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Refining geography teaching : an error analysis.

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CHAPTER 2

LITERATURE REVIEW

2.1 Overview

The previous chapter provided an introduction to the study. In this chapter related literature will be reviewed to help to investigate how teaching may be refined through the process of error analysis in order to enhance student performance in COSC Geography examinations. First, I examine how error analysis may assist in improving students' performance. Secondly, I give an outline of different perspectives on performance with a focus to understanding why students' performance varies. An overview of what a curriculum entails and how it links to different strategies that can be used to teach Geography will also be outlined. And finally, I examine Blooms' Taxonomy of Objectives and how they may assist in the analysis of errors to determine whether students have achieved the objective level as required in each question. Bloom's Taxonomy of Objectives also serves as a guiding principle to this study.

2.2 The importance of carrying out Error Analysis

Error analysis is the study of the type and quantity of error that occurs, particularly in the fields of applied Mathematics (particularly numerical analysis), applied linguistics and statistics (Taylor, 1982). It is very important for teachers to determine the kind and quantity of errors that students make to be able to predict how errors can be minimized in order to improve academic performance. Studies have shown that although error analysis may seem tedious, without proper analysis, no valid scientific conclusions can be drawn. Research further reveals that since there is no way to avoid error analysis, it is best to learn to do it right. Furthermore Physists pay more attention to errors because the failure to specify the error for a given measurement can have serious consequences in Science and real life (http://phys.columbia.edu/~tutorial/intro/, accesses, 12 May 2006). The implication is that teachers face the challenge of paying more attention to the type of errors students make so that they can devise teaching and learning strategies to correct them. Gipps & Cumming (2004: 8) are of a similar opinion as reflected in their comment "by noticing and recording in a systematic way the child's errors and analysing the possible causes, teachers can correct misunderstandings, help the child develop appropriate strategies, and reinforce skills. That means, through errors teachers can determine how much students have learnt and still have to learn. Thus, a lack of fit between the learners' needs and the items taught could be avoided (www.teaching.stylesonline.com/error, accessed, 15 November 2007). Through error

analysis, teachers get a picture of errors students make in Geography aspects that cause learning difficulties. When these are understood in the right perspective, remedial measures could be planned and materials produced to help students. Teachers will also be in a position to devise teaching strategies that best suit the needs of the learners. It is imperative that teachers undertake a systematic analysis of the learners' errors. Below is an example of a study of error analysis done in English concerning a spelling test as shown in Table 1.

Table 1 Spelling Test

Student A	**Student B**
Cat	Cat
Dog	Dog
Luft	**Elefant**
Jif	**Girarffe**

Both children had 2/4 score, but one child is in the semi-phonetic phase of spelling and the other is in the transitional phase. This demonstrates the need to consistently look at the ways children write words rather than the score they receive on a test. A close analysis of a child's spelling of each word provides the key to the stage of spelling development they have attained. Developmental phases signify which spelling strategies need to be emphasized in the teaching program (http://wwwfp.education.tas.gov.an/English/, accessed, 11 November 2007). Edge (1993: 1) argues that if making mistakes is a part of learning, then correction is part of teaching. When students make errors they provide teachers with valuable information that reveals the manner in which students have grasped the concepts as a result teachers can easily identify areas where students experience difficulties and then devise teaching and learning strategies geared towards improving their academic performance.

2.3 Intellectual development and variations in academic performance

Within any class group there will be marked variations in the ways that pupils learn, the speed of their learning and the levels of attainment they achieve as well as the kind of learning difficulties and problems they experience (Battersby, 1997: 69). Following Lewis's (1989: 97) definition of variation in abilities, it is better understood when the term 'mixed abilities' is used to describe this variety and is most marked in comprehensive schools that have abolished streaming, setting and banding. This explains why "some students are better at geography than others" (Leat, 1997: 151). He argues further that some of this variation is

accounted for by interest, motivation and quality of teaching, but much of it must be attributed to intellectual development.

However, some contemporary researchers argue that a child's academic performance is primarily determined by genetics; therefore intervention may have little or only temporary effects on achievement (Herrnstein & Murray, 1994 & Scarr, 1992). This approach was criticised for failing to account for unequal access to education and for assuming that mental instruments are universally applicable in a culturally pluralistic society (Hillard, 1991). He acknowledges that the genetic-deficiency perspective undermines and diminishes an understanding of the social and economic conditions that affect students' outcomes. Madhere (1995) also rejects this view by arguing that student achievement is a socially constructed outcome that cannot be viewed as innate ability. On the contrary, research confirms that because of genetic potential, children whose parents have more innate ability are likely to have more innate ability themselves. This has been confirmed by "adoption studies" in which children brought up in socioeconomic environments different from their biological parents are more similar in their academic achievement to their biological parents than their adoptive parents (Rothstein, 2004: 17). Literature shows also that intelligence and/or ability changes when students are given equal access to high-quality instruction (Sorensen & Hallinan, 1984). Teachers then, face the challenge to make sure that high quality instruction is provided to students so as to cater even for those with low innate abilities.

