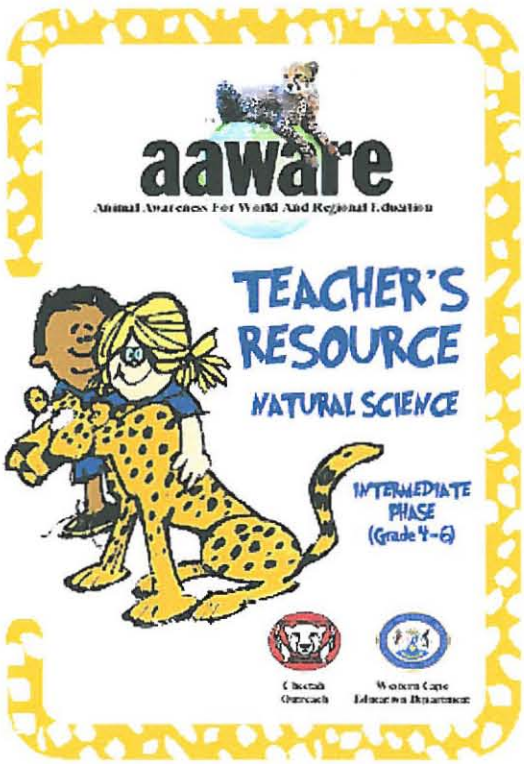
The Evaluation of Environmental Learning Support Materials: A Case Study of the *AAWARE Teacher's Guide*



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ABSTRACT

This evaluative case study investigates the use of a specific learning support materials (LSMs) package, *Animal Awareness for World and Regional Education* (*AAWARE*), in the natural sciences, intermediate phase. Schools with access to the resource were canvassed through questionnaires to assess overall use in relation to distribution via workshop versus hand delivery, class size, availability of alternate LSMs and lastly the level of exposure to the distributing organisation.

Three case studies were undertaken at three different schools. Data was generated through observations and interviews with the teacher undertaking the lesson observed. The aim of the case studies was to gain greater insight into *AAWARE* in practice and the factors that facilitated the use of the resource by these teachers.

The research indicates that while *AAWARE* has overcome some inhibitors of resource use, its potential within Outcomes-Based Education (OBE) and the Revised National Curriculum Statements (RNCS) has not been achieved so far, except in a few isolated cases. Factors enabling the use of the resource are its user-friendly design, availability in all three languages spoken by the majority of Western Cape learners and the integration with education policy. Workshops, although not necessary for the utilisation of *AAWARE* in part, could enhance the integrated nature of the resource and introduce teachers to the potential of using the resource as an entire unit as opposed to a collection of separate lesson plans. A relationship is seen between exposure to the distributing organisation, the personal interest in wildlife of the teacher and the use of *AAWARE*.

Finally recommendations are provided to increase the use of *AAWARE*. It is suggested that the resource undergoes a more effective alignment to RNCS content (RNCS policy was not an issue) now that RNCS implementation is completed. Further workshops should be offered in the use of *AAWARE*. Lastly a long-term strategy should be developed to enthuse schools and teachers about the intentions, goals and appropriateness of the resource.

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CHAPTER ONE
INTRODUCTION

1.1 Introduction to Chapter

This chapter provides the background to the research and the development of the *AAWARE (Animal Awareness for World and Regional Education)* Natural Science Teacher's Guide (from here on referred to as *AAWARE*), as an explanation of my choice of research topic. I will explore the assumptions underlying the research and set forth the aims of this research.

1.2 Background to the Research

Cheetah Outreach, situated outside of Stellenbosch, Western Cape Province, was established in January 1997. The organisation raises funds in order firstly, to create public awareness regarding the plight of the cheetah, secondly to support in-situ conservation and thirdly to provide an educational experience for learners. The education programme's mission statement is: *To increase the pride and respect for South Africa's fauna among the youth of previously disadvantaged communities, using the cheetah (Acinonyx jubatus) as an ambassador species and to sow the seed of a conservation ethic.* This is undertaken through four different avenues:

- once-off presentations based on the life history of cheetah including a hands-on experience with a hand-raised cheetah
- capacity building workshops in Environmental Education (EE) for teachers,
- international EE fellowships for teachers from disadvantaged schools
- and lastly the development of curriculum-integrated learning support materials (LSMs).

AAWARE, the first resource developed by Cheetah Outreach, was a response to the changes in curriculum policy. The aim was to assist teachers in incorporating environmental education into their classroom practice. *AAWARE* encompasses a series of intermediate phase (grades 4-6) natural science lessons, based on the cheetah, to introduce learners to natural science concepts.

The resource is situated within the *Life and Living* content area of natural science, which focuses on "life processes and healthy living, on understanding balance and change in environments, and on the importance of biodiversity" (National Environmental Education Project for General Education and Training (NEEP-GET), 2004a). The scope of the lessons range from the morphological differences of the large cats of Africa, to food webs, habitats, the interaction between populations and habitat components (balance and change) nutrition and more.

The logic behind the programme was derived from the Kenyan experience. In Kenya, learners are highly aware of the social implication of the parks and wildlife adjacent to their communities yet lack the ecological understanding. It was surmised that this was due to an absence of the integration of the parks and wildlife into the schools curriculum (Ali, 2002). A contextual profile was undertaken by Glover (2004) at Siviwe primary school in Guguletu (an underprivileged community in Cape Town, Western Cape Province). This profile revealed that the learners are ignorant of their broader environment; in addition the teachers are also mired in the outdated concept that the environment is the animals and the trees. The ecological or social implication of the rich wildlife heritage of South Africa remains opaque to the learners. This is perhaps exacerbated in the Western Cape Province, which is at a distance from the majority of our national parks. A greater awareness of our wildlife and the economic implications of environmental heritage are two focus areas that Cheetah Outreach is attempting to introduce to learners. The curriculum, and the manner in which it is presented, has the possibility of developing 'remedy owners' and custodians of the environment through the use of curriculum-linked resources.

Education is increasingly regarded as the key to sustaining our environment, (McIvor, 1999). Teachers however baulk at the work involved in order to incorporate this into their teaching (Glover, 2004:12). In the past environmental education was the preserve of environmental clubs mostly involving short-term issues such as community clean-ups and vegetable gardens at school. Outcomes-based education (OBE), through the Revised National Curriculum Statements (RNCS), is a suitable vehicle to improve this situation. The teachers however need adequate training; not only in departmental policies, but also in their subjects (many have diplomas in teaching, but little more than Matric in the subject). This corresponds with the findings of Lotz-Sisitka and Janse van Rensburg (2000), who state that educational responses will only adequately address the issues

once the educators acquire an in-depth knowledge and understanding of the environment and its complex relationship to development. The understanding, not only of the environment and environmental education, but also of the new education policies lacks depth. The contextual profile unfortunately did not develop detailed descriptions concerning the real understanding of the teachers at the school as to the concepts of the RNCS, OBE and EE. However as McIvor (1999) is of the opinion that successful education must include the context of peoples' lives. The problems prevalent in this community give rise to the concept of environment meaning diverse things to different sections of the community. Consequently, the resource, if it is to fulfil the OBE / RNCS policies, has been designed to develop scientific skills while imparting conservation knowledge.

1.3 Development of *AAWARE*

AAWARE was developed together with a group of intermediate phase, natural science teachers from the Western Cape over a period of one year. As the education officer of Cheetah Outreach I was responsible for the co-ordination of this project and participated as a writer. The teachers highlighted the natural science concepts appropriate to each grade. We then chose the concepts which related to an aspect of the life history of the cheetah and adapted existing or designed new lesson plans incorporating the cheetah as an aid to developing knowledge and process skills related to the concept.

The English draft of the resource was piloted in 8 schools to highlight any potential problems. Any impediments were corrected and the resource subsequently translated into the two other predominant languages of the Western Cape (Afrikaans and Xhosa). Although the education department policy required English as the medium of instruction from Grade 4, the Western Cape Education Department specifically required that we made the resource available to teachers in all three languages. The end of 2004 saw the guide distributed to 400 primary schools within the province. However there is a need to evaluate the effectiveness of this resource and its classroom use. Its integration with the latest curriculum policy was of key importance resulting in the constant updating during development of the curriculum links as new policy emerged within the

Education Department. Research has shown that learning support materials can aid the implementation of the new curriculum, but they are not necessarily effective unless teachers are enabled in the selection, access to and use thereof (Olvitt, 2004). Consequently there is a necessity to evaluate both the efficacy as learning support material for natural science teachers, and what precisely facilitated their use of it.

There were several assumptions made during the development of *AAWARE*:

- learners will enjoy the topic of cheetahs and therefore be more enthusiastic about learning
- the design of the resource would facilitate use
- the incorporation of the teacher team would ensure the materials were grade and subject appropriate thereby facilitating use
- *AAWARE* was a worthwhile project, both for teachers and for the organisation
- the parallel implementation of AAWARE with the RNCS training would be of benefit to the teachers and promote the use of the resource

Nduna (2003), investigated the use of LSMs to "mediate learning and teaching in the classroom" for her Master's thesis. Her research suggested a relationship between learning theories (and the teaching methods used) and the classroom use of LSMs. Russo (2003:84-86) found that the contextualized use and adaptation of LSMs is an important feature of resource-based learning and information literacy. Issues highlighted by Nduna, (2003) regarding LSMs use included access, planning and over-use of materials, yet she concludes that LSMs are necessary within the outcomes-based education framework. My research will assess whether *AAWARE* conforms with their findings and if so how.

Olvitt (2004:ii) researched the development and trial of *Hadeda Island,* a LSM based on the 1st principle of the RNCS. In her study she found that teachers emphasise either the ecological or the social aspects of the environmental and recommends that there is a need to pay more attention to the learning outcomes and assessment standards that emphasise the environment. The *AAWARE* resource primarily develops the concepts of Natural Science, but attempts to build up the learners' knowledge of the natural environment for a deeper understanding of why environmental issues have impact. The teachers' guide ends with a discussion lesson on the human-nature relationship

occurring within the arena of cheetah conservation. Does the use of this resource correspond with her findings or perhaps allay some of her concerns?

1.4 Outline of *AAWARE* Lessons

1.4.1 Grade Four

- Lesson One: Introduction to the Cheetah Outreach

Compares the cheetah to the lion, leopard, caracal, domestic cat and tiger in terms of physical appearance. It compares colour photographs of each and sorts the cats into similar groups.

- Lesson Two: Habitats

Introduces the learners to basic habitat terminology and explains the composition of a habitat.

- Lesson Three: Adaptations

Introduces the learners to adaptation terminology, discussing the adaptations for speed of a cheetah in comparison to everyday objects with the same purpose (e.g. cleats on a rugby boot compared to the semi-retractable claws of a cheetah).

- Lesson Four: Food Chains

Introduces the learners to the terminology of food chains, food webs and food pyramids.

1.4.2 Grade Five

- Lesson One: Introduction to the Cheetah

Compares the cheetah to lion, leopard, domestic cat, caracal and tiger in terms of habitat, diet, hunting behaviour, social behaviour, sexual maturity and threat to man through an interactive tracking game.

- Lesson Two: Habitats

Reviews habitat terminology. This is followed by a series of activities designed to compare different habitats. It identifies the animals that would be able to live there in terms of their survival needs and adaptations.

- Lesson Three: Life Cycles

Compares the development of a cheetah to that of a human child from birth to adulthood in terms of rate of growth and stages of development.

- Lesson Four: Nutrition

Discusses the various types of teeth and what they are used for. The learners use pictures of skulls and classify them, giving reasons, into the categories of herbivore, omnivore and carnivore.

- Lesson Five: Population Change

An interactive game helps the learners graph the interaction between habitat elements (space, shelter, food and water) and a population of cheetah. This illustrates a population in balance provided all elements are present and the drastic changes in population that occur should one of the elements be removed.

1.4.3 Grade Six

- Lesson One: Adaptations

Reviews adaptations from grade four. Students then have to design, conduct and report on an experiment using a local insect to explain a selected adaptation.

- Lesson Two: Animal Behaviours

Learners undertake a research project on a selected topic of animal behaviour; for example what survival strategies does a cheetah cub need to survive in the wild.

- Lesson Three: Nutrition

This lesson illustrates and discusses the different energy values in grass as compared to meat. This is extended into a discussion of applications to agriculture.

- Lesson Four: Population Change

Reviews population change lesson of Grade five, then shows the impact humans can have on an otherwise balanced ecosystem. The use of a hunter or farmer is used to illustrate the possible detrimental effect on the population of cheetah.

- Lesson Five: Threats to Survival

Lesson five further develops lesson four. In lesson five learners are introduced to the threats facing the cheetah and strategies being undertaken to enable its survival. The learners are encouraged to take action either for the cheetah or for a relevant environmental issue in their community.

1.5 Research Aims and Goals

The research was undertaken to give necessary insights into the use of the resource and whether the assumptions (in section 1.3) were appropriate. My research goals were therefore to both evaluate the use of *AAWARE* and to gain insights into the potential alternative ways of using the resource. This research attempts to achieve these goals by investigating the trends between the resource use and the following variables:

- method of introduction to AAWARE – workshop versus hand delivery
- availability of alternate LSMs
- class-size
- the school's relationship with Cheetah Outreach
- interactions between the teacher and the learners
- interactions between the learners

Cheetah Outreach is interested in the research as a tool to provide recommendations to adapt *AAWARE* if necessary. Consequently my research question is to ascertain the use of learning support materials in the Natural Sciences through the case study of the *AAWARE Teacher's Guide*.

1.6 Overview of Chapters

Chapter one has given the background to the research interest and the LSM under evaluation in order to orientate the reader to the research goals.

Chapter two contextualises the research in terms of the current curriculum practices in South Africa. It also addresses international and national research into the use of LSMs by teachers and more specifically the use of wildlife orientated LSMs.

Chapter three reflects on the methods and methodologies chosen in this research process. This chapter provides the theoretical reasoning behind the choices made for data generation (questionnaires, interviews and observations) and analysis and makes recommendations for changes in methodology should the research be repeated.

Chapter four analyses the data generated from the questionnaires. A discussion on the overall findings is developed and compared to similar research. The trends in *AAWARE* use are identified and relationships to the variables set forth in section 1.5 explored.

Chapter five analyses and develops the three case studies undertaken through the interviews and observations. Further trends within and across the case studies are highlighted and discussed in terms of similar research and the variables set forth in section 1.5.

Chapter six reviews the conclusions to the research and summaries any actions recommended throughout this research.

CHAPTER TWO
CONTEXTUAL BACKGROUND

2.1 Introduction

In this chapter I contextualise the use of environmental education learning support materials (LSMs) in the South African education system. I review the literature available within Southern Africa and internationally as to the impediments to the use of LSMs.

2.2: Revised National Curriculum Statements (RNCS)

2.2.1 The Environment within the Revised National Curriculum Statements

In 1994 the Reconstruction and Development Programme stated a need to develop "environmental education programmes to rekindle our people's love of the land and to increase environmental consciousness amongst youth, to co-ordinate environmental education policy at all levels and to empower communities to act on environmental issues and to promote an environmental ethic" (African National Congress, 1994). The South African education system has since been in a state of change from a content-based syllabus towards an outcomes-based curriculum, which requires learners to meet specific outcomes before leaving school (Olvitt, 2004). The first principle of the new curriculum is that of 'social justice, a healthy environment, human rights and inclusivity'. There has been a move to include environmental issues and how human wellbeing is affected by issues such as soil erosion, lack of sanitation, pollution etc in formal education since 1994 (Department of Education, 2002).

New education policy, through the development of the Curriculum 2005 (C2005) in 1997, allowed this need to be addressed. This was later amended to the RNCS, which incorporates environmental concerns under one of the critical outcomes. This outcome states that learners should be able to use critical skills and knowledge developed to show responsibility towards the environment. The environment is seen as integral to all learning areas in order to develop

students' broad and in-depth awareness of environmental issues and viable solutions so that they may become active participants in addressing these issues. One of the natural science learning area purposes is to develop an understanding of the relationship between the environment, science and society, and "to know earth's life-support systems and act responsibly" (NEEP-GET, 2004a:11). The NEEP-GET project (NEEP-GET, 2004a:7) identifies the importance of science process skills for investigating, understanding and solving environmental issues through providing an awareness of the biophysical environment and its relationship to the social, economic and political environments.

Furthermore NEEP-GET (2005a:8) discovered that the inclusion of an environmental focus in the learning areas was not enough to ensure integration into classroom practice. The project concluded a further need to "support curriculum support staff and teachers to 'make sense of' and to 'apply' this focus in their day to day curriculum work". One such initiative was exposure to environmental learning resources through the use of partner-produced learning and teaching support materials."

2.2.2 Learning Support Materials Development for Revised National Curriculum Statement Outcomes

The *Gaborone Declaration* by the Environmental Education Association of Southern Africa (EEASA), as cited in Russo and Lotz-Sisitka (2003:2), discusses the aid LSMs bring to an understanding of environmental education issues. Their role in the "re-orientation of education and training in all sectors", with active and situated learning being a component of these resources is also recognised. Czerniewicz, Murray and Probyn (2000:48) stated that the implementation of the forerunner of the RNCS, the C2005, was "reliant on access to learning materials". Lotz-Sisitka and Raven (2001) also conclude in their report on the NEEP-GET pilot project that the development of EE-LSMs to aid teachers in the planning of their learning programmes was one of the requirements to successfully include the environment into the curriculum.

Environmentally orientated LSMs may be developed from different viewpoints. Some might incorporate a nature bias, while others may include the socio-economic aspects of environmental issues. Whatever their orientation, if the LSMs are intended for school use it is important to incorporate education department policy (Russo & Lotz-Sisitka, 2003). LSMs design can influence learning in different ways and designers need to consider the context of their use. School materials need to take into account the organisation of the school in terms of timetable, learning areas, assessment standard etc.

Vinjevold (1999:163) describes LSMs within the education system as being "materials which provide a systematic learning framework" as opposed to "supplementary materials which are used in support of the systematic learning framework". LSMs therefore need to help "structure and organise the learning experience of the class, assist the teacher in ... preparing lesson plans, and ... provide recapitulatory material ..." (Vinjevold, 1999:183). Vinjevold also lists some of the principles developed by the Department of Education for LSMs as needing to:

- promote critical thinking, logical reasoning and problem solving skills as essential life skills
- promote awareness and respect for the environment and the diverse cultural heritage of society at large
- link content, concepts, knowledge and understanding to skills and to values, dispositions attitudes and norms (Department of Education as cited in Vinjevold, 1999:164)

LSMs are therefore recognised as a means to address all RNCS principles, including the environmentally orientated outcomes.

2.3: Learning Support Materials & Outcome-Based Education (OBE)

2.3.1 Outcomes-Based Education in South Africa

The changing education system (refer to Section 2.2.1) is metamorphosing towards an OBE curriculum approach, described as an attempt to bring theory and practice closer together (DoE, undated). Malcolm (1999:77) describes OBE as a "way of managing curriculum and assessment

that has many forms" and that the theoretical model does not necessarily coincide with the actual classroom practice where teachers combine OBE with their own theories and practices.

The Department of Education (DoE) chose to work within a model of transformational OBE, which is described by Malcolm (1999:86) as taking into account the role of the learner in the larger world and not just emphasizing knowledge and skills. The DoE describes the important characteristics of transformational OBE as following:

- Involves the integration of concepts in a cross-curricular approach which embraces not only the structure of the curriculum, but also the methods by which instruction is delivered and meaningful assessments made;
- curriculum development should put learners first, recognising and building on their knowledge and experience, and responding to their needs;
- learner-centredness is an important principle to the approach and gives considerable emphasis to constructivist approaches to learning;
- promotion of cooperative learning which is regarded as one of the key elements to learning success;
- progress is demonstrated through integrated tasks and the application of skills to real world problems, and is monitored through multi-dimensional methods of assessments;
- includes all learners
- it remains the responsibility of educators to construct meaningful learning experiences that lead to the mastery of outcomes; … " (DoE, undated: p9-10)

The documentation produced by the department to explain the new curriculum approach emphasises that the foundation of OBE is a constructivist framework (DoE, undated; WCED, 2000). The Western Cape Education Department describes constructivism as a move to the learner actively inventing knowledge as opposed to passively accepting it. The DoE (undated:11) describes "constructivist teaching practices" as follows:

- Help learners to internalize and reshape, or transform, new information. Transformation occurs through the creation of new understandings that result from the emergence of new cognitive structures.

- Emphasis in a constructivist classroom is not on transmitting information but on promoting learning through learner intellectual activity such as questioning, investigating, problem generating and problem solving. It's about constructing knowledge, not receiving it.
- It's about understanding and applying and not parroting.
- It's about thinking and analyzing (Crap detecting), not accumulating and memorizing information.
- It's about being active not passive learning.

Constructivism concentrates on the processes and development of cognition, being able to relate the knowledge developed to problem-solving and existing knowledge and beliefs, as well as to critically reflect thereon. Moll (2002:28) clarifies constructivism as proposed by the DoE to be: "a core of theses and propositions that suggest that new knowledge arises in children out of real developmental mechanisms, some of which are social and some natural, and on the basis of activity ...". Therefore learners should be given the opportunity to engage with real life issues and construct the knowledge themselves, individually or as groups, through research. The teacher's role within OBE then becomes a facilitator and mediator of knowledge. (Western Cape Education Department, 2000)

The constructivist classroom moves away from primarily using textbooks and includes hands-on experiences and other resource materials. NEEP-GET (2005b:10) states that the constructivist orientation of C2005 has been softened in the streamlined RNCS, which is more structured and progressive. However there are still opportunities for open-ended and active learning approaches, allowing contextualised LSMs to be used within a learner-centred classroom.

OBE specifies what learners should know and what they should be able to do through a series of outcomes – the results of learning as opposed to the experiences from which learning results (inputs). This allows teachers to include other inputs of learning (daily experiences, family, LSMs, television etc) with the traditional role of the teacher and textbooks (Malcolm, 1999:80). In comparing the old and new curriculum approaches, OBE as a learner-centred approach is described as relying not on textbooks but on "primary data sources" and hands-on materials. Textbooks are not disregarded but used in conjunction with other learning support materials to

provide not only process skills, but to ensure that the learners have access to the curriculum content as well. Malcolm (1999:79) states that: "the test of OBE is whether it enables the teacher to design good curricula". Czerniewitz, Murray and Probyn (2000), agree that the production of LSMs is necessary for Curriculum 2005 and hence the RNCS to succeed. Therefore a key component of OBE is resource-based learning. This approach requires learners to be able to utilise resources to "identify, extract, synthesise and manipulate information" (Czwerniewicz *et al.*, 2000:ii). Teachers need to be able to incorporate these LSMs within their structured learning programmes through the selection and adaptation of LSMs for use in the classroom (Czerniewizc *et al.*, 2000, NEEP-GET, 2005b).

2.3.2. Learning Support Materials in Outcomes-Based Education

LSMs are described by Russo and Lotz-Sisitka (2003:48) as being resources that "scaffold .... learning interactions". Czerniewicz *et al.* (2000:20) describe LSMs as being "shaped to a pedagogical purpose" and includes textbooks under this heading.

