easy to understand. Apart from the fact that learners are required to draw on background knowledge for the terms mentioned earlier, the explanations are to the point and concise.

The Fry Graph for estimating readability found this passage to have a reading level of 13 years.

The phases of matter and the particle model

UNIT ONE

CHAPTER ONE

Matter and materials

Forces between particles

A force is something that can attract or repel. There are forces of attraction or repulsion between the particles of matter. In Activity 3 you should have observed that, when you turned the plate, the drops of water on the plate not covered with Vaseline joined together. This is because the particles of water attracted each other. There are forces of attraction between the particles of water.

In Activity 3 the drops of water did not stick to the Vaseline. There are forces of repulsion between the particles of water and the particles of Vaseline. This means the particles of water and Vaseline could not stick together.



I understand that there are forces of attraction and repulsion between the particles of matter. But how can we explain the difference in the spaces between the phases of matter using forces?



What would happen if there was no gravity?

In the next section of this unit we discuss why the forces of attraction between particles in the three phases of matter are different. Before you learn more about the forces of attraction between the particles of matter, do Activity 4.

New Word

Repulsion
A process in which things push each other apart. We say that objects repel each other.



Did you know?
The earth exerts a strong force of attraction on all objects, including people. The force of attraction is called the force of gravity. If the earth did not exert the force of gravity, we would fly off into space!

ACTIVITY

Discuss these questions with your partner. Write down your ideas in your exercise book.

1. Do you think there are strong forces of attraction between the particles that make up ice? Explain your answer.
2. What do you think happens to the forces of attraction when ice melts and forms liquid water? Explain your answer.
3. Are the forces of attraction between the particles of steam or water vapour strong or weak? Explain your answer.
4. Do you think there are forces of repulsion between solid or liquid water? Go back to Activity 2 on page 7 to help you answer this question.



Did you know?
We can pour water (as a liquid), but we cannot pour ice. The forces of attraction between particles of water are much weaker than the forces of attraction between the particles that make up ice. We can pour water because the forces of attraction between the particles are quite weak. The property of being able to pour a liquid is called fluidity. A liquid can also be called a fluid.

Temperature and forces of attraction between particles
As the temperature of a substance such as ice (solid water) increases, the forces of attraction between the particles become weaker. The particles of the substance move faster and push away from each other and this causes the forces of attraction to become weaker. When the ice becomes liquid and changes phase, the forces become a lot weaker and the particles move much further apart. This means that the spaces between the particles increases.

When water is boiled and the liquid changes into steam or water vapour (a gas), the forces of attraction between the particles become very weak. The high temperature makes the forces of attraction between the water particles very weak. The spaces between the particles are very far apart.

New Word

Fluidity
The property of a liquid that can be poured.



We can pour water, but we cannot pour ice. This is because the forces of attraction between particles of a liquid are weaker than the forces of attraction between particles in a solid.

DISCOURSE ANALYSIS RESULTS: PASSAGE 4: FORCES BETWEEN PARTICLES

In this passage, learners do not have to rely too much on prior knowledge as most terms and concepts that the writer thought may be problematic to the learner's understanding of the topic are immediately explained once they had been used. New concepts such as 'forces of attraction and repulsion' are preceded by an activity whose purpose is to provide a more concrete understanding for the learner, followed by further explanation in the main text. These words are also placed in a glossary on the same page where it is used, thereby reinforcing its meaning. Interesting facts also appears in "did you know" boxes. Terms that the writer thought were totally new to learners were also clarified by placing its meaning in brackets next to the word. For example, a sentence would read "... a substance such as **ice (solid water)** or "...**water vapour (a gas)**).

Apart from the subject-specific terms such as ' phase, particles, liquid, solid, gas', the language used in the text is not complex and explanations are explicit. Even second language speakers of English would have found this passage easy to read and understand.

Evidently, the Fry Graph for estimating readability found this passage to have a reading level of 17 years. This high reading level can be attributed to the nature of the topic and the fact that many multi-syllabic words were used often, such as 'temperature, attraction, repulsion, and particles.'

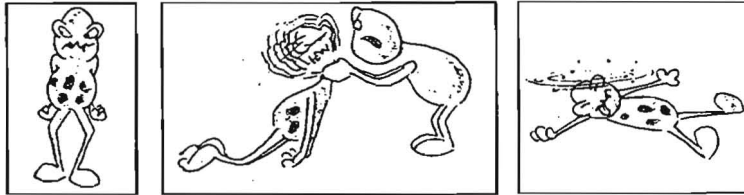
The science view - HIV infection

Phase Organiser: Communication
 Programme Organiser: The science view - HIV infection
 NS: SO 2, AC 1
 A&C: SO 1, AC 1

The germ that causes AIDS is a virus called the HIV. Your body has a special defence system that fights viruses. This defence system is called the immune system.

