SPATIAL CONCEPT DEVELOPMENT AND THE TEACHING OF GEOGRAPHY IN PRIMARY SCHOOLS.

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PREFACE

Until recently educational geographers have concerned themselves largely with questions regarding those parts of the discipline which should be included in school and university curricula (Fitzgerald, 1969; Thomas, 1978). The advent of the quantitative and more recently the behavioural approaches to geography have focused attention on the nature of the discipline and educationalists faced with the change in emphasis from a regional to quantitative approach have incorporated new areas of study into the school curricula, without (in many cases) considering the needs of school children and their stages of conceptual development.

The emphasis in geography teaching has in this manner moved away from a factual basis towards the teaching of concepts. Geographic concepts which are important for children to acquire have been defined by academic geographers (Hagget, 1975) but unfortunately little research has been undertaken into the teaching of these concepts. Only recently have geographers begun to show an interest in the way in which concepts are acquired by young pupils. In particular, the works of Blaut and Stea (1973, 1974), Catling (1978, 1978b, 1979), Balchin and Coleman (1973), Naish (1977), Cole and Beynon (1968, 1969), Rushdoony (1971) and Cracknell (1976) have focused attention on the need for geographic educators to understand the way in which pupils develop spatial concepts so that teaching strategies can be correctly planned.

Deep seated prejudices regarding what children can understand at primary school are being subjected to careful analysis with sometimes surprising results (Blaut and Stea, 1974). Research into spatial concept formation and the teaching of geography is still in its infancy and more research is needed to enable geography at the primary school level to play a meaningful part in the total development of the child. In this regard the emphasis placed on the teaching of graphicacy needs special attention and mapwork skills need to be improved (Balchin and Cole, 1973).

In this thesis an attempt is made to analyse and discuss the major theories of spatial concept development and to apply the ideas of the theorists to the practise of geography teaching in senior primary schools. The research

into childrens' spatial concepts in two Natal primary schools, and into ways in which mapwork concepts can be utilised to aid spatial concept development, should help to improve the effectiveness of geography teaching at this level.

I am indebted to my colleagues at Edgewood College of Education, Mike Cottrell, Clive Waddy and the late Gordon Morton, for their encouragement and the constructive criticism they supplied. The staff of the schools which participated in the research were always willing to give up their valuable time to help in testing the pupils. They were also willing to complete the questionnaires on teacher attitudes towards the teaching of geography, and for this I am most thankful. In particular a grateful word of thanks goes to John Butler-Adam who has encouraged me and in a tactful manner supplied an abundance of sound advice regarding the structure and conceptual framework of this thesis. Finally, I should like to thank my mother, Joy Ballantyne, for the many hours of hard work she put into typing this thesis.

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CHAPTER ONE

INTRODUCTION TO THE STUDY OF SPATIAL CONCEPT DEVELOPMENT AND THE TEACHING OF GEOGRAPHY

Since the advent of the "quantitative revolution" and its aftermath in their discipline, geographers have been exploring new avenues and areas of geographic concern (Gould, 1969; Gregory, 1978). As a result, knowledge has been advancing at a considerable rate. Walford, (1969) notes :

> "our knowledge is doubling every fifteen years it has been estimated. Several of the contributions in Geography's feature, 'This Changing World' are themselves outdated in some respects by the time they appear in print." ..... (p.9).

One result of this vast increase in knowledge is that teachers of geography in schools are finding it increasingly difficult to keep pace with their university colleagues.

It is perhaps inevitable that a gap should appear between academics, or trend-setters in the discipline, and those whose concern it is to impart knowledge of the subject at a time of great change. However, it is disturbing that at a time when geography is experiencing such exciting steps forward, few researchers have entered the field of geographic education. Geography, a subject which until recently was mainly of value to those embarking on a career in education, has, by and large, forgotten its old master in its search for new pleasures. Laidig (1967) remarks

> "that one is confronted by an ever-increasing concern that geographers have not and are not addressing themselves in significant numbers to problems related to geographic education." ..... (p.11).

While appreciating the fact that geography has relevance apart from being a school subject, it should be born in mind that the majority of people have their first experience of the subject during their formative years. Because of this, geography should, at this level, cater for their needs in an

enlightened and interesting way. Whilst most academics and teachers would agree on this point, far less consensus would be found on the content and nature of the school curriculum and on the matter of its pedagogic method. It is in the areas of curriculum planning and teaching methods that most research remains to be done.

Opinion amongst academic geographers is often critical of the school curriculum and teaching methods, but very few of the criticisms are based upon up-to-date experience of the normal school situation or on research findings. The controversy surrounding curriculum planning at school level is symptomatic of an increasing gap between academic geography and teachers in the school. Geography at university level is seen by many to be evolving into a new subject while retaining its old title. In this regard Wise, commenting on the introduction of new aspects of geography in the school curricula warns that

> "It is thought by some that the effect of introducing the new elements into the school curriculum may be to reduce the appeal of the subject certainly for pupils of average or less than average ability." ..... (Wise, 1977, p.249).

The debate between academics and teachers concerning the school curriculum is important insofar as change in the past has been affected by a filtering-down process of ideas from the university to secondary school and finally primary school (Gregory, 1969). Motivation for change in the subject matter taught at each level comes from above, often with little regard for the needs of pupils. While there are merits in the present system of curriculum planning, in that teachers are continually having to rethink and learn new ideas about their discipline, there are often disadvantages for the pupil.

It could be argued that what is of relevance to a university student differs from what is relevant to a pupil in the primary school who has only just begun to develop spatial concepts and knowledge of the environment around him. It might also be true that the aims of geography teaching at primary, secondary and tertiary levels are different and as such, subject matter and methods of teaching should also differ (Wise, 1977). There seems to be a need to move away from a purely discipline-centred approach to curriculum planning in the schools, to one which is child-centred.

Because of their complementary skills and experience, curriculum planning in the schools should be the product of consultation between academics and geographic educators. If this strategy were adopted, a balance between the needs of the discipline and those of the educator would result. In the past it seems as though the needs of the child have largely been ignored in favour of those of the discipline. Perhaps the reason for this is the fact that geographic educators have been reluctant to cross swords with the academics of the subject due to a lack of knowledge and concrete proof concerning what the needs of the pupil at primary and secondary school level are. If geographic educators are to play a meaningful part in curriculum planning, they must establish in concrete terms what the abilities of their pupils are in regard to their concept formation at different ages as they progress through school.

In this thesis an attempt is made to draw attention to the need for geographic educators to identify the manner in which pupils think in spatial terms at different ages and then to apply this knowledge to the teaching of geography at the primary school level. Research into the performance of primary school pupils on tests of spatial concept development enables an evaluation of the role that geography is playing in the formation of these concepts and suggests ways in which the effectiveness of the subject can be enhanced. The results of the study should aid the move away from a discipline centred approach to geography teaching, to an approach that is more child centred. As a result of this study it is hoped that a more relevant geography, from the point of view of the children and educators, may result.

The thesis is composed of four major parts. First, theories concerning spatial concept development are discussed resulting in a general statement regarding the use of these theories in the teaching of geography in the senior primary school. Second, research into the state of spatial concept development in the senior primary school and the results obtained are presented. These results are compared with those of similar studies undertaken overseas and this leads to discussion on the state of spatial concept development in the Natal senior primary schools tested. Thirdly, geography teaching at the senior primary school level is analysed in the light of the research findings. The syllabus, teaching practices and attitudes of teachers are discussed and suggestions made about how geography teaching in the senior primary school can be improved. Finally,

as a result of the need to improve the teaching of spatial concepts in geography, the principles gained from spatial concept theories are applied to the construction of a mapwork course for use in senior primary schools. It is hoped that by using this mapwork course, children's spatial concept formation will be enhanced.

Due to the time available and costs involved, it was not possible to test pupils in other Provinces of South Africa. Although the work presented here deals specifically with the spatial concept development of pupils in Natal primary schools, similar findings and conclusions could be expected from schools situated in other areas of South Africa, all of which use the same core syllabus and have access to the same teaching aids. It is contended, therefore, that the research findings of the thesis, although concerned with the condition of spatial concept development amongst pupils and the teaching of geography in Natal primary schools, can be applied to the other Provinces as well. The sections dealing with the theoretical guidelines for the teaching of concepts in the senior primary school, the effectiveness of the syllabus in fostering spatial concepts, teacher attitudes and practice towards the teaching of geography and methods of teaching mapwork to young pupils are applicable to primary schools anywhere in South Africa.

CHAPTER TWO

THEORIES CONCERNING THE ONTOGENETIC DEVELOPMENT OF SPATIAL CONCEPTS.

The study of concept development in humans has been the concern of psychologists for many years. Developmental psychology sees "human behaviour as a changing system that includes both biological and socio-cultural determinates, which work together to produce behavioural development" (Schell, 1975, p.5). Concept development is viewed as an interaction between biological and environmental forces which shape the individual as he or she progresses from an infant to an adult. The nature of development is such that different stages of complexity in thought patterns and behaviour can be observed. These stages follow each other in an orderly pattern which can be measured.

Historically, the search for an understanding of how individuals develop a concept of space has resulted as a "spin-off" from the larger issues concerning child development. Spatial concept development has been largely ignored by researchers and writers of child development text books. Research has tended to be concerned with the broader issues of child development, for example, the development of intelligence. Historically, theories concerning spatial concept development form part of general theories of concept development and therefore an understanding of these theories is desirable.

Originally researchers in the field of concept development were concerned with the question of whether a concept of space was innate or learned. Today, however, the research emphasis has moved away from this unproductive argument towards an understanding of the ontogenetic spatial concept development of the child. Spatial concepts are viewed as

> "systems of meanings within the mental organisation of the individual. They arise as he generalises from his experience, and serve as expectancies or hypotheses for the classification of incoming information." ..... (Almy, 1967, p.24).

If the process of concept formation is faulty or incorrectly developed, the classification of information will be incorrect. From the above it

should be seen that knowledge about spatial concept development of the child should be a prerequisite for successful geography teaching, especially in the primary school.

Although most of the research results dealing with spatial concept development have come from psychologists, geographers have recently taken an interest in the subject. R.A. Hart and G.T. Moore (1973) have reviewed the relevant work by psychologists and geographers in the field of spatial concept development. Research results have stimulated interest but they have not as yet had any real impact on geographic education in South Africa. Geographers have been stimulated by the ideas generated by viewing geographic phenomena through the eyes of the psychologist, but have failed to apply some of the knowledge gained to help improve the standard of geography in the schools. The problem is expressed thus :

> "Geographic education will flourish only as the best minds in geography are willing to turn their attention to research needs in the teaching of their discipline."... (Laidig, 1967, p.11).

Geographic educators are interested in the manner in which children come to an understanding of space around them. From the time a child is born it comes into contact with objects around it. Interaction between the child and its external environment is recorded cognitively and organised into schemas which act as the basis for further interaction. As the child grows physically, so it develops mentally, and there is "a qualitative change in the organisation of behaviour " (Hart and Moore, 1973, p.205). Cognitive development occurs "as a function of the interaction between current organisation and discrepancy with the environment " (Hart and Moore, 1971, p.250). Theories of child development concern themselves with observing qualitative change in individuals through time as they interact with their environments. Ontogenesis is of prime concern to the social scientist and it is from the study of many individuals that generalisations concerning concept formation can be drawn. Unless the educator knows what a child is capable of understanding at a particular age, he or she will not be able to plan meaningful courses. Individual differences occu all the time but it is nonetheless possible to generalise the normal development of spatial concepts on the basis of research results.

The major researchers who have studied spatial concept development are Cassirer (1944), Werner (1948, 1957), Piaget (1948, 1969, 1977),

Inhelder (1948, 1965) and Blaut and Stea (1973a, 1973b, 1974). The work of these researchers will be briefly reviewed with the aim of arriving at some general statements concerning the spatial concept development of the child which may be of use to geographic educators.

1. CASSIRER - EXPERIENCES OF ACTIVE, PERCEPTUAL AND ABSTRACT SPACE.

Cassirer was one of the first theorists to deal with the formation of spatial concepts from a developmental standpoint. He identified three types of spatial experience through which the individual passes. These are the experiences of active, perceptual and abstract space. It is the ability of people to advance to the last stage and experience space in an abstract dimension which differentiates them from animals. According to Hart and Moore, Cassirer "made an important distinction between concrete acquaintance with, and abstract knowledge of, space and spatial relations " (1973, p.253). There is, Cassirer maintained, a difference in spatial concept competency between the ability to learn spatial skills derived from the repetition of actions in space, and that derived from the perception of relationships between objects viewed from different standpoints. This idea, which implies that there is a difference between the ability to manipulate an object and the ability to describe it, is a concept of which the geographic educator should take cognisance. Presenting the pupil with learning situations where, to be good at geography, the pupil has merely to learn to manipulate and describe objects in space, is not helping him to develop his spatial concept to its limits.

Cassirer argues that concrete acquaintance with objects should precede abstract knowledge about them, and in this respect he shares the findings of later researchers, e.g. Piaget. Often geography teachers are content to lead children through the stage of concrete acquaintance without proceeding to develop their abstract thinking about space. As a result, learning situations often go no further than presenting the pupils with facts about regions, population statistics, physical build, names of cities and rivers, climate or vegetation. The emphasis, especially in the primary schools, is on description and rote learning. The young pupil is rarely challenged to think about the region in such a way as to find linkages between the facts and the reasons which underlie spatial patterns. The situation is such that often a pupil who achieves good results in school

geography is one who also shows little understanding of spatial concepts, but who has the ability and motivation to memorise facts and produce them when called upon to do so.

2. WERNER AND ORGANISMIC-DEVELOPMENTAL THEORY.

A more comprehensive exploration into spatial concept development occurred with the publishing in 1948 of Werner's "Comparative Psychology of Mental Development." Like Piaget (whose work will be reviewed later), Werner was not concerned with spatial concept development per se, but rather with spatial concept formation as an integral part of the development of the mental ability of the whole person. His views on spatial concepts must therefore be seen in the light of his general theory of development.

Werner's general theory of concept development rests on what he termed the 'orthogenetic principle.' He maintains that

> "developmental psychology postulates one regulative principle of development; it is the orthogenetic principle which states that wherever development occurs it proceeds from a state of relative globality and lack of differentiation to states of increasing differentiation, articulation and hierarchic inter-gration." ..... (Werner, 1972, p.47).