The NEEP-GET (2004b:2) booklet on the use of LSMs discusses the role of teachers not only as facilitators of learning, but also as "interpreters and designers" of learning resources. As discussed previously OBE requires learners to be active in the learning process and therefore requires more adaptable, learner-centred materials and it is here that LSMs can play an important role in conjunction with textbooks. This agrees with Russo and Lotz-Sisitka's description of LSMs especially as he goes on to say that LSMs also contribute to the development and planning of learning opportunities by the teacher. The constructivist foundation to OBE imbues the use of LSMs with a sense of the opposite in the light of their statement that: "LSMs should enable EE processes that are supportive of participatory processes in which knowledge and experience is collaboratively developed to ensure relevance and meaningful actions".

Nonetheless, NEEP-GET (2005a:37) in their critical dialogues identified the poor use of LSMs in schools as contributing to the problems in implementing Curriculum 2005 (C2005). This needed to be rectified in order to facilitate the learning outcomes. During the revision of the C2005 the

revision committee identified the poor use of LSMs as one of the factors impeding the implementation of the curriculum. They recommended that different LSMs and high quality textbooks were needed to achieve better learning outcomes.

NEEP-GET (2005a:37) states that: "OBE involves resourced-based learning approaches" requiring different LSMs to address the different learning outcomes within the multitude of contexts at schools. Czerniewicz *et al.* (2000:iii) also previously discussed that LSMs are considered central to teaching and learning in C2005, and to supporting curriculum change. Czwerniewicz *et al.* go on to state that there is evidence that access to LSMs influences teaching practices. Notwithstanding confusion about or lack of commitment to OBE, the availability and use of LSMs promotes learner-centred active learning and supports critical thinking. Nduna (2003:118) concluded her research on the use of environmental LSMs within an OBE classroom with the following statement: "the use of LSMs appears to be an integral dimension of the mediation of learning within OBE".

2.4 Use of Learning Support Materials

2.4.1 Internationally

Vinjevold (1999:167) states that most of the international literature on LSMs refers to the role of textbooks, which research indicates do improve science and mathematics. Crouch and Mabogoane as cited in Bot, Wilson and Dove (2000:59) refer to international literature, suggesting learners with access to learning materials develop cognitively rather than just accepting information. Czerniewicz *et al.* (2000) discuss this role that adequate LSMs have in improving the effectiveness of schooling. Indeed they consider that LSMs are considered one of the four basic inputs in education. The above research has shown that the availability of textbooks have a greater impact in developing countries as compared to developed countries were they are prevalent.

International research on resourced-based learning acknowledges the role that LSMs have to play in stimulating the relationship between knowledge, skills and values (Todd, Lamb and McNicholas, 1993 and Nicholson, 1993). The researchers referred to difficulties in the use of LSMs in that they were outdated, and insufficient and/or the teachers lacked the expertise to utilise them. Manitoba Department of Education (1994) discusses the necessary guidelines that resource-based learning requires for effective use as well as continued support in the use of and adaptation of LSMs and access to a variety of LSMs. Ghelani, Shoolbred, McNicol and Nankivell (2002) concluded that the use of resources is shaped by their availability in terms of numbers and access, the support given in the use of the resource and the familiarity with the topic.

Within Southern Africa Olën (1993) found that there was a dual reason for non-use of LSMs. On the one hand a lack of physical access due to poverty, while on the other the sudden growth in the number of schools meant that the structure and furnishings of the schools were prioritised resulting in a consequent lack of sufficient resources. An additional cogent reason for non-use was inappropriate language reducing an intellectual access in the context of learners with a high level of illiteracy and functional illiteracy. Olën found that badly organised LSMs were available in the content of the school library but remained unutilised by teachers. Media centres and libraries were not seen as an integral resource for teaching.

2.4.2 South Africa

"Access to appropriate LSMs is essential. However, access alone is not enough. It is quite possible that LSMs may be delivered to schools and classrooms and either be used inappropriately or not at all" (Czerniewizc *et al.* 2000:vi).

At the time of Vinjevold's (1999) research in 1999 there was no extensive research in South Africa on the effects and use of LSMs. Mbanjwa (2002:135) agrees that the use of LSMs in South Africa is under-researched. Smaller studies on the utilisation of specific LSMs indicated that their use could increase individual and group work and improve test-scores. In addition the studies illustrated that LSMs can play a role in promoting discussion, explanation, questions,

reading and writing in a large class environment. Moreover the presence of the LSMs increased the types of interaction within the classroom (Vinjevold, 1999:174). LSMs promote more learner-centred methods of teaching. The research suggests that teachers canvassed in the study did not produce their own LSMs, in spite of an awareness of the importance of such resources. In some instances a lack of time, support facilities such as libraries and copying capabilities resulted in this deficit of initiative. However the same researchers discovered a high use of materials supplied by NGO's, yet concludes that this is a supplementary role and should not replace a "systematic learning programme". The study worryingly concluded that textbooks are not used systematically by most teachers. It argues that the teachers lacked the content knowledge. The teachers on the other hand argued that the textbooks were outdated and could not be read by pupils.

Recent research by the National Environmental Education Project for General Education and Training (NEEP-GET) introduced educators to the use and adaptation of LSMs in their classroom practices. The *Critical Dialogue 5 on Learning* (NEEP-GET, 2005a:33), responds claiming teachers and curriculum support staff appreciated this approach but nonetheless a proportion of the staff felt "they needed more –in-depth orientation to the materials" to utilise the LSMs with teachers. Further findings included the importance of the alignment of the resources to the curriculum, and the ease with which the educators could use the resource without resorting to further investigation and research. Support and training in the use of the resources remains an important issue, with several suggestions about how to involve teachers in the actual development of the LSMs. These insights were reinforced in the NEEP-GET report (2005b) on lessons learnt for EE within the GET band. This report emphasized the importance of learner context; however, it maintained that the emphasis should lie in supporting teachers in selecting and using LSMs rather than encouraging them to design their own. Looking at a number of readings (Czerniewicz *et al*, 2000; NEEP-GET, 2005a; Russo & Lotz-Sisitka, 2003; Vinjevold, 1999) they agree utilisation of the materials depends on the following criteria:

- context,
- links to curriculum (this was emphasized in Mbanjwa's, 2002, study on the use of LSMs in OBE)
- teacher support in the selection and use of the materials,

- appropriate language,
- a shared understanding of the goal of the LSMs and
- access to the material (this access to appropriate LSMs has been found to be particularly poor in under-resourced schools, NEEP-GET, 2005a)

NEEP-GET adds to this the ease of use and preparation time required.

Russo and Lotz-Sisika (2003:37) go on to say that LSMs can influence learning process by providing different learning opportunities based on their design. They argue that designers frequently lack strategic focus concerning the actual training use within the classroom. Nduna (2003) takes this further, in Nduna's opinion learning was "trivialised" when teachers started to use the LSMs, occasionally utilising the LSMs as a mere comprehension lesson. Consequently teachers as mediators play a large role in the success of LSMs. This again suggests that the educator may require scaffolding in the use of the materials. Russo and Lotz-Sisitka (2003:37) state that "an educational process usually involves interactions between learners, educators, materials and or real objects, an important facet of planning for these interactions involves considering what LSMs to use". Therefore the use of the LSM and its success depends on the teaching and learning actions undertaken in its use.

From all the above readings it would appear that the optimum way to understand the use of a specific LSMs is to observe its use in the classroom to assess how best to improve its development.

2.4.3 Use of Wildlife Orientated Learning Support Materials

Research, mostly in developed countries, has been undertaken on the attitudes of children to wildlife including the use of wildlife resources in the classroom.

Pomerantz (1991:16) researched the use of the Missouri Conservation Department's environmental education resource materials. These were designed not only to provide information on conservation issues, but in addition to assist teachers to attain their curriculum requirements.

She found that the resources were predominantly designed to address basic ecological principles, not necessarily specific issues, nor did the material aid the learners in developing critical thinking skills. AAWARE was developed with the same goal of assisting in the attainment of curriculum goals, while developing an understanding of conservation issues by the end of the lessons. However part of the curriculum goal is development of the process skills seen to be important to the growth of the learner into a critically thinking member of society (NEEP-GET, 2004a).

Chipman and Brody (1993) in their research on the use of wildlife magazines within American classrooms concluded that the teachers considered them an important source of useful and relevant information on wildlife and nature. The utilisation by teachers was quite diverse, from highly integrated into learning activities to primarily a source of information to supplement existing lessons. One of the important uses of these resources was to teach ethics and values. They chose to use these wildlife magazines which were seen to:

- be written at a level appropriate for students,
- help improve student learning skills
- address current issues,
- be written by practicing wildlife biologists,
- include ethics and values related to conservation
- publish things that interest students,
- use articles that are focused – one can find information on a particular species,
- provide information that is good for student reports and information, and
- appeal to kids because the kids can relate to the issues. (Chipman *et al.*, 1993:13)

Eagles and Muffit (1990) found a high naturalistic and "ecologistic" attitude amongst Canadian learners as opposed to the utilitarian attitude of the older generations. They attributed this to exposure to information on wildlife through education programmes at school and the popular media. Milton, Cleveland and Bennett-Gates (1995) concluded that an education-orientated interaction with nature could instil a sense of ownership in learners of wild places, while increasing their ecological knowledge. Dettmann-Easler and Pease (1999) found that learners had a more lasting positive attitude towards wildlife if they experienced a programme located in nature itself as opposed to within the classroom. This positive attitude towards nature and wildlife was

found to increase and last longer, the more time was spent on a programme (Lindemann-Matthies, 2002).

Hines, Hungerford and Tomera (1986/7) and Hungerford and Volk (1990) found a positive correlation between learners' environmental behaviour and their exposure at school to environmental knowledge, knowledge of issues and action strategies as well as their personal feelings of being able to make a difference. Chawla (1999) investigated what prompted adults currently in environmental fields to choose that lifepath and concluded that the five main factors, which primarily occurred in childhood, were: experience of wild places, family, organisations, destruction or pollution of a natural area and education. Xin and Bateson (1999) found that a positive attitude towards science was linked with a general positive attitude towards the environment.

2.5 Conclusion

In this chapter I have discussed the role of LSMs within the South African curriculum and the impediments to their use. The following trends were identified:

- Teachers lack the expertise to effectively utilise LSMs
- Availability and access to LSMs affects their use
- Availability does not necessarily equate to use
- Language and literacy competency is an issue in the use of LSMs
- The use of LSMs promote a more learner-centred method of teaching
- Teachers need support in the selection, adaptation and use of LSMs
- LSMs need to be aligned to current curriculum policy

International findings on the use of wildlife specific LSMs and learner attitudes to wildlife were also explored and it was found that:

- wildlife LSMs tend to be ecologically biased and do not necessarily promote educational competency.

- use of wildlife LSMs is diverse from highly integrated materials to supplementary information
- exposure to nature / wildlife issues / environmental education programmes can increase environmental awareness amongst learners especially if it incorporates a hands-on experience
- there is a correlation between a positive attitude to the environment and a positive attitude to science.

In the next chapter I will discuss the methods and methodologies undertaken in my study on the use of *AAWARE* within the schools in the Western Cape Province.

CHAPTER THREE
METHOD & METHODOLOGY

3.1 Introduction to Chapter

The previous chapter discussed the context of the study and gave an overall view of the literature. This chapter outlines and discusses the methods and methodology used in the research process. I furthermore explore the difficulties encountered with the data generation methods selected.

3.2 Research Orientation

I have chosen to work with an evaluative case study, described by Bassey (1999) as a method which can be used to judge the worth of an education programme. I recognize that the worth of the resource material will be subjective, as different stakeholders would consider different aspects to be of value. This agrees with Yin (2003a) who states that case studies are useful when the researcher is investigating how or why something is occurring within a real-life context.

The theoretical framework utilised in this study is that of the naturalistic and constructivist approach as described by Rosenberg (2004). This evaluation method incorporates both interviews and observations. The conclusions are constructed together with the participants within the context of the research. This part of the research investigates the propositional knowledge component of the resource. Though Cheetah Outreach does have an organizational value orientation in the context of biodiversity conservation, the introduction of a value orientation is minor and the emphasis of the resource is on propositional knowledge. The data generated was analysed to assess the learning actions taking place within the school context. I looked at the construction of knowledge using the resource with respect to constructivism as explained by the Western Cape Education Department (2000).

Moreover I classify the research as an interpretive case study. Interpretative case studies are

described by Stevenson (2004: 43) as enabling: "in-depth information to be revealed about the specific context as well as the intentions, organization and processes surrounding ... the implementation of ... educational program or activity, usually by focusing on the unique understandings and experiences of the individuals involved." He goes on to add that these studies will include any recurrent patterns deriving from the data, but bearing in mind that the findings can not be generalized for other situations. Interpretivism, described by Connole (1993), debates the underlying intentions of actions within certain contexts and whether the researcher role is to develop a negotiated understanding of situations in order to identify patterns and make generalisations. Van Rensburg (2001:16) too links case studies to interpretivism, as "an interest in contextual meaning-making, rather than generalised rules". She continues to discuss the nature of the data collected as being detailed qualitative data, generated without any prior theory being framed.

My research makes use of multiple case studies. Robson (1993:161) discusses the selection of multiple case studies either to provide "analytical generalization" to support a theory or to substantiate predicted contradictory results. Yin (2003b:34) agrees with this, stating that multiple cases are used to show a "replication" of results, in circumstances where the researcher predicts comparable findings. The multiple case studies I selected were to determine any similarities or differences in the use of the resource and to see whether these had any commonality regarding the variables present within the case studies. Berg (2004:256) in his chapter on case studies, refers to multiple case studies as "collective case studies", described as a number of selected "instrumental case studies" to provide a greater insight or to better apply a theory to a larger context.

Three case studies were undertaken at three different schools in order to evaluate the use of the *AAWARE* Natural Science Teacher's Guide resource by teachers in different circumstances. This research has been undertaken to help facilitate the use of the resource by seeing how others are using the materials within the classroom context. Stevenson (2004) explores the use of a case-study to generate knowledge of educational practices and inform change in practice, noting that a case study is useful where the context of the study has a large influence on the data.

3.3 Data Generation

To generate data, I used a combination of questionnaires, interviews and classroom observations.

3.3.1 Questionnaires

During 2003 and 2004 *AAWARE* was distributed to 414 schools throughout the Western Cape Province. It was my intent to gather general data from these schools regarding the utilisation of the resource material. I chose questionnaires (Addendum B) as an inexpensive way to generate a large amount of data as suggested by Cohen, Manion and Morrison (2004:245-266) in their chapter on questionnaires and Sanders and Pinhey (1983:127-153). Robson (1993:243) describes the questionnaire as being "efficient in terms of researcher time and effort" if well constructed. In choosing to fax instead of posting the questionnaire to the schools, I made the assumption that the schools had the financial means and equipment to return the questionnaire by fax. This decision was based on previous experience of distributing information to the schools. The hand delivery of questionnaires in this situation was impractical. In a previous experience a greater number of schools received faxes in comparison to posted information. A questionnaire could be completed in my absence. The distances involved precluded my active support in completing questionnaires. I focussed on gathering specific information on the use of *AAWARE* together with background data on the schools. This was necessary for comparison purposes, as well as to evaluate if the data would establish complimentary enquiries for the rest of my research.

The final questionnaire contained 14 closed-ended questions and two open-ended questions establishing the number of teachers and pupils in each intermediate phase grade and class, the resources available to the school, the method by which they had received the resource materials from Cheetah Outreach and their subsequent use. It questioned whether they were utilising with *AAWARE* and in the absence thereof they could select from a list of possible reasons or a category of other to respond more fully. If they were using *AAWARE*, they were requested to identify the precise materials utilised within each context. A second type of question sought to establish which of the lessons required modification from the original design in order to improve or develop

their use. Detail of potential required changes or further facilitation to enhance use was requested in the form of an open-ended question.

I piloted the first draft questionnaire (Addendum A) at 12 of the 414 schools that had received the resource, selected on a random basis. I received 8 back, one of which consisted only of the first page of the questionnaire. The pilot version of the questionnaire did not list all the lessons for ease of selection, but requested a statement of the lessons they utilised. This did not adequately provide the required information as they nominated a minimum number of lessons. I therefore altered the questionnaire to include all the lessons listed under either a heading of "using as designed" or "changed in order to use". Cohen *et al.* (2004:260) state the importance of the pilot to test the respondents' understanding of the questions as well as to ensure that the answers do provide the information needed by the researcher. Robson (1993:243) states that a pilot using open-ended questions can be used to design the final questionnaire as it can provide suggestions for close-ended questions. I designed the questionnaire to be no longer than two pages and easily completed so as not to intrude on the busy schedules of the schools more than necessary.

This final questionnaire was then faxed out to 293 schools. 109 of the schools who had received the resource material were not available by fax. Of the 293 that received faxes, 35 full questionnaires were returned. One return had the first page only and there were two 2 emails with a general message (i.e. no answering of the questions). I chose to include the pilot questionnaire answers in my data analysis where the answers corresponded with those of the final questionnaire.

The questionnaire data was amalgamated into a spreadsheet to allow comparison across schools and between the variables of resource availability, class size, method of receiving the resource and the type of relationship with Cheetah Outreach. This relationship ranged from the only contact being delivery of the resource (coded as no relationship) to an intense developmental relationship with one or more teachers at the school. The relationship data was retrieved from my experience working with the schools and records held at Cheetah Outreach. Any trends in resource use, with respects to the variables, were represented as graphs. Trends observed were analysed in the context of the original questionnaire answers to ascertain any possible connections. Statistical analysis was not conducted due to the nature of the data, namely qualitative data and not

quantitative. The data was therefore analysed using thick description (Stake, 2003).

Due to the low rate of return, it would on reflection probably have been more effective to have administered the questionnaire personally to a stratified sample of schools selected to cover the variables mentioned above. (The variables would have needed to include a variety of socio-economic backgrounds, pupil population size and method of receiving *AAWARE.* I would not have been able to randomly select, as these variables may not have been represented in a random sample.)

The experience concurred with Cohen *et al.* (2004:261-242). I experienced a problem with this method of data generation due to the inability to correct any misunderstanding on the side of the respondent as well as lack of opportunity to probe or clarify any answers. After analysing the data, there are some gaps that could have been avoided if the questionnaire had been personally administered or a follow up questionnaire or interview conducted. An in-depth probe into why certain lessons were consistently left out would have added value to this research.

3.3.2 Observations

The next step in my research, after gaining an overall background view on the use of *AAWARE*, was to look at individual interactions with the resource material to gain a deeper perspective. To this end I elected to undertake "naturalistic observations" (Angrosino & Mays de Pérez, 2000: 673) within the classroom. The advantage of the observation was that I could gain first hand knowledge, instead of relying on the teacher's perspective of the actual use of *AAWARE* within the classroom. At the same time I was cogniscent of the fact that my presence could influence the very interactions I wished to observe (Angrosino & Mays de Pérez, 2000:674, Cohen *et al.*, 2004, and Mertens, 2005:382-385).

Neuman, (2000:361-362) agrees with the above authors that an observation needs to encompass a number of dimensions. From their work I have synthesized the following categories:

- physical context of the observation,
- the people involved in the interaction,
- how the participants interact with each other,
- the actual activities taking place
- general attitude – not just what is said, but how it is said

An observation schedule (Addendum C) was designed to acquire specific data but to remain sufficiently open to unexpected contexts and occurrences. As Cohen *et al.* (2004:305) recognise, a semi-structured observation allows for the deriving of key issues from the observation as opposed to the researcher utilising prior knowledge of issues and searching for the substantiation of these issues through the data collected.

The distances and costs involved precluded the incorporation of some schools within the Western Cape Province, consequently the observations were restricted to schools within the greater Cape Town area. Schools utilising the resource material were selected from the respondents to the first questionnaire. The principal was telephonically contacted and an interview including the right to observe a lesson utilising the material, was requested. Some schools had used *AAWARE* in the first quarter of the schools year; others were only using the materials in the last quarter term. This fell outside of my data collection period. The other schools were unwilling to take part in the research process. Sixteen schools indicated interest in taking part. However on subsequent communications either the contact person was unavailable, the schools were involved in departmental administration issues, had competing departmental observations taking place or could never provide a definite date and time for the observation. The Education Department permission to research in the schools was conditional on it occurring between specific dates. The constant hiatus in communication resulted in the research dates being exceeded. The result was that only three of the schools took part in this phase of the research process.

These three schools were accessible in terms of distance and permission, and enthusiastic to take part in the study. The schools are all situated in disadvantaged communities, two rural and one urban. They exhibited differences in resource availability.

I originally planned to observe four schools in the following contexts:

- received the resource materials through the medium of a workshop and had a high level of alternate learning materials and electronic media for support,
- received the resource materials through hand delivery and had a high level of alternate learning materials and electronic media for support,
- received the resource materials through an introduction workshop and had a low level of alternate learning materials and electronic media for support,
- received the resource materials through hand delivery and had a low level of alternate learning materials and electronic media for support.

This would have enabled me to compare the possible effects the level of resource availability and an introduction workshop could have had on the use of *AAWARE*. All three schools, which took part in the research process, fell into the last category. Two of the schools observed received the resource via distribution to the principal, the third school had one teacher attend the launch workshop in 2003. However in the latter case, on the day of observation, I discovered that the teacher had since left the school and had failed to pass on any of the resource material. Hence the teacher requested by the principal to accommodate my observation, had not seen the resource material until the prior week and was confused as to what was required. In a discussion with the teacher I explained the aim of the resource and the research, namely the main objective of the observation and interview. The aim was to establish how the teacher chose to use, and interact with, the materials at hand (this discussion was recorded as School 2, pre-observation interview for referring back to after the observation took place). The observation and interview were rescheduled to take place the following week.

Observations varied between schools dependent on lessons planned and the willingness to have the lesson video-taped using a hand-held camcorder. The first observation took place over two periods and was video-taped. The camcorder was placed to the side of the classroom to allow the teacher and as many learners as possible to be recorded. Some observations were noted on the observation schedule during the lesson and were expanded later from the video-footage. The second observation was conducted within a single period and more comprehensive written notes

were taken of the process according to the observation schedule. This observation was not taped due to complications with the equipment, instead it was recorded on a digital recorder in order to be able to follow the lesson outline more closely and allow for other variables to be noted during the observation itself. The third observation also took place over two periods and was video-taped. As per observation one, the notes that were taken in class were expanded later from the footage taken.

Cohen *et al.* (2004:310) define an 'observer as participant' as not being actively involved with the participants, but is known to the participants as being a researcher. This can be equated to Merten's (2005:382) 'passive participation' where the researcher is present at the observation but does not interact with the group under observation. This was my role in the observations. I did not participate in the lessons themselves. I took notes and recordings from an area in the room where I would not interfere with learners or teacher. All the learners knew who I was and why I was there and occasionally the teacher would refer to me to confirm that the information being given was correct.

I found it difficult to work with a camcorder. This was a novelty item at all of the schools and drew the attention of the learners constantly. Some learners were therefore too shy to participate while others kept looking towards the camcorder before answering. To position the camcorder where all activity could be recorded was impossible and if adjusted even slightly to film other sections of the class it immediately diverted the learners' attentions away from the lesson. To work off the video afterwards was consequently problematic as much of the lesson happened off screen, as the teachers tended to move around their classroom throughout the lesson. The sound was also not of a consistently good quality and the lesson was difficult to hear in places. The process was particularly aided by the notes taken by myself in class and the subsequent expansion of the notes from the video rather than the sole reliance on the video. Bassey (1999:82) agrees that working with a camcorder can cause problems as the participants are aware of being under observation. He suggests that one way to overcome this is to work with notes augmented by an audio recording (as was done in the second observation). I, however, found returning to the visuals, which were primarily of the teacher, more helpful than the audio recording.