The immune system has white blood cells and antibodies. When viruses enter your body, more white blood cells and antibodies are made to fight and destroy the viruses. Therefore, the immune system protects you from getting sick.

This cartoon explains how white blood cells and antibodies protect us.



1. Viruses may enter your body.
2. The white blood cells and antibodies fight the viruses.
3. The viruses are usually destroyed.

White blood cells and antibodies destroy viruses.

Each kind of virus has a different coat. The immune system makes particular kinds of antibodies to match the virus coat. Your blood has antibodies for almost every virus that has entered your body!

If a person is infected with the HIV, antibodies will form to fight it. Doctors are able to test blood for antibodies. If the HIV antibodies are in the blood, the person is said to be HIV positive.



Blood can be tested for HIV.

Activity 6

Find out more about blood and the HIV.

- A sample of blood is needed for a HIV test. Ask a doctor or a medical pathologist to explain how a sample is collected and tested.
- Visit a blood bank.
- What do they use blood for? How do they collect blood? How do blood banks ensure that the blood used for transfusions is safe?

Viruses attack particular kinds of cells. Flu viruses attack lung cells while polio viruses attack nerve cells. The HIV attacks the white blood cells – the important cells that protect you from other germs. For a while, the antibodies will stop the HIV from increasing in number. However, HIV can change its coat so that the antibodies do not recognise them. The virus will then multiply and destroy the white blood cells.

Without white blood cells, the immune system cannot fight against other germs such as TB, diarrhoea and so on. The person becomes ill with other diseases. He/she then has AIDS. The other diseases get worse and may eventually cause death. AIDS causes many deaths in South Africa.



1. White blood cells usually protect your body against viruses.
2. However, the HIV attacks and destroys white blood cells.
3. Other viruses rush in and multiply.



4. The person becomes ill.

HIV destroys your immune system.

Activity 7
 Communicate the role of the immune system to other people.

Do one of the following activities to explain how the white blood cells and antibodies that usually protect us are destroyed by the HIV and how this can make us ill.

Either present a short play or draw your own cartoon using the following captions:

1. At first, white blood cells and antibodies destroy the HIV.
2. HIV changes its coat. Antibodies do not recognise the HIV.
3. The HIV multiply rapidly. They destroy the white blood cells.
4. Other diseases cannot be controlled. They make you ill and give you AIDS.

In your group, discuss the following:

1. Explain the differences between the terms HIV positive and AIDS.
2. Find out the symptoms of AIDS.

Useful words
 AIDS
 antibody
 defence system
 HIV positive
 immune system
 multiply
 pathologist
 symptom
 white blood cells

Assessment. Can you...

- outline how the immune system works?
- explain what is meant by HIV positive?
- present a play or draw cartoons to communicate your ideas?
- explain the difference between HIV and AIDS?

Assess how you worked:

- in a group
- on your own

DISCOURSE ANALYSIS RESULTS: PASSAGE 5: HIV INFECTION

While the passage is concerned with the topic of AIDS and HIV, the authors assume learners are familiar with the meaning of the acronyms because it does not appear in this passage. Incidentally, the HIV acronym is spelled out earlier in the chapter, but not in this particular part of the chapter, which discusses how the virus operates and how one can eventually get AIDS. Learners are therefore required to know the meaning of these acronyms, or look up its meaning. As such, they were required to rely on prior knowledge.

Subject-specific terms like 'white blood cells, antibodies, virus, immune system', which once introduced, are simply and adequately explained.

The accompanying diagram explaining how the body is protected by white blood cells and antibodies is in the form of a cartoon which would have appeal for learners. At the same time, it enhances the text very well by providing a clear, visual explanation.

Except for the subject-specific terms, the language of the passage is simple and easy to read. However, words that the writer thought were crucial to their understanding of the topic or new to learners such as 'pathologist, multiply, symptoms' are highlighted, but not explained.

The diagrams together with the expository text made the passage explicit and logical and does well in clarifying a complicated process so that it can be easily understood by Grade 8 learners, thereby laying a sound basis for new facts to be built on.

The passage was given a reading level of 15 years on the Fry Graph.

PLATFORM 2:

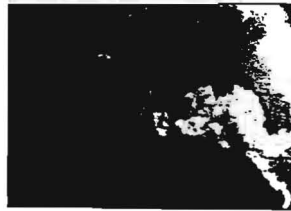
Rainfall

<p>AC</p> <p>During your time spent at this platform, or at the end, when you leave for another platform, you should be able to:</p> <ul style="list-style-type: none"> ◆ Acknowledge that science is but one way of looking at and explaining phenomena. ◆ Use scientific knowledge to inform actions. ◆ Collect data using various forms of technology and sources of information for collecting, measuring, analysing data. ◆ Show evidence of working with temperature and time. ◆ Communicate findings and conclusions. 	<p>AS</p> <p>Self-assessment Peer-assessment Educator-assessment using rubrics</p>
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Towards attaining SO 1, 2, 3, 4 and 6

Rainfall is formed after clouds have formed. If condensation continues after clouds have been formed more droplets develop. They grow larger until they can no longer float in the air and begin to fall down as rain. Different processes may cause the humid air to rise and cool. Three different types of rain are recognised.

