CHAPTER TWO

GEOGRAPHY TEACHING APPROACHES AND SCIENCE PROCESS SKILLS

2.1 INTRODUCTION

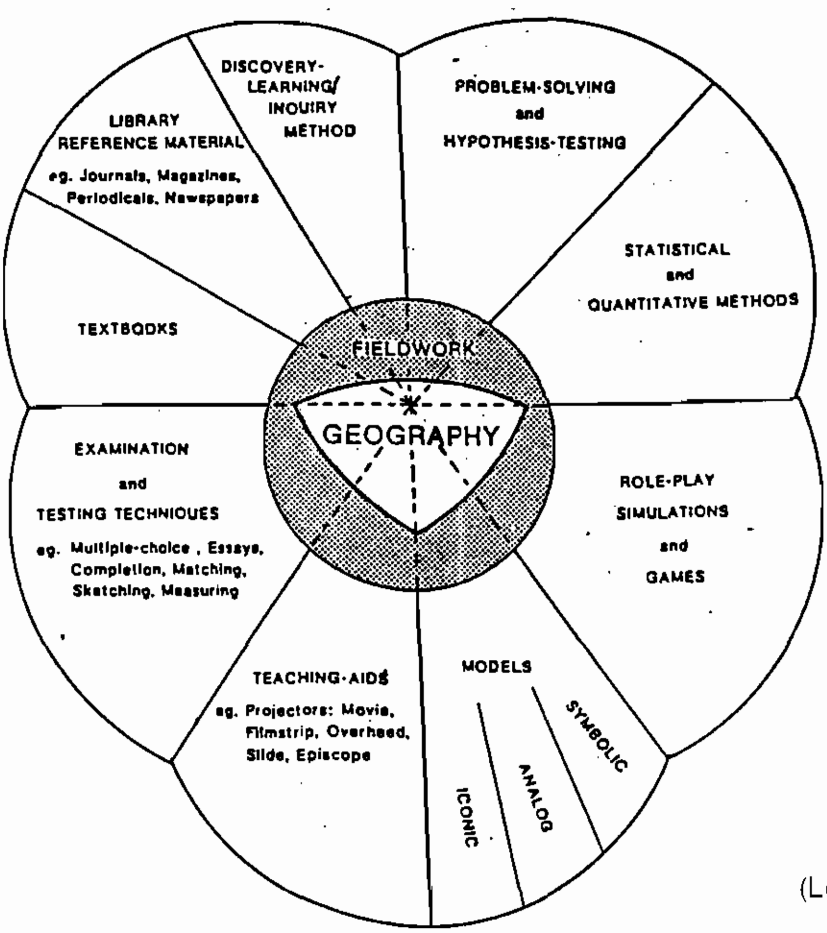
The previous chapter outlined and delimited the problem investigated in this study. This chapter reviews the literature that discusses teaching approaches in secondary school geography education with particular emphasis on South African secondary school geography. An inquiry teaching approach is described and justified as a method of teaching likely to improve and enhance the teaching of secondary school geography.

The chapter also argues for the adoption of inquiry teaching supplemented with the application of science process skills to the teaching of geography. Furthermore, the nature and structure of the science process skills with a focus on basic and integrated science process skills is explained. It also attempts to give a critical reflection of the importance of science process skills in the curriculum. In order to establish how science process skills can be integrated into secondary school geography, the applicability of science process skills to the teaching of geography is also highlighted.

2.2 TEACHING APPROACHES IN GEOGRAPHY EDUCATION

Teaching approaches indicate how teachers may develop effective learning experiences in their learners. This section discusses the importance of geography teaching approaches, because they are likely to reveal that geography should be taught in such a way that learners develop an eagerness for further study and individual inquiry. Figure 2.1 below clearly indicates a model of teaching strategies that could be applied to the teaching of geography in South Africa.

Figure 2.1Teaching strategies: A model for new geography in South Africa



(Ledger 1978: 11)

It is important to note that some sectors presented in Figure 2.1, especially the library reference material, discover-learning/inquiry method, problem solving and hypothesis testing, and statistical and quantitative methods represent strategies that include science process or inquiry skills. Figure 2.1 further shows that teaching and learning approaches proposed in Curriculum 2005 (cf. 3.5) are nothing new as they have been advocated about quarter of a century ago. One of the cornerstones of Curriculum 2005 is that teachers should make every effort to develop the affective domain of learners. This implies that every effort should be made to involve learners in environmental problems that affect their communities. Involvement in community matters entails decision making on the part of learners.

Proper decision making is possible only if inquiry teaching and inquiry learning, which raise learners' level of thinking and understanding, are adopted (Winter 1992: 141). The development of critical thinking skills is possible if geography teachers could arouse learners' interest and curiosity. This implies that geography learning should follow the issue-based approach (Bale 1983: 64) which is likely to enable learners to solve the communities' pressing social and environmental issues. For instance, the teacher may request learners to investigate pollution as an issue that affects their local environment. Learners would be compelled to investigate the interrelationship between people and their environment. In their investigation of the causes and effects of pollution, learners are likely to use some process skills. Issue-based approach facilitates inquiry into human values and attitudes (Bamber and Ranger 1990: 60). Learners are encouraged to always 'find out' on their own. If teachers adopt this approach effectively, they are likely to foster inquiry behaviours which are essential when learners seek information. The fostering of inquiry behaviours is likely to develop learners into better scientific inquirers.

It is further recommended in Curriculum 2005 (1997: 13 -27) that teachers should inter alia, adopt the holistic approach which involves learners in scientific investigations, use both the descriptive and the problem-solving approaches, the thematic approach and interdisciplinary approach.

The adoption of these approaches is likely to promote the development of geographical knowledge and science process skills which are necessary when learners study and seek information. This is likely to put less emphasis on "what" and more emphasis on "how" and "why". The discussion in the next paragraphs highlights the teaching approaches that a geography teacher is supposed to practice in his/her classroom.