3.3.3 Interviews

I chose to include interviews with the teachers who were observed as part of the research process in order to discuss what had been observed in the classroom situation. The interviews were also a tool to gain the teachers' perspectives on the lesson and the decision-making processes that took place. It was my intention that the interviews would be used to cross-check the observations.

As Cohen *et al.* (2004:267) discuss in their chapter on interviews, knowledge may be seen as being socially constructed through the exchange of ideas. Wengraf (2001:3) agrees with this noting that: "the interview as a whole is a joint production, a co-production, by you and your interviewee". I chose to undertake a semi-structured interviews (Addendum D) as per Cohen *et al*, (2004:270) and Wengraf (2001:5) to allow me to adjust the interview questions and incorporate issues raised by the interviewee which may not have previously been included in my questions. Wengraf describes semi-structured interviews as being prepared questions that are open to subsequent questions that arise out of the interview itself. This is one of the advantages of the interview compared to a questionnaire, it allows clarification and the in-depth probing of answers.

In addition the teachers observed were interviewed to gain their critical evaluation of the resource. To evaluate the use of the resource within the classroom I interviewed teachers individually. Originally I had intended to use focus-group interviews, as I am aware that there are benefits to be gained from the interaction between the group participants (Mertens, 2000:386). However due to the dynamics of the schools, I needed to change this. In the first school there were only two teachers using *AAWARE* due to mixed grades and the teacher of the higher grades was not using it in the year in question. In the second school only one teacher was using it as the solitary intermediate phase natural science teacher. At the third school the decision and inclusion into the year planner was not a group decision, but rather facilitated by the subject head (who was interviewed). In the third school a subsequent teacher discussion later in the term concerning the user-friendliness of the resource and the outcome of the lessons within the classroom was held. I did not receive an invitation to attend this meeting so it remained unrecorded.

The interviews covered how *AAWARE* had been incorporated into the year planner, how easy the

teachers had found it to interact with the resource and if they had changed it at all to facilitate use. The interviews were digitally recorded (with the understanding that any visual / non-verbal information would be lost as per Cohen *et al*, (2004:281), but the nature of the questions dictated that the focus would be on the verbal answer). The interviews were subsequently transcribed. During the transcription process any discussion that was personal, potentially harmful and / or irrelevant to the research was removed from the transcripts for the privacy of the participants. In some cases it was very difficult to hear part of the participant's response.

3.4 Data Analysis

Yin (2003a: 109) in his chapter on analysing case studies states that: "Data analysis consists of examining, categorizing, tabulating, testing, or otherwise combining both quantitative and qualitative evidence to address the initial propositions of a study". He also comments that due to analytical methods not being clearly defined, that analysis of case studies can be difficult. Bassey (1999:69) agrees with this stating that there is no specific method of data analysis in case studies.

The analysis of the questionnaires is addressed in section 3.3.1, and is therefore precluded from this discussion.

I chose to analyse the observations and interviews through coding according to a set of pre-selected categories relevant to the research topic:

- actual use of *AAWARE*
- the extent of changes from the original design
- what had been excluded
- what facilitated the use
- teacher – learner interaction
- learner-learner interaction

as a means to address my research goals stated previously in section 1.5.

Once coded, similar data within each case study and across the case studies was grouped together as analytical statements, described by Bassey (1999:70) as being "meaningful statements ... firmly based on the raw data". It is from these statements that the discussion was developed while referring back to the original observation or interview. The data has been recorded as thick description so that the reader can refer back to determine where the conclusions have been derived from. Thick description, according to Stake (2003:140), describes the details of a case and provides its uniqueness, and it is these details that allow comparisons to be made with other case studies.

3.5 Evaluation of Methods

I have already suggested some alternate methods of data collection previously in the chapter, which I will synthesis in this section. Due to the difficulty in the distribution, and the low return rate, of the questionnaires, as per my previous suggestion in section 3.3.1, I should have administered the questionnaires personally to a smaller number of schools across a stratified sample from those who had received *AAWARE.* This would probably not have taken up too much more time, as firstly faxing out over 300 questionnaires and then following up on the receipt of those questionnaires by phone consumed many hours. Administering the questionnaires personally would have ensured that all questions were answered as fully as possible and any ambiguities could have been solved immediately.

More personal communication, other than by telephone, would have increased the interest in partaking in the interviews and observations. In any further research, I will approach the principal for an interview at the school where I can propose the research to the principal and staff and organise observation and interview dates immediately. This approach would hopefully negate the communication problems experienced in this phase of the research.

I would include pre-observation interviews with the teachers to gain insights into how they intend to use the resource, to increase my understanding of how they perceive the resource integrating into their learning programmes and to introduce myself to the learners so that my presence is not

such a novelty in the classroom. The pre-interviews could also possibly have informed my observation schedule, especially if the teachers had a lesson plan available. During the observation themselves, it would have been helpful to have included an assistant to engage with the camcorder. The assistant could have concentrated on the filming and following teacher and learner actions, leaving me free to make more extensive notes during the lesson to improve data validation.

Both the observations and the interviews would have benefited from a piloting of the schedules. This would have allowed me to refine the questions asked and include some interesting points which arose, such as those relating to the teachers' individual interests in animals. The piloting of the observation schedule would have focussed my ability to discern the interactions to be concentrated on.

Overall the data generation and analysis would have benefited from being undertaken in cycles. As data was collected and analysed, further questions arose. If time had permitted another cycle of interviews and observation, the research would have been greatly enriched.

3.6 Reliability and Validity

Sanders and Pinhey (1983:77) assign reliability to the methods used to generate the data, that is to say that a "measure" is reliable if it measures consistently over time. Robson (1993:73) describes reliability as being the ability to repeat the same case study with the same results. The study should moreover eliminate any possible observer and subject bias or error. Yin (2003b:40) suggests that reliability is shown in the use of "formal case study protocols and the development of a case study database". He continues that the use of the protocols will "ensure same procedures are followed in multiple case studies" and that the "database differentiates evidence from the manuscript".

In my generation of the data, all methods of data generation were utilised through all three case studies in the same way. Some decisions needed to be made in the actual generation process due

to unforeseen circumstances, which changed the methods slightly. For example in the second school with the operating failure of the camcorder, the digital voice recorder became the only alternative to capture the data together with a greater level of in-depth initial observations using the standardized observation schedule. All original questionnaires, observation schedules, camcorder footage and interview recordings have been kept to keep the trail of evidence intact.

Sanders and Pinhey (1983:77) again subscribe validity to the "measure", comparing what the data generated was supposed to be against what was actually generated. Robson (1993:66-72) and Yin (2003b:39-40) categorise validity into construct validity, internal validity and external validity (Robson notes that this term is interchangeable with generalizability).

Construct validity is to ensure that the methods of data generation actually do generate the data that you intend the methods to generate. Robson discusses that each method does have shortcomings and a way of overcoming this is to use multiple methods, if they result in similar findings, then one can be more confident in their validity. Yin (2003b:32) agrees that multiple methods of measurement work well in a case study. Hence I chose to use a number of data generation methods (questionnaire, interviews and observation) in order to cross-correlate findings as well as to provide data not generated by the other methods used.

Internal validity is the confidence in the relationships theorized from the data, that is to say that the relationships are real and not due to a variable not portrayed in the research (Robson 1993:69, Yin 2003b:40). Yin states that this can be seen in the detailed description of the methods used to collect and analyse the data and if any rival theories have been negated through analysis of the data. In my analysis I attempted to include the effect any of the variables may have had on the results obtained. I took into account that a particular outcome may have had opposing reasons behind it and discussed this in my analysis chapter using thick description to enable the reader to investigate the findings themselves. The thick description used ascribes to Maxwell's (1992:285) category of descriptive validity which is seen to be the "factual accuracy of their account". To show that the researcher is not incorrectly stating what was heard or seen, Maxwell suggests that thick description and an evidence trail in the form of the original recordings etc is used in the research. As discussed at the beginning of this section, a case study database was kept. All

interview and observation schedule data were delivered to the interviewees before finalizing the analysis so that they could include any variables that I may not have recognized or unintentionally omitted as having an effect on the data.

External validity (or generalisability) is considered to signal and confirm the relevance of the analysis or theory derived from the case to other similar cases. Yin (2003b:40) qualifies this as being if generalizations can be made from the theoretical relationships derived. Berg (2004:259) states that when "properly undertaken, they (case studies) should not only fit the specific (case)... but also generally provide understanding about similar (cases)". Within this research, I am confident that the relationships can be generalised to similar cases dealing with the use of *AAWARE* in schools of similar background to the three cases observed as well as across the three cases as shown in the analysis.

3.7 Ethics

Teachers and schools were asked to participate voluntarily and no activity was undertaken that demeaned the participants in any way. Interviews and observation data taken were given to the participants with the option to change or exclude any answers given and was only included in the case report with the permission of the interviewees. A contract (Addendum E) was signed to this effect, where as the researcher, I agreed to hold the name of the school and participant confidential and that any sensitive information received in the intimacy of the interview and irrelevant to the research would be discarded from the transcript. The Western Cape Education Department (WCED) granted permission for the research, provided certain criteria were met as per the letter received from the department (shown as Addendum F). These criteria were adhered to, including complete anonymity of the schools and teachers. Both the WCED and the schools involved in the research will receive summaries of the finalised research as requested.

3.8 Conclusion

This concludes the chapter on methods and methodology. Having situated the research as an evaluative case study, with a contructivist approach, I proceeded to discuss the definition of a case study and why this was chosen as one of my methods. Data generation took place through questionnaires to attain an overall sense of the use of AAWARE in the schools and the case studies were undertaken through individual, semi-structured interviews and classroom observations. Difficulties in the research process were reflected upon and improvements suggested. The reliability and validity of the research was explored and the procedures discussed that were decided upon to increase confidence in the trustworthiness of the research process and findings. The ethical considerations of the research were outlined.

In chapter four we will be looking at the analysis and discussion of the questionnaire findings.

CHAPTER FOUR
OVERVIEW OF USE OF *AAWARE*

4.1 Introduction to Chapter

In the previous chapter the process of data collection was explained. In this chapter I will synthesize the data obtained from the returned questionnaires to investigate the overall use or non-use of *AAWARE*. I concentrate on the following variables: firstly whether or not teachers at the school attended a workshop in the use of *AAWARE*, secondly alternate LSMs availability, thirdly class size, fourthly the use of individual lessons and finally the schools' relationships with Cheetah Outreach. Furthermore I will investigate if there is any relationship between use and the above variables in the schools that modified lessons to facilitate the use thereof.

4.2 Why Schools are Not Using the Resource

The literature review in section 2.4.2 showed some of the reasons why schools were not using resources to be:

- the resource was too difficult for learners to read on their own
- the resource was outdated
- the teachers had limited subject knowledge and this could therefore prevent meaningful interaction with the resource
- the resource was not in the language in which the learners were taught
- the resource was either inadequately aligned or not aligned with the current curriculum
- lack of access to relevant materials particularly in disadvantaged schools
- the resource requires too much preparation in terms of reading and further research
- lack of support in selecting and using LSMs (teachers lack access to departmental guides which explain the methodology / use of new materials)

(Czerniewicz *et al.*, 2000, NEEP-GET, 2005a, NEEP-GET, 2005b Vinjevold, 1999)

AAWARE attempted to solve some of these issues by: ensuring that the resource was available in the learners' languages and in the language of instruction. It further aligned the resource with the RNCS, providing accompanying relevant resources in the form of the posters and delivering copies to all primary schools within the Western Cape Province. Workshops in the use of *AAWARE* are optional and not a precondition for delivery of the materials. This was to allow for the difficulty of teachers attending non-departmental activities over and above their departmental duties. Part of the strategy of incorporating teachers into the development team was firstly, the intention to ensure updated information in terms of curriculum content, secondly, increasing the understanding and readability of the resource for both teachers and learners and finally to provide lessons requiring minimal preparation by the teacher. Russo & Lotz-Sisitka (2003:10) discuss the importance of participatory approaches to the development of LSMs, to increase contextual relevance and to better address learners' needs.

The questionnaire findings as to the reasons *AAWARE* was not being used seem to suggest that the impediments referred to in the first paragraph were overcome to some extent. Reasons given by respondents for non-use were:

- the use of an alternate resource
- the arrival of new teachers who did not know about the resource or had not attended the workshop
- the resource had only been handed to one grade
- the teachers had never seen the resource although the school had received copies
- implementation of the new Revised National Curriculum Statements (RNCS) prevented the implementation of *AAWARE*
- it was not timeously received to allow for inclusion into year plan
- the teachers had forgotten that they had received the resource

The above findings suggest that the primary reasons for non-use have little to do with the resource design, but are strongly affected by a lack of opportunity for implementation (with respect to timing of planning and / or access to resource). Furthermore, the findings above suggest a lack of personal interest and commitment by the respondents in the resource. I would suggest these obstacles could be easily overcome through enhancing the methodology in order to

engage the teachers' interests and excitement about the topic and resource. This could be achieved through promoting the attendance at the introductory workshops in *AAWARE*. As previously stated in this section, research identified a lack of support in the selection and use of LSMs as a reason LSMs were unutilized by teachers. However the disinterest suggested above might in contrast imply simply a lack of familiarity with the resource and its potential use. In section 4.4.1 in support of this statement I compare the use of *AAWARE* in schools which received the resource through a workshop with those that did not.

Ideas outlined in the questionnaires, which might facilitate the use of *AAWARE* were confined to the following two suggestions:

- increased workshops / training in the resource for improved understanding on how to integrate with learning areas (this first suggestion reinforces the previous discussion of a support in the use of the resource)
- to evaluate whether the lessons could be integrated into large classes and consequently fit into a three week framework

Two schools that were not using the material might have misunderstood the questionnaire. Instead of suggesting methods to enhance the use they stated the following:

- that the use would be facilitated through using the lessons as is
- that the lessons were fully integrated with the RNCS policy and had the possibility of making the subject alive for the learner. (alignment with current curricula is emphasised by NEEP-GET, 2005a findings)

This misunderstanding could be due to an ambiguity in the phrasing of the question. However in the pilot the respondents showed clear understanding of the question in their answers. Nonetheless these answers further suggest that the design of the resource does not inhibit use, but rather the external factors. The first reason above was offered by a school that maintained its reasons for non-use was a lack of training in *AAWARE* and a conflicting use of an alternative resource. The school that made the second comment had received the information too late in 2004 to incorporate it into 2005 therefore were utilizing alternative resources. The lack of participation in a pre-organised workshop meant that the material was unexpected. This school equated the use of AAWARE with an excursion to the Cheetah Outreach facility and stated that the excursion

schedule had been set for 2005 by the time the resource was received. These two cases again reinforce the concept that the lack of accompanying support in the use of the specific LSM is predictive of future non-use. As stated in paragraph one of this section, research has shown that non-alignment to the curriculum is a reason for non-use of LSMs. The second response above suggests that for this school the non-use is not linked to the curriculum alignment as they consider AAWARE adequately aligned.

The questionnaire findings suggest that the predominant reasons for non-use of *AAWARE* are:

- teachers are unaware of its availability in the school and
- inappropriate use of the material.

Indeed the lack of in-depth, relevant suggestions to support the increase of its use would support this contention. The answers to this question show a clear dearth of interaction with the resource. This would appear to be an obstacle to further use that is easily overcome. The simultaneous implementation of the RNCS with the distribution of *AAWARE* through workshops became a blockage to extensive workshops while distributing the materials. Teachers simply did not have the time to attend an AAWARE introductory workshop, as was experienced by myself whilst attempting to organise workshops throughout the Western Cape to introduce AAWARE to the schools. . The schools that requested workshops to aid them in the integration of the resource into their classrooms can now be approached; the implementation the RNCS within the intermediate phase was due for completion in 2005.

4.3. Why Schools are Using the Resource

The questionnaires attempted to ascertain what made the resource user-friendly within their schools by asking questions as to why they were not using the resource, how they had changed the resource and what would facilitate their use of the resource. Nine schools provided answers. Similar reasons were offered by the respondents namely: simplicity, ease of understanding, user-friendly to learners, required no intensive preparation or further research, was colourful, contained useful information, and was relevant. Research by Czerniewicz *et al.* (2002) had indicated that extensive further preparation work would act as a barrier to use. While acknowledging the low

response to this question (9 respondents), they nonetheless indicate that the design of *AAWARE* is such that minimal preparation work is needed. This agrees with the conclusions reached by (NEEP-GET, 2004b) which emphasise teachers are more likely to use LSMs with minimal preparation work required.

To facilitate user-friendliness, some respondents modified a few of the lessons to achieve the following:

- an adaptation to the particular context of the various learners
- an alignment of the amount of material to the time-periods available
- modify the level to suit particular learners
- incorporate with previously used resources or
- use as a material to benefit another lesson rather than as part of the set lesson plan.

(This information was amalgamated out of the information given by those teachers who had answered the question on how the teachers had changed the lesson for use.)

This was not unforeseen. The diversity of learner abilities, teaching styles and classroom contexts would demand in the designers' opinions a certain modicum of adaptation. The lessons were intended to be fairly generic and therefore easily amended if necessary. The utilization of the material by the respondents implies an inherent value in the lessons.

Some of the respondents of the questionnaires suggested that the use of the resource would be improved through:

- further workshops (concurring that support in the use of LSM is an important condition to their appropriate use)
- better correlation with the contents of the curriculum
- the inclusion of further resources such as videos
- further integration into other learning areas (the resource is based in the Natural Science learning area and integrated where appropriate with literacy and numeracy)
- and lastly having a cheetah visit the learners, learners visit the cheetah or by choosing an animal with which the learners are familiar.

The first two suggestions correlate fully with standard reasons for disuse as discussed in section 4.2, though these teachers are indeed using the resource, they feel workshops and improved correlation to the RNCS would increase their use of *AAWARE*. This raises the question as to whether the development team, experienced in the grades and subject, were nonetheless not fully familiar with the newer curriculum. It questions whether the process should have been postponed until teachers were fully conversant in the RNCS. The resource was, however, given to two subject advisors for comment in addition to the pilot programme. This lack of correlation to content was not indicated at the pre-implementation stage, implying that while it was deemed appropriate on paper, it is a different situation when in use in the classroom context.

The suggestion of introducing an interaction with a cheetah or adapting the resource to an animal with which the learners are familiar is particularly interesting. In section 2.4.3, Dettmann-Easler and Peases' (1999:33) research showed that a personal encounter with "nature" increased the positive attitude towards wildlife as opposed to simply a classroom lesson. This emphasis on the need for learner familiarity is interesting in that the teachers in this survey recognise this aspect.

In contrast to the schools not using the resource, the greater familiarity with the resource by this latter group of teachers has produced more insightful suggestions and are thus of greater benefit for the improvement of *AAWARE*.

4.4 Variations in Use

4.4.1 Workshops

15 schools in the survey received the resource through a workshop. Of these 12 schools (80%) were using *AAWARE*. 29 schools had *AAWARE* by means of delivery to the principal or subject head 19 (65%) of which were using the resource. Of the entire 44 schools, 31 schools (70.45%) were using *AAWARE*. (These numbers were taken from the 7 fully completed pilot questionnaires, the 35 wholly completed final questionnaires and the two emails informing the researcher that the material was not being used.) This data can be seen graphically represented in

Figure 4.1 on the following page (please note that all graphs in this chapter show the actual values on the graph itself).

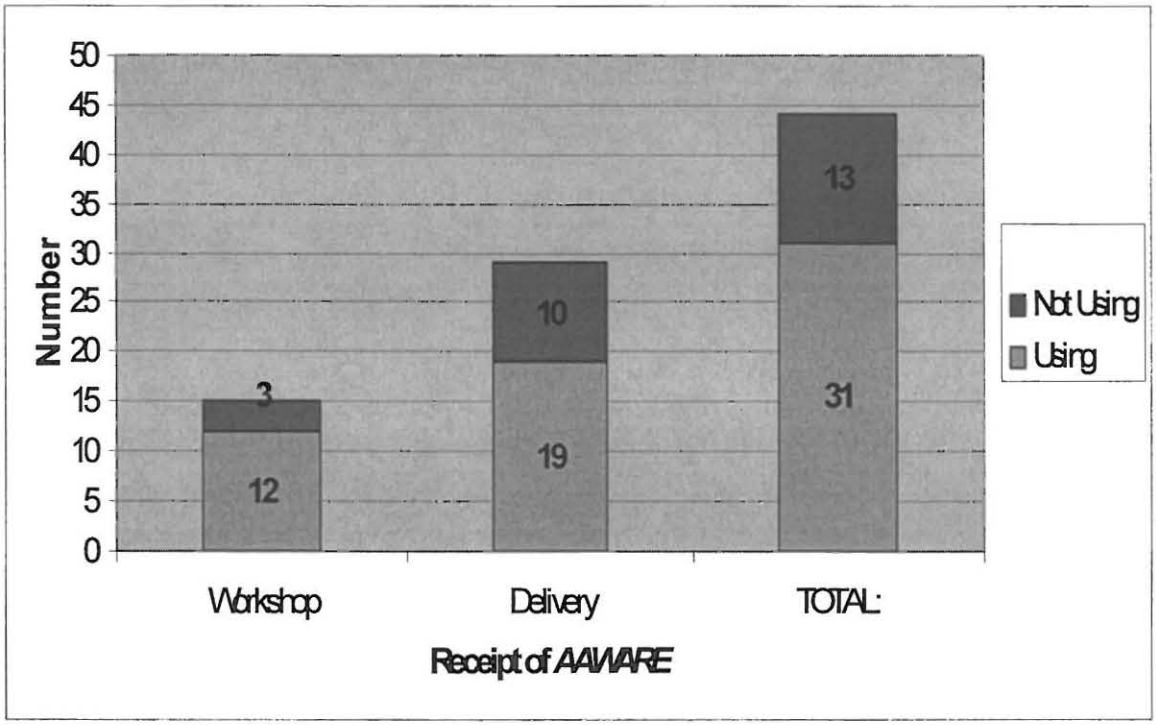

Figure 4.1: The comparative use of *AAWARE* between schools that had participated in a workshop on the material and those who had not.

The workshops do not appear to have substantially increased the overall use of *AAWARE*. The use of *AAWARE* with workshops is only 15 % greater than that of delivery without a workshop. There is still a greater usage of the resource in both cases than non-usage.

Literature suggests teachers require support in the use of LSMs in general (NEEP-GET, 2005a, NEEP-GET, 2005b, Vinjevold, 1999) and greater orientation to specific LSMs (NEEP-GET, 2005a, NEEP-GET, 2005b). NEEP-GET (2005a:41) noted that: "there was little point in handing out resources without support ..." Although this does not appear relevant in the case of *AAWARE*, this aspect will be revisited when we look at the usage of the individual lessons.

4.4.2 Access to Alternate Learning Support Materials (LSMs)

Did the availability of alternate LSMs and equipment such as photocopiers, overhead-projectors and computers at the school influence the use of *AAWARE*? The questionnaires included questions on the presence of, and access to equipment such as photocopiers and overhead projectors, as well as a library, resource centre and Internet access. These questions were included in order to ascertain some background as to available resources at the different schools. The following assumptions based on the experience as the education officer for Cheetah Outreach were made:

- that the presence of a library would indicate the availability of reference material for learners and teachers,
- a resource centre would contain LSMs for teachers to utilise in lesson planning
- the presence and access to overhead projectors and photocopiers would facilitate the use of alternate LSMs (*AAWARE*'s design was selected to facilitate use without access to this equipment – the assumption being that this would increase its use in less resourced schools.)