1. Relief or orographic rain forms as a result of air rising to pass over mountains.
2. Convective rain is produced when one small part of the earth's surface becomes warmer than its surroundings.
3. Cyclonic or frontal rain occurs when air flows into a low pressure cell. Rain, snow, hail are collected in a rain-gauge expressed in millimetres.



What do you need?

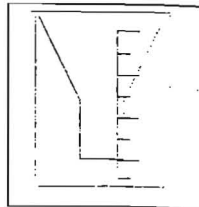
- Two-litre cold drink bottle
- Pair of scissors
- A tin or glass beaker
- Ruler

EDUCATOR'S NOTES: How can rainfall be measured? Rain is measured using a rain-gauge. The amount of rain which falls must be recorded daily. When measuring rainfall it is important to consider several conditions such as wind, temperature and the size of the droplets.

- ◆ Why is it important to measure rainfall?
- ◆ Discuss this question with a partner.
- ◆ Share the information among the groups.

Make a rain-gauge

When measuring rainfall, it is important to consider several factors such as wind, temperature and size of the droplets. These could affect the amount of rainfall measured. When you measure, dip the ruler into the glass beaker to count the millimetres. Record rain over a period of one week during the rainy season.



EDUCATOR'S NOTES: It is important to tell learners that the rain-gauge must be placed out of the way — there must be no obstructions.

Test how acidic rain water in your area is

What do you need?

- Rain water from the gauge
- Litmus paper

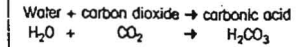
TESTING!

Dip the end of a strip of blue litmus paper into the rain-water

- ◆ Does it change colour?
 - ◆ If so, what colour does it turn to?
- Record your observation.

Did you know?

When rain falls it dissolves some of the carbon dioxide in the atmosphere to form a weak acid known as carbonic acid



Acidic rain-water is dangerous to our health. The acidity of rain-water is being increased by the amount of exhaust gases of vehicles and smoke of factories today.



Never taste acidics from the lab since some are very poisonous!



- ◆ Take water from a neighbouring rural or countryside and water from your urban area and compare which one is more acidic.

- ◆ Find out the reason for this.

Investigating the Effects of Rainfall as an Element of Weather on the Environment

Rainfall is a vital element of weather, in terms of long and short term effect. The two key elements contributing towards rainfall are the intensity and duration.

If the intensity is too high and the duration too long, floods may occur. The opposite is true if we receive too little rainfall and drought may also occur.

- **intensity** — the rate of rainfall
- **duration** — the period that rainfall lasts



- ◆ Conduct research to find out when were the last floods experienced in South Africa.

- ◆ What was the extent of the damage on the environment?

- ◆ Write a summary of one page of your findings and communicate it to the rest of your group.

- ◆ Keep all your research data in a well-organised and presentable portfolio.

Did you know?

Flash floods occur within 6 hours of the rain event. Flooding is a longer term event and may last a week or more.

DISCOURSE ANALYSIS RESULTS: PASSAGE 6: RAINFALL

In this passage, the very first sentence reads: *“Rainfall is formed after clouds have been formed.”* No introduction to the topic is given. The next sentence reads: *If condensation continues after clouds have been formed more droplets develop.* Nowhere in this passage is the meaning of ‘condensation’ established before or after use. Its meaning is only given four pages later in the discussion of the water cycle. This seems to be the pattern throughout the passage where subject-specific terms crucial to the learners’ understanding of the topic are not clarified within the text. Another example of this is the writer’s use of the term ‘low pressure cells’, where again no explanation is given. The writer, therefore, is assuming a great deal of background knowledge on the part of the learner or assumes that these terms are going to be explained by the teacher.

There seems to be no logical connection in the way different points are being made. For example, one paragraph contains explanations of the three types of rainfall, immediately followed by how rainfall is measured. There is no separation of the two topics, which although they were related, are discussing two different things.

In the passage, the following heading appears:

“Investigating the Effects of Rainfall as an Element of Weather on the Environment”

As a heading, this is too long. Learners are already lost half way through the sentence and neither is it very explicit for Grade 8 learners.

Apart from the subject-specific terms for which there is no explanation in the text, the use of ordinary English words and phrases such as ‘humid, drought, vital, elements of weather’ may add to learners’ misunderstanding.

The text does not allow for learners to work with it independently and needs the guidance of a teacher to make concepts clear. The Fry Graph for estimating readability found this passage to have a reading level of 13 years.