Development is viewed "in terms of the degree of organisation of the system " (Hart and Moore, 1973, p.254). Organisation arises as a result of experience of the environment. The orthogenetic principle explains and raises some interesting ideas regarding the spatial development of the child. According to Werner, a child is born with little or no spatial concept. It could be assumed, for instance, that to a new-born infant, space has no limits or boundaries. As a child grows so its interaction with the environment allows its concept of space to develop. This process may be observed in the change that occurs in a child's beliefs about fairies, Father Christmas and imaginary people who live in "other" spaces within our world. The gradual organisation of spatial concepts limits, in a sense, the way in which an individual child perceives the environment around itself.

Werner perceives three successive processes in the development of the individual. These are :-

1. progressive self-object differentiation;

2. progressive constructivism; and

3. progressive perspectivism.

He maintains that during the stage of progressive self-object differentiation individuals perceive themselves as being at one with the immediate environment and unable to separate themselves from it. As a child matures, so it is progressively able to separate itself from its surroundings and the stage of self-object differentiation is gradually reached. During this stage a child's behaviour is directed towards observable goals. In the earlier part of goal directed behaviour an attempt to reach the goal is approached from one type of behaviour only. By crying, for example, the child may learn that it receives attention. Gradually, however, "new means-ends chains may be established" (Hart and Moore, 1973, p.254). Characteristically the child's goals and behaviour are egocentric during the stage of progressive self-object differentiation.

Between the ages of two and eight children enter the progressive constructivism stage of development. During this period children become more able to actively construct their own thoughts and actions in the surrounding environment. Egocentric thoughts in goal behaviour slowly give way to the ability to view ideas and actions from different perspectives. However, Werner maintains that egocentrism is still dominant over perspectivism at this stage.

After the age of eight Werner regards the child as being

> "able to construct knowledge about the universe, to clearly differentiate and integrate a wide range of means and ends, and to adopt the perspectives of others as well as his own."
> ..... (Hart and Moore, 1973, p.254).

The names given these processes suggest that ontogenesis is ongoing and not static. The organism interacts with the environment and reorientates itself towards new goals.

Werner considers that ontogenetic development occurs at three levels. These are the sensorimotor, perceptual and contemplative levels. The child progresses from a concrete experience of the environment to abstract knowledge of it. The term "polarities of orthogenesis" is used to explain how

development occurs from concrete to abstract thought in different stages. There are five polarities, each with a different means-end behaviour attached to it. These polarities are as follows :-

1. The individual changes from viewing all 'ends' as being equally desirable to viewing some as being preferable to others. This involves a process of selection in goal direction. Hart and Moore (1973) state that the process can be seen in the subordination of short-range to long-range goals.

2. Means diversify from being limited in choice to being more goal specific. Wish fulfilment by dreaming, changes to fulfilment in real life. As one grows so more means become available to allow goal achievement.

3. Behaviour changes from being diffuse to being specific and purposeful in terms of goal behaviour.

4. In order to maintain personal integrity during goal behaviour there is a movement from concrete to abstract thinking and reasoning. There is a move from rigidity of thought and actions to one of flexibility.

5. At this stage there is an increased move from lability to stability.

Having briefly reviewed Werner's general theory of child development it is possible to relate his ideas to the subject of spatial concept development. According to Hart and Moore (1973)

> "the organismic-developmental theory treats the development of space from action-in-space to perception-of-space to conceptions-about-space, as a function of increasing differentiation, distancing, and reintegration between the organism and its environment."
>
> ..... (Hart and Moore, 1973, p.255).

Werner, when discussing spatial concept development, sees space as one aspect of the child's consciousness of his body. Initially the child perceives space as ending at the periphery of its body. Experience of space, therefore, is very limited. Werner calls this limited experience

of space primordial. As the child grows so primordial space gives way to a space-of-nearness. Body space is differentiated from the space around it. From this point in the developmental sequence, "space continually expands into more and more distant regions" (Werner, 1965, p.173).

Viewing spatial concept formation in the light of his three progressions and five polarities of development, Werner states the following general propositions concerning ontogenetic development. First, from birth to the age of 6 months the child learns to differentiate its body from the environment around it. This step allows the child to see itself as separate from objects around it which it can reach out and touch. Later far-space perception occurs which is a move from action in primordial space to space-of-nearness.

Second, the child becomes more active in his behaviour towards the environment. Werner argues that "space is given to the young child primarily as a personal space of action" (1965, p.173). Instead of being a passive agent in the environment, he or she becomes more and more active. The child interacts with the environment so as to achieve its personal ends. During this period specific areas and objects are not connected together. Werner notes that

> "a child may be able to orientate himself perfectly well so long as he (or she) can carry out a familiar sequence of movement, but be quite lost if he has to start from some new point of departure." ..... (1965, p.176).

Third, between the age of two and eight the child moves away from an egocentric outlook. It is no longer mentally tied to the perception of the physical environment around about. There is a change from irreversibility to reversibility of situations and the child is able to view objects in space from different viewpoints. Werner uses the development of the child's notion of left and right to demonstrate the change in spatial development. He states that at the age of approximately eight, children acquire the ability to distinguish between the left and right sides of other persons. Werner argues that the ability to reverse positions demonstrates a break from the egocentric past.

Finally, the child outgrows its concrete relationship with objects in space and adopts an abstract relationship in which symbolic thinking

plays a role. Once abstraction has taken place individuals carry a mental concept of spatial relationships around with them. This allows them to make sense of differing spatial situations in a complex material environment. For example, the comprehension of models of urban structure allows one to make generalisations about different cities.

Werner's theory of spatial concept development proposes that the child develops from egocentrism to perspectivism over a number of years. Spatial concept development is a long process and as such is a long-term learning situation in which the individual interacts with the environment in both formal and informal learning situations. The importance of activity in space is stressed. This should be born in mind by geographic educators when formal learning programmes are designed.

Werner, like Piaget, is often criticised for suggesting ages during which different stages of development will occur. However, these age divisions are not exclusive and should not be seen as absolute. What is important is the sequence of the stages rather than the exact age at which each is accomplished, as well as the change in mental outlook which accompanies them. Werner states

> "these age levels must not, of course, be taken as an absolute ... What we are interested in, however, is the succession of steps which reveal a steady development of spatial ideas characterised by an increasing separation of ego and object." .... (1965, p.174).

Hart and Moore reinforce this point when they argue that "these ages should only serve as very rough guideposts " (1973, p.254). However, for educators it is important that a rough indication is obtained of what the child is capable of understanding at different class standards. Without the availability and use of such a guide, curriculum planning and effective teaching methods would become a hit-and-miss affair. Although it is realised that within each standard individual differences will be found, a class or standard average as regards spatial concept formation can reasonably be assumed for planning purposes.

Werner's organismic-developmental theory has much in common with Piaget's equilibration theory of child development, which will be reviewed below. Piaget, however, is more concerned with the ontogenetic process of spatial concept development and is more experimental in his approach,

which has enabled educationalists to apply his theories to the school situation. Werner, on the other hand, has concerned himself with the pathological uses of his theory rather than the value of the theory to educationalists.

3. PIAGET AND STAGES OF SPATIAL CONCEPT DEVELOPMENT.

Jean Piaget is undoubtedly the most famous and influential theorist in the field of cognitive growth. His research into the cognitive development of children has had a great impact in the field of education. Piagetian theory has been used to form the basis for curriculum planning and to indicate successful teaching methods in the classroom. His research into concept development has been extensive and includes the consideration of "The child's conception of geometry" (Piaget, Inhelder and Szeminska, 1960), "The moral judgement of the child" (Piaget, 1977), "The child's conception of the world" (Piaget, 1977), "The psychology of the child" (Piaget and Inhelder, 1969), and, most importantly for this thesis, "The child's conception of space" (Piaget and Inhelder, 1963).

According to Hart and Moore, Piaget's work is, "due to its complexity, thoroughness and prolific output, almost impossible to summarise " (1973, p.258). The brief discussion which follows cannot, therefore, do justice to his work and serves only to highlight those ideas which are felt to be of relevance to the teaching of geography.

Development, according to Piaget, is different from learning. He defines development as "a process which concerns the totality of the structures of knowledge" (Piaget, 1972, p.38), whereas learning "is provoked by situations... it is provoked, in general, as opposed to spontaneous " (Piaget, 1972, p.38). Development occurs as the organism interacts with the environment. Piaget argues that this process takes place in a series of equilibrations. He sees equilibration as "a process of self-regulation," which "takes the form of a succession of levels of equilibrium..." (Piaget, 1972, p.42). The levels are arranged in a sequence.

> "It is not possible to reach the second level unless equilibrium has been reached at the first level, and the equilibrium of the third level only becomes possible when the equilibrium of the second level has been reached, and so forth." .... (Piaget, 1972, p.42).

The child's interaction with the environment is of crucial importance during concept formation as it causes the organism to adjust itself constantly in relation to external perceptions. During the process of equilibration two functional invariants, adaption and accommodation, play an important part. According to Piaget "the motivation for all biological and psychological development is adaption " (Hart and Moore, 1973, p.258). Adaption is the process which leads the organism to higher functions of behaviour. As development occurs so there is an increase in means-end behaviour in the organism. The number of means available to achieve a given end increases. As the variety of means increases with development, so the organism is able to successfully interact with the environment.

As the child interacts with the environment, Piaget sees learning taking place through the processes of assimilation and accommodation. Assimilation is "the integration of any sort of reality into a structure " (Piaget, 1972, p.46). Assimilation precedes accommodation, which is the readjustment of the organism to the external world. In the learning situation assimilation involves activity on the part of the child, whereas accommodation is the result of the activity.

Piaget stresses the importance of activity on the part of the child if learning is to take place. Speaking at a child-development conference he stated that

> "My remarks today represent the child and the learning subject as active. Learning is possible only when there is active assimilation..... All the emphasis is placed on the activity of the subject himself, and I think that without this activity there is no possible didactic or pedagogy which significantly transforms the subject." ..... (Piaget, 1972, p.46).

As a proponent of the child-centred teaching approach, Piaget disagrees with learning theories which view the child as a sponge which absorbs knowledge passively.

In his research on child development Piaget has concerned himself largely with the understanding of operations which are structured to support the development of knowledge. Operations are concerned with the rules and laws that govern the way in which mental activity occurs as the child develops In "Development and Learning", (Piaget, 1972, pp.36 - 46), Piaget stresses

the importance of operations in the formation of knowledge. He argues that

> "knowledge is not a copy of reality. To know an object, to know an event, is not simply to look at it and make a mental copy or image of it. To know an object is to act on it..... An operation is thus the essence of knowledge; it is an interiorised action which modifies the object of knowledge.. it is a reversible action; that is, it can take place from both directions, for instance adding or subtracting, joining or separating. Above all an operation is never isolated. It is always linked to other operations, and as a result it is always part of a total structure."

Operations result as the organism adapts to changing environmental situations and perceptions, during the process of assimilation and accommodation. In his theory of child-development, Piaget isolates four general stages in the ontogenetic development of the child. These are the sensorimotor, preoperational, concrete operational and formal operational stages. These general stages of development need to be discussed as they form the framework upon which all Piaget's theories are based.

(a) <u>General Stages of Development</u>.

The sensorimotor stage, according to Piaget, takes place between birth and two years. From the moment of birth there is a gradual change from reflex to co-ordinate behaviour. The child's thoughts are tied to its actions and there is no evidence of internalised representation. This stage of development is marked by the process of object identification and permanency. The ability to identify an object and view it as a stable entity comes about as a result of the infant's interaction with the environment and the resulting process of assimilation, accommodation and adaption. Once the child is able to think of an object without seeing or touching it, the pre-operational stage of development has been reached.

The pre-operational stage occurs at about two years and normally continues until the child reaches the age of seven. During this stage the child develops its sensory co-ordination. Symbolic thought gradually evolves and the child is able to contemplate its actions mentally. Egocentric thought is the dominant determinant of behaviour. As a result the child's image symbols are a collection of actions, objects and events, which

are related in an egocentric manner. Space is embodied in the shape of things, in nearness, separation, enclosure and continuity; objects are not recognised from a different viewpoint even if the child has an incomplete sensorimotor experience of it. This stage is seen to be complete when "a type of loose reversibility develops " (Hart and Moore, 1971, p.260). However, the child still

> "fails to see the necessity of justifying assumptions, has difficulty in decentering from one aspect of a situation, and focuses on particular states rather than transformations."
> ..... (Hart and Moore, 1971, p.260).

Between the ages of seven and twelve the child proceeds through the stage of concrete-operations. Actions are gradually performed mentally before attempted physically. Behaviour is derived originally from physical actions in the environment which now become internalised. Reversibility of actions and conservation occur. By the time the child reaches the end of this stage it is able to link statements of the type "A = B = C, therefore A = C." The child's relationship with the environment is one of accurate observation and experimentation.

The formal operational stage is reached after the age of twelve. As a result of past experiences of the environment, gained during experimentation in the concrete-operational period, a reorganising of knowledge takes place. Thought and behaviour are no longer egocentric in character. The outcome of a situation is viewed in an open-ended as opposed to a closed manner. There is the ability to reverse thought processes. Propositional thought (if-then) and deductive strategy mark the thought behaviour of the child at this stage.

In the creation of these stages Piaget "utilises two general and four specific criteria " (Hart and Moore, 1971, p.259). The two general processes which occur are hierarchization (fixed order of development through the stages) and equilibration. In order to classify behaviour into the four stages Piaget has invoked the specific criteria of qualitative differentiation, integration, consolidation and co-ordination. (Hart and Moore, 1971, p.259). The major changes in behaviour at each stage of development result because of interaction between the individual and the environment. Piaget argues that cognitive development limits what the child is able to comprehend at different ages. It is this belief (which

stresses the importance of maturation) which has brought him into conflict with other psychologists such as Bruner, who contend that the process of concept development is not constrained by the age of the child.

(b) Stages and the Spatial Concept Development of the Child.

Piaget's theory regarding spatial concept development needs to be viewed in the light of his general theory of development. It will be recalled that Piaget argues that spatial concept development occurs in four stages and is a result of the processes of adaption, assimilation and accommodation. In "The Child's Concept of Space" (1963) published jointly with Barbel Inhelder, Piaget describes in detail his research on spatial development. Hart and Moore (1971[3]) in their review of this work have stated that there are four general conclusions which arise from the research. First, the representation of space arises from the co-ordination and internalisation of actions. Second, the genesis of the image arises from the internalisation of deferred imitations. Third, there are four levels or structures of spatial organisation: sensorimotor, preoperational, concrete operational, and formal operational space. Finally, there are three classes of specific spatial relations which form the content of spatial cognition: topological, projective and euclidean.