Czerniewicz *et al.* (2000:ii), support these two assumptions: " Teachers and learners both need access to resources, which implies access to a library or resource centre". Ghelani, Shoolbred, McNicol & Nankivell (2002), support the argument that the use of resources is shaped by access in terms of amount and availability as well as support and guidance in use of resources.

- Internet access allows the teachers to investigate information for further reference data and allow the download of alternate lessons from the web, (I asked respondents to indicate how easy it was for them to physically access this technology rather than exploring the ability to use the technology. The assumption was made that if physical access was easy they were more likely to be utilising the Internet as a resource for information and lesson plans.)

Two trends were anticipated on perusing the data. Firstly, that there might be a greater use of the resource in schools with access to a number of resources as the teachers would exhibit more experience with the general use of LSMs. Alternatively that less resourced schools might show a greater use of *AAWARE*, because of the lack of alternative resources. Instead the data shows no correlation between the level of resources available at the school and the use of *AAWARE*.

Questionnaire findings indicate a wide range in the extent of access to library resources (ranging from none to 12000 books), resource centres (ranging from none to "lots") and to the Internet (ranging from none to very easy access) across the schools using *AAWARE*. The schools not using *AAWARE* had a similar range of resource availability (within the same categories as above). Based on this finding it is possible that both the trends anticipated are evident. The presence of a school library, according to Czerniewicz *et al.* (2000:xi), does not necessarily imply that teachers know how to utilise the resources contained therein. They continue that teachers need to be trained in the use of libraries and develop a relationship with the librarian.

International research supports the role that libraries play in learning and also cautions that teachers are currently lacking the skills and confidence to incorporate the resources available into the classroom practice (Nicholson, 1993, Todd, Lamb & McNicholas, 1993). Local research by Olën (1993) finds the same problems in southern Africa, with physical and intellectual access to resources being blocked by poverty, illiteracy and language. Libraries, where present, are underutilized, disorganised and not seen as beneficial to teaching. Reflecting on this argument, further questions should be addressed to the school on the ways in which the teachers utilise the library resources in order to assess whether any positive correlation exists regarding accessibility of library resources and the use of LSMs within a school.

A surprising number of the schools had a library. Of the 45 schools for which the background information was completed, 32 (71%) schools had libraries. Czerniewicz *et al* (2000:v) provide statistics of 83% of schools within South Africa without library facilities and that the Western Cape Province had only 100 out of 1881 schools with librarians on the staff. Many of the schools taking part in the survey were from disadvantaged communities; resulting in an interesting contrast in information.

4.4.3 Number of Learners per Class

Could the resource material be used across a range of class sizes? Would designated group activities confine the resource use to a smaller, more manageable class size? Questions regarding the average size of the class per grade as well as the number of classes per grade were included in the questionnaire. There appeared to be some confusion in the answers received. Certain classes were given as a size of, for example, 187 pupils. This did not seem logical, but when looking at the number of classes per grade there were three – therefore 60 pupils per class. This seems more logical so I took the liberty of adjusting the data set to accommodate a maximum of 60 pupils. I left out any questionnaires where the answers to these questions were not fully completed. The result was that *AAWARE* was being used in class sizes that ranged in number from 7 pupils to 60 pupils. Those schools not using *AAWARE* had a similar range of class sizes. In this case class size ranged from a smallest class of 9 pupils to the largest class of 61 pupils. I would conclude from this that *AAWARE* is adaptable to different class sizes and this should not therefore effect the use of this LSM within schools.

4.4.4 Use of Individual Lessons

Which lessons from each grade were being used the most, which were not being used at all and which were being consistently modified to facilitate use? Figures 4.2, 4.3 and 4.4, illustrate the use of each lesson within each grade as a percentage of the total completed questionnaires for this section out of a total 32 fully completed questionnaires indicating use of individual lessons.

4.4.4.1 Grade Four

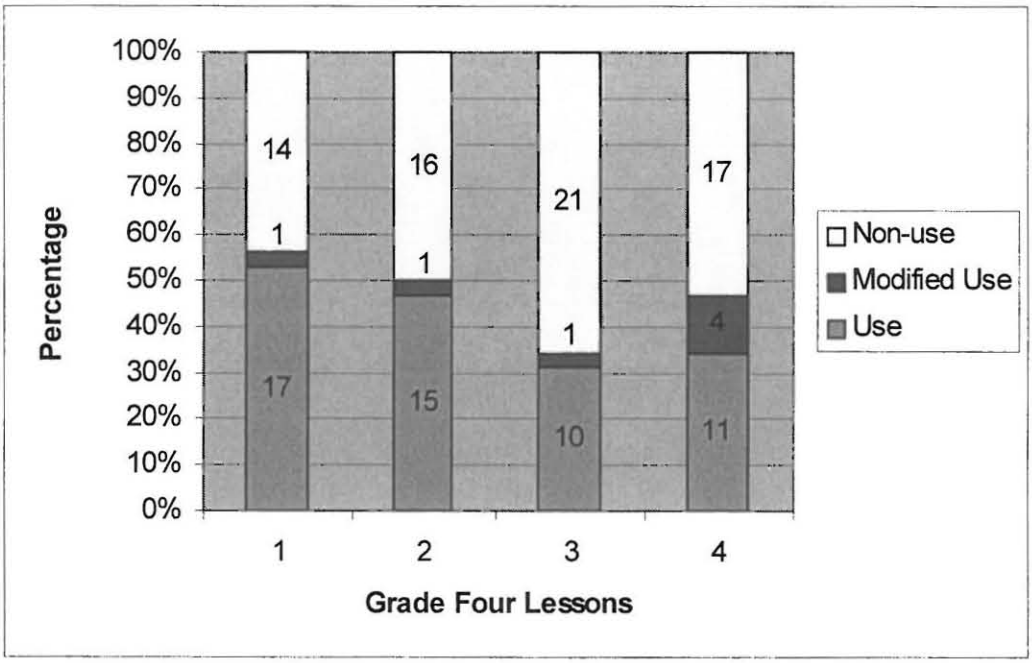

Figure 4.2: Use of individual lessons showing use in its original form, modified use and non-use for grade four lessons.

The grade four lessons show use (original and modified) of between 30-54%. Lesson one, the highest declared use, consists of a basic introduction to six different cat species in terms of morphology. Lesson two, the next highest use, is a basic introduction to the concept of habitats. Lesson three, the lesson on adaptations, shows the least use. This is conceptually a relatively difficult lesson for the learners. In one of the case studies presented in the next chapter, the educator left this lesson out of the term schedule considering it too difficult for learners at this level. Lesson four is a very generic lesson on food chains, which is not cheetah specific and easily replaced by an existing lesson on this topic, possibly explaining why it shows the highest modified usage.

4.4.4.2 Grade Five

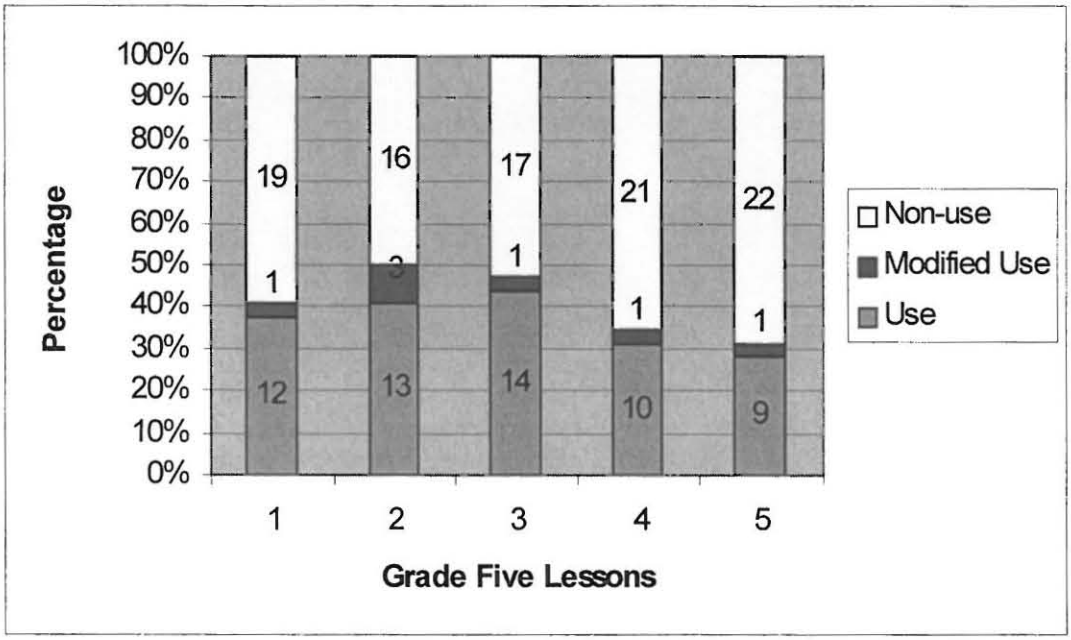

Figure 4.3: Use of individual lessons showing use in original form, modified use and non-use of grade five lessons.

Grade five shows a slight decreased use in the lessons as compared to grade four, the use dropping to between 30-50% across the lessons. It is particularly for these lessons that a workshop might facilitate an improvement in use. Lessons one and five, which show a particularly poor usage are two lessons that teachers really enjoy in the workshops claiming both ability and desire to use with their learners. These two lessons have more complex instructions and the first lesson especially, requires more preparation by the teacher. Lesson five is on population change and is designed to facilitate an understanding of the interaction between the biophysical environment and animals, which brings about a balance in populations. This is achieved through a very simple multi-stepped game. This is a lesson used at a workshop for the educators to experience the learner's perspective of the material. Lesson four discusses various teeth; the activity consists of classifying a number of skulls as carnivores, herbivores or omnivores according to their teeth. A few teachers at workshops have mentioned to me that this concept is generally taught in grade seven. The two lessons used the most, are the simplest. Lesson two delves more deeply into the

concept of habitats and lesson three explores life cycles (comparing the growth and development of a child and a cheetah cub).

4.4.4.3 Grade Six

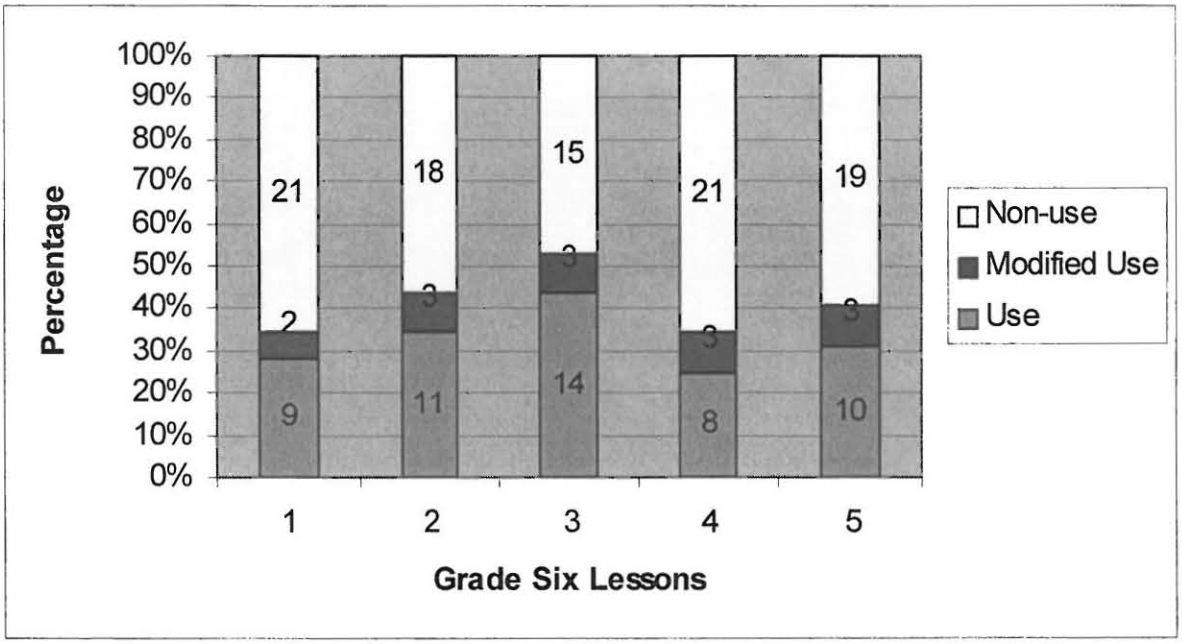

Figure 4.4: Use of individual lessons showing use in original form, modified use and non-use of grade six lessons.

At first glance, grade six appears to utilise the lessons least (ranging between 25-52% across the lessons). However, when assessing the combined lesson usage, including modified use, grade six actually shows the greatest usage of lessons in total. These lessons are again more complex requiring more detailed instructions and greater preparation. The concepts involved are, moreover, at a higher level, with the introduction of learners to the design and implementation of experiments in lesson one, the techniques of research in lesson two (one of the least utilised lessons) and the relationship between man and the environment in lessons four and five. Lesson three, with the highest use, is a discussion on the different nutritional values between grass and meat and the consequences to the natural behaviours of herbivores and carnivores. Then follows lesson two, the research assignment into animal behaviours. Similar to grade five, the lesson

indicating the lowest usage is that of population change, which remains surprising based on workshop enthusiasms (section 4.4.4.2). However on referring back to the questionnaires, there is a strong correlation between use of these modules and attendance at a workshop and the inverse, namely non-attendance increased the potential for non-use. Hence the suggestion above that a workshop may improve the use of these lessons.

4.4.4.4. Across the Grades

Assessing use of the individual lessons as opposed to the total package, it is clear that although schools use *AAWARE*, only three schools utilize the entire resource as designed. One of these schools received the resource through a workshop (and had a teacher involved in the development of *AAWARE*). Nonetheless this school marginally adjusted the timing of the lessons in order to accommodate their periods. The second school received the resource through delivery to the school (delivery corresponded with a recent school presentation on the cheetah and had previously attended workshops hosted by Cheetah Outreach, inclusive of a recent workshop on the environment in literacy). Both these schools are situated in disadvantaged communities. They do, however, have a library, access to overhead projectors, photocopiers and the Internet. The third school received the resource through delivery without a workshop, but had in prior years entertained presentations on the cheetah. This school is well resourced and is not situated in a disadvantaged community.

All of the other schools had selected particular modules or lessons for use. The trend appears to involve primarily using it in its original form or to discard the modules. Few schools adapt the design to facilitate use. Merely three of the schools consistently changed the lessons that were used to suit their particular requirements. Two of these schools chose lessons for a specific grade (the third school selected from all grades). Two schools received the resource through delivery, are relatively well resourced and are the two schools selecting specific grades only. The third school using lessons across the grades participated in a workshop in the use of *AAWARE*. The other schools used some of the lessons as designed and modified a few others. All, except one of these other schools, were from more resourced schools and had received the material through

delivery. The only school that had changed some of the lessons from a less resourced school had received the material at a workshop.

It would be interesting to assess whether teachers who varied the use of individual lessons show any trends in terms of class teachers versus subject teachers. I would assume that the selection within one grade only suggests that the teachers are class teachers and the selection across grades is a subject (natural science) teacher. It is difficult to identify from the questionnaire which teachers are class and which are subject teachers. The questionnaire should have included a question as to whether the school incorporated class or subject teaching. This would have given another dimension to the data showing selection of lessons across and within grades.

The selection of specific lessons could indicate, (discussed in section 4.2), that the resource may not be completely aligned to the content of the curriculum, consequently the teachers are selecting lessons that fit in with their content requirements. This requires further investigation as to why specific lessons were selected.

Too much emphasis should not be placed on these findings as:

- Two of the schools that had indicated use of the resource had marked the same lessons under both use without modification and use with modification. For my spreadsheet I marked these down as modified lessons.
- Two of the schools that had indicated use of the resource had a couple of lessons marked under both headings and some under use without modification. Again I marked these down in the spreadsheet as modified lessons where the overlap occurred.

(This is perhaps due to an ambiguity in the design of the questions. The teachers might have understood the first question to ask which lessons they were using in any form as opposed to the question "Which lessons are you using as designed? Please tick appropriate lesson." (Addendum B) The initial assumption might be that this was as a result of language. The questionnaire was exclusively available in English and not Afrikaans or Xhosa. On referring back to the received questionnaires, three of the schools were not English medium schools.)

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- Two of the schools that indicated non-use of the resource had, however, marked lessons under use without modification. (Possibly these schools intend to use these lessons in future. I include these lessons in the analysis under non-use.)
- All three schools observed in this study had marked the lessons down as "using as designed" on their questionnaires. Two of these schools had obviously adapted the lesson from its original format in the observations. The third school, while using the lesson as designed in the observation, was not actually using the resource in grades 5 or 6 during 2005, the year the research took place.

These suspect responses place the reliability of the data under question. To what extent have the other schools made similarly erroneous choices in selecting a particular answer over another? Perhaps some schools were selecting what they interpreted as the optimum answers for the researcher. However, time and cost precluded participant observation at all the schools.

4.4.5 Relationship with Cheetah Outreach

Table 4.1, identifying the relationship between the canvassed schools and Cheetah Outreach. The relationships were ascertained from relevant records held at Cheetah Outreach. (Other teachers awarded fellowships / or part of the development team were either of irrelevant grades or did not return the questionnaire.)

Using Resource	Relationship with Cheetah Outreach				
	School presentation	Previous Workshop	Design of Resource	Fellowship	None
32 Y	22	14	2	5	10
14 N	2	3			10

Only one school not using the resource fell into two of the positive relationship categories – that of attending a workshop and receiving a presentation at the school. The remaining three fell into a single positive relationship category of receiving presentations. Ten schools had no pre-existing relationship with Cheetah Outreach. Ten schools using the resource had no relationship, but by

far the majority had a single or multiple relationship with Cheetah Outreach. Eight schools had received presentations only. Nine schools had received presentations and workshops. Three had a further relationship of a teacher who was awarded an EE fellowship, and a further two fellowship awardees who had participated in the development of *AAWARE*. Analysing the three schools using *AAWARE* completely as designed, reveals that two had single relationships and the third covered all four categories of relationship. Use of the resource carries a strong positive correlation with experiencing pre-existing contact in some form or other with the organisation. A mere 4 (15.38%) of the 26 schools with varying positive relationships with the organisation, were not using the resource. There was no notable difference between schools with no pre-existing relationship with Cheetah Outreach, between use (50%) and non-use (50%).

I must qualify, however, that this trend may be a misrepresentation. The data may be skewed towards a higher usage in schools with a relationship to Cheetah Outreach simply because those schools were more likely to be sympathetic towards the research and return the questionnaires. A review of the original faxes sent indicated that 110 (36%) of the schools fell into categories of a positive relationship with Cheetah Outreach while 195 had no relationship with Cheetah Outreach. The ratio of returned questionnaires indicate 26 (56%) responses from schools with a prior relationship to Cheetah Outreach. Schools with previous relationships therefore show 23.6% return rate versus schools with no relationship at 10.25% return – almost double. I recommend further investigation into the use of the resource. A telephone call to the schools with unreturned questionnaires inquiring into use would suffice. If the ratio of use versus non-use continues to be higher in schools with a relationship with Cheetah Outreach, this would confirm the trend proposed above.

4.5 Conclusion:

In this chapter I analysed the questionnaire data to gain insights into the reasons behind the use and non-use of *AAWARE*. I looked at variables such as the use of workshops in delivery, the availability of alternate resources at the school, the number of pupils within a class, and the level of the school's relationship with Cheetah Outreach. I reached the following conclusions.

Although 31 schools (70.45 %) which returned questionnaires are using *AAWARE,* there is a predominant trend of using particular modules and not as a complete resource across the grades as envisioned by the development team. The process began with assembling a team of intermediate phase, Natural Science teachers. These teachers highlighted the topics / themes that they felt should be covered in each grade based on what they had previously been teaching in their classrooms. The assumption was made that this would be common to most primary schools and therefore would be of greater benefit in assisting the teachers to make the transition between the two curricula. While this still may be the case but would require further research. The content of the resource could be more optimally aligned to the RNCS content requirements and requires further investigation. This is supported by a comment on one of the questionnaires requesting an improved correlation with curriculum contents.

The data moreover shows that workshops do not appear to affect whether or not the resource is utilised within a school. However the data does suggest that workshops may facilitate the use of individual lessons.

The main trend identified in this section of the research is that the utilisation of the resource does appear to be most influenced by the relationship, or lack thereof, between the school and the organisation (Cheetah Outreach) responsible for the development and distribution of the resource. Of the 26 schools with a positive relationship with Cheetah Outreach, 22 schools (85%) were using the resource, compared to 50% of the schools with no prior relationship. I have used the term 'positive relationship' to describe those schools which are affiliated with one of Cheetah Outreach's outreach programmes for learners or teachers, and which have not shown any negative reactions to the organization.

I would make the following suggestions to further research some of these trends. The RNCS training and implementation was completed for the intermediate phase at the end of 2005. Once teachers have had a year to interact with new curriculum and become more familiar with the concepts of OBE, process skills and assessment standards, the original writing team of AAWARE should be re-assembled. Together with other interested teachers, the materials should be realigned to the RNCS contents and assessment standards. The teachers' new experience of

classroom practice of RNCS policy will allow for greater correlation to be achieved. Some in-depth interviews should be conducted with individual teachers and focus groups to assess in greater detail why only certain lessons were selected for use within a school. These interviews could also include the teachers' perspectives of Cheetah Outreach to confirm the suggested trend that the relationship / experience with Cheetah Outreach resulted in the increased likelihood of the resource being utilised.

In Chapter Five I will proceed to analyse the data obtained from the case studies through observations and individual interviews to gain further, in-depth insights into the classroom practice with regards to *AAWARE*.

CHAPTER FIVE
INTERVIEWS AND OBSERVATIONS

5.1 Introduction to Chapter

This chapter sets out the analysis of the observations and interviews and explores any trends in overall use of *AAWARE* and lesson specific use within classroom practice.

5.2 School One

All information for section 5.2.1, and 5.2.2 was gathered from the questionnaire relevant to the school, as well as interview 1 and observation 1 which took place at the school.

5.2.1 Description of School

This school is situated in a very small rural residential community. This community is about 15 minutes away from two large towns. The school consists of approximately 180 learners coming from disadvantaged communities. About half the learners in the class observed were foetal-alcohol syndrome babies (pers. comm. confidential, September 2005.). Some of the learners are from two nearby orphanages. All learners receive slices of bread with peanut butter for lunch at school. The educator whose class was observed has been working at the school for over 20 years. There are only four staff members at the school where the principal's duties include being a full-time teacher. The teachers are all grade / class teachers and not subject teachers. There is one Grade 1 class, similarly one Grade 4 class, Grade 2 and 3, however, are combined into a single class as are grade 5 and 6.

The school is under-resourced and has no library or resource centre. It does not have Internet access although there is a computer. There is only one photocopier and two overhead projectors. There are no television or video machines in the classrooms. The classrooms have enough tables

and chairs for the learners. In the class observed the only posters on the walls were those from the resource guide and a few other old life orientation posters. There was a couple of old cupboards in the room with old workbooks stored in them.