In other studies achievement relates to students' social class and cultural differences (Bowles & Gintis, 1976 & Persell 1977). Variations in school performance are attributed to differences in their home environments (Glick, 1994). This explanation assumes that the achievement gap is present even before students begin formal schooling because of limitations in their home environment (West et al. 2000) because concerns about the black family structure are viewed as creating a 'culture of poverty' which is believed to be a source of low student achievenment (Frazier, 1966 & Valentine, 1968). On the basis of social class analysis, Bernstein (1971), Bourdieu & Passeron (1977) proposed that students from lower social classes are disadvantaged because they do not possess the habits and attitudes of the middle class, nor do they speak the formal language as well as members of the middle and upper classes (DeMerrais & LeComplete, 1995). They argue that these students do not have the "cultural capital" that offers the highest exchange rate in school, which makes it even more difficult to be high achievers. Rothstein (2004: 15) confirms that children from higher social classes come to school with more skills and are more prepared to learn than children from

lower classes. He argues further that all children learn in school, but those from lower classes, on average; do not learn so much faster that they can close the achievement gap. It is clear that this gap will always exist due to differences in socioeconomic backgrounds that students come from however, teachers need to take the responsibility of providing equal opportunities to quality instruction so that all students regardless of background have equal access.

In an attempt to help us understand variations of abilities, Jean Piaget (1986b, in Bishop, 1994) categorised more precisely the four stages of human development:

- ***The sensori-motor stage:*** (0-2 years). There is no abstract reasoning; "intuitive" thoughts closely linked to actual physical action and immediate observation. The child cannot think of the results of an action unless he actually carries it out and cannot also draw logical conclusions from his activities and experiences.
- ***The pre-operational or pre-conceptual stage:*** (2-7years). The child learns to manipulate things mentally, but only those he can concretely. Mental operations develop with active exploration of things in the child's immediate environment and s/he can appreciate the variety of living things and objects around him and he also develops the ability to discuss and communicate.
- ***The stage of concrete operations*** (7-11 years). The child can now perform more varied and powerful mental operations. Problems are solved in a more ordered and quantitative way and s/he is able to visualize objects from different angles and can classify living things and non-living materials in different ways.
- ***The stage of formal or abstract thinking*** (11-15 years). The child is now able to think about abstractions; is no longer tied to the concrete and to the here and now. S/he is able to use hypothetical reasoning. Abstract and logic are now at his disposal. He is able to distinguish observations which are pertinent to a solution from those which are not and is also able to undertake "controlled" experimentation.

Children go through these stages in the same order but the way concepts are acquired becomes an individual matter. Bishop (1994: 70) confirms that "although all children pass through Piaget's stages of cognitive development in the same order, each child in his own way, at his own rate and his own time and his own style, passes through these stages at a different rate". He concludes therefore that no two children will be acquiring a concept at exactly the same moment in time. This is no exception to a Geography class, concepts will not be acquired in the same manner, rate and time. Even the way in which students will remember concepts in the examination will be totally different that is why they will always vary with

respect to academic performance. This implies a need for teachers to devise meaningful teaching and learning strategies that will cater for the range of individual abilities. Siegler (1979) finds it necessary to take a more modest approach in which one attempts to adjust particular curricular materials in line with the child's understanding as described by Piaget, while Bishop (1994: 71) argues that this does not mean a need for an individual programme for each child but more flexibility in the way in which the curriculum is taught, that is, different teaching methods. He suggests that these teaching methods should allow the child to develop at his own pace within the classroom situation for instance, the idea of smaller groups within the class, the children in each group working together on a specific topic, and even sometimes individual work, is also a possible solution. However, it may not always be possible to address students' individual needs especially because most classes are overcrowded.

Although Piaget's classification of intellectual development is sometimes criticized as being negative because it tells more of what we cannot do at various stages and ages, Bishop (1994: 73) contends that there is no doubt that such a classification of cognitive development is of tremendous help and importance to anyone concerned with the design and development of curriculum as it alerts us to several psychological and pedagogical pre-conditions that must be taken into account.

Teachers and learners, too, impact heavily on academic performance. Hanushek & Havbinson (1992: 211) argue that having good teachers is extremely important for students' achievement as indicated by the estimated substantial effects of a good teacher by any measuring stick. They argue further to show that increasing the proportion of highly skilled teachers could bring about revolutionary changes in student performance. However, those who view learning as an almost exclusively intellectual process consisting of the sorting of accumulated facts in the filing drawers of the mind, insist that a teacher's qualification be judged only by his mastery of his subject matter. Hanushek & Havbison (1992: 197) confirm that there is strong evidence that specific knowledge on the part of the teacher is important because teachers who know their subject matter better perform better than those who do not. There is a challenge though; knowing the subject matter is one thing but delivery is another. Brown et al. (1985: 11) argue that a teacher who knows his subject matter but cannot put it across to students is poor in methodology. This implies that teachers need to master both because if they know the content but cannot pass it onto students, they still impact negatively on students' performance.

Research shows that the performance of each student today also depends not only on the activities of his current class but also on the students' preparedness for curricular material (Hanushek & Havbison, 1992). They argue that since education is a cumulative process, preparedness depends in part on the activities of past classes but students differ in ability to absorb and retain material which for simplicity we might label as innate abilities. The fact that students vary in abilities should not justify their declining performance, but they need to seriously take the responsibility of their learning and working hard enough to do well in the examinations.

2.4 Curriculum development and Geography teaching

Following Stenhouse's (1976: 6) definition, curriculum can be defined as "an attempt to communicate the essential principles and features of an educational proposal in such a form that it is open to critical scrutiny and capable of effective translation into practice. At a minimum as a basis for planning a curriculum should offer:

- Principles for the content selection – what is to be learned and taught.
- Principles for the development of a teaching strategy – how it is to be learned and taught.
- Principles for the making of decisions about sequence.
- Principles on which to diagnose the strengths and weaknesses of individual students and differentiate the general principles 1, 2 and 3 above to meet individual cases.