2.2.1 The Holistic Approach

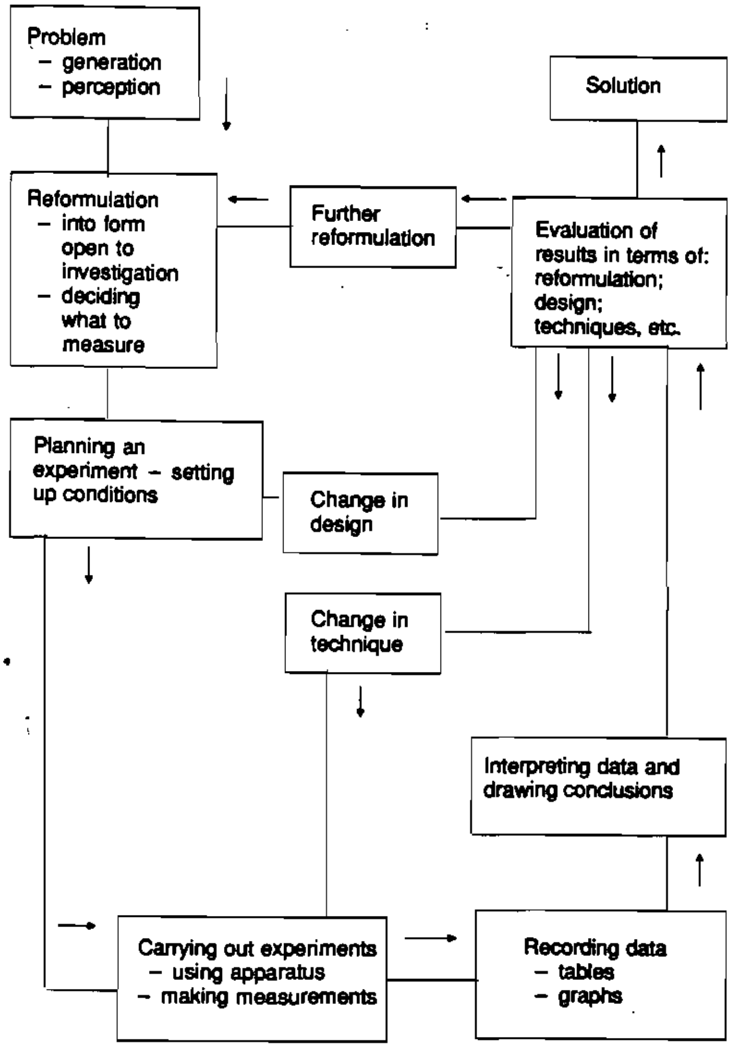
While following the holistic approach, the teacher should help learners to view different disciplines of geography as parts of the 'whole' geography. Furthermore, learners should be able to see the interrelationship and interaction between different disciplines of geography and other subjects. For example, wherever possible, learners should see the interrelationship between physical geography, human geography and ecology. Bailey (1987: 8) regards the purpose of teaching geography as enabling the growing child to conceptualise and set the dimension in which all human beings live in order. This implies that geography learners should be taught to realise that human actions have some impact on the environment and that the environment also has some impact on human behaviour. For instance, learners should realise that pollution of water sources affects the ecosystem as aquatic plants and animals may die as a result. Furthermore, learners should be aware that lack of adequate rainfall may affect subsistence farming. Hence, subsistence farmers could cultivate less crops and harvest low yields. The holistic approach helps learners to see knowledge in an integrated way, which in turn enable them to transfer and apply skills they learn in geography to other real life situations.

2.2.2 The Descriptive and The Problem-solving Approaches

Curriculum 2005 (1997: 29) states that both the descriptive and the problem-solving approaches have a place in the teaching - learning process although much emphasis should be placed on the problem-solving approach. Descriptive geography describes and interprets cultural and physical phenomena of the world (Rambuda 1994: 11). Davies (1987/1988: 118) contends that descriptive geography encourages rote learning which is unintelligent memorisation of concepts and facts. As a result, geography becomes a burden to learners' memory. Consequently, intelligent learners tend not to opt for geography studies at secondary school level. Able learners may become demotivated as this approach encourages learners to receive knowledge passively with minimal involvement in the learning process. A mixture of this style of teaching with a teaching style that challenges learners' intellect is essential. This is aptly supported by the substance and syntax of geography (cf. 3.3). The substance and syntax of geography show that because of its geographical facts, principles and laws, geography cannot be taught without creating and maintaining a sound body of knowledge. This implies that teachers should supplement descriptive teaching with problem-solving. This is likely to meet today's educational demands for reflective thinking, competence building and inquiry into the real world. Investigators may use Gott and Murphy's problem-solving model to follow some order in problem-solving. Figure 2.2 which is drawn on the next page depicts this problem-solving model.

Figure 2.2 indicates tasks which are carried out when a problem is investigated. In order to implement this model, the teacher should start from the left side to the right side. Boxes on the left represent the planning phase of problem-solving. A problem is identified and defined. The investigator decides and plans methods for carrying out the investigations. In the middle boxes the defined problem is reformulated, and designs and technique may also be changed. The investigation is carried out after this process. Boxes on the right represent the continuation of the implementation phase. Learners collect and interpret data with minimal teacher intervention. The teacher acts as facilitator and guide. Learners use their interpretation to reach conclusions. Figure 2.2 below illustrates the problem-solving model.

Figure 2.2 Gott and Murphy's Problem-solving Model



(Parkinson 1994: 117)

The discussion on Figure 2.2 clearly implies that in the problem-orientated approach, learners should be trained in the scientific method of inquiry *(statement of a hypothesis, followed by the collection and classification of information, and finally, the testing of the hypothesis)*. It also implies that learners should be afforded the opportunity to identify and resolve problems, which in turn equips learners with experience in conducting a form of inquiry investigation. Inquiry investigation is likely to help learners to be confident when engaged in processes such as observing, hypothesizing, experimenting and concluding.