The Grade 4 class normally consists of 26 learners, but in the lesson observed only 16 were present as the other learners were at remedial work. The home language of the teacher and learners is Afrikaans. The medium of instruction is also Afrikaans and the particular version of the resource utilised by the teacher was in Afrikaans.

5.2.2 The Use of *AAWARE* Natural Science Teachers' Guide

The teacher did not attend a workshop in *AAWARE*, the resource had been delivered towards the end of 2004, directly to the principal combined with a brief meeting as to the background of the resource and the layout. The school was offered a workshop in the use of the resource; however it chose not to accept the offer. The primary reason the educator using the resource was a personal interest in animals and a consequent "attraction" to the resource resulting in its rapid implementation within the classroom. The educator believed that to teach learners utilizing animals would have positive spin-offs as they evoke learner excitement. This corresponds to the research reviewed in section 2.4.3 where a link between positive attitudes to science and wildlife was found by Xin *et al.* (1999).

The teacher, who had gained a prior pool of knowledge through watching television programmes, found the resource easy to understand. The layout of the resource was considered user-friendly as it explained what to do and how to do it. Consequently a teacher straight from college would understand how to use it. The inclusion of the assessment standards and learning outcomes of the Revised National Curriculum Statements was considered to be helpful. The observation, however, indicated that the teacher experienced difficulties with some of the concepts. The teacher was of the opinion that the language was not too difficult for the learners. Instead it challenged them to go beyond their comfort level, preparing them for more difficult concepts with which they would engage at a later stage.

The four concepts addressed by the grade four lessons are: firstly, an introduction to the cheetah in comparison to other cats, secondly, habitats, thirdly, the adaptation of the cheetah for speed, and finally food chains. These concepts were all addressed within the third quarter of the school year. The lessons were not, however, used as designed. Habitat was addressed using pre-existing lessons on birds and frogs and the concept mentioned in the adaptation lesson was considered to have been taught previously. Prior to the lesson observed, the learners had learnt about the cheetah and other big cats, including some of the adaptations for speed from the Grade Four: Learning Programme 3. (The learners had already utilized the crossword puzzle from the adaptation lesson in a previous lesson.) This information was re-incorporated into the lesson observed, with the lesson going into more depth on the adaptations for speed. The teacher did use descriptive concepts for the adaptations utilizing learner-familiar items, but did not use the props as suggested. The reason offered was that the learners would be unable to bring the props to school if asked. The extra information provided for the teachers in the resource was included in the lesson during the discussion on the adaptations.

In a previous lesson the teacher had given the introduction to the cheetah, but did not include the snap game provided. Instead the teacher introduced magazines from home, had the learners cut out the pictures of the different cats, and then required them to match the pictures to those of the same cat species. The family tree was also omitted, as the learners were due to do their own family tree later on in the term. The teacher intended to return to the cat family tree once the learners were familiar with the concept.

The lesson observed was integrated with life skills / life orientation. For example the teacher consistently returned to asking the learners if it was okay to stone / shoot animals.

For an outline of the lesson taught, see Box 1 below (the original lesson from *AAWARE*, Grade Four: Learning programme three – Adaptations, can be found as Addendum H). The lesson was observed in Afrikaans, while the observation schedule was written directly in English.

BOX 1: LESSON OUTLINE: SCHOOL 1

GRADE FOUR LEARNING PROGRAMME THREE: ADAPTATIONS

Introduction:

The learners were asked questions about the cats that they knew – summary of previous lesson introducing the cheetah (Grade Four: Learning Programme One - outlined in section 1.4). The learners constantly referred to the poster provided with the resource, showing the different cats, which was on display at the back of the classroom. The learners were asked to provide the names and distinguishing features of the different cats. The learners all responded enthusiastically, calling out answers at the same time as raising their hands for attention. Most of the answers were correct. An in-depth discussion on the cheetah was then initiated.

Adaptations:

The teacher started this part of the lesson by asking why a cheetah (jagluiperd) is called by this name. (Hoekom is hy 'n jagluiperd genoem? – Omdat hy jag sy prooi.) This brought the educator to the following facts on the cheetah:

- can run at 110-120km per hour
- has a stride of 8m (paced out the distance)
- is the fastest animal on land

Reasons were given as to why the cheetah is so fast: (no visuals were used although the lesson design does call for the use of props comparing the adaptation of the cheetah to a man-made item with a similar function, to bring the adaptations into a familiar context for the learners)

- long and slender (*"not so fat as me"*)
- lightened skeleton
- less muscles
- light on feet
- long legs
- long tail for balance

(Included a question about where the learners think the cheetah would run, amongst trees / in grasslands)

- if a car tyre is flat – no grooves – and the road is wet what would happen? led the discussion in to the adaptations that the cheetah has for traction: grooves on pads and semi-retractable nails
- oxygen needed for speed – would this mean a large or small heart? Led discussion into the fact that the enlarged heart allows enough oxygen to get to the muscles.

The teacher used hand and body movements throughout his lesson to emphasis the concepts discussed.

LESSON OUTLINE: SCHOOL 1 - continued

(Started discussing the fact that the cheetah predominantly hunts alone, although on occasions brothers stay together. Unlike lions they do not attack people. The learners were asked if this meant they could go up to a cheetah in the wild to pat it – explained it is still is a wild animal. Could only pat if hand-raised and then only if handler allows)

- The cheetah hunts when the sun is sinking or rising and is therefore situated low in the sky. It was discussed that the black tear marks are there to absorb the light of the sun to protect the cheetah's eyes.

Guiding questions on the adaptations were asked as a way to repeat and emphasise the information given. The adaptations stressed in this section of the lesson were that the cheetah is the fastest animal, has an enlarged heart, is slender, has a light skeleton, has a tail for balance, has nails that are semi-retractable, has an 8m stride and a flexible spine. The learners were very energetic in answering and showed great enthusiasm in giving the correct answer.

The teacher then started asking the learners if they would throw stones at a cheetah behind a fence. Or horses / sheep etc. Learners responded in the negative rather vehemently. It was explained that the cheetah is an endangered species. A further question was whether killing a dove was acceptable; the learners answered for food or if it was used in some way. The next question as to what people would do with cheetah meat was put forward. The learners asked what people did with the cheetahs they killed. The answer was that they made mats out of the skin. A short debate considered whether this was acceptable. The majority consensus by the learners was that this was not a good thing to do.

The teacher informed the learners that after school-break they would be given a worksheet to fill in on the adaptations of the cheetah. Before concluding the teacher reiterated that animals should not be harmed. The learners were again asked who would stone or shoot a cheetah, horse, sheep and the birds at home.

BREAK

LESSON OUTLINE: SCHOOL 1 - continued

The teacher started off the lesson after break by discussing the concepts of adaptation and function. The adaptations of the cheetah were reiterated. The difference between the adaptation and the function was stressed: e.g. the flexible backbone (adaptation) allows for large strides (function); enlarged heart (adaptation) allows for enough oxygen to muscles (function).

The teacher then handed out the afore-mentioned worksheet, informing them that the answers were in the paragraph below the table that required completion. The learners worked individually. (The worksheet was in Afrikaans – this is the learners' language of instruction.)

The lesson recalled the killing of animals. The learners were asked as to how many springbok a cheetah would kill and in comparison how many the learners / people would shoot. The concluding statement was that people hunt not just for food like a cheetah.

The learners were given time to fill in the table. The teacher utilized this time by walking around the classroom constantly stressing the difference between the adaptation and the function. The educator then proceeded to go through the answers for the table asking the learners to tell him. The learners knew the answers if asked verbally although not all of them had filled them in on the table. They were then asked to finish the table including their names. The teacher circulated amongst individuals, helping them by asking questions and reiterating again the difference between the function and the adaptation. While this was happening some of the learners took out their Afrikaans readers, which had a story and pictures of the cheetah and talked about the pictures together.

The lessons ended with the worksheets being handed in.

5.2.3 Interaction between Teacher and Learners

The teacher stood in front of the class and very energetically imparted information, constantly asking the learners questions in order to get to the facts about the cheetah. There were no visual aids used for the learners other than intermittent references to a poster at the back of the class showing pictures of the six different cat species. Questions asked of the learners were all

pertinent to previous knowledge learnt and then related to the new knowledge being imparted. There were no guided discussions between the learners and teacher, yet the lesson did not appear to be a lecture either. The learners were very enthusiastic and quick to answer questions and appeared to be concentrating on the teacher. There appeared to be a relationship of respect between the learners and teacher and obvious caring on the side of the teacher. The whole lesson was full of asides and jokes with the learners.

5.2.4 Interaction amongst Learners

There was no group activity for the learners to work together. They did, however, help each other with the answers to the worksheet given during the lesson. They appeared to enjoy the lesson, but struggled with some of the concepts. The concepts of adaptation versus function seemed to be difficult for the learners to understand although the educator kept emphasizing the concepts. Nonetheless several of the answers on the worksheets indicated confusion between the two principles. The learners competed amicably to be the one giving the answers and did not react negatively when any of their classmates provided an incorrect answer.

5.3 School Two

All information for section 5.3.1, and 5.3.2 was gathered from the questionnaire relevant to the school, as well as interview 2 and observation 2 which took place at the school.

5.3.1 Description of School

The school is a rural school on farmland in a building sponsored by a company, having moved in 3-4 years ago after teaching out of a series of prefabs on a farm. The school consists of two such disadvantaged farm schools. The learners are all from the surrounding farms. The area is not far from a large town. The classrooms are large, light, clean, airy and well equipped with furniture. The school is well equipped with boards, has two photocopying machines and one overhead

projector. The school also has the use of the conference centre facilities (e.g. television and video) associated with the sponsoring company. There is also scheduled access to the Internet. Although the school does not have a resource centre, they do have resources within reach. There is no library. The only posters up in the classroom observed were those used for the lesson with a few other news articles up on one board. A few reading books were in the room as well.

The school consists of approximately 300 learners. There is one class per grade in the intermediate phase with on average 40 learners per class. During the observation there were 32 learners present. Both the learners and the educator had Afrikaans as their home language (except for six learners whose home language was isi-Xhosa, understood Afrikaans but had trouble writing it). The resource used was the Afrikaans version. The educator is a subject teacher for Natural Science and Technology.

5.3.2 The Use of AAWARE Natural Science Teachers' Guide

The school received their copies of AAWARE through one of the launch workshops held in 2003, which was attended by one of the teachers. Arrangements for the observation were made through the principal. Upon arrival I discovered that the teacher who attended the workshop had since left the school and none of the other teachers (or principal) knew where the teacher's guide and posters were stored. The principal had, through other channels, received a copy of only the teacher's guide. It was from this that the teacher was attempting to work. Considering that the teacher had only seen the resource the week before when, on the request of the principal, the teacher was asked to accommodate the observation request, there was understandable confusion. I spent the time explaining the aim of the research and that the important aspect was the teacher's interaction with the resource. We then rescheduled the observation for the following week. The timed use of the resource was entirely due to the principal's request. Plans were for the resource to be used in 2006 throughout the intermediate phase. The teacher, as subject teacher, will implement usage throughout the grades. The principal would like to use *AAWARE,* as the cheetah is available for visits to the school as well as learners are in a position to visit the Cheetah Outreach facility.

The lesson observed, closely followed that of the designed lesson in *AAWARE*. The family tree was however omitted as being too difficult for the learners. The black and white card poster for the snap game was used for looking at the similarities and differences between the cats. This was in order to ensure that the names of the cats were not visible to the learners (the names are on the full-colour poster suggested for this purpose). The learners then had the opportunity to name the cats and point to the correct picture. After feedback the educator gave a more in-depth description of the cheetah, following a discussion on the differences between the cheetah and the leopard.

See Box 2 for a complete outline of the lesson given. The original *AAWARE* lesson from the teachers' guide (Grade four: Learning programme One – Introduction to the cheetah) can be seen as Addendum G.

5.3.3 Interaction between Teacher and Learners

The teacher guided the discussions with questions. All the learners were given the opportunity to provide their ideas, if they had not raised a hand for attention, the educator would call on them by name and ask them their thoughts. Learners were not under pressure to provide an answer, if they declined to provide an answer the educator did not force the issue. During the paired activity the teacher moved around the class assisting and asking leading questions for the learners to arrive at the answers, suggesting that the learners go and look more closely at the pictures. Extra time was spent with the learners whose home language was isi-Xhosa. The teacher then led the discussion, encouraging the learners to arrive at the correct answers. Although at times the correct answers were not given – perhaps due to a lack of familiarity with the facts of the cat family.

The discussions that took place during the lesson showed a trend whereby the teacher was the dominant voice. The learners did not seem to either have much prior knowledge or perhaps were inhibited by my presence. During the feedback on the activity the learners' information was prioritised without correction until the discussion took place later.

BOX 2: LESSON OUTLINE: SCHOOL 2

GRADE FOUR LEARNING PROGRAMME ONE: INTRODUCTION TO THE CHEETAH

As observed in the classroom I have divided the lesson into three distinct sections as follows:

Section one:

The teacher used the black and white poster comprising photographs of 6 different cats (designed to be used for a game of snap by cutting the photographs into cards). Two copies of the same posters were put up on a mobile white board in front of class (one on each end of board). The teacher then handed out a sheet of paper with six columns drawn on it. There was one sheet for every two learners. The learners were to write the name of one of the cats at the top of each column and then list what they saw by comparing the cats in terms of similarities and differences. The teacher started this process by asking questions.

Question 1: How many different animals do you see? (Answers were: 4,7,3,5,8,6 – there are two different photographs for each cat on the card poster)

Question 2: Name the different animals? (The teacher selected learners to come up to point at a picture and name the cat – cheetah, lion, caracal, tiger, domestic cat and leopard. Learners who did not volunteer were also selected, but never pressured into giving an answer. The names were then written on the board between the two posters.

The learners were given ten minutes of working in pairs to write down on the worksheet any differences and similarities between the six cats. During this time the teacher walked around the class helping and directing the process by asking leading questions such as the size of the cat and the colour of their coats (based on what they know rather than the black and white card poster). The learners' ideas were guided by questions relating to what they saw and allowing them to go closer to the posters on the board and discussing their answers with them. More in-depth discussions took place with those learners needing special attention such as two learners, first language Xhosa speakers, who were paired together. During this time I noticed that many of the learners were not concentrating on the activity. They were speaking to others, staring around the class and showing signs of restlessness until the educator came to their aid. Others seemed to have difficulty working in their pairs with some learners doing the work while the team member watched.

After the ten minutes were up, the teacher stuck up the colour poster with single large pictures of each cat and gave the learners five more minutes to write down further answers. I observed that many learners had not finished the required work within the time given. Each group was then asked to give one description (the learners were not necessarily corrected at this stage if the answers were wrong – for example some learners stated that the leopard was the fastest cat). The teacher ended off this section by having a discussion with the learners guiding them to the correct answers.

LESSON OUTLINE: SCHOOL 2 - continued

Section two:

The teacher had the class look at just the cheetah and leopard (which are very similar and often confused as they are both big spotted cats). Detailed differences were discussed such as the cheetah's tear-marks, the differences in the size of their faces, the colour and shape of their spots and the size of their bodies in comparison to each other.

Section three:

The teacher finished off by giving the class a more in-depth description of the cheetah, writing the information on the blackboard as the particular characteristic was addressed: (*italics denotes the information written up on the blackboard)*

- *predator* – chases other animals
- *fastest animal* - discussed the adaptations affording the cheetah its speed: the slender body, the elongated legs, the lightness of the body etc (this is addressed by AAWARE in the second lesson of grade four)
- *male heavier* – discussed weights

(The above information was then verbally repeated as it was written on the board.)

- *approx 3000 spots* – The leopard has a different spot called a rosette (did not discuss the difference)
- *babies stay with mother for about 2 years* – compared this to puppies of eight weeks leaving the mother to live with people. The teacher also discussed how the mother teaches her cubs how to get their own food. (This information is given in the 'Animal Behaviours' chapter of grade six, Lesson Programme 2.)

A discussion was initiated as to why the cheetah has spots: lives in grassland, the colouring helps it to blend in (called camouflage – c.f. to chameleon whose colouring allows it to hide when not moving).

The teacher then told the class that their next lesson will move onto the habitat of the cheetah (explaining that habitat meant where the cheetah lived) and finished off by reading the information from the table in the manual on the differences and markings of the six different cats.

5.3.4 Interaction amongst Learners

As observed in Box 2, some learners worked well in their pairs. But as most of the lesson was a class effort there was not a large amount of interaction between the learners themselves. Some groups had a dominant individual who took the lead, while in others there was an equal division of labour. Many of the learners were easily distracted from the activity, concentrating only when the teacher was interacting directly with them or with a group in their immediate vicinity.

The learners were all attentive to the educator and enthusiastic about answering and coming up to the board. They were not shy or embarrassed to interact with the rest of the class and were very quick to correct each other if they thought the answer was wrong.

5.4 School Three

All information for section 5.4.1, and 5.4.2 was gathered from the questionnaire relevant to the school, as well as interview 3 and observation 3 which took place at the school.

5.4.1 Description of School

The school is a situated in a disadvantaged urban community in a suburb of a large city. The school is situated within a region of gang activity. The school building is a brick double story with sport fields. The classroom is well equipped with boards, furniture, posters and learning support materials in the form of teaching props (e.g. tank for keeping small animals, nests, box guitars). The posters included those from *AAWARE*, previous learners' work, the life cycle of the frog, organs, skeleton and a number of life orientation posters. The teacher had a television and video machine available, as well as five overhead projectors (all out of order at the time), one photocopying machine and Internet access. The school has a library, but no resource centre for the teachers.

The school consists of around 350 learners. (The learners are provided with a sandwich for lunch.) There are two grade four classes of around 30 students each. The educator has training in Natural Science, but is a grade teacher for grade four. The learners are 50% English and 50 % Afrikaans home language. The language of instruction is English. The educator is Afrikaans speaking, but speaks, reads and writes English. The educator used the Afrikaans version of the resource and translated it, unaware that there was an English version available at the school.

5.4.2 The Use of AAWARE Natural Science Teachers' Guide

The teacher chose to use the resource as the grade was already focusing on mammals within life and living, one of the four Core Knowledge areas of the Natural Sciences. The teacher indicated that using the resource required less research than might otherwise have been needed. Although the teacher does not normally concentrate on a specific mammal, the cheetah was used in this case as there was a perception of the cheetah being popular, interesting and available. The lessons are incorporated within the year planner as a supplement. The teacher interviewed and observed is responsible for developing the lesson programmes for the sections within Natural Science. This is done through a mind-map of the term planner and is subsequently distributed to the other Grade four teacher to implement. A discussion is then held as to the manner of implementation within the classroom and any problems that may have arisen. The provided example of an assessment rubric in each lesson was appreciated as this explains what the learner should be able to do by the end of the lesson; everything is clear including the worksheets.

In the lesson observed, the teacher chose not to use the snap game, but rather to use the photographs on the poster to identify the animals instead. Near the end of the week once they had finished with all six cats, they would then draw a card from the pack and describe the animal to get a point. The lesson was highly integrated with language (reading, writing and listening). A range of other LSMs, such as a caracal skin, a video on lions, animal puzzles and a reading booklet, were included in the lesson. The picture page and the table of information from the designed lesson in *AAWARE* were photocopied to facilitate the group's work. A news article on

Cheetah Outreach was on the wall from a previous lesson on the cheetah. The learners' previous work from the last lesson on the cheetah and leopard were also up on the wall (fig. 5.1).

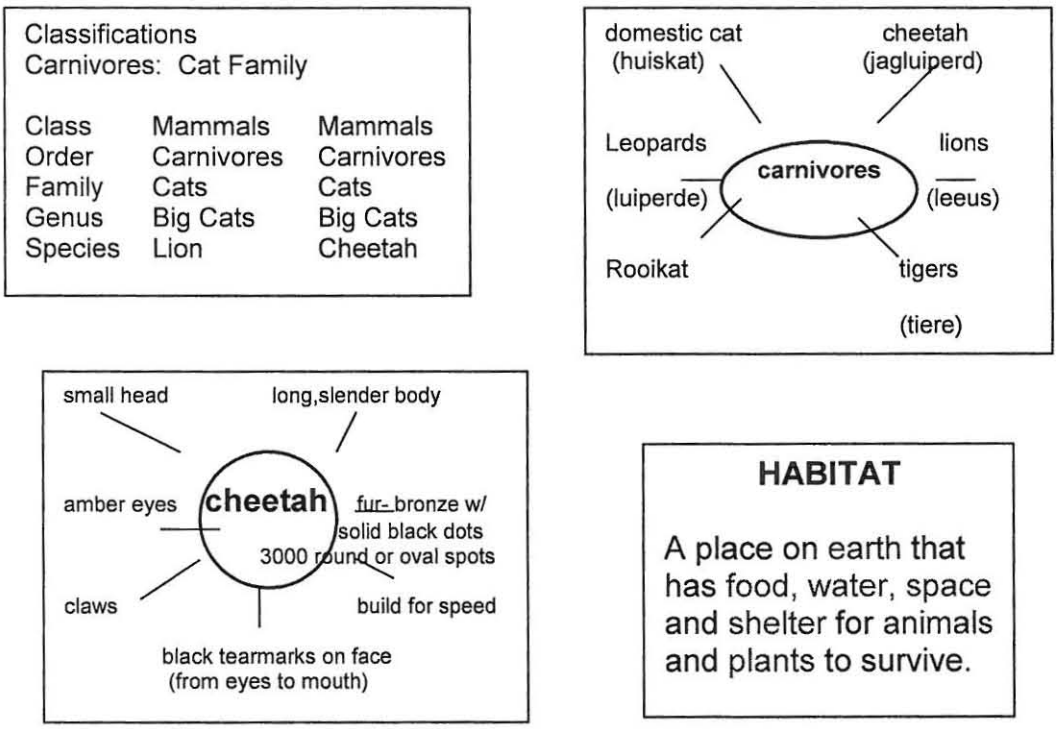

Fig 5.1: Learners work from first lesson adapted from Learning Programme One: Introduction to the Cheetah.

The adaptation lesson within grade four is not utilised. The teacher is of the opinion that the lesson will be too difficult for the grade fours. A choice was made to focus on the features of the different cats, as well as the habitat. The level of the language for the teacher is appropriate however the suggestion was that it is slightly difficult for the learners so perhaps the worksheets could be simplified. The teacher also added in a group assessment to the lesson, which was developed by the learners.

Box 3 gives further detail on the lesson observed. This case study shows the greatest adaptation to the resource. The original lesson, Grade four: Learning programme one – Introduction to the cheetah (Addendum G), is designed to only take up one 45 minutes lesson period. The observed lesson covering only part of the designed lesson already exceeded three lesson periods.