In their comprehensive review of Piaget's work on spatial concept development Hart and Moore divide the research into the structure and content of space. The structure of space deals with the levels of spatial organisation and the content of space with the specific spatial relations which are constructed. This helpful organisational framework will be used below.

(c) Levels of Spatial Organisation.

(i) Sensorimotor Behaviour

The levels of spatial organisation are, as previously stated, sensorimotor space, preoperational space, concrete operational space and formal operational space. During the first part of sensorimotor space the child learns about proximity, separation, order, enclosure and continuity. These concepts are learned by means of the child's perception. For the child to proceed successfully through the sensorimotor stage it must develop the genesis of the image, object permanence, movement in co-ordinated space and

the internalisation of thought patterns. According to Piaget and Inhelder (1963) the genesis of the image arises from the internalisation of deferred imitations. Hart and Moore (1973) express it thus:

> "Initially, the sensorimotor child copies or imitates other people's actions. Subsequently, as this imitation schema is internalised, and hence able to be deferred, the response becomes symbolic." ..... (p.261).

The development of object permanence is easily observed in the young child. 'Peek-a-boo' type games, which often elicit a smile, derive their success from the fact that for the child at this stage the hidden object ceases to exist. The face hidden behind a cushion is continually appearing and vanishing to the child. Gradually the child realises that hidden objects do exist even though they may be obscured from view, a lesson learned through the handling of objects.

> "An object passed from one hand to the other, turned over in all directions, touched at the same time it is looked at, is from a spatial point of view an entirely different thing from the same object seen from a distance, or merely touched without being seen." ..... (Piaget, 1963, p.10).

Because of the child's active participation in its environment, object permanence is learned.

For a while after birth the child operates in a series of separate spaces. These are the postural, buccal, tactile, auditory and visual-perceptual spaces. Piaget and Inhelder feel that the first two stages of development are marked by an absence of co-ordination between the various sensory spaces. There is a lack of co-ordination between vision and grasping (Piaget, 1963).

Gradually the child co-ordinates its view of these spaces and is able to perceive them as interrelated. As a result of this process "the child is able to move freely and confidently through a limited spatial terrain " (Hart and Moore, 1973, p.262).

Before a child moves from the sensorimotor to the pre-operational stage, it must be able to disassociate its thoughts from its own behaviour in space. The child has to learn to internalise its thought patterns as regards motor schemas in space.

The sensorimotor period ends when the child is able for the first time to delay imitation due to the ability to create a mental image (Piaget, 1963). The genesis of the image at this stage is of vital importance for the future development of spatial concepts. Up to this time the child is capable of observing objects but now it starts to think about them. From this time on until the child reaches the stage of formal operations, there is a narrowing gap between the ability to perceive an object and the ability to develop a concept of it. Perception of the environment is more advanced than conceptions about it.

(ii) Pre-operational Behaviour

During Piaget's pre-operational stage the child builds on its experience gained during the sensorimotor period of development. The period of pre operational spatial behaviour occurs between the ages of two and seven and is seen by Piaget to consist of the two sub-stages of symbolic and pre-conceptual thought. Cognitive patterns and therefore behaviour in space during these stages are egocentric in nature and are tied to the child's concrete experience of the environment around it. Hart and Moore state that

> "although certain rudimentary and isolated transformations can be performed, the representation of space is essentially static and not immediately co-ordinated into a reversible structure." ..... (1973, p.263).

The child is still tied in its thought process to its experiences in the environment although towards the end of the pre-operational stage it becomes less egocentric.

(iii) Concrete Operational Behaviour

Piaget's third stage of spatial organisation, the concrete operational stage, is divided into two sub-stages, i.e., the appearance of concrei operations and the organisation of operations into logical structures. Concrete operations are reached when the child is about seven years old and are completed at the age of eleven or twelve. Around the age of eight "the single major developmental change in spatial imagery occurs " (Hardwick, McIntyre and Pick, 1976, p.5). About this age the child starts to free itself from its previous egocentric viewpoint and behaviour and "de-centers" with the result that space can be viewed from other viewpoints. According

to Hardwick et al

> "spatial images become flexible. They become capable of anticipating and reproducing both physical movements and imaginary transformations of present reality. Prior to this point in the child's development, spatial images are static: that is, they are capable of representing non-movement only." ..... (1976, p.5).

By the end of this stage the child is able to abstract to a large degree, due to its experience in the environment and its increasing ability to co-ordinate "space from multiple viewpoints " (Hart and Moore, 1973, p.263).

(iv) Formal Operational Behaviour

The final stage, that of formal operational space, is reached when the child is freed entirely from egocentric thought patterns and can view space in an abstract manner without any concrete restraints. From this point on, "spatial operations can be completely removed from real action, objects, or space " (Hart and Moore, 1973, p.263).

(d) Construction of Spatial Relationships.

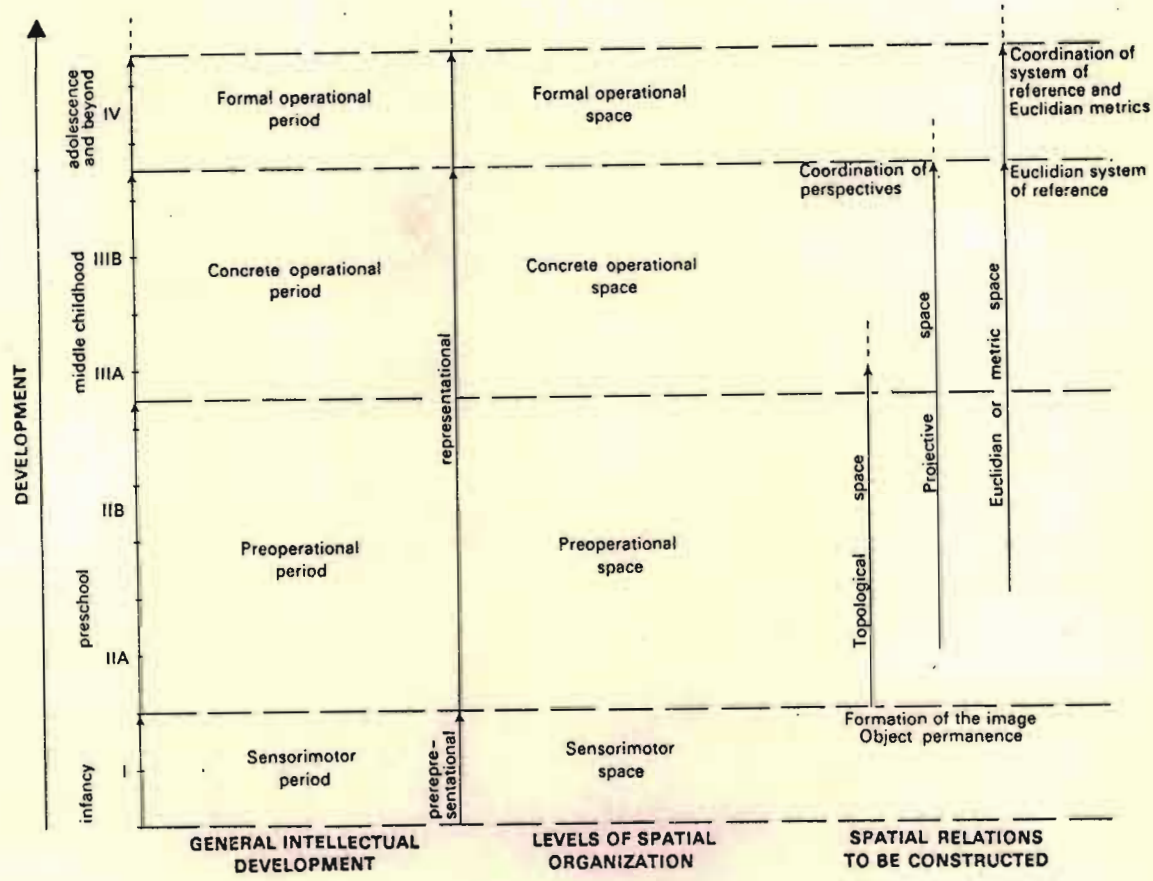
As the child progresses through Piaget's stages of spatial concept development, it learns to master topological, projective and euclidean spatial relationships. Hart and Moore (1973) define the properties of these spaces as follows :

> "Topological properties are simple qualitative relations like proximity and separation, open and closed, which remain invariant under continuous deformations excluding tears or overlaps. Projective properties are relations in terms of a particular perspective or point of view, such as a straight line, triangle or parallel lines which remain invariant under projective or perspective transformations. Euclidean or metric properties of space are relations in a system of axes or co-ordinates whose equivalence depends on mathematical-geometric equality; for example, an angle, an equal interval, or a distance." ..... (p.263 - 64).

Figure 2.1. relates these spatial relationships with the development

of the child. The figure shows that there is a sequence in the development of spatial relationships, with topological space evolving first, projective space second, and euclidean space third.

FIGURE 2.1. SCHEMATIC REPRESENTATION OF PIAGET'S THEORY OF THE DEVELOPMENT OF SPATIAL COGNITION IN RELATION TO OVERALL INTELLECTUAL DEVELOPMENT.



(Hart and Moore, 1973, p.265).

Piaget and Inhelder (1963) constructed a test to demonstrate the sequence of development between these spatial relations. Using a set of variously-shaped objects children of different ages were asked to identify them by means of tactile stimulation in the absence of visual stimulus. The shapes were felt and the child was asked "to name the object or shape - to identify it among a visible collection or set of drawings or to draw the object it had felt " (Holloway, 1967, p.4). By observing the childrens' responses, Piaget and Inhelder were able to conclude that understanding of topological, projective and euclidean space does not develop at the same rate: the process is staggered. Three stages were identified in the process of spatial relations development. The first was the recognition of familiar

objects and topological shapes but not euclidean ones. The second stage showed the progressive recognition of euclidean shapes and the third was the stage of operational co-ordination where the understanding of the three types of space was complete. Piaget and Inhelder (1963) note that "the construction of space begins on the perceptual level and continues on the representational one " (p.38). In the first stage "the only shapes which are recognised and drawn are closed, rounded shapes and those based on simple topological relations " (Piaget and Inhelder, 1956, p.43). In stage two the child begins to recognise euclidean shapes and in the final stage

> "the connection between shapes and co-ordinated actions becomes clearly apparent in that the return to a fixed point of reference which is necessary to their conceptualisation is equally necessary to their recognition and representation.
>
> ..... (Piaget and Inhelder, 1963, p.43).

Holloway (1967) in a discussion of the acquisition of spatial relations remarks that "the abstraction of shape is achieved on the basis of the co-ordination of the child's actions and not, or at least not solely, from the object direct " (p.8). The child must therefore play an active role in the environment if it is to identify correct spatial relationships.

Piaget and Inhelder (1956) devised simple tests to examine how children developed their understanding of topological, projective and euclidean space.

(e) Development of Topological Space.

In the case of topological space development, Piaget and Inhelder used three tests to show how the child's concept was formed. These tests were concerned with linear and circular order, the study of knots and the relationship of surrounding, and the idea of points and continuity. The research findings indicated that "not until the appearance of concrete operations are notions of proximity, separation, between, and order clearly formed " (Hart and Moore, 1973, p.264). The understanding of topological relationships of proximity, separation and order result from the child's activity in the environment. Holloway, (1967) commenting on the development of topological relationships says

> "order is abstracted through the increasing co-ordination of actions

such as transferring and replacing, step by step and piece by piece. It is the result of reconstructing the object through ordered actions and not a directly abstracted quality." ..... (1967, p.17).

At the end of the topological stage of development the child comprehends the concept of continuity and moves on to an understanding of projective space.

(f) Development of Projective Space.

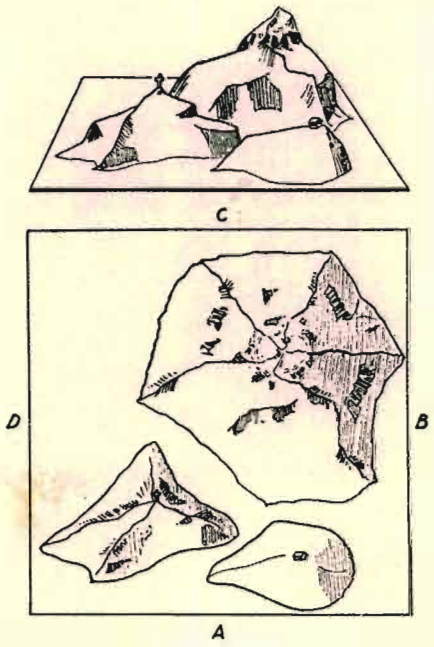
Piaget and Inhelder's research into the development of projective space concerned itself with the projection of lines and perspectives, the projection of shadows, the co-ordination of perspectives, geometrical sections and the rotation and development of surfaces. Projective structures are not as easily formed as are topological ones. They are more complex and involve the conservation of straight lines, angles, curves and distances. Holloway states that

"projective space begins psychologically when the object or pattern is no longer viewed in isolation but begins to be thought of in relation to a point of view ... It is concerned with the inter-co-ordination of objects separated in space rather than the analysis of isolated objects."
..... (1967, p.28).

During the formation of projective spatial structures the child learns to de-center further from its egocentric outlook to one of perspectivism.

One experiment used by Piaget and Inhelder to show the development of co-ordination of perspectives illustrated the process of change from egocentrism to perspectivism very clearly. A model of three different coloured mountains was constructed. Each mountain differed from the others not only in colour but in size and the features located on it. (See Figure 2.2.) Children were placed in front of the model at position A. A small doll was placed alternately at positions A, B, C and D. The children were asked to select from a set of pictures the view that best fitted that of the doll. This experiment was concerned with tracing "the child's developing awareness of his own viewpoint and its relation to others " (Holloway, 1967, p.41).

FIGURE 2.2. THE THREE MOUNTAINS.



(The Child's Concept of Space, p.211).