Rakow (1985: 290) maintains that implementation of science process skills produces knowledge. Construction of knowledge needs a learning environment which promotes scientific literacy, the development of critical thinking skills and the opportunity to explore geographical phenomena using science process skills. However, Davies (1987/1988: 118) has noted that very few geography learners ..."*have enquiring mind and critical ability.*" The study of Rambuda (1994: 76-77) also found little evidence of inquiry teaching and inquiry learning in geography classrooms. Rambuda (1994: 78) observed thirty geography lessons and discovered that learners never questioned or disputed whatever their teachers told them. Learners were unable to distinguish between geographical facts and opinions. This practice suggests that geography learners appear not to understand geographical principles and concepts. Learners seem not to possess the ability to make objective judgements. The fact that learners generally possess inadequate problem-solving skills, could be attributed to the way geography is taught in schools.

This problem points to the need for constructive alternatives to this unsatisfactory state of affairs. Hence, it might be impossible to realise the aims and objectives of Curriculum 2005 in general and outcomes-based education in particular, if this problem is not redressed. One of the principles of outcomes-based education is to make inquiry behaviours the central focus of teaching and learning in South Africa, as it is hoped that this practice may develop citizens who can tackle and solve problems with confidence (Curriculum 2005 1997: 10).

Geography as a school subject is likely to provide opportunities to satisfy the goals of teaching responsible citizenship in South Africa. The teaching of geography is supposed to adapt and change in order to meet this challenge. Ballantyne (1989/1990: 124) points out that change in the nature of geography education should focus on the teacher rather than the subject. This implies that teachers have to adapt and improve the quality of their practice. In addition to this, learners should also be genuinely involved in the learning process. This study proposes that innovative teaching and learning in geography education should involve the application of inquiry teaching and science process skills in order to motivate learners to develop questioning attitudes and the habits of critical and reflective thinking.

Trowbridge and Bybee (1990: 194) are of the opinion that inquiry teaching needs a questioning teacher with good questioning practices. This idea is also supported by Hill (1994: 15) who states that teacher questions guide inquiry in order to merge the inquiry process with the conclusion drawn. Directly linking teacher questions and learner answers helps to achieve an intellectually satisfying understanding of a problem. Amongst others, a teacher classifies questions by using the processes of science to ensure that the basic structure of science and critical thinking is taught (Trowbridge and Bybee 1990: 195).

The teacher is likely to devise questions which examine skills which include observing, hypothesizing, designing an experiment, graphing, setting up equipment, reducing experimental errors and inferring. It is interesting to note that Davies (1987/1988: 110) questions the ability of geography learners to observe, measure, calculate and communicate reports. These are basic elements of science process skills which are important in problem-solving. Science process skills are likely to encourage learners to use data to draw conclusions, a process which may develop high-level thinking. The conscious application of science process skills to the teaching of geography is likely to regenerate geography classroom practices.

2.2.3 Thematic Approach

The International Charter on Geographical Education (1992) recommends the adoption of a thematic approach in geography teaching. The International Charter on Geographical Education (1992: 10-12) classifies this approach into systematic, issue-based and system approaches. Systematic approaches deal with physical and human geography, for example, physical geography may include broader fields such as climatology or geomorphology. The focus of study for human geography may include fields such as population geography or settlement geography amongst others.

In issue-based approaches, geographers deal with current issues or problems at local, regional, national or global scales (cf. 2.2 and 2.3). Amongst others, examples of issues which could be studied are hazards and disasters, conflict, developmental problems and strategies.

Systems approaches imply teaching about physical systems, human systems and ecosystems. Examples of physical systems include climatic systems, biotic systems and so on. Human systems involve social and cultural processes in human organisations such as agricultural systems, settlement systems and so on. Ecosystems include the study of human and natural systems' integration in an ecosystem.

The approaches discussed above are used in combination and regardless of the approach adopted, teachers should encourage learners to engage in questioning and enquiry. It is essential that learners develop the geographical skills of seeking solutions to current and future problems in the organisation of space. In this way, geography curricula play a substantial role within political, social, ethical, personal, humanistic, aesthetic and environmental education (International Charter on Geographical Education 1992: 12).

Geography learners may undertake inquiry as individuals or as members of a group on short independent study topics. Learners are supposed to undertake well planned and meaningful fieldwork. They are expected to be competent in the use of measuring instruments and other apparatus. Geography teachers and learners should make use of diagrammatic representation of statistics (cf. 6.2) to communicate the results of their investigations (Teaching Geography 1995: 96).

All these recommendations are related to science process skills in one way or another. It is inevitable that geography teachers who implement these recommendations need to include science process skills in their teaching practice. The application of systematic approaches, issue-based approaches and system approaches in thematic studies curricula, enhances the role for geography in the interdisciplinary approach. Davies (1987/1988: 117) claims that some geography learners are unable to transfer their knowledge of other subjects into their geographical studies. The researcher assumes that the transfer of knowledge can only be possible if geography teachers foster the development of inquiring minds and questioning attitudes in their learners. Inquiry learning and inquisitiveness are likely to help learners see knowledge as integrated rather than compartmentalised.

2.2.4 The Interdisciplinary Approach

Guideline Document and Interim Syllabus for Geography Grades 10 to 12 (1996: 6) states that:

- ☐ *concepts studied in Geography may overlap in with those of subjects such as biology science and economics*;
- ☐ *interdisciplinary studies should form part of the broad teaching strategy*;
- ☐ *notwithstanding the overlap with other subjects, studies should always be undertaken from a geographical perspective*.

It is interesting to note that the interdisciplinary approach recommended above plays a substantial role within Curriculum 2005. Subjects with related learning knowledge are grouped together in the same learning area. This has led to the classification of knowledge into eight learning areas, namely,

- *Language, Literacy and Communication*;
- *Human and Social Sciences*;
- *Technology*;
- *Mathematic Literacy, Mathematics and Mathematical Sciences*;
- *Natural Sciences*;
- *Arts and Culture*;
- *Economics and Management Sciences*, *and*
- *Life Orientation* (Department of Education 1997a: 15).

As geography mainly deals with the earth sciences, it falls within the Natural Sciences Learning Area (cf. 3.5.3). Curriculum 2005 and outcomes-based education are discussed in detail in Chapter 3.