2.4.1 Teaching and learning strategies

The South African Higher Education Quality Committee (2004, in Leibowitz & Andenduff, 2007: 15) defines teaching and learning strategy as "a set of specific goals, priorities and targets set at institutional level within a specified time frame for the management and improvement of teaching and learning. It includes setting out responsibilities, resources, and review and evaluation mechanisms. It is usually aligned to the institutional mission, strategic plans and quality management system". Barnett & Coate (2005: 21) define it similarly, "an effective teaching and learning strategy will outline what an institution wishes to achieve with regard to learning and teaching, how it will do so, and how it will know when it has succeeded". In addition any teaching/learning strategy must take note of:

- The age of and ability of the learner, that is, Piaget's stages of sequential intellectual development are very important in this regard although they can be uneven in that in one area of his thinking a child may be at one stage, in another area, at another stage.

So different strategies must be adopted for children of different abilities, the very able must be stretched, the less able not fobbed with diluted academic treatment.

- Motivation and interest in what pupils learn can be enhanced by ensuring that what they experience is relevant to life, has some bearing on the social conditions, the environment, and the world around them. With this in mind many schools now use, as against the straight didactic method of expounding facts to be learnt, a variety of teaching/learning approaches – a topic centred, interdisciplinary enquiry, problem-solving projects, life-adjustments courses and so on. The greater the variety of experiences offered the more likely is the child to find activities that will assist his learning (Bishop, 1985: 102).

With the right methods and techniques students can grasp concepts and ideas that they never believed possible (Brown et al. 1985: 11). A good teaching method is one that works in the circumstances in which one is teaching, that is, one that enables pupils to learn what they are supposed to learn. Perhaps the first thing that can be said about teaching strategies is that they must be in harmony with one's aims and objectives (Graves, 1997: 28 in Barnett & Coate 2005). Objectives are specific statements, best defined in terms of what pupils will do or achieve in a lesson (Bailey & Fox, 1996: 66). They argue that before the lesson starts, teachers need to be clear in their own minds as to what they expect it to achieve so that they can guide and direct pupils to specific goals. Objectives are determinant features of any teaching strategy because it is only when the teacher knows the objective for a particular lesson that he can decide on the teaching strategy. Bishop (1994: 138) adds on that "for curriculum planning to be rational it must start with clear and specific aims and objectives, and then, only then, address itself to discovering the means, the content and methods, in terms of which the objectives are to be achieved". He argues further that there can be no curriculum without educational objectives.

Mager (1962, in Bishop, 1994) argues that when clearly defined goals are lacking, it is impossible to evaluate a course or programme efficiently and there is no sound basis for selecting appropriate materials, content or instructional materials. He indicates also that objectives should emphasise action verbs which might be called "performance objectives' for instance, state, list, compute, *etc.* Clarification of objectives provides some guidelines in deciding which teaching and learning activities should be used (Roberts, 1997: 41) and they also become important in geographical education as a means of accountability. The success of a course of geographical education is for the most part measured publicly by the achievement

of predetermined objectives. The terms of reference to the Geography Working Group stated that “there should be clear objectives, attainments targets, for the knowledge, skills and understanding which pupils with different abilities and maturities should be expected to have acquired by the end of the academic year (DES, 1990 in Roberts, 1997: 41).

2.5 Communication with reference to teaching Geography

The media of communication, too, will have an influence on the teaching strategy. Communication implies the existence of people who have something significant to share with each other and that this sharing affects the way they behave. It also implies that there are many different media through which people communicate and language is just one of them (Brown et al. 1985: 14).

2.5.1 Language as a media of communication

Language is defined as the means by which we communicate with one another and it plays a very important part in the educational system of any country (Bishop, 1994: 12). The majority of learners in Southern Africa receive education through the medium of a second language, English (Uys et al. 2007). However, there is ample evidence that students experience difficulties understanding English as reflected in the Examiners’ Report (2001) that “some candidates did not have sufficient command of English Language to understand some of the questions and to express themselves”. Research shows that teachers are also responsible for the difficulties students experience in English because schools are highly verbal and bookish that students are often “swamped by a flood of words and other symbols concerning which they have no experience. Occasionally the confusion reaches such Babelic proportions that they have no choice but to rely on parrot memory if they are to meet examination requirements” Mouly (1982, in Rasangane, 1985). The use of jargon in the classroom would create an impenetrable boarder to communication (Thomas, 1978 in Rasangane, 1985: 80) and it is important for teachers to remember that students are still in the process of learning English and its social practice as a result this requires them to use simple and clear English that students can understand especially because they need to understand it in order to understand the content being presented. This according to research implies that “as English second language speakers they are faced with a double challenge of learning English and its social practice and Geography content which has its own discourse (Rollnick, 2000 in Thamae, 2006: 10). It is recommended that since Geography has its own terminology and specialist language which can create problems for pupils, the use of technical language is

necessary to help advance the development of pupils' understanding of geographical concepts (Butt, 1997: 165). Nonetheless research evidence reveals also that not only second language speakers of English have difficulties even first language English speakers are alienated by scientific discourse because it differs from the English of everyday usage (Halliday & Martin, 1993 in Thamae, 2006: 10).

Since the most important way of communicating concepts and ideas in the classroom is by word of mouth, Bailey and Fox (1996: 33) caution that the misuse of language, whether intentionally or not, can distort reality and convey stereotyped images and ultimately reinforce prejudice and that mental images, once formed, are very hard to replace or alter. It is important that language is used constructively so that students end up not being misinformed. Butt (1997: 154) argues that it is important for geography teachers to gain an understanding of how the use of language can affect the learning of their subject and that all teaching methods and materials used by the geography teacher therefore have important implications for language and understanding. As Bishop (1994: 14) has argued "unless the linguistic concepts are presented in concrete and dynamic form, the language used by the teacher is often a mystery to the hearer".