As this experiment is utilised later in this thesis the results which Piaget found are of importance and will be expanded on in more detail in Chapter 4. Briefly, the results were as follows. Below the age of two years, children were unable to comprehend the questions asked and as a result could not participate in the experiment. From the age of two the child's viewpoint is bound by its own egocentric thought pattern. A child at this stage will choose its own view of the model, as representing that of the doll's, no matter where the doll is placed. The child fails to discern that its view and the doll's is different. At this stage Piaget has found that the child is unable to draw objects according to perspectives. "It is only when he becomes aware of his own viewpoint as being one among many that he is able to indicate it by specifically projective relationships " (Holloway, 1967, p.43). Gradually the child attempts to break away from its egocentrism but cannot accomplish this completely. Piaget and Inhelder note that

> "the child can only discover his own viewpoint as he becomes able to envisage those of other observers. This is why the discovery of perspective is equally difficult when he deals with objects as they appear to him and when he deals with the same objects as perceived by other observers." .... (Piaget & Inhelder, 1963, p.243).

Piaget and Inhelder found that between the ages of seven and nine, there is a dualism in the child's choice of the doll's viewpoint. Some of the pictures chosen were correct while others were not. Often the perception of depth was correctly gauged but the concept of left and right was confused. At the age of nine or ten, children found it easier to construct a viewpoint seen by the doll rather than choosing a picture. The active construction of a viewpoint allows the child to participate in the doll's image, i.e., the child is able to 'place' itself in the doll's position and thereby transfer the doll's view to its own. From this point in development the child's thought gradually starts to break away from its egocentric position. Holloway states that

> "there is now for the child only one position corresponding to a given picture. This indicates the existence of a completed operational schema of the structure, from which other viewpoints are reconstructed intellectually. ..... (1967, p.45).

(g) Development of euclidean space.

From their research involving the conservation of parallels, the discovery of proportion and conservation of angles, and the development of a simple co-ordinate system of reference needed to construct horizontal and vertical axes, Piaget and Inhelder have proposed a series of transitional stages leading from projective space to an understanding of euclidean space (1963, p.301). One of the experiments used by Piaget and Inhelder to show the change from projective to euclidean spatial perception, involved the solution of problems concerned with the construction of a topographical schema. A layout of a model village was used. The first problem involved the use of two identical models. One model was turned through 180^{o} relative to the other. The child was required to place a doll in the same position on one model as where the researcher placed his on the other. The second problem involved the child in the layout of a model village. Children were shown the model and were asked to draw it from a particular viewpoint. They were also asked to reproduce the model with the aid of similar objects. The sketching of the model village entailed

> "the selection of a particular point of view; a system of co-ordinates along with the implied concepts of straight lines, parallels and angles; reduction to a specific scale, which

entails the concepts of similarity and proportion."

..... (Holloway, 1967, p.71).

The sketching exercise therefore incorporates all the skills and concepts discussed by Piaget and Inhelder as being necessary for abstract thought. The research results showed how the child's concept of space progresses through topological, projective and euclidean stages. By the age of twelve the child has a concept of a "co-ordinated reference system which takes into account the additional projective and euclidean relations of proportional reduction to scale, accuracy of distance and metric co-ordinates " (Hart and Moore, 1973, p.268). Although concepts involving projective and euclidean space start to develop during the concrete stage of development, it is not until the child is able to co-ordinate these concepts into a stable system of reference, that true abstract thought becomes possible.

(h) An Evaluation of Piaget's Research.

Having briefly reviewed some of Piaget's work in child development it is pertinent at this point to consider some of the views of those who do not agree with his research findings and theories.

Although Piaget's research into cognitive development has dominated this area of psychology for well on 30 years, it has not been without its critics.

Criticisms levelled at Piaget's work include

"such issues as whether concrete and formal operational thought can be explained by a single mechanism, its failure to consider the meaning of the task for the child, his familiarity with its contents, his perceptions of the goal and even the social ambience of the task situation; and more generally the inappropriateness of propositional logic to model human thinking."

..... (Lovell, 1979, p.104).

A major criticism of Piaget's work has centred around the validity of the concept of stages and the way in which they have formed the basis for curriculum planning in the schools.

Three major areas of criticism are pertinent in this thesis. These

are Piaget's concept of stage, his research methodology and the problems involved with application of his theory to education.

(i) The Concept of Stage.

Piaget's theory of concept formation is intricately linked to the notion that children pass through a series of predetermined stages of development which are characterised by certain behaviours and ways of thinking. These stages can be identified by means of tests which demonstrate particular ways of thinking. Criticism of the use of stages in developmental psychology stems, to some extent, from a misinterpretation of the use of the concept. Piaget and others who have utilised the concept of stages have done so largely as a result of the framework it provides for the discussion about changes in childrens' cognitions. If a stage is viewed in a concrete manner, i.e., the exact age at which a child should change from one way of thinking to another, then very real problems will be encountered as this viewpoint can easily be disproved empirically. Although Piaget has been criticised for the use of stages, this criticism is not altogether valid. Stages, as proposed by him, are not to be viewed in a concrete manner. Rather, they should be seen as a structuring device within which the changes in modes of thought can be examined. It is important, therefore, when discussing Piaget's stages of development, to beware of taking the age levels too seriously especially when attempting to use his theory in the formulation of school curricula.

(ii) Methodology.

The assumptions underlying Piaget's research methodology have been discussed fully by Driver (1978) who criticises Piaget on the following grounds:-

1. The a priori approach to his research. Driver comments that "experiments performed in Geneva are selected and shaped to reflect the underlying structures being studied, as opposed to possibly putting their existence to the test."

..... (1978, p.56).

2. Data from the research are "reported in a selective way so that they are shown to be consonant with the theory" (Driver, 1978, p. 56). Normally data are presented in dialogue form with

comment on the subject's reactions to a particular test. This approach makes it difficult to compare the results of duplicate research. There is no doubt that a more quantitative approach to the research would have been more useful to subsequent researchers. This fact is discussed in more detail later in this thesis.

3. Much of the enthusiasm for Piaget's work has resulted from the similar results obtained by corroborative research. However, Driver feels that it is as a result of following Piaget's procedure that similar findings have been advanced. The methodology, she claims, is largely responsible for the results. Instead of asking "the more open-ended question 'what structures of thought do the children use to handle problem situations?" (Driver, 1978, p.56), researchers ask the question "do the children have a certain cognitive structure?" (p.56). This leads to the checking of Piaget's structures and whether they appear at the ages he says they should, rather than questioning the kinds of structures children utilise in cognitive development. Driver asks "Are we not defining the possible responses by the inherent structure in the tasks?" (1978, p.56).

4. Piaget's choice of subjects for his tests have also come under criticism. The sampling technique used is open to criticism as it is based upon the assumption that there are universal structures of thought and therefore strict sampling of children from different backgrounds would not alter the overall results. Although replication studies have tested Piaget's results in many different cultures and obtained similar results, the fact remains "that documenting variability is not his concern " (Driver, 1978, p.57).

Problems involving Piaget's methodology, although serious, have not done much harm to his research findings. However, when dealing with his theories it must be born in mind that his ideas have been based on subjective insights, gained by research on a less than universal sample group of subjects. Due to the presentation of his research results, duplication studies are not easy to undertake as he describes his method-

ology in an imprecise manner. This problem was encountered during research in this thesis when Piaget's test for perspectives was duplicated.

(iii) Problems of Application.

Driver (1978) has identified the major problems of application as being those concerning :-

1. Problems of specifying formal level thinking: is it an entity or a collection of skills?

2. Problems in analysis of the conceptual demands of subject areas.

3. The dependence of thinking skills on the context of the task.

4. Influence of Piagetian structures on curriculum.

The conclusion Driver (1978) reaches is that the danger of Piagetian theory "is to assume that the only structures of thought necessary to develop are those discussed by Piaget" (Driver, 1978, p.59). If this occurs the case can arise in which the importance of the psychological process of thought is placed above that of the desires of the school subject curriculum. The important point to note, therefore, is that due to the questionable validity of Piaget's research, curriculum planners should take the needs of the discipline concerned and interpret these in a manner linked to the child's way of thinking at a certain age, rather than trying to mould the syllabus into a prescribed psychological framework based on the child's logical processes of thought.

From discussion about the many criticisms of Piaget's work the impression may be gained that these necessarily negate his research and theories. This, however, is not the case. Critics of Piaget are often at pains to point out the positive aspects of his work. The majority of critics agree with his findings but disagree with the emphasis that is placed on the testing for levels of thought. Rather, as Driver indicates, it would be preferable to see more weight placed

"on the need for diagnosing problems in specific content areas, and in particular for teachers to be their own diagnosticians:

> to be aware that part of their teaching function is to understand how a pupil interprets a situation in order to lead him or her to a fuller or different understanding."
>
> ..... (1978, p.60).

To conclude this brief discussion of criticism of Piaget's work it is appropriate to quote the words of the critic whose article has formed the basis for the discussion. "Many initially sceptical researchers have found that Piaget's experiments have given repeatable results" (Driver, 1978, p.59). Lovell sums up the general feeling one gains when reading the many articles and books on Piaget's work when he says

> "if the stature of a man is measured by the amount of research his theory generates, then to historians of developmental psychology he will appear a giant, in spite of the fact that some of his ideas will have to be dropped or amended."
>
> ..... (Lovell, 1979, p.104).

4. BRUNER AND THE CONCEPTUAL GROWTH OF THE CHILD.

Apart from Piaget, the theorist who has had the greatest influence on educational views concerning concept formation is J.S. Bruner. His theory of concept development differs from those of Werner and Piaget in that he opposes the notion that rigid stages of development occur at specific ages.

Bruner uses the terms 'enactive, iconic and symbolic' to describe the development of cognitive growth in the child. These levels of thinking occur as the child learns to represent its experience of the world and organise its knowledge for future use. The enactive period is one where "the child's world is known to him, principally by the habitual actions he uses for coping with it" (Bruner, 1966, p.1). This period parallels Piaget's sensorimotor and concrete stages of development discussed earlier in this thesis. Iconic representation occurs with development of imagery which is relatively free from action. Gradually symbolic thought emerges as the child translates action and image into language. (Bruner, 1966, pp.1 - 6). Children learn about the world through action, image and symbol. The three modes of representation work together to form concepts. Concept growth and problem-solving strategies occur when there is disequilibrium between

any two modes of representation; between what one sees, for example, and how one describes the sight by means of language. Bruner remarks that "the three representational systems are parallel and each is unique, but all are also capable of partial translation, one into another" (Bruner, 1966, p.11).

Enactive representation occurs from the first day of birth and is a result of the interaction between the child and the environment, mainly through visual stimulation. The requirements of action are related to the property of the visual field (Bruner, 1966, p.16). Bruner explains that the concept of object permanence results in the child perceiving that the world has objects in it which are independent of actions taken towards them. This viewpoint is shared by Piaget. Bruner does, however, feel that Piaget's observations on the separation of action and perception are interesting but not explanatory. "His theoretical account is so far removed from the specifics of the behaviour he describes, that one is again left without a sense of detailed explanation " (Bruner, 1966, p.17). Bruner feels that the separation is achieved

> "by a shift from response learning to place learning - in effect, the placing of the behaviour in a spatial context or layout that makes possible its organisation in more flexible ways, notably by making possible detours and substitutions to meet changed conditions." ..... (1966, p.18).

The process of abstraction from the environment is a slow one and even when the child is able to think in action-free images it does, in certain situations, rely on enactive representation. Werner has gone so far as to suggest that the separation between image and perception is never complete (Werner, 1965). However, by the age of two, the child can represent the world by means of images and its thought processes are relatively free from action in space. At this point the child is seen to enter the stage of iconic representation. Manipulation of objects must still, according to Bruner, form an important aid to imagery (Bruner, 1966, p.21).

Iconic representation "bridges the gap between the rigid serial representation of earlier enactive representation and the language-saturated phase of later childhood " (Bruner, 1966, p.28). For symbolic representation to occur it is necessary that the child, through interaction with its environment, learns to progressively distance itself from its concrete perceptions of the environment. During this period Bruner concurs with

Piaget's view concerning the basic egocentric outlook of the child at this age as discussed previously in the thesis. He states:

> "He, himself, is at the origin of all the co-ordinate systems that order his perceptual fields, and he cannot appreciate other origins. Taking a view external to himself is as difficult for him socially as it is perceptually and intellectually."
>
> ..... (Bruner, 1966, p.26).

The child is easily distracted and thoughts are connected to experiences in the environment by means of a matching process in which sensory correspondence plays a major part. Bruner notes that

> "it is only when he can go beyond this 'match by correspondence' that he comes to deal with such sensory ideas as the relations between quantities, invariance across transformations, and substitutability within a conceptual category."
>
> ..... (Bruner, 1966, p.29).

Symbolic representation occurs when the child is able to divorce itself from the environment and think in abstract symbols. Language plays an important role at this stage since concepts are built on words. Bruner states that

> "we take the view that symbolic representation stems from a form of primitive and innate symbolic activity that, through acculturation gradually became specialised into different systems. The most specialised natural system of symbolic activity is, of course, language " (Bruner, 1966, p.30).

Language which enables symbolic representation to occur is a "powerful tool for thinking or problem solving " (Bruner, 1966, p.37). Words enable one to disassociate oneself from the immediate perceived environment. Thus abstract thinking can occur because words generate images. Bruner gives the example of this process at work when he mentions the case of a child wondering what the world would be like without apples after having just eaten one. Through symbolic representation the child is freed through the medium of language and the images it generates to construct and appreciate ideas which contradict the perceived environment. Once this occurs the child is able to think in abstract terms.

Bruner does not maintain that the three methods of representation follow one another in a process similar to Piaget's stages. Rather they are seen to interact with each other at the same time. For example, it has already been mentioned above that sensorimotor skills require the integration of action and sensory perception. Bruner states that the systems of representation can relate to each other in three main ways, i.e., by matching, mis-matching or by independence of each other (Bruner, 1966, p.49). Mis-matching between two modes of representation causes conflict which the organism has to deal with. It is through the process of conflict-solving that the child learns. Early on in the child's life independence characterises the systems of enactive and symbolic representation. However, as the child grows so its experience of the environment increases and language enables the matching of actions with words. Independence between the three modes of representation decreases as actions are organised in such a way that motor behaviour corresponds to words. "Where no such preliminary correspondence exists, there is an independence between the two systems, and we have the ubiquitous case of 'he who talks a better game than he plays' " (Bruner, 1966, p.55). Success in symbolic representation depends on the way in which behaviour has been brought into line with language needs.

The development of concepts, according to Bruner, occurs through the process of action, image and symbol. The child's behaviour and decision-making in the environment relies at different ages more upon one mode of representation than another. Eventually, however, the child is freed from its concrete relationship with the environment and is able, through language and resultant image, to think in terms of symbols.