The teaching approaches reviewed, imply that geographers study how human beings interact with each other and with their environment. The interrelationship between humans and the environment is bound to lead to environmental problems which human beings have to apply their inquiring minds to find solutions to such problems. The occurrence of environmental problems implies that development of process skills in geographic inquiry should characterise the teaching of geography. Process skills of science are likely to enable learners to make informed decisions when solving problems. Their solutions are likely to be supported by evidence which is collected through the application of science process skills. This could be possible if geographic inquiry is introduced in geography teaching.

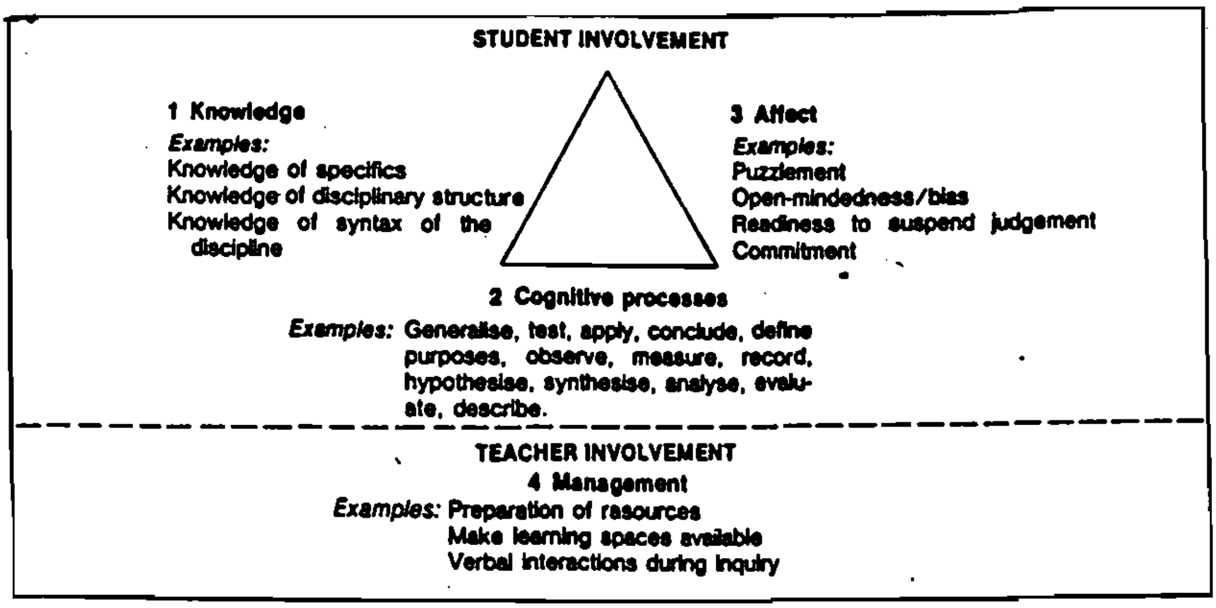
2.3 GEOGRAPHIC INQUIRY

Geographic inquiry became part of the methodology of school geography during the 1970s (Levy 1984: 201). The development of geographic inquiry may be encouraged through the adoption of issue-based geography (cf. 2.2 and 2.2.3). Issue-based geography inquiry fosters active learning and critical thinking (Hill 1994: 17). Inquiry is concerned with solving human and environmental problems. Bartlett (1982: 67) points out that geographic inquiry can be based either on the traditional method of observation and interpretation, or on systems analytic procedures. The steps of the traditional method of inquiry are to:

- Observe;
- Select and record;
- Describe and classify;
- Interpret: involving a combination of
  analysis
  synthesis
  evaluation
  explanation
  application; and
- Predict and control (Bartlett 1982: 67).

Bartlett's (1982: 67) steps of the traditional method of inquiry differ with Cox's (1984: 90) elements of classroom inquiry and are depicted in Figure 2.3 below.

Figure 2.3 The Elements of Classroom Inquiry



(Cox 1984: 90)

Analysis of these models of inquiry reveals that Bartlett has neglected the aspects of knowledge, affect and teacher involvement in classroom inquiry. However, Cox (1984: 92) declares that a productive classroom inquiry incorporates elements such as knowledge, cognitive processes, affect and teacher management which are interrelated.

However, it is important to note that these models of classroom inquiry have something in common. In both models, learners are likely to be involved in cognitive processes such as, observing a problem, selecting the methods they will use to solve it, collecting data, recording and interpreting their findings objectively.

Bartlett (1982: 67-68) further argues that successful inquiry is possible if steps of systems analytic procedures are developed and used. Steps of systems analytic procedures include the following:

- *Identify the problem or topic. Observation may be involved;*
- *Describe the system, its environment;*
- *Select alternative objects, linkages;*
- *Implement the system (draw a flow diagram, simulate ...);*
- *Evaluate and test the effectiveness of the designed model to improve it (i.e. predict changes); and*
- *Revise using one element to change the interrelationship among elements in system, continue implementation and test for understanding and accurate prediction.*

This implies that both the traditional method of observation and interpretation, and systems analytic procedures enable learners to be engaged in fruitful investigations and to offer reasons for their findings. This is also emphasised by Hill (1994: 17) who asserts that "*inquiry is essentially the method of science and of good detective work. It poses questions and proposes answers about the real world, and it tests its answers with real data.*" When applying geographic inquiry, teachers are more likely to supplement it with inductive and deductive inquiry, hence the discussion in the next section.

2.3.1 Inductive Inquiry

In this method, learning starts from the particulars (parts) to the whole, i.e. learning starts from facts to a law or principle. The following is a practical example for the application of inductive inquiry to geography. In a synoptic weather chart, learners may start by learning the elements of weather such as air temperature, humidity, air pressure, types of precipitation, dew point temperature, amount of cloud cover, wind speed and wind direction before they can interpret a synoptic weather chart. These elements of weather are the 'parts' and the synoptic weather chart is the 'whole'. After they have mastered the elements of weather, learners are able to interpret the synoptic weather chart (Appendix 13).