Thomas (1978 in Rasangane, 1985: 80) shows that the quality of classroom language depends very largely on the extent to which pupils can actively use language in the solution of academic problems. ILEA (1981 in Mills, 1988: 42) argues that it is largely through language that children formulate and express their thoughts and interact with others and most importantly, they can interpret their experience, organize their thinking and make sense of the world around them. He argues further that as children mature, they respond increasingly to direct experience, mediated through talk, books, music, television, *etc.* Mills (1988: 42) suggests that clearly, geographical work is of importance in creating situations which will enlarge the child's experience and which will stimulate him to engage in talking, reading and writing. For instance, he argues that talking by children is now recognized as a powerful aid to comprehension and learning. Listening is also important however, it is important not to make children listen to the teacher too much or they switch off. This implies that teachers should also afford their students an opportunity to talk in class. Mills (1988: 43) argues that talk is important as learning because it gives the talker a chance to explore, rehearse, elaborate, refine or re-assess with immediate feedback. So the importance of talking here lies with the fact that students are not only passively learning but they are also actively involved and taking responsibility of their learning.

Since whole-class teaching rarely gives each child the chance to talk, giving children the opportunities to discuss their own ideas in geography lessons is therefore important if effective learning is to take place (Butt, 1997: 158). Research shows that "possibly the best way to acquire a language is to talk to other people, gradually mastering through communication with them the meanings that inform their discourse" (Pring, 1976: 13). Unfortunately the curriculum of our schools is often constructed in a way that makes conversation impossible that is, the system of short periods in which a different teacher is related to in a formally arranged environment with minimum attention given to basic conditions of social interaction. Apart from that "many geography teachers are understandably nervous about allowing pupils too many opportunities to talk because they may fear a potential loss of control, or may simply be unsure about whether pupils will actually discuss what they have been asked to" (Butt: 1997: 158). However, he shows that in many schools there is now a realisation that active and pupil centered styles of teaching and learning are often the best ways of promoting such talk either as a part of group work, or in role plays, simulations or decision making exercises. If effective learning is to take place then the teacher has to allow students to interact because through this interaction with their peers, they will learn from one another. Piaget (1965 in Rowell, 1989: 364) confirms that knowledge construction is optimized by a cooperative social organization which, in turn, presupposes a social equality of participants and, for logical rules to apply to argumentation (the normative exchange of ideas), that they understand each other in an ambiguous manner. Thus for Piaget, the teachers should not impose "truth" to students but guide them in discovering it.

Pupils actually engage in higher-order thinking when discussing questions or problems in groups as Slater (1989 in Butt 1997: 20) confirms "through talk, children clarify their ideas, come to realise what they do not understand and yet work through what they know to make new connections". Student participation is desirable because it actively involves them in their learning, provides instructors with feed back about their progress and difficulties of students, and provides opportunities for instructors to model for students' problem-solving behaviour and applications of course to novel examples Clark (1995). Teachers then need to create a conducive environment in which students are involved in talking and can take control of their learning.

2.6 Prior knowledge

Teaching becomes very effective if it involves drawing on students' personal experiences with respect to the topic being presented. According to Ausubel (1978), learners' prior ideas impact on the learning of new scientific concepts. His principle of meaningful learning states that, "the most important single factor influencing learning is what the learner already knows". Also confirmed by Driver (1983 in Leat, 1997) "constructivists argue that we all learn largely through the framework of what we know". Leat (1997: 145) develops this argument further to show that new information will be understood only if it can be interpreted through existing knowledge structures. It is important to find out about students' prior knowledge before making them learn new structures because prior knowledge provides concrete foundations to new constructions. For instance, it is well understood that pupils are assisted in their understanding of condensation by reference to breathing on cold window-panes. Similarly, McKeachie (1980: 44) confirms that in order to understand the topic, you have to be able to relate it to other things that you know. It makes sense that the relation should be made by taking some already existing knowledge and adapting it to the new situation. Unanimously Rowell (1989) asserts that "first, as is fundamental to all teaching, the teacher must be aware of the knowledge children have which is relevant to the problem or considered relevant by them. For instance, studies show that children have their own firmly held ideas about many science topics before they have had any science in school (Harlen & Osborne, 1985). Children bring these ideas in an attempt to make sense of their science activities and the result may be that their own ideas remain unchanged or are changed in an unexpected way; in their case differing from the ideas the teacher may have assumed the children to have formed. It is imperative to inquire into students' thinking to find ways in which children view the world around them. According to Hewson et al (1998) "valuing learners' ideas is a good pedagogic practice, as it is the basis for conceptual change". In her study, Thamae (2006) found out that Lesotho students had misconceptions about earthquakes because they seemed to think that earthquake occurrences are always linked to volcanic activity and they also attributed the causes of earthquakes to water, perhaps because the earthquake in their area was caused by impoundment of the dam. This goes to show how misinformed students were with regard to the mechanisms and processes involved in the occurrence of earthquakes. The power of prior knowledge lies in its ability to help the teachers to bridge the gap between students' everyday and school knowledge. If prior knowledge is not taken into consideration students end up assuming that what they know is

right and this contributes to one of the reasons why students make errors when responding to questions and ultimately to their declining performance.

What is involved in learning is the interaction between new and existing conceptions, with the outcome dependent on the nature of the interaction (Hewson & Hewson, 1984). They argue that if these conceptions can be reconciled, then learning requires that existing conceptions be reconstructed or even be exchanged for the new ones. For this to happen the student has to recognise that there is societal knowledge that transcends his personal cognition and then this gives him motives for participating in and expectations about the content of classroom teaching (Hedegaard, 2002: 23). She indicates further that the teacher who wants the student to learn an appropriate knowledge and skills that can transcend classroom activities and influence the student's every day activities, has to acknowledge the student's everyday cognition as knowledge he must build upon and develop. She warns however that, the problem for the teacher is to create learning activities that connect subject-matter knowledge with students' everyday cognition rooted in their activities both within and outside school. Thus, teachers need to be highly imaginative, strategic and innovative in order to find a connection between students' present conceptions and the content being presented.