Although Bruner's theory of concept development has areas of agreement with Piaget's theory, one basic difference emerges; this is the way in which each views the age at which different thought processes can occur. Piaget tends to advocate the notion that stages in concept development are more rigid than Bruner assumes. Bruner's viewpoint is summed up in his often quoted idea that 'the basic principles of any subject can be taught to any child in an intellectually honest form'. Bruner's theory stresses the environmental factor in development rather than the maturational one. Compared with Bruner, Piaget tends to stress the importance of maturation in the process of concept development. Therefore Bruner's theory leads one to the conclusion that concept development can be speeded up if learning situations are manipulated, whereas Piaget's does not.

Two geographers, Blaut and Stea, have undertaken research into spatial concept formation, the results of which tend to favour the views of Bruner. Their research and the way in which it relates to the theories of Piaget and Bruner will be discussed below.

5. THE RESEARCH OF BLAUT AND STEA.

Recently, two Geographers have produced research findings which give some insight into the ontogenetic development of cognitive representation. These findings are of value to geographic educators as they indicate, contrary to common thought, that cognitive spatial representation starts at a very early age, i.e., pre-school. Blaut and Stea's research findings have shown that pre-school children are able to understand and interpret aerial photographs. As a result of this they have concluded that "place learning occurs quite generally without formal schooling " (Blaut and Stea, 1971, p.226).

These researchers argue that place learning is a fundamental part of development of the child. To interact successfully with its environment the child must, early on in life, develop a cognitive map. This cognitive map has its origin, presumably, in the central nervous system and "enables the child to predict the environment which is too large to be perceived at once, and to establish a matrix of environmental experience into which a new experience can be integrated " (Blaut and Stea, 1971, p.228).

In two interesting articles "Studies in Geographic Learning" (1971) and "Mapping at the Age of Three" (1974), Blaut and Stea have shown that pre-literate children have developed cognitive mapping ability. By analysing children's understanding of aerial photographs and non-verbal analysis of concept formation by means of modelling techniques, they have concluded "that children in the population studied are able to represent a cognitive map in the form of a physical map at the age of three" (Blaut and Stea, 1974, p.7). However, it is stressed that the child is unable to verbalise the process involved and one must be cautious about research methods which rely heavily on verbal competence, i.e., Piaget's research. A major conclusion the researchers have arrived at is that "mapping is an essential part of human development and an important activity of pre-school children " (Blaut and Stea, 1971, p.88).

Blaut and Stea's research adds fuel to the debate about whether Piaget's or Bruner's theory of cognitive development should form the basis of educational practice. At first glance it would seem that the research bolsters Bruner's claim that the learning process can be speeded up. However, upon closer investigation it becomes apparent that the methodology used in the research relies totally on egocentric viewpoints and is therefore concrete in nature. The dilemma, therefore, still remains as to whether Piaget's stages of cognition culminating in abstract thought can be speeded up by manipulation of the learning environment. The research of Blaut and Stea therefore does not disprove Piaget's theory although it lends support to Bruner's contention that teachers can manipulate the learning environment so as to teach advanced concepts in a concrete manner.

In the following chapter an attempt is made to integrate the views of the two major theorists discussed, i.e., Piaget and Bruner, in order to identify guidelines that can be observed by geographic educators wishing to develop pupil learning of spatial concepts.

CHAPTER THREE

PIAGET AND BRUNER: GUIDELINES FOR THE TEACHING OF CONCEPTS IN SENIOR PRIMARY SCHOOL GEOGRAPHY

Having discussed research into concept formation in general, and spatial concept development in particular, it remains for an attempt to be made to extract the major ideas that are relevant to education in the field of primary school geography. This is a daunting task as Downs and Stea have pointed out when discussing the problems involved in comparing the work of the two major theorists, Piaget and Bruner, as "it is not always possible to determine precisely the points of agreement and disagreement in the two positions " (1977, p.206). Having studied the ideas and research of Piaget and Bruner one is left with the impression that although in many instances, their ideas overlap, the usage made of individually-coined terminology to describe concept development has made comparisons increasingly difficult. Piaget, as quoted by Downs and Stea, sums up the problem of comparing his ideas with those of Bruner: "I never understood Jerome Bruner and I don't think he ever understood me " (1977, p.207). Because of the confusion and controversy which await anyone who tries to compare and contrast the work of these two researchers, a more profitable approach would be to identify the effects which the application of their theories would have on the teaching of geography. An approach along these lines would allow one to skirt the theoretical points of apparent disagreement in favour of identifying how approaches to teaching of geography would be affected if one theory or the other were adhered to.

The two major ideas which stem from the work of Piaget and which relate to the teaching of spatial concepts in geography at the primary school level are as follows :-

1. A child's thinking develops in a distinct sequence of stages. Each stage is characterised by a different way of thinking (Downs and Stea, 1977, p.194).

2. Learning takes place through the process of assimilation and accommodation. Learning is thus dependent on the active interaction of the child with the environment. The implications

of this approach are expressed by Driver:

" the idea of learning as equilibration and the related idea of operation knowledge is a reminder that each learner has to think old thoughts anew and tread well-trodden paths again: that far from being a boring repetition this can be an interesting journey for each individual " (1978, p.60).

Most of the pupils at senior primary school are at the concrete stage of development which means they rely heavily on visual stimuli in the learning process. Hall (1976) observes that as a result of children being at the stage of concrete operational thought, curriculum planning has to be approached with care.

"Meteorological concepts of instability, pressure and even air mass would be inappropriate at the level of concrete operational thought.... Similarly, teaching the causes of the seasons, or attempting an analysis of world climates deductively, is quite foolish if children are still working at the concrete level." ..... (Hall, 1976, p.234).

It is necessary to note, however, that Hall's approach would not be shared by Bruner and is the type of reasoning which stems from Piaget's research. As mentioned previously, this type of thinking has been criticised (Driver, 1978). In the debate regarding the definition and value of stages it seems that the truth is best obtained by steering a middle course between those who adhere strictly to them and those that disregard them altogether. Lovell's feeling that "there can be no classroom practise which is specifically Piagetian" (1979, p.104) and Hall's statement that "all Piaget can do is to alert teachers in secondary schools to the fact that some children will be working within the confines of concrete experience throughout their schooling" (1976, p.236), express 'middle of the road' feelings about the use of Piagetian theory in the school situation. Teachers and curriculum planners should be aware of Piaget's stages and their implications but not allow them to totally dominate their approach to education.

The real value of Piaget's research has been to alert educationalists to the different ways in which children perceive their environments from the way in which adults do. At primary school level this has meant a movement away from teaching strategy where children are regarded as being passive

participants in the learning situation. Pupils today have to be actively involved if conceptual, as opposed to rote learning, is to occur. Resulting from the active involvement of children in the learning situation has come the emphasis on discovery methods of teaching, which allow children of differing abilities to realise their full learning potential. Piagetian research into concrete operational thinking has also encouraged the use of good audio-visual aids which enable pupils to experience foreign regions and people in a concrete manner.

Piagetian research into concrete operational thinking has encouraged educators to concentrate on the way in which concepts are taught to young pupils. As a result the use of audio-visual aids has increased in the classroom as teachers endeavour to create concrete learning situations for the pupils. Together with the emphasis on concrete learning situations has come the realisation that children are not to be regarded as passive recipients of knowledge. Pupils must be actively involved in the learning situation if assimilation and accommodation are to occur correctly. Discovery methods of learning have become important as the pupil is intimately involved in the process of learning. Hall, when discussing the way in which Piaget's theory has affected teaching remarks that "guided discovery, flexibility, experience as the initiation of problems raised in discussion and co-operative tasks, are the prerequisites of successful adolescent learning " (1976, p.237).

Perhaps the most important result of Piaget's research for geographical educators is that they have been provided with a series of tests which can be used to indicate the state of spatial concept development at different class levels. From this teaching methods and content matter can be suitably chosen so as to improve the learning of spatial concepts.

While Piaget's theory has had a marked influence on the approach to teaching at the school level this has, in many instances, been in relation to what should and should not be included in a curriculum depending upon the stage of development of the child. In this way teaching strategies are designed to conform to the stage of conceptual development of the child. Bruner's theory on the other hand, has led to a consideration of methods of teaching which will speed up the process of concept development.

The major idea which has emanated from Bruner's writings which

affect the teaching of geography is the part which instruction plays in the process of concept development. Whereas teaching strategy based on Piaget's ideas could be termed 'passive' in that it moulds itself around the thought processes of the child, Bruner's is 'active' as it endeavours to speed up the process of concept formation. As mentioned previously, this difference in teaching strategy stems directly from the different emphasis placed on maturation and environmental factors in concept development. Bruner views education as

> "a concern with intellectual growth where 'human beings go swiftly from a state of either helplessness to one of control', and instruction as concerned with the shaping of assistance of growth." ..... (Hall, 1976, p.237).

As discussed previously, Bruner feels that many of the skills taught at school depend largely on either enactive or iconic learning. Only a few require the interaction of enactive, iconic and symbolic thinking. At all three levels of thought instruction can be improved with the use of more precise language. Bruner, however, does not feel that efforts to improve the medium of instruction are all that is required to speed up the development of concepts. Concepts should be revisited by the pupils a few times as they progress through school. This contention has led to the adoption of a spiral curriculum plan in which central concepts are developed and refined year by year.

Bruner's ideas lead one to view the role of a teacher as a "props manager and consultant and not as expositor" (Hall, 1976, p.239). In this he has a similar approach to Piaget. However, he breaks the process of learning down further than Piaget when he suggests that as 'instructor' the teacher should approach concept development by first treating it in an enactive manner, second in an iconic manner and finally in a symbolic way.

In conclusion, the theories of Piaget and Bruner should affect the teaching of concepts in geography in the senior primary school in the following ways:-

1. Learning should occur as an active process in which the child participates through guided self discovery.

2. Learning programmes should be devised so that they take into account the developmental sequence of concept formation.

3. Teaching of concepts should be approached initially in such a way that concrete methods are used. Once these have been acquired, symbolic reasoning can be attempted. Attention must be paid to the way in which the teacher provides aids for the learning of concepts.

4. School curricula should be based on the spiral method to reinforce and refine concepts.

Later in this thesis these conclusions regarding the teaching of concrete concepts in geography together with other findings emanating from research into spatial concept development in the senior primary school will be employed to construct a conceptual framework for the teaching of mapwork.

In the following chapter research is undertaken to determine the level of spatial concept development of pupils in selected primary schools. Although, as has been pointed out above, Piaget's research can be criticised for many inadequacies it does provide a comparable minimal standard for assessing achievement which other research does not. Piaget's tests can be successfully duplicated and the results obtained compared with his original findings. For this reason research into the development of spatial concept development of primary school pupils in this thesis is based upon Piagetian research which enables comparisons to be drawn regarding the retardation or advancement of the pupils compared with Piaget's findings.

CHAPTER FOUR

THE STATE OF SPATIAL CONCEPT DEVELOPMENT AND MAPWORK TEACHING IN NATAL SENIOR PRIMARY SCHOOLS

INTRODUCTION TO THE STUDY.

The major aims of the applied research undertaken in this project are :-

1. to ascertain the state of spatial concept development amongst pupils in Natal senior primary schools, and

2. to determine the success of mapwork teaching in developing spatial concepts at the primary school level.

In order to measure pupils' spatial concept development, Piaget's test for perspectives was duplicated as accurately as possible. This test was chosen as it has been well documented and can be used to identify the complete range of spatial stages proposed by Piaget. Using an established test which has been duplicated by other research workers allows comparisons to be drawn between "normal" or established findings and the results obtained in the schools tested. To establish the part which mapwork teaching plays in the formation of spatial concepts, an exercise was devised which allowed pupils to exhibit the spatial ability they had acquired during mapwork lessons. Performance in the mapping test is intended, therefore, to indicate the spatial concepts which pupils have learned during formal geography lessons.

The specific aims of the research can be summarised as follows :-

1. To identify the stage of spatial concept development of pupils at different ages and standards during the senior primary phase of schooling. Once identified these results will be compared with the expected norms proposed by Piaget;

2. To establish whether or not there is any evidence of sex differences in ability to acquire and use spatial concepts;

3. To ascertain the success of mapwork lessons in the senior primary school as regards the formation of spatial concepts.

For the purpose of this research two senior primary schools were chosen. The schools to be used, due to time and cost factors, needed to be located in the vicinity of Pinetown. School A is a co-educational institution catering for pupils from Class 1 to Standard V. It has an intake of 528 pupils, all of whom are drawn from the surrounding residential area. The inhabitants of the catchment area could be classified as lower middle class in character, as the school is located in one of the older railway suburbs of Durban.

School B is also co-educational and caters for pupils from Standard II to Standard V. The intake is similar to that at School A (619) but the residential catchment area caters for a higher socio-economic class of inhabitant.

A sample of 210 pupils was chosen with an approximately equal number of males and females in each standard. (Table 4.1.). The reason for this was to enable the researcher to ascertain whether there were significant differences between the sexes in spatial concept development at different ages and standards.

TABLE 4.1. NUMBER OF MALE AND FEMALE PUPILS TESTED AT SCHOOLS A AND B

	Males	Females
School A	66	63
School B	44	37
TOTAL	110	100

As mentioned previously, two tests were carried out. Piaget's test of perspectives was duplicated to establish the state of pupils' spatial concept development, and a drawing test to ascertain the role mapwork teaching plays in the development of spatial concepts in the schools at present.