Eggen and Kauchak (1988: 109) maintain that inductive inquiry is "...*designed to develop the thinking skills of observation, comparing, finding patterns, and generalizing while at the same time teaching specific concepts and generalizations.*" An application of inductive inquiry requires the learner to start with an *observation* and then *formulate a hypothesis* (Van der Horst and McDonald 1997: 127) which (s)he uses to explain the results or the findings. Feibleman (1972: 83) regards induction as a logical term which is a general proposition in the form of a question suggested by a particular data. The question posed in the induction process may lead to a generalisation. Induction usually leads to hypotheses that are subsequently verified by observation, experiment, calculation, prediction and control. This statement correlates with Eggen and Kauchak's (1988: 112-113) model of the general procedure of inductive inquiry. The model is illustrated as follows:

PHASE ONE: THE OPEN-ENDED PHASE

- *Show the learners an example of the concept or generalization or a non example.*
- *Ask the learners to observe and describe the example.*
- *Show the learners a second example or non-example.*
- *Again have the learners observe and describe the second example.*
- *Continue the process using as many examples and non-examples as have been prepared.*

- *Ask the learners to compare the examples and non-examples.*

PHASE TWO: THE CONVERGENT PHASE

- *Prompt the learners to identify patterns in the examples.*

PHASE THREE: CLOSURE

- *Explicitly state the patterns in a definition.*

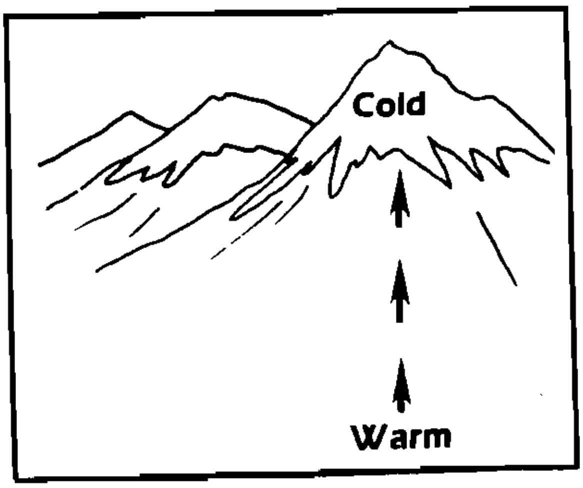
PHASE FOUR: THE APPLICATION PHASE

- *Apply the definition with additional examples.*

The model outlined above clearly shows that if it is followed properly, learners could be guided until they reach a universal rule. The following classroom scenario highlights the application of the inductive process in a hypothetical geography lesson on *condensation.* The teacher shows learners pictures of a snow-capped mountain (Figure 2.3) and a karst scenery (Figure 2.4) of a mountain. As illustrated below, (s)he uses the pictures to develop science process skills such as *observing*, *communicating*, *predicting*, *inferring* and *identifying variables* in the learners. The inductive lesson goes as follows:

Figure 2.4 If Warm Air Rises, Why is it Cold at the Top of the Mountain?

PHASE ONE: THE OPEN-ENDED PHASE



Snow-capped Mountain

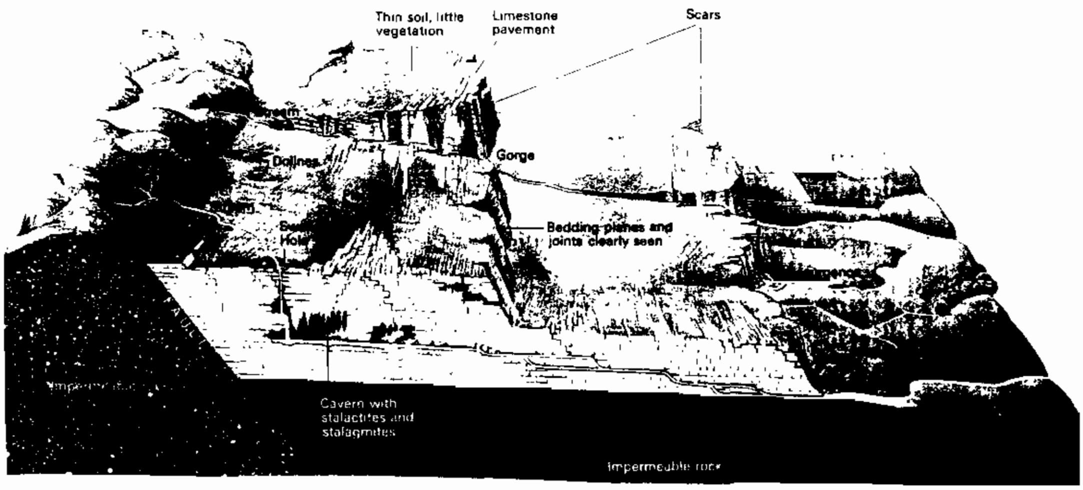
(Friedl 1991: 143)

Teacher: "*Could you describe what you see in this picture*?" (This question is likely to promote the development of basic science process skills of *observing* and *communicating* in learners).

Learners: "*We see a snow capped mountain peak, a rugged terrain, rocky outcrops and streams.*"

Thereafter, the teacher also shows the learners the second picture which depicts karst scenery of the mountain.

Figure 2.5 Karst Scenery of the Mountain



(Wiegand and Galbraith 1988: 39)

Teacher: "*What do you see in this picture*?" (*observation and communication*).

Learners: "*We see streams, thin soil with little vegetation, rocks, a plateau with a hole.*"

PHASE TWO: THE CONVERGENT PHASE

The outcome in this phase of the lesson is to enable learners to identify patterns in the pictures. This phase is likely to promote the development of basic science process skills of *classifying* and *inferring*. This is illustrated by the following dialogue between the teacher and the learners.

Teacher: "*Are the streams perennial or non-perennial?*" (*Classification*).

Learners: "*The streams are perennial.*" (Learners *infer* that the streams are perennial because they are represented by a solid blue line as a dotted blue line represents a non-perennial stream).