Prior knowledge makes learning effective as reflected in Brown et al.'s (1985: 104) contention which states that "learning is more efficient if students have adequate prior understanding of the materials". Krueger (1929 in Bishop, 1984) develops this idea further to say that specifically prior knowledge should form the basis for incorporating new information presented in a course into semantic memory. As new information is assimilated, existing knowledge structures should be modified and extended. He provides an example to show that when prior knowledge is repeated during instruction, over-learning should occur and higher levels of retention result. Nonetheless, Helpin & Helpin (1982 in Brown et al. 1985) argue that knowledge retention is typically measured by performance on paper-and-pencil test. This implies that the more knowledge students are able to retrieve in an examination the better is their performance because the success of any education system in any country is measured by students' performance in the examinations as an indication that learning has actually occurred.

Studies show that concepts should not be taught in isolation but be treated together with already existing conceptions to make learning more meaningful (Hewson & Hewson, 1984: 6). They argue that learning is not simply the addition of new bits of information but the interaction between new and existing knowledge. Thus, it is necessary to treat the two forms

of knowledge holistically to help clear misunderstandings and common sense reasoning. Research shows that if knowledge is acquired in a meaningful way, it is retained longer because it is linked to existing information, differentiation takes place and subsequent learning of related concepts becomes easier. If information is forgotten, a residual effect on the relevant concept is left also making the learning of related information easier (Tilch, 1983: 19). As such, teachers need to start with simpler concepts that students can fit easily within their present conceptions because they are easy to remember and this will help prepare their minds for the learning of more complex ones in future.

Rasangane (1985: 19) states that "most concepts taught in Geography are complex but relational". This implies a need for students to understand one concept in order to understand others which serve as prerequisites and which combine in alternative forms to facilitate access to the meaning of the over-arching concept. Students need to be shown this relationship that exists between concepts and be taught in a manner which shows that concepts follow each in a chronological and logical sequence to make learning more meaningful. For instance, in teaching 'evaporation', Van der Mark (1979: 8 in Rasangane, 1985: 19) maintains that "before presenting the concept of "evaporation", the concept gas and liquid should be familiar to the student". Students are able to fit in new structures of knowledge when they can fit them with what they already know. However, if a teacher introduces new concepts which are completely outside the learners' experience without involving them in the elementary processes of contact with the findings described by any language he uses then "he is likely to do more than teach the sounds of the symbols-words without meaning which may enable a learner to parrot statements about the phenomena.

Integrating prior ideas is what distinguishes constructivism from teaching based on traditional practice which does not value learners' prior knowledge. In traditional practice, learners were considered to have minds like blank slates with no prior ideas on the topic taught and they were ready to receive knowledge passively (Gilbert et al. 1982 in Bishop 1994). In addition, Knowles (1970) states that in traditional pedagogical practice, the function of the teacher is defined as "to teach". The teacher is expected to take full responsibility for what happens in the teaching-learning transaction. The learners' role tends to be that of a fairly passive recipient of the teacher's instruction. Bishop (1994: 104) argues that "the result is that schools are full of teaching and no learning". He argues further to contrast ordinary schools with infant school, where the emphasis is on play, on purpose, on activity, hardly anything is taught but at every minute valuable lessons are learnt.

Contrary to traditional practice, the constructivist position holds that knowledge is not passively received, but is actively built up by the cognising subject (Driver et al., 1984 & Von Glaserfeld, 1989 in Thamae, 2006). The constructivist approach puts more emphasis on the construction of knowledge which is consistent with the constructivist perspective of the student as a meaning making person continuously integrating prior experience with new information, even in the most traditional classrooms. Constructivists suggest that authentic intellectual achievement requires 'construction' to reach beyond retrieval and imitation of knowledge previously produced by self and others. For them, authentic construction of knowledge involves application, manipulation, interpretation or analysis of prior knowledge to solve a problem simply by routine or reproduction (Newman et al. 1996: 286). Bishop (1994: 112) concludes therefore that, a good teaching strategy is one that emphasises finding out with the pupils, investigating and discovering facts for themselves, using their own eyes, hands and brains.

Although the andragogical practice does not say anything about integrating students' prior ideas, it holds a more or less similar perspective to constructivism because it also treats the learning-teaching transaction as the mutual responsibility of learners and teacher (Knowles, 1970). He argues further to show that in fact, the teacher's role is redefined as that of a procedural technician, resource person and co-inquirer: he is more of a catalyst than an instructor, more guide than a wizard. Andragogy assumes that a teacher cannot really 'teach' in the sense of 'make a person learn' but that one person can only help another learn. This means that the teacher cannot impose truths any longer but students are equally involved and responsible in the construction of truth.

It is against this background that I find it crucial for teachers to inquire into students' prior knowledge and guide them from where they are into constructing their own truths. Making connections between students' everyday experiences and their schooling makes Geography more meaningful and accessible to them. Walkerdine (1982: 138) confirms that "familiar contexts provide essential starting points for teaching young children to reason formally". She warns however that not just any everyday example provides a suitable jump off for higher levels of conceptual development and so teachers need to be aware that sometimes it is not easy to negotiate the boundary between every day experiences and school knowledge.