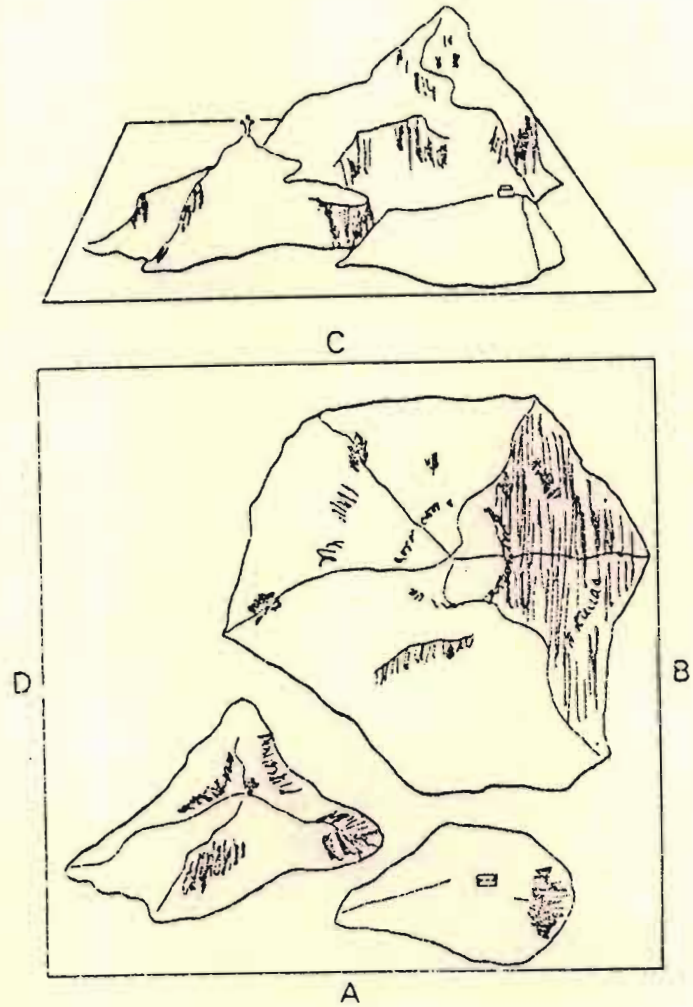
The test used to measure the stage of spatial concept development of the pupils was devised by Piaget to determine changes in children's views of perspective. The test has been discussed in detail earlier in the thesis. The purpose of the perspective test was

"to try and discover to what extent each child could appreciate

that people seeing the model from a different position from his own would perceive a view of the mountains that was different from the one he was seeing."

..... (Sime, 1973, p.31).

FIGURE 4.1. PIAGET'S THREE MOUNTAIN TEST MODEL.



(After Piaget and Inhelder, 1963.)

A model was constructed along the lines of Piaget's, consisting of three mountains. (See Figure 4.1. above.) As far as possible the model was an exact replica of that used by Piaget and described by him in "The Child's Concept of Space" (1963, p.211). A child sitting in front of the model would see, in the right foreground, the smallest mountain with a house on the top, while in the left middleground, a hill was situated with a cross on its summit. In the background the largest hill had a

mantle of snow covering its upper section. Each mountain was painted a different colour, i.e., brown, green and grey. The reference points which the children could use, then, were the house, cross, snowcap and different colour of each mountain.

In Piaget's classic experiment, children were shown ten pictures which represented the mountains seen from differing viewpoints around the model. Each picture showed the reference points clearly. They were also given three pieces of cardboard which represented the three mountains in colour and shape and these could be used to create views from differing vantage points around the model (Piaget, 1963, p.211).

Piaget used a small doll (2 or 3 cm. in height) which he placed in various positions around the model. The doll's function was to focus the children's attention on the view the doll would perceive from its location. The children did not move from their position in front of the model and had to reconstruct the doll's view mentally. Piaget explains the process involved thus :-

> "The child has the problem of trying to imagine, and to reconstruct by a process of inference, the changes in perspective that will accompany the doll's movements, or the different positions which the doll must occupy to suit the various perspectives."
>
> ..... (Piaget, 1963, pp. 211 - 212).

Three methods were employed for testing the children. First, cardboard replicas were used by the children to duplicate the view seen by the doll in different positions. Second, the pictures were presented to each child, who had to choose the one which best fitted the doll's view. Third, the child was given a picture and asked to place the doll in the position it would have to occupy to take a similar photograph (Piaget, 1963, p.212). In his research, Piaget used one hundred children, "21 between 4 and 6,6 years, 30 between 6,7 and 8 years, 33 between 8 and 9,6 years, and 16 between 9,7 and 12 years " (Piaget, 1963, p.212). Piaget's results can be summarised as follows :-

At first the children were found to be completely egocentric in their response to the tests. "The child distinguishes hardly or not at all between his own viewpoint and that of other observers represented by the doll in different positions" (Piaget, 1963, p.212). The child is seen to choose its

own view of the mountains regardless of the position of the doll. Later the child may attempt to break away from its egocentric viewpoint but is unable to do so. Evidence of this would be the random choice of pictures other than that representing its own viewpoint. This random choice would indicate that "so far as the child is concerned, all the pictures are equally suitable for all points of view, so long as they show three mountains" (Piaget, 1963, p.213). The child is unable to separate its own perspective from that of the doll.

By the age of 8 years, Piaget feels the child should be advancing towards a progressive discrimination and co-ordination of perspectives. Between the ages of 8 and 9 years "certain relationships are varied with changes in the position of the observer, but there is still no comprehensive co-ordination of viewpoints" (Piaget, 1963, p.213). The child at this stage becomes aware of left-right as well as before-behind relations. Although aware of the differing viewpoints of the doll from its own, the child is still, due to the complexity of the relationships involved, initially unable to master the perspectives correctly. Piaget identifies a continuous progression from the age of 9 to 12 years during which the child increasingly becomes more proficient in the mastery of the perspectives involved. By the age of 12 years the child should be able to separate itself from its own viewpoint and reconstruct that of the doll. Its viewpoint and that of the doll are now understood to be different.

As a result of his experiment Piaget makes certain statements regarding the child's knowledge about perceptions and perspective viewpoints. He notes that "the perspective system which the child builds up in the course of the four sub-stages we have identified is not perceptual but conceptual in character" (Piaget, 1963, p.245). The child learns mental operations which allow it to project itself into other positions. This process shows the "transition from egocentric realism to relational co-ordination" (Piaget, 1963, p.246).

In "A Child's Eye View - Piaget for Young Parents and Teachers" (1974), Mary Sime has reproduced Piaget's experiment on perspectives and obtained similar results. Sime remarks that the results reached give teachers a warning.

> "It is that, in most infant and junior children, there is insufficient pre-mathematical foundation for them to under-

> stand, as contrasted to achieving mechanically, many of the tasks that adults set them involving reproduction of maps and charts, map drawing (e.g. in History or Geography studies) and any arithmetical or even literary studies that pose problems of moving objects or on changes in position."
>
> ..... (Sime, 1974, p.30).

Teachers of geography in the primary school should be aware of these problem and appreciate the difficulties encountered by pupils. One area in which research could be undertaken in this regard is in the teaching of regional geography to primary school children. In the primary school, regional geography can be seen to be the backbone of the geography content to be learned by pupils. This involves the child in learning about countries and their people through the eyes of adults. Much attention should be focused on the methods used to convey the data to the class as the learning situation involves the problem of imagining other viewpoints and the acquisition of mental concepts and images based upon these. Often pupils are expected to create correct images of a region simply on the basis of the verbal utterances of a teacher. Piaget's research shows the folly of method of teaching in the primary school which rely heavily on the child gaining knowledge and appreciating other viewpoints solely upon verbal or written words. Research by Piaget into the appreciation of perspectives shows the importance of using correct and vivid visual material in geography lessons.

Sime found that "very marked stages could be seen in the development of children's realisations of their own and of other people's points of view" (Sime, 1974, p.32). The stages and the behaviour of the children she tested were found to be similar to those described by Piaget. She feels that teachers should be careful not to confuse children by introducing spatial data which are not understandable at particular stages of concept development. Teachers, she feels, should refrain from giving children topographical maps and world maps before they know that the child can imagin the view they represent from other than their own point of view (Sime, 1974, p.36). This standpoint is Piagetian in character and would presumably be criticised by followers of Bruner's ideas on concept formation, as discussed previously in this thesis.

From the discussion above it can be seen that the usefulness of the choice of Piaget's perspective test chosen for this research, lies in the

fact that it is easily reproduced, controlled and the results may be compared with those of other researchers. The test of perspectives is also very appropriate as it hints at and gives answers to the important questions of what data should be taught, and what methods employed in the teaching of geography in the primary school.

The mapping task designed to test mapwork concepts consisted of asking pupils to map the Piagetian model. This open-ended test allowed pupils to demonstrate concepts supposedly learned during geography lessons. It forms a useful complementary study to the perspectives test as it is during mapwork lessons that one would expect pupils to acquire and develop spatial concepts. If mapwork lessons are poor, spatial concept development could be retarded.

RESEARCH PROCEDURE

At both schools class lists were obtained of pupils in Standards II, III, IV and V. As the pupils in each standard were streamed, a system was devised whereby a cross-section of each standard would be tested. Instead of selecting a completely random choice of candidates for the test for each standard, an equal number from each class was used. As far as possible the same number of males and females were tested from each standard. (Table 4.2. Using this method of selection it was felt that the results obtained would be indicative of the spatial concept development of the standard as a whole.

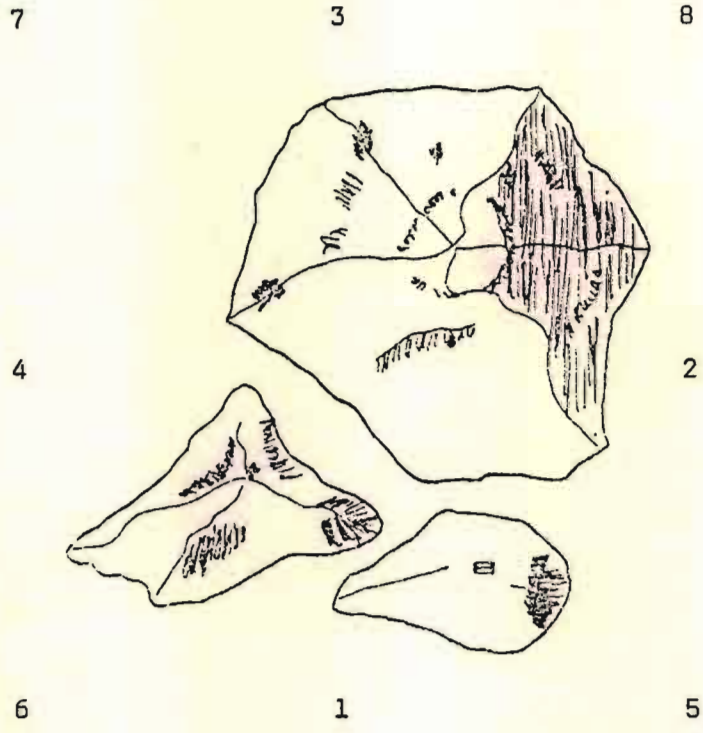
TABLE 4.2. NUMBER OF MALES/FEMALES TESTED AT BOTH SCHOOLS BY STANDARDS

STD.	2	3	4	5
Male	28	26	28	28
Female	31	25	22	22
Total	59	51	50	50

The pupils were tested in a one-to-one situation, a time-consuming ($\pm$ 20 minutes per pupil) but necessary procedure designed to provide accurate results. The method of testing allowed the researcher to place the pupils at ease and ensure that they understood what was expected of them. Another advantage of one-to-one testing was that the examiner could question the pupils about their choice of picture and thereby gain valuable insight into the child's reasoning.

Pupils were placed in front of the model and the purpose of the test was explained to them. They were then shown the doll and given an example of what the tester required. After this they were encouraged to pose any questions about the test and any misunderstandings or uncertainties were cleared up. The eight photographs taken of the model from different viewpoints were then given to the child.

FIGURE 4.2. POSITIONS FROM WHICH PHOTOGRAPHS WERE TAKEN AROUND THE PIAGETIAN MODEL.



The doll was placed in locations correlating with the pictures in a predetermined sequence, i.e., at each position the child chose a picture to match the view of the doll. Once the picture was chosen it was handed, together with the others, to the researcher. The choice was noted and then the picture was replaced randomly in the group remaining and handed back to the child. The child's choices of photographs for all eight viewpoints were noted. Incorrect responses were indicated by noting the number of the incorrect photograph chosen. These incorrect views were tabled as it was hoped that they might indicate to some degree the process involved in correct selection, e.g., the process involved as the child relates to before/behind, left/right and obtuse viewpoints. It was felt that incorrect responses could shed light on the understanding of children's

spatial concept development as much as monitoring the correct responses as the child increases in age.

Once the children had completed Piaget's three mountains test, they were asked to map the model. Subjects were told that they were to imagine they wanted to make an exact copy of the mountains when they went home. To do this they needed to map the model. Pupils were then supplied with paper and pencil and left to map the model without further comment from the researcher. No time limit was given for the completion of the task and only when the child was satisfied with his or her map and indicated that the task was completed, was the plan handed in. From this exercise an indication of the child's knowledge of map concepts was gained as the overall strategy used in attempting the mapping task indicates the synthesis of mapwork concepts learned during geography lessons.

While the tests were being conducted the researcher talked to the subjects, often asking questions about why they had chosen a particular photograph rather than another, or why they hadn't drawn the model from a vertical viewpoint. Children who did particularly well in either test were asked where they had learned to draw from the vertical viewpoint or where they had learned about mapping. Informal questions about their likes and dislikes in geography classes were also posed. Some of these informal chats provided information about the type of teaching taking place in the primary school geography classes.

Although the tests and procedures used in this research may appear, on the surface, to be simple, the results obtained and the indications they give about the process of spatial concept development are thought-provoking and give a clear indication of the part geography is playing in the process of developing spatial concepts at senior primary school level. The recording of pupil responses in terms of correct or incorrect views chosen is in contrast with Piaget's research methods, where pupil comments form the basis for discussion. It is felt that the quantification of results will enable future comparisons to be drawn between similar research undertaken in other schools.

As the research results of Piaget's Perspective Test are recorded according to the ages of the children rather than the number of years schooling they had undergone, the ages of the children tested were recorded. The

performance of the children on the test was related to their age as well as to their school standard. This enabled comparison with Piaget's results as well as allowing an average performance for spatial concept development to be calculated for each school level. Those interested in the planning of school curricula have to concern themselves with the average performance of a group rather than the range, which is the problem solved by the teacher through the use of teaching methods which allow for individual differences. Results, which relate performance with standard level, are best used when discussing curriculum problems, while those relating performance on the test to age are mentioned during discussion about the suitability of various teaching methods.

Pupil maps of the model, at both schools, were collected and collated according to Standard level. These were evaluated according to criteria discussed later in the thesis. The evaluation provided insight into the effectiveness of mapwork teaching in the primary school.

ADMINISTRATION OF PIAGET'S PERSPECTIVES TEST AND THE MAPPING EXERCISE.

The test results of the thesis are discussed in two sections due to the nature of the major aims of the study stated previously. These are :-

1. The presentation of pupil results on the perspectives test. This data provides insight into the state of pupils' spatial concept development. These results are discussed under three sub-headings;

   A. A comparison of the pupil results with Piaget's findings.

   B. Male/female differences in performance.

   C. The progression of spatial concept development from Standard II to Standard V.

2. A presentation of pupil drawings of the Piagetian model and what they reveal concerning the effectiveness of mapwork teaching in the schools tested.