Teacher: "*What is the drainage pattern of this basin?*" (*Classification*).

Learners: "*The drainage pattern of the streams is radial.*"

Teacher: "*Why do you say it is a radial drainage pattern.*" (*Inference*)

Learners: "*It is a radial drainage pattern because streams start from the same source and flow to different direction.*"

Teacher: "*Why is the mountain peak covered with snow?*" (*Inference*)

Learners: "*It is cold on top of the mountain, condensation has taken place and temperature is very low.*"

Teacher: "*Why is the temperature low at the peak*?" (Inference)

Learners: "*It's low because the higher the altitude, the colder it becomes.*" (A general geographical rule).

PHASE THREE: CLOSURE

In this phase, the teacher explicitly states the pattern in a definition. The definition or rule is *the higher the altitude, the colder it becomes.*

Teacher: "*What are the variables contained in this rule*?" (Identifying variables)

Learner: "*Altitude and temperature.*"

This answer implies that altitude (height) and the rates of temperature are related. When moist air ascends the peak, it is cooled adiabatically and condensation takes place. Clouds and snow are also formed.

Teacher: "*What would happen if the snow at the mountain's peak melt.*" (Prediction)

Learners: "*The melting snow will fill up the streams and flooding could be a major problem in low lying areas.*"

PHASE FOUR: THE APPLICATION PHASE

The teacher and learners apply the definition with additional examples.

Figure 2.6 below illustrates diagrammatically the sequence of events that are involved in an inductive inquiry lesson.

Figure 2.6 Sequence of Events in Inductive Inquiry

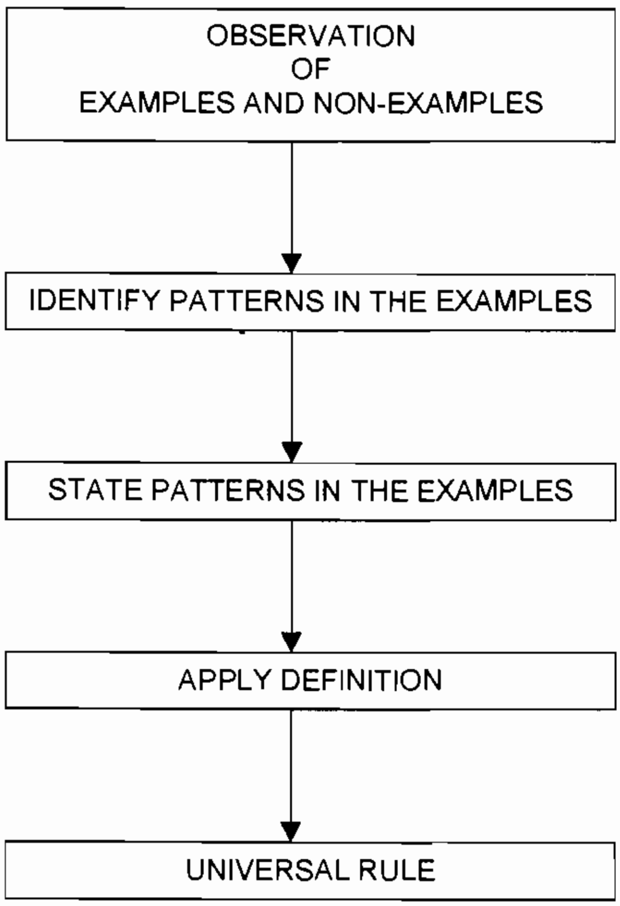


Figure 2.6 shows that to arrive at a universal rule, the teacher and his/her learners observe, identify patterns, state patterns, apply definition and state examples. Consequently, in this lesson, it is clear that science process skills such as *observation, communication, prediction, inferring and identifying variables* are developed. This lesson also implies that inductive inquiry promotes active learning and it is likely to increase learners' interest and motivation. It

develops learners' skills for discovering knowledge. These auger well for outcomes-based education although Davies (1987/1988: 118) claims that the quality for discovering knowledge is lacking amongst geography learners.

In this lesson, learners had to demonstrate mastery of these skills hence OBE focuses on what learners know and are able to do. Demonstration of learned knowledge and skills is what OBE requires (cf 3.6). Therefore, it is assumed that to realize the principles and objectives of Curriculum 2005 and OBE, geography teachers could develop interactive teaching through the general procedure of inductive inquiry. Furthermore, Inductive inquiry could be adopted in combination with deductive inquiry.

2.3.2 Deductive Inquiry

This method of inquiry is a counterpart of the inductive approach. However, according to Eggen and Kauchak (1988: 253) both approaches are similar because they teach concepts and generalizations, they rely on examples and they depend on active participation of the teacher in facilitating learning. Their difference is "*...in the sequence of events during the lesson, the thinking skills involved in the processing, the motivational features of the procedure, and the time involved*" (Eggen and Kauchak 1988: 253).

Deductive inquiry is a teaching strategy that encourages learners to apply a given statement or principle to specific contexts or situations. In deductive inquiry, learning starts from the general to the specific. Learners are required to first get a clear image of the topic or theme being studied. For example, to learn about physical features of a specific area. Learners may start by identifying the features in the topographical map of that area (whole) before they could learn the actual features in the environment (parts). The structure of deductive inquiry (Eggen and Kauchak 1988: 255) is as follows:

PHASE ONE: PRESENTATION OF THE ABSTRACTION

- ☐ *Defines the concept or states the generalization.*
- ☐ *Links the new material to the content previously covered.*
- ☐ *Clarifies the terms within the abstraction and explains the objective(s) for the lesson.*

PHASE TWO: ILLUSTRATION WITH EXAMPLES

- ☐ *Classifies examples as belonging or not belonging to the concept.*
- ☐ *Asks learners to do the same by relating the examples to the characteristics identified in the definition.*

PHASE THREE: APPLICATION PHASE

- ☐ *Asks learners to provide additional examples of a concept or apply a generalization to a unique situation.*

PHASE FOUR: CLOSURE

- ☐ *Asks learners to restate what they had learnt in the lesson.*

The following classroom scenario highlights the application of the deductive process in a hypothetical geography lesson. The lesson is on *permeability of rocks*.