BOX 3: LESSON OUTLINE: SCHOOL 3

GRADE FOUR LEARNING PROGRAMME ONE: INTRODUCTION TO THE CHEETAH

The lesson began with a discussion on the different animal families: e.g. amphibians where the baby is different from the adult (tadpole to frog). A previous lesson on the group of mammals, concentrating on the cat family, was then reviewed. The class was asked if they remembered which two cats were discussed in this previous lesson (cheetah and leopard). The learners were then asked what the most important features were, with a suggestion that they open their work books on the pictures they had coloured in of the two cats. The teacher spoke about the cheetah's tear-marks and re-explained their function and followed up the other distinguishing features by asking leading questions of the sketches. The class was reminded of the comprehension they had done. The books were closed and a discussion initiated on the adaptations that enabled the cheetah to move so fast:

- light bones
- small head
- energy (reminded them how they had run and listened to their own hearts) – enlarged heart and lungs

The teacher then asked about other cats in the family: the learners mentioned lions and caracals (although the lesson was in English the teacher elected to call the caracal by the Afrikaans word, rooikat, as this was the name the learners were familiar with). The teacher discussed an uncle who was a farmer and had problems with rooikat killing his sheep and brought out a rooikat skin that had been borrowed from the uncle for the learners to see. It was explained to the class that the subsequent lesson would concentrate on the lion and rooikat.

The teacher started by discussing that people should not kill animals, mentioning the word endangered and asking what it meant (learners replied that it meant hunting and killing cheetah). An association was drawn between protecting animals and the word endangered with an explanation that there was very few cheetah left. Tins representing the food pyramid were brought to the front of the class and a pyramid built with two 'cheetahs' on top. The class was asked what would happen to the rest of the pyramid if a hunter came along and took out the cheetahs, stating that there would be problems for the food chain (which they would be looking at in a later lesson). The learners were asked what a cheetah ate, leading to the answer meat which represents a carnivore. What would a cheetah eat – mice / springbok etc. This would lead to a field full of mice or springbok if the cheetah were removed. What do the mice and springbok eat? Grass – therefore there would not be enough grass for all of them (eating grass makes them herbivores).

LESSON OUTLINE: SCHOOL 3 - continued

The teacher then informed the class that they would be watching a video on lions and they were to look for the differences to the rooikat (the skin of which was placed in front of the classroom for them to see). Leading questions were asked as to the head and ears of the rooikat, leading to the fact that the ears are tufted and the head is small. The coat was discussed in terms of the differences to a cheetah and leopard (i.e. no spots). The learners were told to take out the picture page of the cats (photocopied from the teachers' guide) and write down the observations from the video on the lion on the back of this page.

The video was played and depicted two prides of lions, one in Botswana and one in Kruger. The learners only watched the first part of the video on the Botswana pride. The teacher made comments to the learners throughout the video of what features to look for: e.g. look at the movements, features, fur, differences between male and female, pointed out the hyena, asked what you called baby lions. The video was stopped after the learners had seen footage of a hunt, a male courting a female, males holding a territory and a discussion on cubs and how they learn to hunt through play. Just before allowing the learners out for school-break the learners were asked to come up to the board and write down one word of what they had learnt about lions on the board. Selected volunteers came up and wrote down the following words and sentences:

- lions (when written correctly the educator encouraged the class to applause)
- cub
- stalking to hunt their prey (the learner wanted to write the whole sentence instead of just a word – the educator encouraged this and aided the learner, asking the class afterwards what needed to come at the end of the sentence – full stop)

The teacher explained to the learners that they would be receiving a book to read on the lion after break. Further they would be comparing the lion to the rooikat using this information after the break.

BREAK

(During break several of the students stayed behind in the class in order to talk to me about the cheetahs in my care. They were interested in names, ages and personalities and enhancing the information they had learnt about cheetahs in the previous lesson.)

LESSON OUTLINE: SCHOOL 3 - continued

The learners were divided into customary groups around their tables with one reader and one large sheet of brown paper in the centre of each group. The group leaders were then called to the front of the class and told to sit in their usual places and the rest of the class told to join their group leaders. (The group leaders are the more advanced readers in the class.) The group leader then read the pages on the lion while the rest of the group listened. Their task was to draw a mind-map on the paper using what they learnt about the lion. (On the walls of the classroom were previous mind-maps on mammals, cheetahs etc). The learners worked in their groups with the educator moving about the class making sure everyone in the group had the opportunity to partake in the activity, correcting and aiding where necessary and stopping unruly behaviour.

The teacher started off the mind-map for the group by drawing the centre circle in which to write the word lion while the groups were still reading, while simultaneously asking the group questions and answering questions by directing them to the rest of the class. For example, one learner asked why the cheetah was lighter than a lion, the class came up with the answer that the bones were lighter for them to run faster. The class was reminded of the previous lesson; a previous role-play was alluded to by asking the same student who had participated before to come up to the front of the class. The difference between a lion and a cheetah was demonstrated. The larger teacher (or as one student commented, fat teacher) was compared to the small, slender learner. The learners were asked what would happen if the teacher and learner fought. It was explained that the smaller would rather run away, this lead to the fact that the cheetah is not a fighter / is non-aggressive. The learners were then given some time to do their mind-map. The teacher assisted by reading aloud the section on the lion so that the learners could select words to write down. (In reading certain words were stressed and the harder words were phonetically stated.) The differences between the male and female lion were re-emphasized.

Selected learners from the groups were asked to go up to the board and write down one word from their mind-map on that drawn on the board. The teacher enunciated the word carefully if the learner had difficulty spelling the word. At the same time the learners were asked grammar questions for example why Asia was spelt with a capital letter – the learners all replied that it was a proper noun. The class then went through all the words on the board, reading them aloud as a group. The teacher stated that there were adjectives and nouns on the board and asked the learners to indicate which were nouns (things that could be seen) and what were adjectives (words that described). The adjectives on the board (big, strong, powerful, fierce) where to be identified and when one learner stated claws, the teacher started a discussion on whether claws were a concrete object which could be seen - which made the word a noun.

LESSON OUTLINE: SCHOOL 3 - continued

The lesson then was integrated into an Afrikaans lesson, with the teacher continuing the lesson in Afrikaans. Learners were asked to translate the words on the board into Afrikaans. They were then asked to write two columns on the back of their sheet of paper; one for lion and one for rooikat. The table of information on the different cats provided in the Afrikaans *AAWARE* teachers' guide was handed out and they were asked to read through and write down the differences between the cats. The learners were asked what described the differences of the two cats: eyes, fur, face, length and so on.

Not all the groups did this activity at once. Since not enough tables were photocopied half of the class did puzzles on the big cats instead. The intention was for them to swap around when finished. However when the period finished before this time, the teacher stated that the lesson would be completed another time. While the first half was working on the columns, the teacher walked around the class assisting and asking guiding questions while again ensuring that all had an opportunity to participate without forcing any learner to join in. (Some learners lacked social skills due to their home background.)

5.4.3 Interaction between Teacher and Learners

The teacher provided guiding questions and opportunities for the learners to discover the information as well as providing the information learners were unable to derive from discussions. The learners were aided in the activities to find the answers. Questions from learners were re-addressed to the whole class and a discussion would be held to arrive at the answer. The shyer learners were encouraged to take part in the class discussion and activities as well as the group activities, but were not forced to participate if they demurred. The teacher supervised group activities to ensure that all within the group had the opportunity to provide answers and facilitate the completion of the activity. The teacher also played a large disciplinary role, constantly asking the learners to pay attention and stopping unruly behaviour. If a learner experienced difficulty,

for example, with spelling, the teacher encouraged the class to assist the learner and praised all efforts on the side of the learner.

5.4.4 Interaction amongst Learners

The learners worked well in their groups, encouraging each other. They were obviously very confident and habituated to working in groups. At times the faster learners tended to take control and were then encouraged by the teacher to give the others the opportunity to provide their input. On occasion the learners complained to the teacher about unruly behaviour on the part of individuals within the group. The learners tended to aid each other in the individual tasks such as writing the words up on the board, helping with spelling and applauding when the word was correct.

5.5 Comparison across Case Studies

The urban, slightly better equipped school (school three) showed a more integrated, innovative approach to the use of *AAWARE*. The resource was utilised as the basis for the lesson but with a number of other LSMs included. The two rural, schools tended to use the resource within the Natural Science learning area only and without supplementary support. The lessons were basically were utilized as designed in terms of content and concepts. The first school, however, did integrate the designed lessons with each other.

The learners in the urban school were definitely more confident in their interactions and group work. The teacher in this case, played a larger facilitation role compared to the other two schools. I would suggest that the teacher habitually utilises LSMs, hence the adaptation and use of *AAWARE* in such an integrated manner. This suggestion is supported by the interview discussion where it became evident that the teacher was responsible for developing all the lesson plans for Natural Science for Grade four. Nduna (2003:118) concludes in her research that there is a strong relationship between the teacher as mediator and the teacher's use of LSMs. School 3's

observation definitely showed a higher mediatory role by the teacher and as previously mentioned a more complex use of *AAWARE* and the inclusion of other LSMs.

As discussed in sections 2.3.1 and 2.3.2 OBE requires learners to play an active role in the learning process through flexible, learner-centred materials (NEEP-GET, 2004b). Literature describes the constructivist classroom as giving learners opportunities to engage in real life issues, construct knowledge themselves and undergo hands-on experiences. The teacher plays a mediation role in this process while the learners build on their previous knowledge through cooperative learning. The case study of school three indicates that when used effectively, AAWARE can fulfil these requirements of OBE within the RNCS policies.

One of my conclusions from the comparison across the case study is that it is not necessarily the availability of the LSMs or even support in the use that are catalytic in ensuring the use of the resource, but rather the individual teacher involved. If there is enthusiasm for the context of the LSMs, or for the subject, the likelihood and complexity of the use of the LSMs is increased. This is supported in the literature. Vinjevold (1999:171) states that the "individual teacher rather than the materials used is the significant determinant in the material / practice relationship". Vinjevold continues that the availability of LSMs does not necessarily promote learner-centred activities and achievement, but an enthusiastic and experienced teacher in conjunction with the LSMs. In all three cases it was the presence of a teacher who had passion for the topic of animals, which stimulated the use of *AAWARE*.

The extent to which it was used, was influenced by the confidence and experience of the teacher in using LSMs. This observation corresponds to Taylor and Vinjevold (1999:230) where they conclude that even if teachers endorse the new curriculum; this is impeded by a lack of support and training in conceptual knowledge and understanding of alternative teaching practices as well as content knowledge. Further research has supported the observation that the individual teacher indeed plays a large role in the use of LSMs and concludes that teachers require further professional development to competently select, adapt and use LSMs (Mbanjwa, 2002, Nduna, 2003 and Olvitt, 2004).

The three interviewees all stressed a personal interest in animals and a belief that teaching about animals in the classroom stimulates the learners. This corresponds to the literature review in section 2.4.3. Most of the authors agreed that exposure to information on wildlife at school and outside of the classroom environment does have an impact on children's attitudes to the environment (Chipman *et al*, 1993, Eagles *et al*, 1990, Hines *et al*, 1986/7, Hungerford *et al*, 1990 and Milton *et al*, 1995).

None of the three schools observed attended an introductory workshop; consequently I propose that workshops are not a pre-requisite to promote the use of the resource. This supports my argument in section 4.4.1. However, I suggest that the integration and complexity of use may be supported and increased with a workshop in cases where teachers may lack the content knowledge or experience with using LSMs effectively. As previously discussed this may increase the use of individual lessons if the teacher can see the lesson in action and recognise its potential. An interesting comparison across the studies, was that of the use of Grade 4: Lesson 3. The urban school where the learners were obviously exposed to group work and the integration of concepts was not using the lesson as it was considered too complex. School one, was using the resource without supplementary visual support and the learners understood the content and were able to interact with the teacher on the topic. They were however slightly confused with the difference between the adaptation and the function. The teacher commented that the learners should be exposed to concepts slightly beyond their level as a way of scaffolding them when they return to the concepts later on. This lesson is regularly used in the Cheetah Outreach presentation for Grades 1-7 at schools. In all the grades some of the learners are able to respond to the follow-up questions with the correct adaptations and function.

All three interviewees agree that the design of *AAWARE* encouraged their use of the resource. Design is highlighted by Mbanjwa (2002: 143 – 146) as playing a large role in the subsequent use of LSMs. He emphasises correlation to current curriculum practices and learning theories, the consideration of literacy competency of learners and teachers and the provision of the LSMs in the language of instruction as well as home languages of the learners. Nduna (2003) supports the importance of language and literacy in the effective use of LSMs in her research. Her research identified that learners struggled with workshops not in their home language and could not always

interpret the information even in their home language due to low literacy levels. *AAWARE* appears to have avoided these design issues; their use, according to the teachers, was facilitated by the integration of policy in the resource as well as the availability of the resource in the three dominant languages in the Western Cape Province.

5.6 Conclusion

Chapter five investigated the analysis of the three selected case studies. It provided thick description of the interview and observation findings. Each case study was discussed in terms of the school context, how the individual teacher is using *AAWARE* in the classroom and the interactions amongst learners and between the teacher and learners. The observations for each school were provided in detail in boxes within the chapter. The similarities and differences in *AAWARE* use comparing across the three case studies were explored and the following conclusions reached:

- the urban situated school showed a more modified, integrated and complex use of the resource
- the rural schools did not use any supplementary LSMs in conjunction with AAWARE and tended to stick to the lesson design if not lesson order
- the urban learners showed greater ability to work in groups
- the basic use of AAWARE is not dependent on a workshop although workshops would enhance the use of the resource
- the presence of a motivated, experienced, enthusiastic teacher increases the likelihood of LSMs use and the extent to which they are used
- professional development for teachers in the selection, adaptation and use of LSMs is needed
- the likelihood of AAWARE being used is increased if the teachers have a personal interest in animals / wildlife
- the design of AAWARE facilitated its use (language, user-friendly layout , policy alignment and so forth)

Chapter six will present the overall conclusions of the research and recommendations for future research opportunities. The chapter will also present the recommendations to enhance the use of AAWARE within the schools.

CHAPTER SIX
SUMMARY AND RECOMMENDATIONS

6.1 Introduction to Chapter

Chapter six synthesises the main research findings and evaluates the assumptions made in section 1.3 as well as the extent to which the goals of the research, set out in section 1.5, were achieved. In this chapter recommendations are made for future research opportunities and for the enhanced use of *AAWARE.*

6.2 Conclusions

The absence of an introductory workshop in distributing *AAWARE* to the schools does not inhibit the use of *AAWARE* in the schools. However the use of individual lessons would be facilitated through workshops. A corollary to this would be professional development enabling teachers to select, adapt and use LSM's more effectively in their classroom practice.

There was a disparity in the use of *AAWARE* between the urban and two rural schools taking part in the case studies. The urban teacher showed greater confidence in adapting and integrating the resource with other learning areas and LSM's. The urban learners showed a greater ability to work in groups, constructing the knowledge with the teacher playing a mediatory role. This supports the designers' intention that if used effectively, *AAWARE* has the potential to fulfil RNCS and OBE policies.

The use of *AAWARE* is facilitated by the presence of an experienced and motivated teacher. The motivation for use could be a personal interest in wildlife. Furthermore, subject to further research, a pre-existing relationship with Cheetah Outreach results in a high percentile of use. This could be related to an increased interest in wildlife in the teachers exposed to Cheetah Outreach.

Although *AAWARE* is not being used in its entirety, the design has overcome several potential inhibiting factors to LSMs use. Teachers appreciated the user-friendly layout resulting in minimal preparation work being needed. The alignment with education policy in terms of the RNCS and the availability in all three languages prevalent in the Western Cape were all variables highlighted by teachers as having facilitated their use of *AAWARE*.

6.3 Evaluation of Development Assumptions

The assumptions made by the development team in section 1.3 have to some extent been vindicated by this research. The first assumption of greater learner enthusiasm for learning based on the topic of cheetahs was echoed in the teacher interviews where all three teachers made similar comments regarding using animal themes in their learning programmes. Either the teachers themselves were enthused by the topic or they believed it important to teach such themes to the learners. In the observed lessons, learners appeared to enjoy the topic, although this may have been affected to some extent by the presence of the researcher.

All three interviewed teachers stated that the design of the resource scaffolded their use of it. Very few questionnaires gave answers pertaining to the design of the resource as needing to change in order to facilitate use. Based on these two insights, I would conclude that the development team was correct to conclude that the way the resource was structured would assist teachers in its use.

The incorporation of subject and grade specific teachers into the development team would ensure the materials would be relevant to Natural Science and the grades, was to some extent shown by the data to be erroneous. While appropriate to Natural Science, one of the conclusions from this research later on in this chapter is that the alignment to the content of the curriculum needs to be reassessed once the development team have finalized their training in the new curriculum and have some experience in the classroom with the new curriculum.

The assumption whether *AAWARE* is a worthwhile project or not, remains subjective. One of the goals behind *AAWARE* was to assist teachers in the new curriculum while increasing learners' knowledge of the cheetah. The level at which *AAWARE* is used in schools is raising some awareness of cheetah and teachers are finding sections of the resource useful in their classroom practice. I would therefore recommend that, bearing in mind the goals of the organization, AAWARE is a worthwhile project for Cheetah Outreach. Whether teachers find it a worthwhile project would require further research. From the interviews, I would say that the three teachers in question would agree that *AAWARE* is a worthwhile project. I would however hesitate to extrapolate this to the larger teaching community. I would propose inserting a question to ascertain teachers' opinions of this qualification in future questionnaires pertaining to the use of this resource.

6.4 Evaluation of Research

The research methods have already been evaluated in section 3.5. Overall the research, while gaining some insights, could have been enhanced through further data generation. Section 6.5.1 provides some recommendations for further research opportunities.

The research has fulfilled its goals, although further research would expand on the conclusions reached. The assumptions made in the development of AAWARE have been evaluated in section 6.3 and are seen to be validated. Insights into the use of the resource have been gained and recommendations to adapt the resource are suggested in the next section. Further insights can be gained by refining and including alternative methods in the data collection process as recommended in the next section.

6.5 Recommendations

6.5.1 Further Research to Enhance Findings

Further research is needed to support and enhance these findings:

Individual and focus group interviews at a stratified sample of schools would provide greater insight into a number of questions left unanswered by this research:

- Why do certain lessons show a high level of non-use?
- Why do teachers not modify these lessons to enable use?
- Is there a difference in lesson use and selection between class and subject teachers?

as well as solve the confusion around the perceived alignment with the curriculum policy and contents. Furthermore these interviews could bring clarity to the theorised relationship between a pre-existing affiliation with the distributing organisation and the use of their LSMs. The interviews should include questions on the teachers' perceptions of the organisation as well as their personal interest in wildlife to investigate the personal interest aspect of LSMs use.

Observations at schools that received *AAWARE* through introductory workshops would complement the three case studies undertaken in this research. A comparison could subsequently be drawn as to the effective and integrated use of *AAWARE* in relationship to workshops as a distribution strategy. An interesting variation to this research would be to observe lessons by the teacher not incorporating *AAWARE* and / or other LSMs. A comparison would show whether the use of *AAWARE* and / or other LSMs has any effect on the teaching and learning strategies in the classroom practice and hence whether the goals of OBE and the RNCS are enhanced by the use of *AAWARE* and / or other LSMs. (The research should include why the teacher is not utilizing LSMs in the other lesson.)

6.5.2 To Enhance the Use of *AAWARE*

I have only three recommendations to enhance the use of *AAWARE* with schools. Firstly I would suggest that now the implementation of RNCS is completed, effort be made to workshop all schools in the use of *AAWARE*, including those schools already using the resource. This should enhance effective and more intense utilisation of *AAWARE*. The original writing team should be reassembled now that they have undergone RNCS training to more effectively align the content of *AAWARE* to the RNCS requirements. Lastly, as a long-term strategy, Cheetah Outreach should negotiate more personal relationships with the schools and develop enthusiasm amongst the teachers for the potential inherent in the resource for RNCS, OBE and conservation education.

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PERSONAL COMMUNICATIONS

Confidential (2005, September): person asked for name to be withheld.

ADDENDUM A:

Sample Pilot Questionnaire

CHEETAH OUTREACH: AAWARE QUESTIONNAIRE:

Background information:

1) Name of school:.....

2) How many teachers in each grade in your school:

- Grd 4 .....
- Grd 5 .....
- Grd 6 .....
-

3) What is the approximate size of your classes in your school:

- Grd 4 .....
- Grd 5 .....
- Grd 6 .....

4) Does your school have a photostat machine? YES
NO

- how many? .....
- where is it kept? .....
- can you access it when you need it? .....

5) Does your school have overhead projectors? YES
NO

- how many? .....
- where is it kept? .....
- can you access it when you need it? .....

6) Does your school have a library? YES
NO

- approximately how many books does the library have? .....

7) Does your school have a resource centre for teachers? YES
NO

- how many resources does the centre have?.....
- how easy is it to access the resources?

8) Does your school have internet access? YES
NO

- where is the computer kept? .....
- how easy is it for you to access the internet?.....

AAWARE:

9) How did your school receive the AAWARE Teacher's Guide – tick one of the following boxes

- AAWARE introductory workshop ☐
- Delivery to school / principal ☐
- Youth Environmental School ☐
- Other ☐

  Explain:.....

10) Are you using AAWARE – tick one of the following boxes:

- Yes ☐
- No ☐

11) How many teachers in your school are using AAWARE?

- Grade 4 .....
- Grade 5 .....
- Grade 6 .....

12) Which lessons are you using as designed?

.....
.....

13) Which lessons have you changed in order to use them?

.....
.....

14) How have you changed these lessons?

.....
.....
.....
.....

15) If you are not using AAWARE, why not – tick one of the following boxes?

- lack of access ☐
- lack of training in the resource ☐
- not relevant to your grade ☐
- not relevant to your needs ☐
- using other resource instead ☐
- other ☐

16) What would facilitate or encourage your use of AAWARE?

.....
.....
.....
.....

ADDENDUM B:

Sample Final Questionnaire

CHEETAH OUTREACH: AAWARE QUESTIONNAIRE:

Background information:

1) Name of school:.....

2) How many teachers in each grade in your school:
- Grd 4 .....
- Grd 5 .....
- Grd 6 .....

3) Approximately how many learners in a class in the following grades in your school:
- Grd 4 .....
- Grd 5 .....
- Grd 6 .....

4) Does your school have a photostat machine? YES NO
- how many? .....
- where is it kept? .....
- can you access it when you need it? .....

5) Does your school have overhead projectors? YES NO
- how many? .....
- where is it kept? .....
- can you access it when you need it? .....

6) Does your school have a library? YES NO
- approximately how many books does the library have? .....

7) Does your school have a resource centre for teachers? YES NO
- how many resources does the centre have?.....
- how easy is it to access the resources?

8) Does your school have internet access? YES NO
- where is the computer kept? .....
- how easy is it for you to access the internet?.....

AAWARE:

9)Are you using AAWARE – tick one of the following boxes:

Yes ☐

No ☐

10)How many teachers in your school are using AAWARE?

Grade 4 ..... Grade 5 ..... Grade 6 .....

11) If you are not using AAWARE, why not – tick one of the following boxes?

- lack of access ☐
- lack of training in the resource ☐
- not relevant to your grade ☐
- not relevant to your needs ☐
- using other resource instead ☐
- other ☐

Explain.....

12) How did your school receive the AAWARE Teacher's Guide – tick one of the following boxes

- AAWARE introductory workshop ☐
- Delivery to school / principal ☐
- Youth Environmental School ☐
- Other ☐

Explain:.....