(i) Discussion of the Results of the Administration of Piaget's Perspective Test.

In replicating Piaget's test of perspectives certain problems become

apparent. Piaget's research data, as reported, are non-quantitative in nature and this renders comparison of his findings with those of similar studies very difficult. His research is concerned with illustrating two major areas of importance, i.e., with the child's thought process and the way in which it develops with age; and with the attempt to specify the age at which each child should reach a particular identifiable stage of cognition. Children are placed in certain stages of conceptual development as a result of their statements which, according to Piaget, reveal their thought processes. Numerical data such as the number of viewpoints correctly identified in the perspectives test, takes second place to 'revealing statements'. Replication studies which rely primarily on pupil statements tend, therefore, to be intuitive in nature, lacking a basis for comparison. In order to solve the problem of subjectivity and to bring more comparability to the interpretation of the results, a quantitative approach to the replication of Piaget's test of perspectives has been used here.

This quantitative approach is not without its own problems. Piaget does not mention how many viewpoints a child should be able to distinguish in the perspectives test before he reaches particular stages. It is therefore impossible, solely on the basis of quantitative data, to compare the results obtained here with the ages at which Piaget designated conceptual stage changes. What Piaget does specify, however, is the age at which children should be able to distinguish correctly all the viewpoints (i.e., 12 years), as well as the fact that there should be a steady rise in the number of correct responses to the perspectives test as the age of the subject increases. These two general observations which arise from Piaget's work can be tested quantitatively, and as such provide an objective basis to be established for comparative studies.

A. <u>Comparison of the Perspectives Test with Piaget's Research</u>.

The quantitative approach to Piaget's perspectives test involved recording the correct and incorrect responses given by pupils in the test situation. The children's responses were tabulated in order to show the absolute and relative distribution of pupil performance in relation to school, age, sex and standard level. (See Appendix 1.) From these initial tables it was possible to derive more detailed tables showing a breakdown of responses which offered deeper insight into the spatial concept development

of the pupils tested.

The overall percentage correct responses for each viewpoint, by age, for pupils at both schools were derived (Tables 4.3. and 4.4.).

TABLE 4.3. % CORRECT RESPONSES - SCHOOL A.

AGE	VIEW 1	2	3	4	5	6	7	8	Total	Ave. %
9	77	50	41	25	27	30	27	30	307	38
10	85	30	40	30	45	20	25	55	330	41
11	80	51	45	37	48	31	45	57	394	49
12	92	85	60	71	64	57	53	71	553	69
13	100	44	66	55	77	55	55	44	496	62
14	100	100	100	100	100	100	100	100	800	100
Total	534	360	352	318	361	293	305	357	2880	60
Ave.%	89	60	59	53	60	49	51	60	60	

TABLE 4.4. % CORRECT RESPONSES - SCHOOL B.

AGE	VIEW 1	2	3	4	5	6	7	8	Total	Ave. %
9	85	35	57	35	50	14	28	42	346	43
10	84	61	53	53	73	30	42	46	442	55
11	85	65	75	85	70	40	55	55	530	66
12	81	75	50	56	75	43	62	75	517	65
13	80	60	60	100	100	20	60	60	540	68
Total	415	296	295	329	368	147	247	278	2375	59
Ave.%	83	59	59	66	74	29	49	56	59	

Initially statistical techniques such as the Chi-squared test and Multi-Dimensional Scaling were applied to the data but it was found that, for all ages, pupil responses indicated no significant frequencies in their

choice of photographs. The nature of the data recorded is such that correct responses vary greatly in a random fashion between the ages of 9 to 11 years probably due to the observation that subjects were involved in 'guessing' the correct views. Although Tables 4.3. and 4.4. show an increase in correct responses with age, the overall percentage error for even the oldest age groups is still large ($\pm$ 34%). Guessing does, however, decrease with age as the child's spatial concept development advances.

As discussed previously, Piaget has demonstrated that pupils between the ages of 9 to 12 are involved with a movement away from ego-centrism to abstraction in their thought processes. Initially, therefore, picture number 1 (which corresponds with the view of the child) should be chosen repeatedly regardless of the position of the doll. Later a stage is reached where the child realises that a viewpoint other than its own exists, but the child remains unable to identify such views correctly. Only when the child is able to abstract will he or she be able to choose correct pictures for all viewpoints.

Any statistical test of correlation applied to the data obtained in this research will only reinforce the fact that the majority of pupils tested are in an intermediate stage of spatial concept development as hypothesised by Piaget, where random choices of viewpoints occur. Although the nature of the data precluded the application of advanced statistical techniques, the simple quantification and tabulation of the results yields a reasonable framework within which to analyse responses.

An analysis of the information in Tables 4.3. and 4.4. shows that the correct choice of view, Number 1 (which corresponds with that of the child) remains unaltered from the age of 9 to 13. This suggests that pupils may have confused this view with the similar photographs of views 5 and 6. A scan of the results showing incorrect choices confirms this premise. (See Tables attached as Appendix 1). According to Piaget's theory, one would have expected that view No. 1, being the easiest photograph to choose, would have showed a higher overall correct response than it did.

The view which pupils found most difficult to identify was view 6, which was very close in perspective to view No. 1. This result was predictable because the differences between the two photographs were slight. It is interesting to note that differences between views 5 and 1 were more easily perceived than between views 6 and 1. It is suggested that the

position of the small hill in views 5 and 1 confuse the child, thus indicating that children create the doll's view with reference to the distance of the dominant features. In pictures 5 and 1 the small green hill dominates the foreground, whereas in picture 6 it does not. From a study of Figure 4.2. of the model, it can be hypothesised that views nearest to a mountain would be easiest to identify, while those furthest away, or involving two mountains equidistant from the viewpoint, would be more difficult to distinguish. A look at Tables 4.3. and 4.4. bears out this assumption. Views 6 and 7 are the furthest from a mountain and they have the lowest percentage of correct responses for both schools. This lends support to the idea that pupils rely on a single visual clue to reconstruct the doll's view. The further the cue is away from the doll, the more difficult mental abstraction becomes.

Generally, results of this study show similarities with those of Piaget. Pupils at the age of 9 years were egocentric in their outlook. This was shown by poor correct percentage responses to all the views except No. 1. This egocentrism is particularly noticeable when administering the test. Pupils often attempted to orientate their bodies physically when selecting the correct viewpoint from the photographs. Physical orientation seemed to help the process of mental abstraction which, at this age, pupils found to be very difficult. Piaget also noted this type of behaviour in children who fell into his concrete operational stage of spatial concept development. Piaget notes that children, by the age of nine years, should be aware of left/right, before and behind relationships. Children at this age realise that there is a viewpoint other than their own but they are unable to distinguish it. This would account for the low scores for all viewpoints other than No. 1 as shown in Tables 4.3. and 4.4. From the tables of percentage correct responses it is seen that the majority of scores for views 2 to 8 were less than 50% correct. However, these scores are not sufficiently low to justify the conclusion that no logic was at work in the children's choices.

Piaget has indicated that from the age of 9 to 12 years there is a steady progression towards the mastery of perspective. By the age of 12 years he found that children were able to master the difficult perspectives of the test completely. However, the results obtained from Schools A and B show that by the age of 12 years many of the pupils tested had not fully mastered the problem of mental abstraction. A gradual improvement from the

age of 9 to 12 years can be observed at both schools. The total percentage correct score for School A increased by 31% from 38% to 69%, while School B improved by 22% from 43% to 65%. The total correct percentage for both schools at 12 years of age is, however, below that expected. These results indicate that spatial concept development at both the schools tested is lagging behind the expected norm as proposed by Piaget. Reasons for this inferior performance will be discussed in Chapter 5.

The percentage increase-decrease with age for each view of the perspectives test in both schools are tabled below (Tables 4.5. and 4.6.). These tables were derived from Tables 4.3. and 4.4. and are used to indicate whether the developmental sequence of correct responses proceeds in the manner proposed by Piaget.

TABLE 4.5. SCHOOL A.
AVERAGE % INCREASE/DECREASE IN CORRECT RESPONSES FOR EACH YEAR COMPARED WITH PREVIOUS YEAR.

AGE \ VIEW	1	2	3	4	5	6	7	8	Total	Ave. %
10	8	-20	-1	5	18	-10	-2	25	23	3
11	-5	21	5	7	3	11	20	2	64	8
12	12	34	15	34	16	26	8	14	159	20
13	8	-41	6	-16	13	-2	2	-27	-57	-7
14	0	51	34	45	23	45	45	56	304	38

Increase/Decreas

TABLE 4.6. SCHOOL B.
AVERAGE % INCREASE/DECREASE OF CORRECT RESPONSES FOR EACH YEAR COMPARED WITH PREVIOUS YEAR.

AGE \ VIEW	1	2	3	4	5	6	7	8	Total	Ave. %
10	-1	26	-4	18	23	16	14	4	96	12
11	1	4	22	32	-3	10	13	9	88	11
12	-4	10	-25	-29	5	3	7	25	-8	-1
13	-1	-5	10	44	25	-23	-2	-15	33	4

Increase/Decreas

Tables 4.5. and 4.6. showing the percentage increase-decrease in correct responses for each year indicate an interesting feature. If the results are viewed overall there is an increase in correct responses between 9 years and 13 years. However, at both schools there is a very slight decrease in performance around the ages of 12 and 13 years respectively when compared with results for the previous year. Bearing in mind that this is the age where Piaget expects correct responses to be at a peak due to the ability to abstract, these results are difficult to explain. One conclusion which could be suggested is that the pupils have not progressed because of a lack of experience with spatial situations. This proposal would find agreement with Piaget and Bruner's theories that concept development occurs as a result of the active involvement of the child with the environment. Children who are denied the opportunity to experiment and interact with the environment would logically not develop spatial concepts as fast as those whose learning situation had been geared to promote concept formation. It would seem, therefore, valid to assume that the reason for the decrease in spatial concept competence for the 13 year age group at School A and the 12 year age group of School B is due to a lack of spatial experience during this period as compared with previous years. A study of the syllabus and the amount of opportunity it provides for the development of spatial concepts around this age, however, would not support the above idea. Perhaps part of the answer to the problem of why there is a decrease in performance if the syllabus supplies the opportunity for spatial concept formation, is that teaching methods employed do not allow the pupil to explore spatial relationships in the learning situation. This assumption is further strengthened when one views the drawings the pupils made of Piaget's model. These drawings will be discussed in more detail later, but it is sufficient to note here that they lead one to assume that the teaching of mapwork in the senior primary school in Natal falls far short of what is desirable.

B. Male/Female Differences in Spatial Concept Development.

The total percent correct responses at Schools A and B have suggested that spatial concept development in these schools is not as advanced as it should be. Reasons for this overall lack of competence could be found in sex differences in performance, and therefore it is necessary to compare scores for male/female responses for the test. Tables 4.7. and 4.8. below represent the percentage correct male and female scores from School A according to standards.

TABLE 4.7. SCHOOL A.
% MALE CORRECT RESPONSES

STD.	VIEWS 1	2	3	4	5	6	7	8	Total	Ave. %
2	89	47	57	26	31	42	21	31	344	43
3	86	40	66	33	53	13	40	66	397	50
4	73	86	60	66	46	73	60	86	550	69
5	94	88	58	70	70	58	70	70	578	72
Total	342	261	241	195	200	186	191	253	1869	58
Ave.%	86	65	60	49	50	47	48	63	58	

TABLE 4.8. SCHOOL A.
% FEMALE CORRECT RESPONSES

STD.	VIEWS 1	2	3	4	5	6	7	8	Total	Ave. %
2	65	55	30	25	25	15	30	30	275	34
3	93	13	13	26	46	20	33	40	284	36
4	86	53	40	40	46	35	33	53	384	48
5	92	53	69	53	76	38	38	46	465	58
Total	336	174	152	144	193	106	134	169	1408	44
Ave.%	84	44	38	36	48	27	34	42	44	

Tables 4.7. and 4.8. indicate that the average difference between male and female performance between Standards II and V is 14%. Reasons for male superiority on the test will be discussed later in the thesis. Male and female results show a steady increase in performance up to Standard V. This finding is in marked contrast to the results found at School B and shown in Tables 4.9. and 4.10 below.

TABLE 4.9. SCHOOL B.
% MALE CORRECT RESPONSES

STD.	VIEWS 1	2	3	4	5	6	7	8	Total	Ave. %
2	77	44	44	44	55	11	33	77	385	48
3	81	72	72	63	90	36	63	72	549	69
4	84	76	84	69	76	23	46	69	527	66
5	81	81	54	81	81	45	63	63	549	69
Total	323	273	254	257	302	115	205	281	2010	63
Ave.%	81	68	64	64	76	29	51	70	63	

TABLE 4.10. SCHOOL B.
% FEMALE CORRECT RESPONSES

STD.	VIEWS 1	2	3	4	5	6	7	8	Total	Ave. %
2	81	36	54	18	54	18	18	9	288	36
3	100	60	50	70	60	40	40	20	440	55
4	85	57	71	85	42	28	57	57	482	60
5	77	44	33	66	88	55	66	66	495	62
Total	343	197	208	239	244	141	181	152	1705	53
Ave.%	86	49	52	60	61	35	45	39	53	

Tables 4.9. and 4.10. above indicate that at School B the average difference between male and female performance between Standards II and V is 10%. Male superiority, although less than that found at School A, is still significantly higher. As far as progression in performance from Standard II to Standard V is concerned, School B's results differ from School A's. Females at both schools show an increase in performance as they progress to higher standards. This trend, however, is not found when examining male performance. Although, as discussed previously, males at School A show an increase in performance by standard, this is not found at School B. Male results at School B show male performance peaking at

the Standard III level, decreasing slightly in Standard IV and then reaching the same average level of performance in Standard V as exhibited at Standard III.

The results of male and female performance at both schools raise the following interesting questions :-

1. Why is there no advance in spatial concept development of males from Standard III to Standard V at School B while there is a steady increase in concept formation of males at School A?

2. Why is there a difference in male/female spatial concept development between Standard II and V at both schools, as indicated by the results?