2.7 Instructional materials

The availability of audio-visual aids will also influence teaching strategies. According to Brown et al. (1982: 42) it is important to prepare illustrative materials to accompany the lecture. Short demonstrations or other visual materials are effective means which help facilitate students' understanding. Boyd (1972: 91) asserts that the creative use of materials is of paramount importance to the child, not only for personal development but also as a means of communication. The opportunity to experience and appreciate materials visually and tactually at first hand is a necessity for every child. Teaching strategies are closely linked and determined by several variables besides the teacher and the learner. Obviously, the availability or unavailability of facilities such as teaching materials and equipment, laboratory apparatus, specialist work rooms, *etc* will all influence what is done in the school and how it is done. Nonetheless, words alone can sometimes not be enough to convey a message that would otherwise be conveyed with the aid of instructional materials in Geography as Brown et al. (1982: 42) confirms "words may easily be forgotten but material pictures will long be remembered".

Majority of concepts can best be explained with the aid of diagrams, pictures, graphs *etc* to help make more sense to the students. Padilla et al. (1986 in Kali, 2006) indicate that creating graphs and interpreting data from them are skills not easily acquired by most students. Evidence reveals that students were unable to interpret kinetics graphs convincingly, as indicated by the mean test scores of 40% on the test taken after instruction (Beaner 1994, in Kali 2006). Teachers need to take the responsibility to teach this skill. According to Mills (1988: 271) working with maps, graphs and diagrams require knowledge of their terminology and conventions and the skills of interpretation, extrapolation and analysis of relationships. This necessitates intensive practice to help students develop graphic interpretational skills. To build a concrete background of the skill, Cave (1971) believes that students need to have as much experience as possible with a wide variety of graphs and teachers need to teach students how to interpret graphs not just create them. It is only then that students will be able to read the graphs and be in a position to convert what they see into meaningful information. This means also that teachers need to make sure that when dealing with concepts that can be explained better with the aid of diagrams, they always bring them along so that students get to see them.

Teachers need to consider using instructional materials appropriate for their specific lessons if effective teaching and learning is to take place. Brown and his associates (1985: 167) point out that "because of the development of modern technology, teachers no longer have to rely solely on words to make their meanings clear. There is a great variety of materials around that can be used to make our meanings more vivid and more interesting. These are referred to as instructional aids, and these are used to supplement or compliment the teachers' tasks". All that teachers need to do is select the appropriate instructional materials in order to help achieve the objectives for that particular lesson. Table 2 below shows a list of available instructional materials. Although this list is not exhaustive, it should help the teacher in his choice of appropriate materials for different occasions.

Table 2 Types of Instructional Materials

<table>
<tr><td colspan="5">1. Visual Materials</td></tr>
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D. Flannel or felt boards
E. Bulletin boards</td><td>F. Still Pictures</td><td>G. Audio Aids</td></tr>
<tr><td>- Objects
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Projected
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-Overhead projections
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</table>

Brown and his associates (1985: 10) further argue that "if a teacher wants to teach effectively, he/she is bound to make use of a variety of instructional materials". In addition, Rasangane (1985: 81) points out that, teaching aids are indispensable in making the teaching of Geography meaningful, topical, pleasant and lively and that they are also important as they sustain pupils' interest. Nonetheless she indicates that the teaching of Geography is affected badly because teachers do not fully realise how valuable teaching aids are. The use of instructional materials brings life to a classroom because it gives students a chance to acquire knowledge in a different setting when confronted with reality as opposed by words. For instance, research shows that photographs and slides are important sources of visual material that help geography teachers bring some reality into their classrooms (Balderstone & Lambert, 2000: 138). They also make an important contribution to the development of pupils' vocabulary through picture and word association. Brown and his associates (1985: 10) argue however that, the mere use of these materials does not guarantee effective communication, or

effective teaching. It is their careful selection and skillful handling by the teacher that renders them useful in facilitating learning. This implies a need for teachers to familiarise themselves with the various types of instructional materials as well as the values that can be derived from their proper use. Brown et al. (1985: 196) also confirm that instructional materials themselves cannot do much to improve or promote learning but their value lies in the professional skill of the teacher using and handling them.

Literature has shown that instructional materials facilitate teaching and learning as they help clarify concepts that words alone would not. What students see stays long enough in their memory as opposed to what they only hear. So this calls a need for teachers to use and carefully instructional materials to make sure they are effective.

2.8 Fieldwork

Within any geography syllabus there is a clear need to make use of what children can consider in the field, not only in the area around the school but from evidence collected from work undertaken on school journeys (Mills, 1988: 239). Research evidence reveals that schools do not embark on field trips as reflected in Rasangane's (1985: 79) findings "84.3% of students experienced problems in understanding concepts because they were not taken out to see things". Teachers need to consider taking students to the field more often than is the case to make concepts clearer than could ever be imagined possible. Owens (2006) reveals that some children have little knowledge of their locality either through lack of access or because they are "blind" to aspects of the environment that they encounter everyday but do not see. He argues further to show that structured experiences open up their eyes and enable their geographical vocabulary and understanding to develop in ways that only first hand learning can affect. Mills (1988: 108) confirms also that work outside the classroom uses and extends the world with which the child is familiar. The widening geographical experience provides a basis for the development of concepts and attitudes and equips pupils with an array of skills and enables them to become concerned with issues.