Which lessons are you using as designed? Please tick appropriate lesson:

Grade 4:		Grade 5:		Grade 6:	
Introduction to the cheetah	☐	Introduction to the Cheetah	☐	Adaptations	☐
Habitats	☐	Habitats	☐	Animal Behaviours	☐
Adaptations	☐	Life Cycles	☐	Nutrition	☐
Food Chains	☐	Nutrition	☐	Population Change	☐
		Population Change	☐	Threats to Survival	☐

14) Which lessons have you changed in order to use them? Please tick appropriate lesson:

Grade 4:		Grade 5:		Grade 6:	
Introduction to the cheetah	☐	Introduction to the Cheetah	☐	Adaptations	☐
Habitats	☐	Habitats	☐	Animal Behaviours	☐
Adaptations	☐	Life Cycles	☐	Nutrition	☐
Food Chains	☐	Nutrition	☐	Population Change	☐
		Population Change	☐	Threats to Survival	☐

How have you changed these lessons?

.....
.....
.....
.....
.....
.....

What would facilitate or encourage your use of AAWARE?

.....
.....
.....
.....

ADDENDUM C:

Sample observation schedule

OBSERVATION SCHEDULE:

1) School
2) teacher
3) grade
4) lesson to be taught
5) size of class
6) language of
    - learners
    - teacher
    - resource
7) resources available in classroom
    - projector
    - blackboard
    - posters
    - LSM
    - video /tv
    - other
8) How is the resource being used
    - what has been left out of lesson
    - what has been added into lesson
    - what has been changed in lesson
    -
9) learners interactions
    - with teacher
    - with each other
    - with resource-
        - understanding
        - enjoyment
        -

10)teacher
        - lecturing
        - guiding discussions
        -

ADDENDUM D:

Sample semi-structure interview

INTERVIEW:

1. Received AAWARE how?

- How do you think this affected your use of AAWARE?
- What would you have preferred?

2. Incorporation into the year planner (copy of)

- Did you decide this as a group / individual?
- Why did you decide to place it here?
- How many of the lessons are you using?
- Are all three grades using it?

3. Interaction with the resource

- Do you understand the language?
- Did you find the resource easy to use?
-

4. Which lessons as is, which changed?

- If changed why?
- as is why?
- what is missing?

ADDENDUM E:

Sample of contract with teacher

CONTRACT

BETWEEN: ..... (Educator, ... Primary School) and Dawn Glover (Med Student, Rhodes University.

1st December 2005

I, Dawn Glover, agree to hold the name of the above educator and school in confidence with regards to any data collected at the above school and used during the course and in the write up of my Med (Environmental Education) thesis, 2005. I also agree not to reveal any personal, potentially harmful information at any stage and will remove any statement or any of the data collected should the above educator not wish it to be used.

Signed:.....

Date: .....

I, ..., educator at ..... Primary School, agree to allow the researcher, Dawn Glover use of observation and interview data taken on the 20th September 2005, subject to my approval of collected data.

Signed:.....

Date:.....

ADDENDUM F:

Copy of research permission letter from Western Cape Education Department

Navrae
Enquiries Dr RS Cornelissen
IMibuzo

Telefoon
Telephone (021) 467-2286
IFoni

Faks
Fax (021) 425-7445
IFeksi

Verwysing
Reference 20050902-0033
ISalathiso

Wes-Kaap Onderwysdepartement

Western Cape Education Department

ISebe leMfundo leNtshona Koloni

Ms Dawn Glover
P.O. Box 116
LYNEDOCH
7603

Dear Ms D. Glover

RESEARCH PROPOSAL: ELVALUATION OF THE USE OF ENVIRONMENTAL LEARNING SUPPORT MATERIAL IN THE NATURAL SCIENCES: A CASE STUDY OF THE *AAWARE TEACHER'S GUIDE*.

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **02nd September 2005 to 23rd September 2005.**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December 2005).
7. Should you wish to extend the period of your survey, please contact Dr R. Cornelissen at the contact numbers above quoting the reference number.
8. A photocopy of this letter is submitted to the Principal where the intended research is to be conducted.
9. Your research will be limited to the following schools: **Lynedoch Primary, Raithby Primary, Bellville Primary, Bellville North Primary, Kerria Primary, Protea Park Primary, Primrose Park Primary, Westfleur Primary, Athwood Primary, Idas Valley Primary, Stellenbosch Primary, Holy Cross Sisters Convent School and, Dr Van Der Ross primary**.
10. A brief summary of the content, findings and recommendations is provided to the Director: Education Research.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

    The Director: Education Research
    Western Cape Education Department
    Private Bag X9114
    CAPE TOWN
    8000

We wish you success in your research.

Kind regards.

Signed: Ronald S. Cornelissen
for: **HEAD: EDUCATION**
DATE: 02nd September 2005

ADDENDUM G:

AAWARE:

Grade four: Learning programme one: Introduction to the Cheetah

Learning programme 1
Introduction to the Cheetah

CRITICAL OUTCOMES

CO #1: Identify and solve problems and make decisions using critical and creative thinking.
CO #2: Work effectively with others as members of a team, group, organisation, community.
CO #3: Organise and manage oneself and one's activities responsibly and effectively.

LEARNING OUTCOMES

LO #2: The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Process Skills:

- Observing and Comparing
- Recording Information
- Sorting and Classifying

ASSESSMENT STANDARD

- Categorises information to reduce complexity and look for patterns

TEACHING THE LESSON

Using the picture of the cheetah supplied briefly introduce the cheetah as an African predator to the learners, using the information sheet titled "Introduction to Cheetahs" found on page 6. Give a brief background to its history and behaviour, leaving out the characteristics for the activities.

ACTIVITY 1 - similarities and differences

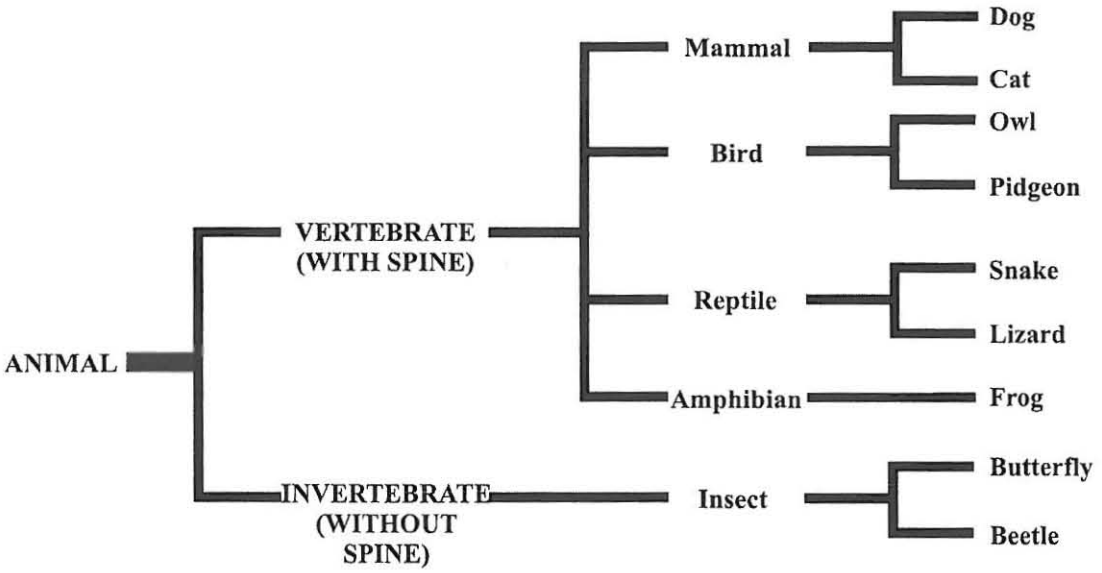
Divide the class into groups of two or three. Using the pictures or the colour poster given, have the learners identify similarities and differences between the six cat species. Some examples of leading questions are offered below:

- Which cats look the same?
- Any similar patterns/shading? Body size? Body shape? Head size?
- Are their legs all the same size?

Let the learners write up their observations on a sheet of paper headed similarities and differences. Give the learners 15 minutes to complete their lists before asking for feedback. Ask each group for one similarity or differences from their list. Using the table of comparison on page 7 discuss with the learners the main differences/similarities between the six cat species.

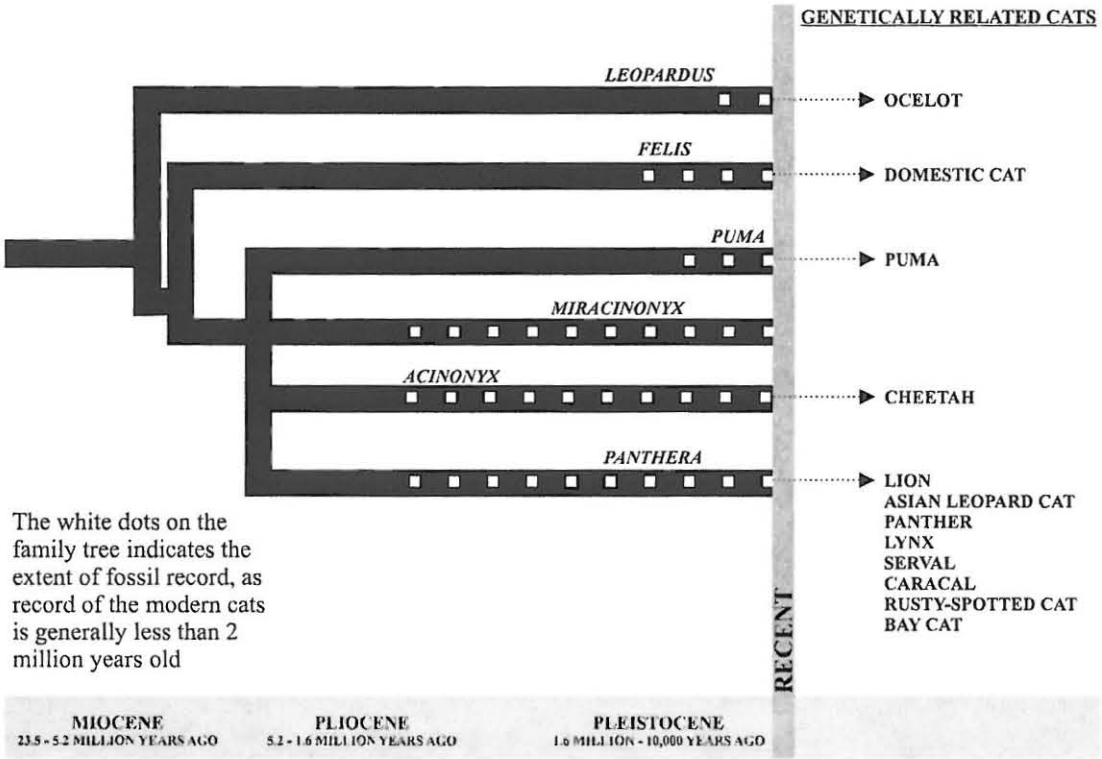
Discuss the concept of a family tree (a method by which you show the relationship between different objects) with the learners, by developing an example as below on the board with their input.

Eg 1: Basic Animal Family Tree



Have the learners draw up their own family tree of the cats using the similarities and differences previously identified. Give them about another 15 minutes before showing them the correct tree below.

Eg 2: THE CAT FAMILY TREE



The white dots on the family tree indicates the extent of fossil record, as record of the modern cats is generally less than 2 million years old

ASSESSMENT

Asessment Rubric for Family Tree:

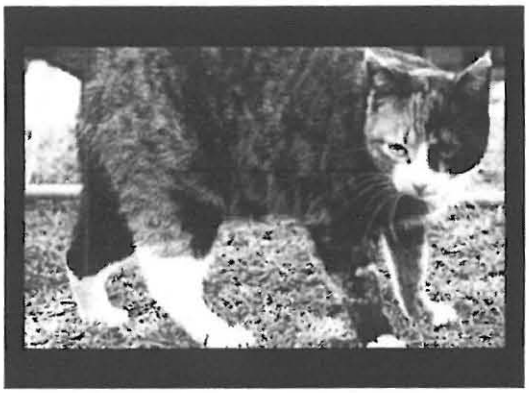
1	2	3	4
The learners could not fully distinguish differences and similarities and did not show any reasoning behind their groupings. Labelling and layout were confusing.	The learners could not fully distinguish differences and similarities between the cats. The grouping showed some reasoning. Labelling and layout is poor.	Learners could distinguish differences and similarities. Learners could group cats showing good reasons. The layout however is poor and labelling is confusing.	The learner exceeded expectations in distinguishing differences and similarities and showed good reasoning behind grouping of cats. The layout is good, with clear labelling.

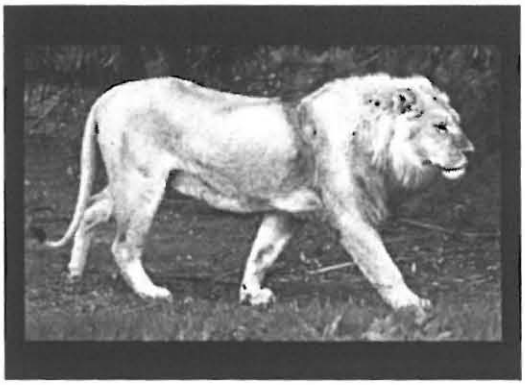
ACTIVITY 2 - snap game

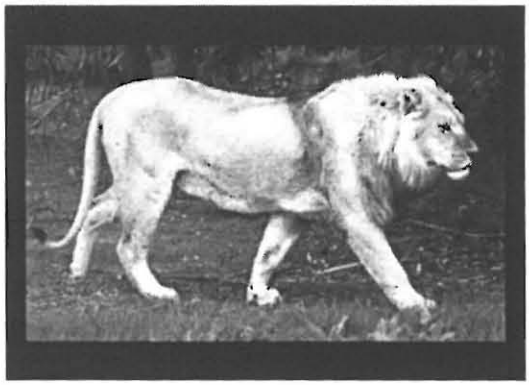
Photostat the cards given on pages 3, 4 and 5 (or cut the cards from the poster given) so that you have 48 cards making sure you have 8 copies of all 6 cats. Divide the class into groups of four, and hand out a set of 48 cards to each group. Mix the cards and deal each learner in the group a hand of 12 cards. Starting with 2 of the four, start the game by placing one card each down, next to each other, face up so that all players can see them. The next two players in the group then place one card each on top of the two piles formed by the previous two players. At any time that these cards match, the learner, who calls snap first followed by the correct name of the cat gets a point. Once all the cards have been dealt, the learner with the most points wins.

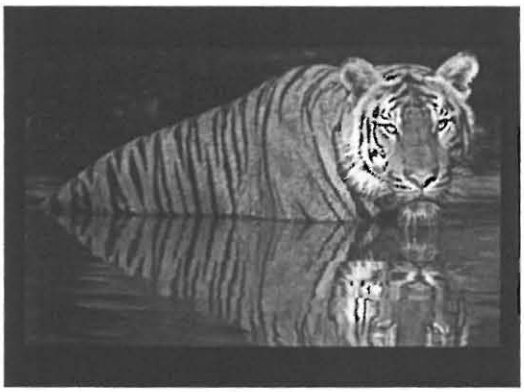
Have the learners assess themselves in the group as to whether they feel capable of moving up to the next level of the game. Use the cards on page5 to produce 24 more cards. Remove half of the cards from the previous deck making sure that you have four copies of each cat and add these to the 24 new cards. Play the game once again to see if the learners are still able to identify the different cats using different pictures. This game can be used to assess whether the learners can distinguish between the six cats based on their differences and similarities.

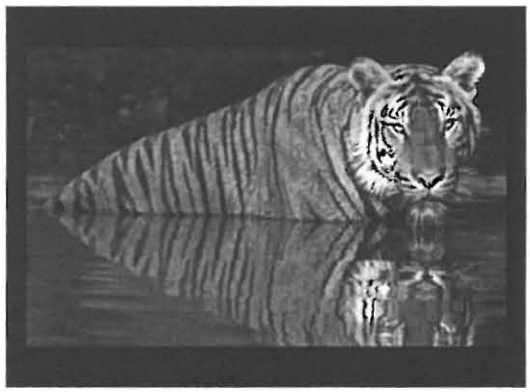
Card Set for easier snap game

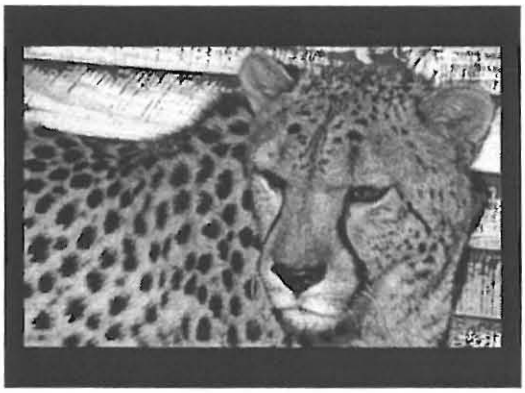


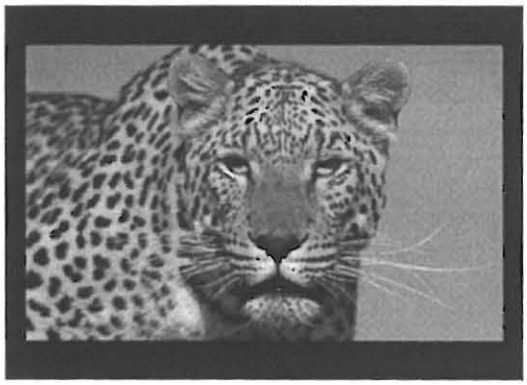


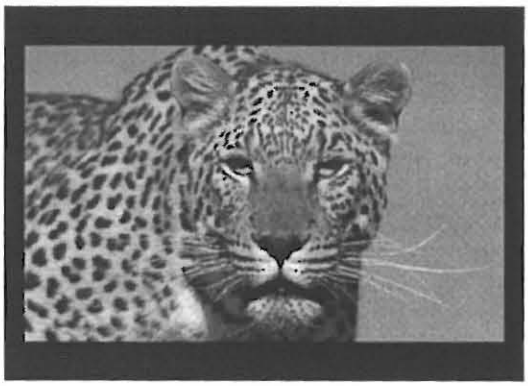




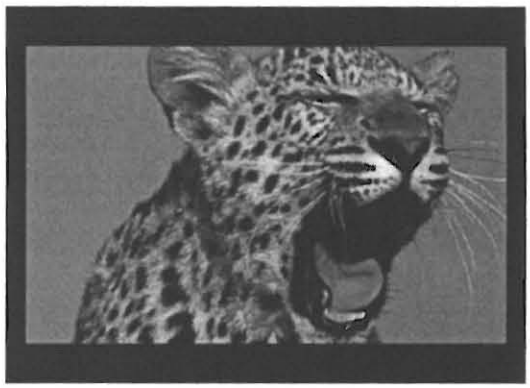


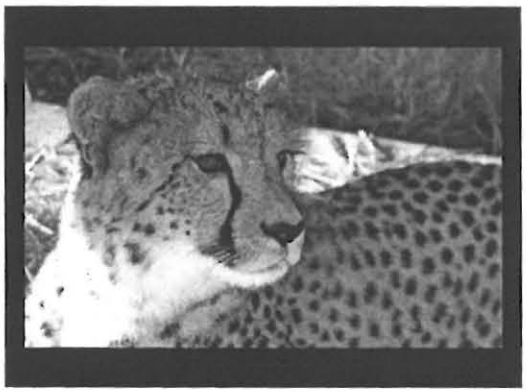


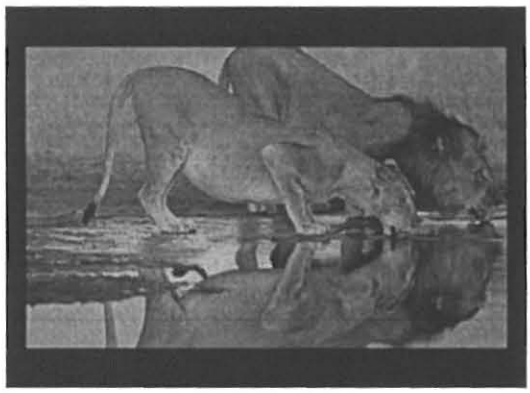




Card set for more difficult Snap Game:







BACKGROUND – introduction to the cheetah (Acinonyx Jubatus)

History:

The cheetah is Africa's most endangered big cat and is a protected species in Southern Africa. It is considered endangered under the United States Endangered Species Act and is listed on CITES Appendix 1. (CITES Convention on International Trade in Endangered Species is an international treaty that monitors trade in wild species. Appendix 1 indicates that the species is threatened by trade and is in danger of extinction.)

Characteristics:

The oldest cat species on earth, fossil remains date back 3.5 4 million years. The cheetah is a highly specialised animal adapted for speed, at a top speed of 110-120 km/h the cheetah is the fastest land animal. In appearance, cheetahs are of light build, making them the lightest of the big cats at 35-45kg for females, and 45-60kg for males. They have long streamlined bodies and long, slim legs. Their size and build is one of the ways that they can be distinguished from Africa's other spotted big cat the leopard. The leopard in comparison is short and stocky, with a large, heavy bone structure and a lot of muscle mass. Cheetah have on average 3000 solid black spots covering their entire body, together with their short tan fur this creates camouflage. Leopards have brown spots surrounded by incomplete black circles called rosettes on their backs and sides. One of the most prominent, distinguishing features of the cheetah are the tear marks running from their eyes to their mouths.

Behaviour:

Cheetah kill other animals for food, we therefore refer to them as predators. They are day hunters due to their speed and are mostly found in open savannah / grassland. They are normally solitary animals sometimes forming groups amongst brothers. Mothers will spend up to two years with their young teaching them how to hunt and to avoid other predators, which is not an instinct for a cheetah. Due to their slight build for running, cheetah do not make good fighters, preferring to run from a threat, we therefore refer to them as non-aggressive. Due to this avoidance of confrontation with other predators, the cheetah is the only predator that has not been known to attack humans in the wild.