PHASE ONE: PRESENTATION OF THE ABSTRACTION

The teacher explains the concept *permeability of rocks* to the learners. Permeability of rocks is the ability of rocks to allow water to pass through them. The outcome of this lesson is that learners should be able to *classify* rocks as either permeable or impermeable. Let assume that in the previous lesson, learners were requested to collect rocks around the school and to place them in a big pile. Learners were also asked to identify and *classify* the collected rocks into igneous, sedimentary and metamorphic rocks.

PHASE TWO: ILLUSTRATION WITH EXAMPLES

In this phase, the teacher requests learners to weigh pieces of rocks such as granite (igneous), limestone, sandstone (sedimentary), and marble (metamorphic). Learners *measure* and record the weights while the rocks are dry and then soak the rocks in water overnight. Learners are requested to *predict* what would happen to the weight of these rocks. They weigh the rocks again the next day. What has happened to rocks' weight? Learners discover that some rocks have gained weight whilst others remain unchanged.

PHASE THREE: APPLICATION PHASE

Learners *classify* the rocks as permeable or impermeable. For instance, limestone and sandstone would have gained weight. Learners *classify* them as permeable rocks. Granite and marble remained unchanged hence classify them as impermeable rocks.

PHASE FOUR: CLOSURE

The teacher asks learners to restate what they had learned in the lesson.

The essence of this lesson is that learners' investigations include the science process skills such as *predicting, measuring* and *recording* the weight of the rock before and after soaking them. They discover that some rocks are heavier after soaking but others do not change. This is because some rocks have pores (thus why they can absorb water) whilst others do not have pores (thus why they cannot absorb water). Consequently, the skill of *identifying and describing variables* is also developed. Learners are also able to *infer* that those rocks that gained weight have soaked up water. They conclude the activity by *classifying* the rocks as either permeable or impermeable.

These two lessons imply that both inductive and deductive inquiry approaches of teaching involve the study of examples or generalisations of an issue or a problem using the process of inquiry. Inquiry process encourages learners to identify questions and issues, to collect and structure information, to process data, to interpret data, to evaluate data, to develop generalisation, to make judgements, to make decisions, to solve problems, to work cooperatively in team situations, and to behave consistently with declared attitudes (Teaching Geography 1995: 96).

All these practices need application of inquiry as a teaching strategy. In the following section, the researcher justifies why inquiry should be adopted in the teaching and learning of secondary school geography.

2.4 REASONS FOR INQUIRY AS AN APPROACH OF TEACHING AND LEARNING GEOGRAPHY

Analyses of Curriculum 2005 (cf.3.7) and the 1996 Grades 10 to 12 geography syllabus (cf.2.2.4) indicate that inquiry teaching and inquiry learning should be adopted to solve current socio-environmental problems. Inquiry approaches build "*...skills and values such as being able to think, to solve problems, to collect, organise and analyse information, to work in a group as well as independently, to communicate effectively and to make responsible decisions*" (Department of Education 1997a: 9). In outcomes-based education, teachers are encouraged to facilitate learning, to guide learning, to assess learners to help them improve and to nurture and support learners through inquiry teaching.

By focusing on inquiry teaching and inquiry learning, and process skills, the researcher does not mean to be exclusive of knowledge and understanding. The researcher only wishes to show that the strength of inquiry teaching-learning is that it requires learners to project a range of science process skills onto a real world question or issue. Therefore, it is proposed that teacher transmission of knowledge and learner passive recipients of knowledge should be applied minimally to the teaching-learning process. Hence, inquiry geography demands teachers and learners to focus on interactive teaching and learning approaches which place learners in the central role and which lead to productive interaction inside and outside of the geography classroom. According to Greasley, Ranger, Winter and Williamson (1992: 3) within the classroom situation inquiry geography:

- *provides a focal point for the problem investigated;*
- *involves the adoption of different teaching and learning styles;*
- *provides stimuli and resource materials with which learners may use in their*

investigations;

- *provides with the opportunity to take their own learning initiative and to clearly demonstrate learning competence; and*
- *provides opportunities for decision-making and clarifying values and attitudes.*

Greasley et al. (1992: 3) also maintain that, inquiry geography within a fieldwork situation provides:

- *a clear focus for the fieldwork being undertaken;*
- *a clear structure for the fieldwork being undertaken;*
- *opportunity for individual and group work;*
- *opportunity for a flexible approach and the uses of a variety of techniques; and*
- *opportunity for variety of outcomes which are not predetermined.*

The inquiry-based learning approach creates the ideal opportunity for learners to become involved in geographical problems that affect their local environment. Stenhouse (1975: 38-39) and Winter (1992: 143) summarised the objectives of inquiry learning as to:

- *initiate and develop a process of question-posing in learners (the inquiry method);*
- *teach a research methodology where learners can look for information to answer the questions they have raised, used the framework developed in the course, and apply it to new areas;*
- *help learners develop the ability to use a variety of first hand sources as evidence from which to develop hypotheses and draw conclusions;*
- *conduct classroom discussions in which learners learn to listen to others as well as to express their own views;*
- *give sanctions and support to open-ended discussions where definitive answers to many questions are not found;*

- *encourage learners to reflect on their own experiences; and*
- *encourage the role of the teacher as resource manager rather than as an authority;*

Stenhouse (1975:39) regards these as objective principles of procedure to avoid confusing them with behavioural objectives or learning outcomes that should be attained at the end of a lesson. Geography teachers who follow the procedures listed above are more likely to improve their teaching practice. These procedures are likely to encourage learners to cease being passive recipients of knowledge. Opportunities are afforded to learners to get involved actively in the learning process. Vakalisa (1996: 4) points out that active involvement in the learning process allows learners the opportunity to:

- *ask questions, especially of the 'how' and 'why' type;*
- *answer teachers' questions which should be more of the inferential type than content-based;*
- *answer peers' questions to explain one's views on particular content;*
- *try out hypothetical solutions to problems related to content;*
- *consult texts or theory to get clarification on particular aspects in order to build their capacity to participate;*
- *seek information from experts (using people as resources);*
- *express their point of view and supporting it with plausible arguments;*
- *critique and evaluate learning content;*
- *apply learned content in solving problems related to it;*
- *discuss content with peers and soliciting feedback;*
- *undertake projects that reveal how content operates in real life;*
- *write positions papers for others to critique and to provide them with feedback that will enrich understanding; and*
- *keep reflective journals about learning experiences at particular levels of development.*

These activities are likely to develop the critical thinking skills of learners through inquiry. These activities are applicable to the teaching of geography, regardless of whether the school is well equipped with learning equipment or not. What is of great importance is for teachers to reduce teacher domination in the geography teaching-learning process. Furthermore, the researcher assumes that there is no any other teaching approach which empowers both less able learners and gifted learners more than the inquiry approach. Greasley et al. (1992: 5) argue that inquiry geography provides for less able learners because:

- *learning content is simple to understand;*
- *teaching starts form the particular to the general. The adoption of inductive inquiry motivates and stimulates the learners' interest. Less able learners are able to understand the learning material much more easily;*
- *it promotes individualized learning allowing learners to learn at their own pace; and*
- *the use of worksheets reduce memorisation and provides learners with the material they can use for revision.*

Less able learners find it difficult to master and understand abstract geographical concepts. They enjoy practical activities more than intellectual activities. Pick and Renwick (1984) have discovered that less able learners need learning essentials such as variety, active rather than passive learning, and inductive rather than deductive learning experiences, amongst others. A suitable teaching response to these learning needs is likely to be inquiry geography. Inquiry geography encourages learners to express their opinions. Learners realize that their inputs are important and valued. This is likely to boost their self-esteem and inspire them to 'find out'.

Inquiry geography is also suitable to gifted learners. Gifted learners "*gain pleasure from intellectual activity and show interest in inductive learning and problem solving*" (Laws 1984: 227). Greasley et al. (1992: 5) further maintain that inquiry geography also caters for gifted learners because:

- *learners study abstract geographical phenomena which suit their abstract reasoning;*
- *learners investigate and discover more knowledge with less teacher guidance;*
- *learners acquire skills for individual inquiry; and*
- *learners are able to identify and move on to investigate the next problem.*

It is important to note that inquiry geography could play an important part in the promotion of the principles of the country's constitution and the Department of Education. South Africa is supposed to be a non-sexist multicultural country (Constitution of the Republic of South Africa 1996: 3). Education has an essential role to play to realise these principles. The Education and Training Act (1995: 42) also recommends the development of multicultural education in South African schools. Inquiry geography could also play its part in the promotion of gender issues and multicultural education. Greasley et al. (1992: 5) maintain that inquiry geography provides for gender issues by:

- *demonstrating that women can also become engineers, farmers or hold positions of authority and active roles;*
- *starting case study material with the particular and small scale readily accessible to all and developing to the more general;*
- *carefully chosen inquiry instruction materials with a non-sexist approach in mind;*
- *providing clear advice on particular gender issues in the inquiry teaching guide: and*
- *encouraging both sexes to hold discussions and work together collaboratively as a unit.*

Furthermore, Greasley et al. (1992:5) maintain that inquiry geography provides for multicultural education by:

- *providing positive case study images of people from a variety of ethnic backgrounds;*
- *carefully chosen inquiry instruction materials which promote a positive multi-cultural image;*
- *providing opportunity for students to study topics relevant to multicultural education: e.g. population dynamics, urbanisation, inequalities of communities, cultural knowledge other than their own;*
- *providing opportunity and suggestions in the inquiry teaching guide for learners to pursue issues which promote multiculturalism; and*
- *developing inquiry activities that engage all learners from different cultural backgrounds in a variety of learning situations.*

This discussion implies that inquiry geography has an important role to play in the development of the aims and principles of the country's constitution and Curriculum 2005. Its role cannot be less emphasised. It is imperative that geography teachers and learners should change and adapt they way they teach and learn respectively. Battersby (1995) as cited by Lambert and Balderstone (2000: 73) argues that inquiry can provide the most appropriate vehicle through which to develop a sense of place for learners. This implies that through inquiry, learners can contextualise issues and begin to see the interrelationships of places.

Figure 2.7 on the page 61 indicates that involvement in inquiry may also encourage learners to employ verbal, quantitative and symbolic data forms such as text, pictures, graphs, tables, diagrams and maps to communicate solutions to investigated problems. Furthermore, inquiry also needs skills in field observation, interviewing people, interpreting secondary sources and applying statistics. Thereafter, learners are supposed to assess the results and draw conclusions. This task may be performed in two ways. This may happen when learners tie up loose ends which are related to the hypotheses (cf. 2.5.2.7 and 4.5.2). Sometimes the teacher may ask learners to study the hypotheses and establish whether the hypotheses fit into the collected data. These processes enable learners to retain a hypothesis or to reject or revise it. Sometimes learners may think that they have collected enough data whilst the gathered data are not enough. When a teacher realises that this is the case, (s)he should prompt learners to ask further questions that will lead to the collection of sufficient data. It is possible that the learners may request the teacher to confirm their explanations.

Figure 2.7 also demonstrates how inquiry teaching activities develop learners' inquiry into questions, issues and problems. Inquiry teaching and inquiry learning foster the development of observational skills, recording skills and communication skills. These skills afford learners the opportunity to be able to identify geographical significant problems and variables of the same problems. Learners are able to understand the nature of the problems, analyse and interpret the problems and take appropriate decisions.

The teacher who adopts inquiry teaching may give a problem for investigation or may give learners opportunities to identify their own problems. Learners would speculate, create new concepts, apply old concepts and infer, test, reject, and accept their tentative solutions to the problem (Bateman 1990:18). These activities promote cooperative learning, a principle which outcomes-based education supports. Following is Figure 2.7.