Studies have shown that Geography without field work is like science without experiments; the field is the geographer's laboratory where young people experience at firsthand landscapes, places, people and issues, and where they can learn and practice geographical skills in a real environment. It provides an opportunity for pupils to relate in new ways to each other and to their teachers, and so to break some of the patterns of behaviour that become fixed in the school environment. For most students fieldwork is a key component of them

studying Geography and one of the strongest elements of their own personal biography. Research shows that the first national geography curriculum in England and Wales, for example, indicated that "fieldwork should not be an optional extra, [for] pupils are entitled to … regular, purposeful and integrated fieldwork" (DES, 1990 in Foskett, 1997: 18). Field work according to Smith (1987: 209 in Foskett, 1997:189) has value which is identified in three broad categories of experience – outdoor studies, outdoor pursuits and personal and social development;

- Outdoor studies relate to the intellectual (cognitive) development of the child. Fieldwork provides the opportunity to apply ideas generated in the classroom to the real world, to test hypotheses by empirical methods and to learn new knowledge and concepts from first-hand observation. In particular, though it enables the development of skills, including subject-specific skills (e.g. field sketching), wider generic skills (e.g. data collection and recording) and intellectual skills (e.g. problem solving).
- Outdoor pursuits – the emphasis clearly depends upon the school grounds, some element of personal physical challenge, the development of physical and practical skills and enhanced awareness of safety issues from experiences outside the classroom.
- Personal and social development is the most important and persistent. It stresses the development of self-awareness and awareness of the needs and skills of others in the context of working co-operatively in new environments.

These categories of experience will not just develop but their success lies with Geography teachers realising the importance of fieldwork as a strategy in teaching and learning geography. It will also take effort on teachers' and students' sides to ascertain that these skills are successfully developed. Through these categories of experience students can interact directly with the environment, with one another confidently outside the boundaries of a classroom by exchanging ideas and helping one another understand concepts in a meaningful way. It is against this background that I take field work as a teaching strategy where learners take control of their learning in Geography. Willy (2006) concludes that fieldwork should not be an option, it must become an integral part of teaching at both primary/secondary level. If children are to become really engaged and switched on to the subject, they must have some fieldwork experience. Bland et al. (1996: 165) warns however, that planning is required for a field trip to be safe and successful.

Balderstone & Lambert (2000: 26) indicate that the purpose of fieldwork is to engage pupils in learning directly in a manner similar to the notion of experiential learning which can be very motivating. Field work gives students an opportunity to observe aspects of the environment directly rather than via some form of mediated image or secondary source. In addition, Mills (1988: 135) stipulates that children respond to, understand and have concern for the environment in varying degrees at different ages and at different stages of their development. The immediate firsthand experiences of, for instance, shops, farms, streets, villages and streams help to establish the concrete stage of development according to Piaget that is, the primary concepts acquired enable children to understand more complex relationships later. Thus, teachers need to make time for fieldwork because students get motivated and teachers achieve a higher concentration which one is not able to get in class ordinarily. However, the problem is that teachers cannot always take students on a field trip since they are constrained by economical reasons, the need to make prior arrangements with other teachers and most importantly, the need to finish the curriculum within the stipulated time frame.

2.9 Bloom's Taxonomy of Educational Objectives as a guiding principle

Schools operate within the framework of the curriculum for teaching and learning to take place. Bernstein (1986:47) argues that "school knowledge is relayed through three message systems: curriculum as valid knowledge, pedagogy as valid transmission of that knowledge and evaluation as a valid realisation of this knowledge by the learner". However, curriculum theorists who found this definition narrow extended it to include not only a description of subject matter but also a set of proposals indicating how this subject matter is communicated and how it brings about the outcomes it is intended to achieve and the methods by which such outcomes are to be evaluated (Carr, 1993). The aims and objectives of curriculum, states clearly the kind of objectives that students are supposed to have achieved at the end of each lesson and these are ultimately reflected in questions that students have to answer either during classroom exercises or examinations as an indication that students have actually achieved those intended objectives. That means when students have learnt something, this change has to be visible as Socket (1976) asserts that the intended change should be described in terms of measurable learner behaviour. Bloom (1970 in Socket (1976) adds on to say "the criterion of determining the quality of a school and its educational functions would be the extent to which it achieves the objectieves it has set for itself".

It is against this background that this research links the respective notions and perceptions thereof to Bloom's (1956) Taxonomy of Educational Objectives which are as explained by Bishop (1994: 148) a standard classification of educational objectives, based on the 'intended behaviour of students – the ways in which individuals are to act, think or feel as a result of participating in some unit of instruction'. Bloom's Taxonomy of Educational Objectives will therefore serve as conceptual framework guiding this research. This taxonomy, represents the first of three interacting areas of behaviour roughly corresponding to thinking (cognitive), feeling (Affective) and acting (Psycho-motor). It has been conceived as an educational-logical-psychological classification system with six major categories of cognitive behaviours arranged from the simplest kinds of learning to the most complex; knowledge, comprehension, application, analysis, synthesis and evaluation.

According to Cave (1971: 86) these categories of cognitive behaviuors can be defined as follows:

- Knowledge requires the knowledge of specifics i.e. terminology and facts. It also requires the knowledge of ways and means of dealing with specifics i.e. knowledge of conventions, trends and sequences, classification and categories, criteria and methodology. It requires also the knowledge of universals and abstractions in a field *i.e.* knowledge of principles and generalisations as well as theories and structures. Although knowledge represents a lower level of performance, it is indispensable to higher level categories which it is to be a prerequisite.
- Comprehension shows that students are expected to know what is being communicated and be able to make use of the materials and ideas contained in the programme. Within this classification three types of comprehension behaviour are considered; one, translation, which involves giving accurate meaning by paraphrase or rendering one language or form of communication to another, two, interpretation involves a recording, rearrangement or new view of the material for example, in considering a configuration of ideas which may require a reordering into a new configuration in the mind of the student, and lastly, extrapolation, which involves making estimates or predictions based on the extension of trends or tendencies beyond the given data.
- Application shows that to apply something, requires comprehension of the method, theory, principle or abstraction applied. Given an unfamiliar problem, the student will apply the appropriate abstraction without having to be prompted as to which abstraction is correct and without having to be shown how to use it in that situation. A

demonstration of application shows that he will use it correctly, given a situation in which no specific solution is indicated.