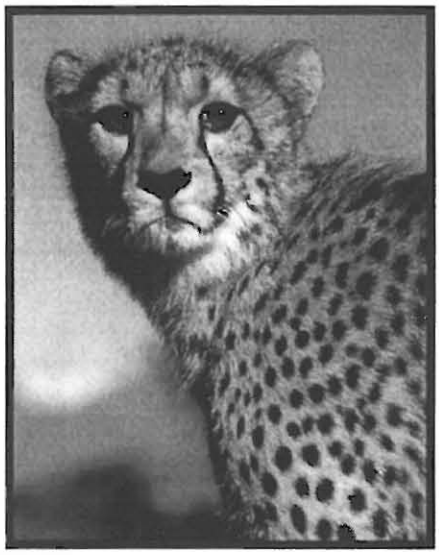
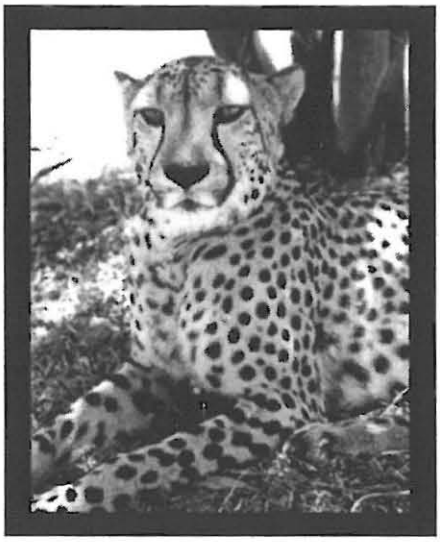


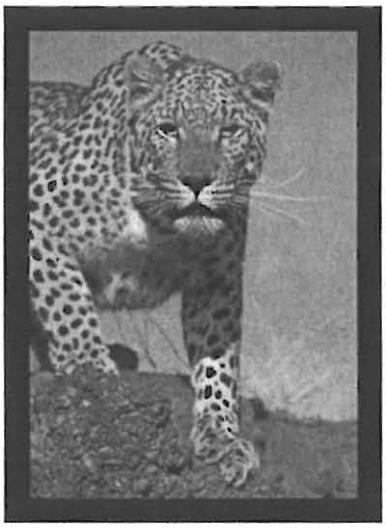
TABLE 1: comparison of general information

	Cheetah	Leopard	Lion	Caracal	Tiger	Domestic Cat
Scientific name	*Acinonyx jubatus*	*Panthera pardus*	*Panthera leo*	*Felis caracal*	*Panthera tigris*	*Felix domesticus*
Distinguishing features	▪ Long slender body ▪ Tan coat with solid black spots ▪ Black "tear marks" on face ▪ Small head ▪ Amber eyes ▪ Semi-retractable claws	▪ Largest spotted cat, short and stocky, muscular ▪ Coats marked with rosettes ▪ No "tear marks" ▪ Large head, powerful jaw ▪ Green eyes ▪ Retractable claws	▪ Largest African carnivore ▪ Uniform tawny / sandy coat ▪ Males have long mane ▪ Tail sometimes black on tip ▪ Retractable claws	▪ Long, slender body ▪ Yellow-grey to reddish-brown coat ▪ Short tails, tapered ▪ Ears narrow and pointed ▪ Long black tufts on ears (4.5cm) ▪ Hind-legs longer than forelegs ▪ Retractable claws	▪ Largest of all cats ▪ Black stripes on an orange coat ▪ Males have prominent ruff / collar ▪ Retractable claws	▪ Belong to the small cats ▪ Variety of colours and patterns ▪ Retractable claws
Size	▪ Total length: 180 – 220 cm ▪ Adult body length: 112 – 135 cm ▪ Tail length: 60 – 80 cm ▪ Shoulder height: 73 – 80 cm ▪ Weight: 30–45 kg (F) 45–60 kg (M)	▪ Body length: 91 – 243 cm ▪ Tail length: 68 – 110 cm ▪ Shoulder height: 70 – 80 cm ▪ Weight: 17–60 kg (F) 20–90 kg (M)	▪ Total length: 230 – 270 cm (F), 250 – 330 cm (M) ▪ Tail length: 100 cm ▪ Shoulder height: 100 cm (F), 120 cm (M) ▪ Weight: 110-152 kg (F) 150-222kg (M)	▪ Body length: 60 - 92 cm (F), 80 – 105 cm (M) ▪ Tail length: 20 – 35 cm ▪ Shoulder height: 40 – 50 cm ▪ Weight: 11–15 kg (F) 13–20 kg (M)	▪ Body length: 119 – 170 cm (F), 170 – 290 cm (M) ▪ Tail length: 53 – 119 cm ▪ Shoulder height: 85 – 124 cm ▪ Weight: 75-300 kg Sumatran - Siberian	Weight: 3-5 kg
Range	Africa: 26 countries Iran: 200 individuals	Africa: Widely dispersed Also in South Asia, Far East and Arabia	Africa: Southern / East Few in Asia	Africa: Asia, Turkestan, North West India, Arabia	Not found in Africa India, China and Indonesia	Found world-wide where humans have settled
Habitat	Grasslands, savannahs, woodlands, bushlands, hill country. Majority live outside of protected areas.	Very adaptable – habitats include woodlands, lowlands, forests, mountains, savannahs, dry steppes.	Wide habitat tolerance: grassy plains, arid woodlands and semi-desert. (Not found in forests)	Wide range from open savannah and woodland to semi-arid areas. Not found in forests.	Not found in open habitats, they tend to live in a variety of forests and mangrove swamps, requiring cover and water.	Human settlements
Period of activity	Hunt early morning, late afternoon	Nocturnal and diurnal	Nocturnal and diurnal	Mostly nocturnal, will be active during the day	Nocturnal	Mostly nocturnal
Threats to humans	Not a threat to humans	Can and do attack humans	Are a threat to humans	Are not a threat to humans	Are a threat to humans	Are not a threat to humans



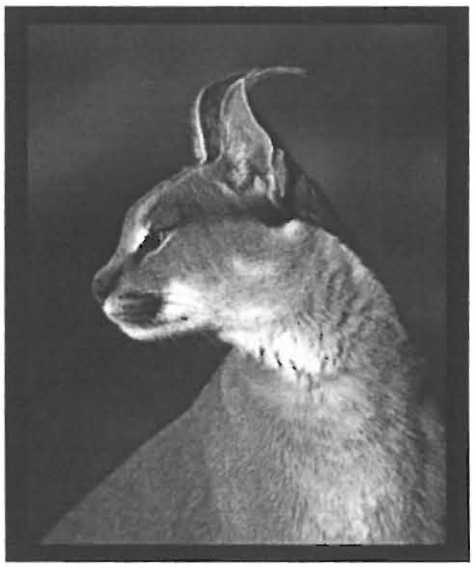
Cheetah

Lion



Leopard

Caracal



Tiger

Domestic Cat

ADDENDUM H:

AAWARE:

Grade four: Learning programme three: Adaptations

Learning programme 3
Adaptations

CRITICAL OUTCOMES

CO #3: Organise and manage oneself and one's activities responsibly and effectively.
CO #4: Collect, analyse, organise and critically evaluate information.

LEARNING OUTCOMES

LO #2: The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

Process Skills:

- Observation and Recall
- Comprehension and Understanding

ASSESSMENT STANDARDS

- Recalling meaningful information when needed
- Categorising information to reduce complexity and look for patterns

TEACHING THE LESSON

Review the adaptations background information found on page 20.

Discuss with learners:

- Animals come in all different shapes, sizes and colours. These differences make each species or individual member of a species specially adapted for success in a different habitat or place within the habitat.

Use the following activity to begin a discussion with the learners on adaptations. To help students understand the great diversity of life forms found in nature, generate a list of species with the colours and shapes listed below. Ask students to come up with as many species as possible. Some examples are listed. Ask the learners why they think the animals have these adaptations, try to draw a link to habitat.

Black (penguins, black wildebeest)
Green (plants, grasshoppers)
Striped (tiger, zebra)
Fur (mammals)
Short tail (hyena, wild dog)
Short legs (warthog)
No legs (snakes, whales)
Grey (elephant)
Spotted (cheetah, leopard, giraffe)
Wings (birds)
Gills (fish)
Long tail (cheetah, lion)
Long legs (giraffe, antelope)

What is an adaptation?

Animals are designed to survive in particular habitats. Just as we might try to guess where people of different cultures are from by observing the way they dress, talk and behave, we can tell a lot about an animal's habitat by observing its behaviours and appearance. Simply explained, an adaptation is a physical or behavioural characteristic that helps an animal survive in its habitat. Those best adapted to the conditions in which they live are more likely to survive and reproduce. For example, take a cheetah with solid black spots. The spots help to hide them in the shade of bushes and trees, making it harder for other predators, which are a threat to the survival of the cheetah, to see them.

Use the following lesson to teach learners the significance and benefit of adaptations using the cheetah and its adaptations.

BUILD-A-CHEETAH

Explore with your students the special body parts and adaptations cheetahs have that allow them to run so fast. Using supplies listed below and the adaptation fact sheets and diagrams, discuss with the students the various adaptations of the cheetah. Next to each of the supplies listed is the body part and adaptation it represents. Go through items one by one and explain why each is an important piece to include in the cheetah. You may want to put up a picture of the cheetah to help students visualise each part.

SUPPLIES	BODY PART	ADAPTATION
Paper aeroplane	Long thin body	Aerodynamic build
Running shoe / takkie	Semi-retractable claws	Traction for running
Long, medium, short sticks	Legs	Long legs for bigger stride
Piece of wire	Flexible spine	Increased stride length
Picture of cheetah	Body / skeleton	Thin and light
Long piece of string	Tail	Maintains balance
Paper heart	Strong, enlarged heart	For oxygen supply
Binoculars (two toilet rolls tied together can substitute)	Eyes	Vision of 5 km
Sunglasses	Tear marks on eyes	Protect eyes from sun's glare

Paper aeroplane:

Throw it into the air and watch it fly. The cheetah has a long thin body to create less resistance to wind while running, just as a paper aeroplane flies easily through the air. Now crumple the paper and throw it; it will not fly like the aeroplane. Animals that move quickly through the air like birds or through the water like fish are streamlined. Cheetahs' long, thin bodies help them to run so fast.

Running shoe/takkie:

What is this? Shoe
What type of shoe? Running shoe / takkie / sneaker
When do we wear these shoes? Running / sport / exercise
Why do we wear these shoes for these activities and not other shoes? Rough sole with grooves, can slip easily with a smooth sole. The rough sole provides better grip decreasing the chances of slipping and falling.
Do you think it will aid a cheetah to have such an adaptation providing grip?
A cheetah's paw has two adaptations to grip: the non-retractable claws, which can dig into the ground and the grooves on the pads which work similar to the treads on a car tyre.

Sticks:

Ask students which sticks they would use for a cheetah's legs. Long legs increase the stride of a cheetah allowing it to cover a greater distance in less time.

Wire:

Bend and straighten the wire to show how flexible it is. This represents the cheetah's spine. The cheetah has a very flexible spine, which allows the body to stretch out in a run. Together with the long legs, this gives the cheetah a stride of 8m (pace out 8m).

Picture of a cheetah:

Is the cheetah thin or fat? Cheetahs have light bones and do not carry a lot of muscles. The bigger and heavier you are the slower you are.

String:

The cheetah's tail acts like a rudder helping the cheetah turn while running and maintain balance. The cheetah uses its tail like we use the handlebars on a bicycle to steer.

Heart:

What is the function of your heart? Pump blood with oxygen to your muscles to that they can work
When you are running and active, would you need more oxygen to keep muscles working? Yes
Why do you get tired when active? Not enough oxygen getting to the muscles.
Do you think it will take a lot of oxygen to run at 120km/h? Yes
Therefore the cheetah has an enlarged heart to help it run that fast.

Binoculars:

If you are a buck, are you going to live near to a cheetah or as far away as possible? Far away
What do we use to see things that are far away from us? Binoculars
Do you think that it would be an advantage to a cheetah to be able to see far? Yes, will be able to see where food is / other predators are?

Cheetahs' eyes work like a pair of binoculars allowing the cheetah to see very far - 5 km. Using a landmark 5 km from the school that the learners all recognise, explain to them just how far 5km is. Cheetahs will be able to see a bird at that distance.

Sunglasses:

Due to its speed a cheetah has to hunt by day in order to clearly see where it is going. At its active times, early morning / late afternoon the sun is low on the horizon often resulting in the cheetah looking directly into the sun. When you look into the sun can you see clearly? Do you think this would be good for the cheetah while hunting and running fast? What do we use to protect our eyes from the sun? Sunglasses. What do you think are the cheetah's sunglasses? Tear marks
The colour black absorbs light so the tear marks attract the glare of the sun to below the eyes, therefore the sun does not hurt the eyes.

Using both of the following activities, you can assess the learners understanding of the lesson as well as their ability to access information from a variety of sources.

ACTIVITY 1 - cheetah crossword puzzle

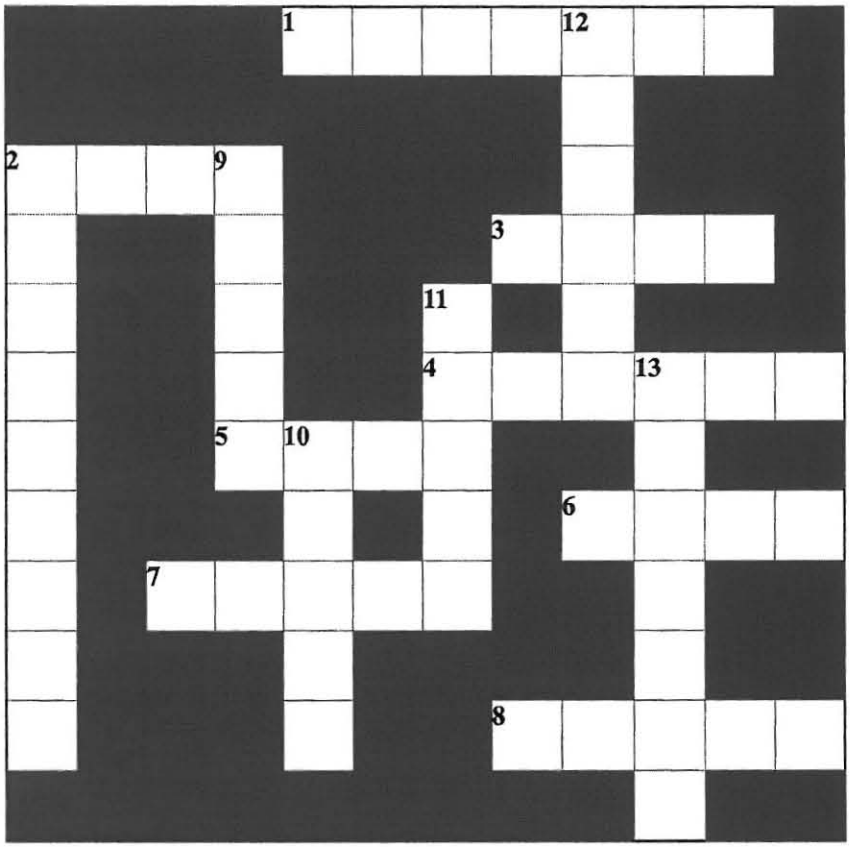
Using the Cheetah Crossword Puzzle Worksheet found on the next page, ask the learners to fill it in using a pencil, recalling what they have learnt in the lesson. Give them 10 minutes to do this. Then allow them to use the poster on adaptations to check and correct their answers.

ACTIVITY 2

Using the paragraph on page 18 and poster on the adaptations of a cheetah, and what you have learnt from the previous activity, fill in the blanks to show the relationships between structure, adaptation, and function on the Built for Speed worksheet on page 18.

WORKSHEET – cheetah crossword puzzle

Name: _____ **Date:** _____



Across:

1: The cheetah is the _____ animal on land.

2: The _____ helps the cheetah with balance and making sharp turns.

3: Its paws are adapted for _____.

4: The heart is enlarged to ensure more _____ gets to the muscles.

5: A cheetah is _____ while a leopard is fat.

6: The cheetah runs on the tips of its _____.

7: The cheetah has semi-retractable _____.

8: The cheetah's stride is 8 _____ at full speed.

Down:

2: The cheetah's _____ are its sunglasses.

9: The cheetah's skeleton is very_____.

10: The _____ and lungs are bigger than other cats.

11: The cheetah's hip _____ can turn.

12: It takes a lot of _____ for the cheetah to run so fast.

13: The cheetah has deep _____ on its pads.

ANSWER SHEET – cheetah crossword puzzle

Across		Down	
1	Fastest	**2**	Tearmarks
2	Tail	**9**	Light
3	Grip	**10**	Heart
4	Oxygen	**11**	Bones
5	Thin	**12**	Energy
6	Toes	**1 3**	Grooves
7	Claws		
8	Meters		

ACTIVITY 2 - built for speed

Name: _____ **Date:** _____

Using the paragraph and diagram on the adaptations of a cheetah and what you have learnt from the previous activity, fill in the blanks to show the relationships between structure, adaptation, and function.

STRUCTURE	ADAPTATION	FUNCTION
Tail		
Body		
Paws		
Spine		
Heart		

Adaptations of a Cheetah for Speed:

The cheetah is the fastest animal on land, with a maximum speed of 110 - 120 km per hour. Running is the cheetah's main form of defence, its speed allows it to hunt and escape from danger. The cheetah has many adaptations, which help it to run so fast. The cheetah has a very light skeleton and does not have a lot of muscles, allowing it to run fast as the heavier you are the slower you are. The cheetah's body is thin and streamlined. The leg bones are longer than other cats and cheetahs run on the tips of their toes giving them a bigger step. The cheetah's spine also can bend a lot more than other cats; this also allows them to increase the size of their steps by stretching their body out. Their hip bones can turn where they are attached to the rest of the skeleton, this allows them to stretch their hind legs out further. All these adaptations give the cheetah a stride of 8 meters while running at full speed. The cheetah's long, narrow tail helps him to keep his balance and steer around corners. The feet give them better grip on the ground to stop the cheetah from slipping while it is running. This grip is provided by grooves on the cushions of the feet as well as the claws which cannot be pulled into the paw completely (we say that they are semi-retractable). It takes a lot of energy for the cheetah to run that fast. It is the oxygen in our blood that provides that energy. The cheetah has a very big heart and lungs to make sure that they get enough oxygen to their muscles while running to keep up their energy.

ANSWER KEY – built for speed

STRUCTURE	ADAPTATION	FUNCTION
Tail	Long and narrow	Balance and steering
Body	Slender, long-legged, streamlined, light	Less wind resistance, and longer stride therefore increased speed
Paws	Semi-retractable claws Grooves in pad	Better traction for acceleration and faster movement
Spine	Flexible	Increases the stride by allowing the body to stretch out further
Heart	Enlarged	Increased oxygen supply to muscles

ASSESSMENT

Assessment Rubric for Activity 2: Built for Speed

1	2	3	4
Learner could not recall, understand information given, resulting in an incorrect table.	Learner could only partially fill in the table, showing some ability to recall the information and correctly categorise.	Learner could recall and understand information given in order to correctly fill in the table.	Learner exceeded expectations showing deeper understanding of information given.

Language links:

These two activities can be used to assess the following language outcomes

LEARNING OUTCOME	ASSESSMENT STANDARD
LO1: Listening	Listens for information in different kinds of texts
LO3: Reading and Viewing	Scans for specific details
	Understands and responds appropriately to information in texts
LO4: Writing	Converts information from one form into another
LO5: Thinking and Reasoning	Processes information from different sources

BACKGROUND – adaptations

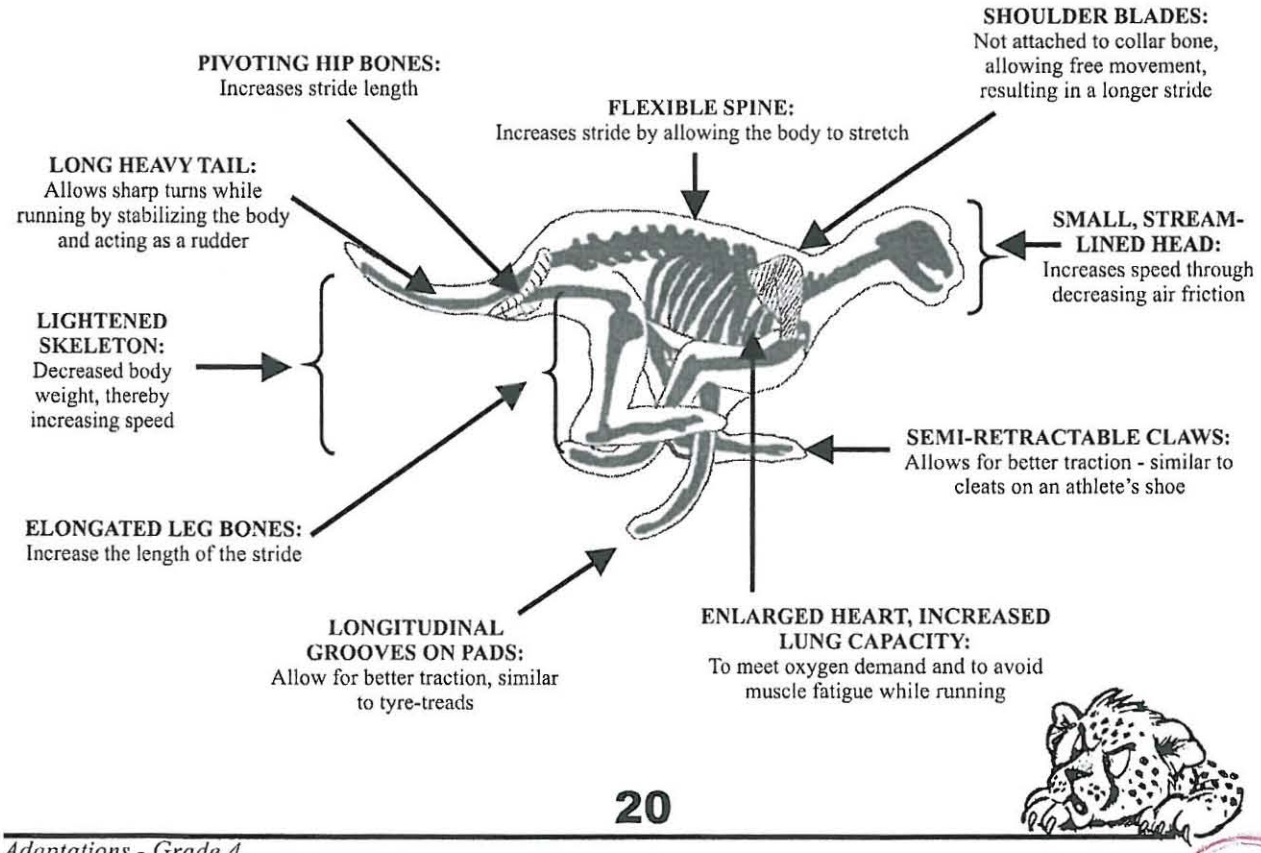
The fastest animal on land, with a maximum speed of **110 - 120 km** per hour, the cheetah can accelerate from 0-80km in 3 seconds. Their top speed can only be maintained for between 400-500 meters resulting in a short burst of speed (20-30s) following which they then need to rest for about 30 min. Running is a cheetah's main form of defense, its speed allows it to hunt and escape from danger. Over generations the cheetah has evolved many adaptations to facilitate a specialization for speed.

Speed consists of the distance one covers in a certain time; therefore by increasing the distance covered one can increase one's speed. To this end, the cheetah is aerodynamic (**stream-lined**) for decreased resistance while running. The **leg bones are longer** in comparison to the other cats and they **run on their toes** giving them a longer stride. The cheetah also has a very **flexible backbone**, which allows it so stretch its body out further. The cheetah's **shoulder blades** are not connected to the collarbone thus allowing the shoulders to move freely and help increase the length of the forelegs while running. The **hip bones pivot** in their sockets allowing for greater length of the hind legs while running. All these adaptations result in a stride of 8m at full speed. The **lightened skeleton** and reduced muscles mass aids the cheetah in running faster by decreasing the weight carried (the larger you are the slower you are).

The **long tail** helps the cheetah to balance and helps the cheetah make sharp turns when running, stabilises the body and acts as a rudder. A cheetah's paw shows several modifications allowing for greater grip while running. The pads on the base of the paw bear **longitudinal ridges** the function of which is equivalent to tyre-treads. The cheetah has **semi-retractable claws**, which serve a function similar to cleats on a track shoe.

It takes a lot of energy to sustain the top speed of a cheetah and therefore the cheetah has several adaptations to allow more effective delivery of oxygen to the muscles. In comparison to the other large cats, the cheetah's **heart, lungs, nostrils and sinuses are enlarged** to increase oxygen supply to the muscles.

Adaptations for speed



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