- Analysis is concerned with the breakdown of the material into its constituent parts, recognition of the relative hierarchy of ideas and the detection of the relationship between parts or ideas once they have been recognized. Bloom (1956, in Cave 1971) points out that although analysis may be conducted merely as an exercise in detecting the organisation and structure of a communication, and may therefore become its own end, it is probably more defensible educationally to consider analysis as an end to fuller comprehension or as a prelude to the evaluation of the material.
- Synthesis involves putting together elements and parts so as to form a whole. As this involves the arrangement of elements in such a way to constitute a pattern or structure not clearly there before, reflection will show that this is an area where programmed learning may be limited in its contribution.
- Evaluation is defined as making judgements about the value for some purpose of ideas, works, solutions, methods, materials and so on. It involves the use of standards as well as criteria for appraising the extent to which particulars are accurate, effective, economical or satisfying. It is a complex process which involves some combination of all the other classifications.

Cave (1971: 85) indicates that Bloom himself describes this arrangement as from the simple to the complex, saying “the objectives in one class are likely to make use of and be built on behaviours in the preceding classes”, and also that a simple behaviour may become integrated with other simple behaviours to form a more complex behaviour. Bloom and his associates believed that such a classification would enable curriculum framers to define expected learning outcomes more clearly and would prove of great value to teachers planning curricula; they could check, for instance, that topics were not omitted or taught in their wrong logical and psychological order.

Bloom’s framework is not the only alternative; there are other ways in which researchers have developed their conceptual frameworks that could be used in guiding this particular study. However, due to the nature of this study they could not be used because it goes deep into the subject to investigate what errors learners make which results in declining performance in Geography and the only way to find out is by employing the six levels of cognitive behaviour. These levels will be used to classify the examination questions to show which objectives they were to achieve and then they will also be used in analysing students’ responses to check if

the intended objectives have been achieved for the content covered in the Geography examination. Besides that as researchers, we are unique in our own ways as a result we approach research from different angles and so this provides justification for the use of different conceptual frameworks. For instance, Nyabanyaba's (2002) study has also considered the decline of performance in Mathematics but developed a sociological framework in which boundaries between "everyday" and "school" knowledges are discussed.

Although Bloom's (1956) taxanomy is dated and the logic contained therein has come under considerable critique by later educationists that it offers a linear and hierarchical scheme and follows in the tradition of the objectives model as espoused by Tyler (1949 & Bobbit 1918, in Cave 1971) while Kelly (1969: 64, in Cave 1971) the objectives model, sees the "process model of teaching merely as the transmission of predetermined knowledge-content chosen in pursuit of certain predetermined objectives". Kelly (1989) further criticises the taxonomy that Blooms' divisions into clear-cut domains are unworkable. It is impossible to have educational activities that concern themselves only with cognitive aims without also involving affective and psychomotor aims as well. On the other hand, Socket (1976: 57) sees the major weakness of the taxanomy as its lack of epistemological coherence because it assumes that different areas of understanding e.g. art, morals and creative writing will have a similar structure. Bishop (1994: 148) also shows that the taxonomy is criticised for its emphasis on "behavioural objectives' The behaviourist school of psychology demands objectives in terms of precise changes in pupils' behaviour which can be observed and measured at the end of a practical teaching unit. But, states of mind are not analyzable into observable states. Achieving understanding, or appreciating art or literature, are very desirable educational objectives, but they do not necessarily result in a person saying or doing anything. Despite all the criticism laid against Blooms Taxonomy of Objectives, it is appropriate for this study because through errors analysis of students' scripts teachers will know the areas where students lack knowledge of content, where they are not able to understand, areas where students are not able to apply the acquired knowledge, where they cannot synthesise, analyse and evaluate and these can only be known through students' responses.

Roberts (1997, 42 in Sadie 1999) argues that Blooms' taxonomy had a broad appeal because of its clear cut outcomes and the clear distinction between knowledge, skills and values which provided a "useful and supportive framework for geography courses, text books and syllabuses during the last twenty-five years. The rationale of the Bloom's taxonomy according to Alan & Cedric (1975: 105) is that students must have knowledge before they are able to

comprehend, they must comprehend knowledge before they are able to apply it and they must also be in a position to apply and comprehend knowledge before carrying out the higher abilities of analysis, synthesis and evaluation. From this analysis it is very clear that knowledge gives students the leverage to perform different abilities. This means when they lack this knowledge, they will not be in a position to answer the questions in a manner that is required.

2.10 Conclusion

In this chapter I have reviewed literature on central aspects pertaining to the study. Research has shown the importance of always carrying out error analysis because it will provide valuable insight into students' problems to help devise corrective strategies. Literature showed also that teaching strategies should not be selected in isolation but with regard to other aspects of the curriculum and should also be in line with the level of students' cognitive structures and that performance varies with respect to genetics, socio-economical background, teacher's knowledge and ability to communicate the subject matter as well as students' preparedness for curricular materials. Bloom's Taxonomy of Objectives became an integral part in the classification of examination questions and analysis of students' responses to check whether intended objectives were achieved. It is on this premise that it serves as a guiding principle to this study as it advocates that students must have knowledge before they can comprehend, comprehend knowledge before they can apply it and before they can carry out the higher abilities of analysis, synthesis and evaluation.

In order to identify the patterns of performance, the errors students made in responding to Geography examination questions and the key informants' suggestions on the corrective strategies to the errors, a variety of methods will be used. These methods are discussed in the next chapter.