It is difficult to suggest answers for the above questions with any certainty due to the complex nature of the problems. It could be suggested however, that variables such as differences in formal and informal learn situations and I.Q. differences may help account for the discrepancies betwe male and female results at both schools and the differences in male results at Schools A and B. However, since both schools are co-educational and the results of the female scores indicate no difference, the importance of differences in formal learning situations and I.Q's can be discounted. This leaves informal learning situations as the possible reason for the noted discrepancies in performance. It was observed during oral questioning that those who performed well on the perspectives test were members of the Girl Guides, Brownies, Scout or Cub movements. This leads one to suspect that the learning of spatial skills in the form of mapwork has aided these pupils in solving the Piaget test. Factors which could result in different informa learning of spatial concepts would be membership of a group such as Cubs or Brownies which teach spatial skills, participation in spatial games and the amount of freedom allowed to individuals in the society as regards exploration and interaction with the environment.

Stea and Taphanel (1974) have noted a number of factors that affect spatial cognition. They indicate that three factors play an important part in its development. These are social role, formal education and environmental experience. It would seem that differences in social role and environmental experience help to explain the results obtained above. Althou consideration of informal methods of spatial cognition is important, it is

outside the scope of this thesis which is concerned largely with the part played by formal education. Research into informal factors which affect spatial cognition could form the basis of an interesting future study.

C. Progression in Spatial Concept Development from Std. II to Std. V.

The progression of spatial concept development of pupils arranged according to Standards shows very little difference from results based on age. The results shown in Tables 4.11. and 4.12. below indicate a general increase in percentage correct responses from Standard II to V at both schools.

TABLE 4.11. SCHOOL A.
TOTAL % CORRECT RESPONSES

STD. \ VIEWS	1	2	3	4	5	6	7	8	Total	Ave. %
2	76	51	43	25	28	28	25	30	306	38
3	90	26	40	30	50	16	36	53	341	43
4	80	70	50	53	46	53	46	70	468	59
5	93	73	63	63	73	50	56	60	531	66
Total	339	220	196	171	197	147	163	213	1646	52
Ave.%	85	55	49	43	49	37	41	53	52	

TABLE 4.12. SCHOOL B.
TOTAL % CORRECT RESPONSES

STD. \ VIEWS	1	2	3	4	5	6	7	8	Total	Ave. %
2	80	40	50	30	55	15	25	40	335	42
3	90	66	61	66	76	38	52	47	496	62
4	85	70	80	75	65	25	50	65	515	64
5	80	65	45	75	85	50	65	65	530	66
Total	335	241	236	246	281	128	192	217	1876	59
Ave.%	84	60	59	62	70	32	48	54	59	

As expected from examination of the results by age, the scores indicate that the sequence of spatial concept development is similar to that found by Piaget. At both schools, however, the average for correct responses at the Standard V level was only 66%. Developmentally, the sequence of spatial concept development is similar to that found by Piaget, but the results show that concept development is not as advanced as might be expected. Generally speaking, few of the pupils tested in the primary schools reached a level where they were able to form abstract concepts. This lack of abstractive ability means that teachers of geography, when dealing with material that relies heavily on regional studies, will have to approach the choice of methods used carefully due to the concrete nature of the pupil's understanding.

CONCLUSIONS REGARDING PUPILS' PERFORMANCES ON PIAGET'S TEST OF PERSPECTIVES.

From discussion above, the general findings regarding pupil performance on Piaget's test of perspectives are as follows :-

1. *Although there was an overall increase in spatial concept development among the pupils tested, they were found to be less developed than Piaget's research findings would indicate to be reasonable.*

2. *The views which the children found most difficult to distinguish between were those furthest away from a single visual cue.*

3. *By the age of twelve, the ability to abstract mentally in terms of spatial perspectives had not occurred in the majority of the pupils tested.*

4. *There is a decrease in spatial concept competence at the age of 12 at School B and 13 years at School A when compared with performances of pupils in the preceding age groups.*

5. *Female candidates did not perform as well as males on the test of perspectives. The reason for this observed difference is probably due to differences in informal learning situations.*

6. *Spatial concept development between Standard II and Standard V follows a similar developmental sequence as that described by Piaget. However, the test showed that pupils at the Standard V level were generally not as advanced as Piaget's research indicates they could be. This should be taken into account by curriculum planners and by teachers.*

THE EFFECTIVENESS OF MAPWORK TEACHING IN THE FORMATION OF SPATIAL CONCEPTS.

Once the pupils had completed the Piagetian test of perspectives they were asked to map the model. This simple task, it was felt, would reveal the influence that formal mapwork lessons have on the construction of spatial concepts. The pupil being tested was required to map the Piagetian model in order to construct a perfect replica of the model at home.

It is important to note that the researcher was very much aware of the problems involved in the wording of the instructions to the pupils, as such wording could suggest different ways in which the test should be approached. The word "map" was used in every case, as it was felt that if the child had been taught mapwork as laid down in the syllabus, maps and map concepts would be familiar and the task would be approached from a mapping point of view.

In order to discuss the results of the pupils' drawings it was necessary to hypothesise what the correct expected behaviour should be. Pupils' maps could then be compared with the features exhibited by the hypothesised drawing.

Briefly, it is hypothesised that the drawing should include the following features :-

1. The map would be drawn from an overhead perspective, i.e., as if one were flying over the Piagetian model. The use of any other perspective would incorporate the problems encountered with hidden objects (as in oblique aerial photographs) and render the task of recreating the model accurately from the drawing impossible.

2. The map should indicate the pupil's appreciation of map elements such as scale, relative distances, sizes, features and colour and show an attempt to depict these accurately.

Pupils' drawings were analysed in the light of the correct hypothesised map presented above. The child's attempt to represent scale, distances, size of objects, distinctive physical features and colour as well as the overall approach to the task in terms of drawing perspective indicates the extent to which mapwork in the primary school is being correctly taught. Deviance from the expected mapping behaviour indicates a lack of understanding and appreciation of mapping concepts. Knowing that some pupils are more skilled in drawing than are others, no attention was paid to neatness. Only evidence of awareness of mapping problems and attempts to overcome them were taken into account in the analysis as presented below. Obviously the drawings of pupils in Standard II were expected to show less conceptual awareness than those of pupils in Standard V. However, the syllabus for Standard II indicates that pupils should be taught the concepts of location, size, area, shape, number and direction during mapwork lessons and therefore pupils should show evidence of their learning in the drawing test.

Pupils at both schools undertook the mapping test. The results of both schools will be discussed together, standard by standard.

At the Standard II level, pupils' drawings indicated a complete lack of awareness of mapping concepts. Drawings showed a lack of appreciation of an overhead viewpoint and the mountains were represented in cross-section. No attempt was made to represent size correctly. Indications of an appreciation of scale could be generally seen in the pupils' attempts to depict the different heights of the mountains although due to their choice of mapping perspective, scale, in terms of horizontal dimensions, was non-existent. (See Figure 4.3.) Although the overhead viewpoint perspective was not used completely in any drawing, a few pupils drew their maps with one of the mountains drawn from this perspective. (See Figure 4.4.)

Pupils at both schools represented distances incorrectly. The margin of error varied according to the child's location in relation to the model as the map was being drawn. Distances generally were represented in relative rather than absolute terms. Drawings did not indicate the different colours of the mountains but they did include the features

STANDARD II LEVEL.

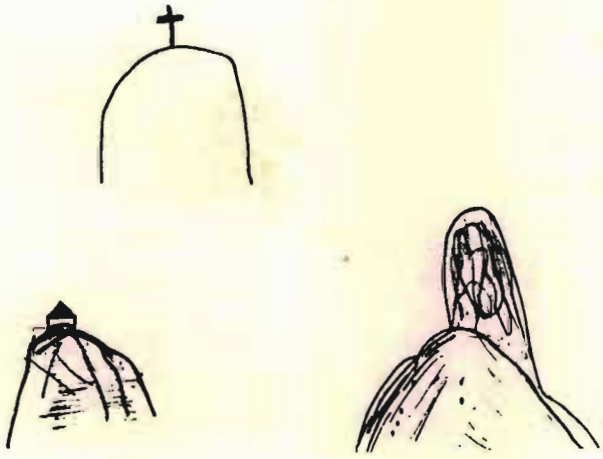


FIGURE 4.3.

PUPIL SKETCH OF THE MODEL

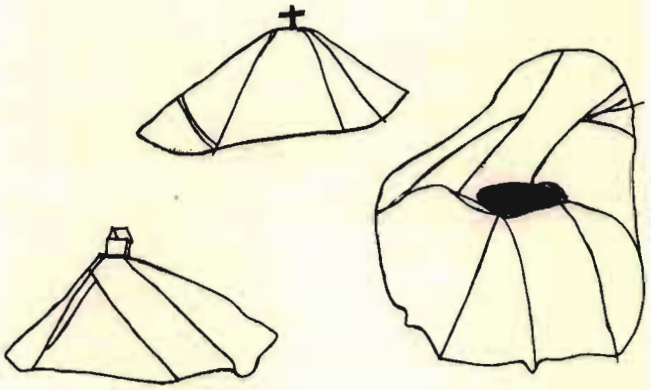


FIGURE 4.4.

PUPIL SKETCH OF THE MODEL

STANDARD III LEVEL.

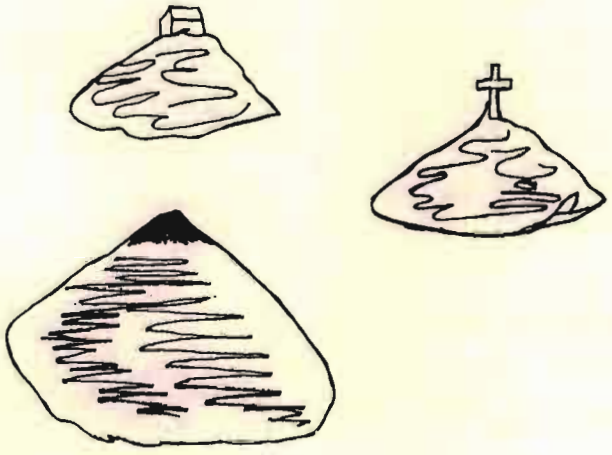


FIGURE 4.5.

PUPIL SKETCH OF THE MODEL

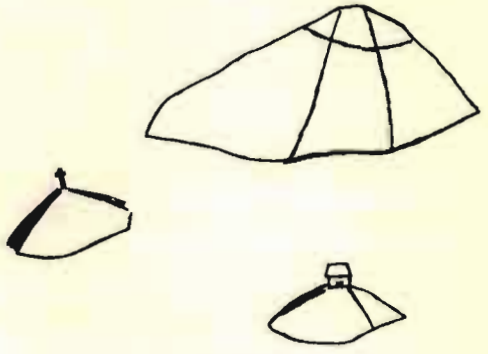


FIGURE 4.6.

PUPIL SKETCH OF THE MODEL

found at the top of them, i.e., snow, a house and a cross. To conclude, then, it would be correct to say that at the Standard II level, pupil drawings exhibited an almost complete lack of appreciation of formal mapping concepts.

Pupils' drawings at the Standard III level were similar in general perspective employed and approach to the representation of content to those of pupils in Standard II. (See Figure 4.5.) All the pupils tested in Standard III drew the model from an oblique perspective and the mountains were drawn in cross-section. The amount of detail included on the maps did, however, increase when compared with the Standard II maps. This was largely due to the attempt by the pupils to represent colour differences by means of shading. The representation of scale, distance and size showed no improvement from the drawings at the Standard II level. (See Figure 4.6.)

At the Standard IV level, pupils included more detail in their drawings of the model. Representation in terms of objects, colour, distances and the accuracy of the differing shapes of the mountains was better than that found at the Standard III level. (See Figures 4.7. and 4.8.) Although, generally, an improvement in mapping can be observed, it is important to note that many drawings at this level showed no improvement from those found at the Standard II level. Some pupils did, however, draw maps which showed that they were aware of mapping concepts. One pupil drew a cross-section as well as a plan view of the model, which indicated his awareness of the problems of hidden features. (See Figure 4.9.) When asked where he had learned to map so accurately, he replied that he had been taught at 'Cubs' and not during geography lessons. Although a few pupils' drawings showed an appreciation of the overhead viewpoint, 78% of those tested at the Standard IV level were still unaware of the advantages of this perspective.

The drawings of pupils in Standard V did not, except in a few instances, show any difference in approach to the task, or in perception of the mapping concepts involved, when compared with those of lower standards. Generally the pupils showed no appreciation of the need for an overhead viewpoint. (70% of the drawings utilised an oblique perspective.) The majority of the drawings also showed a lack of appreciation of correct scale, size, colour or distance. (See Figure 4.10.) However, as found at the Standard IV level, a few pupils produced maps which showed an appreciation of mapping concepts. (See Figure 4.11.) These pupils, when questioned

STANDARD IV LEVEL.

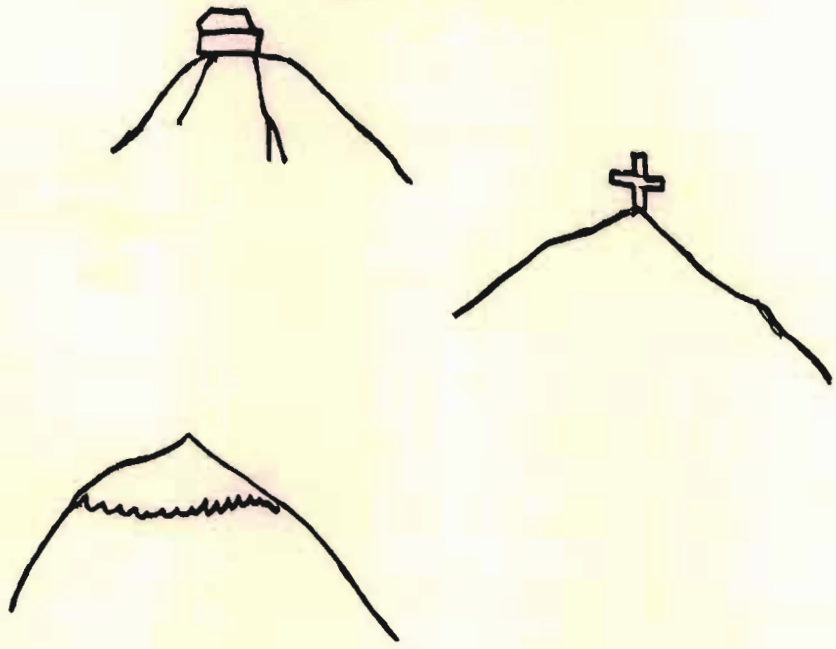


FIGURE 4.7. PUPIL SKETCH OF THE MODEL

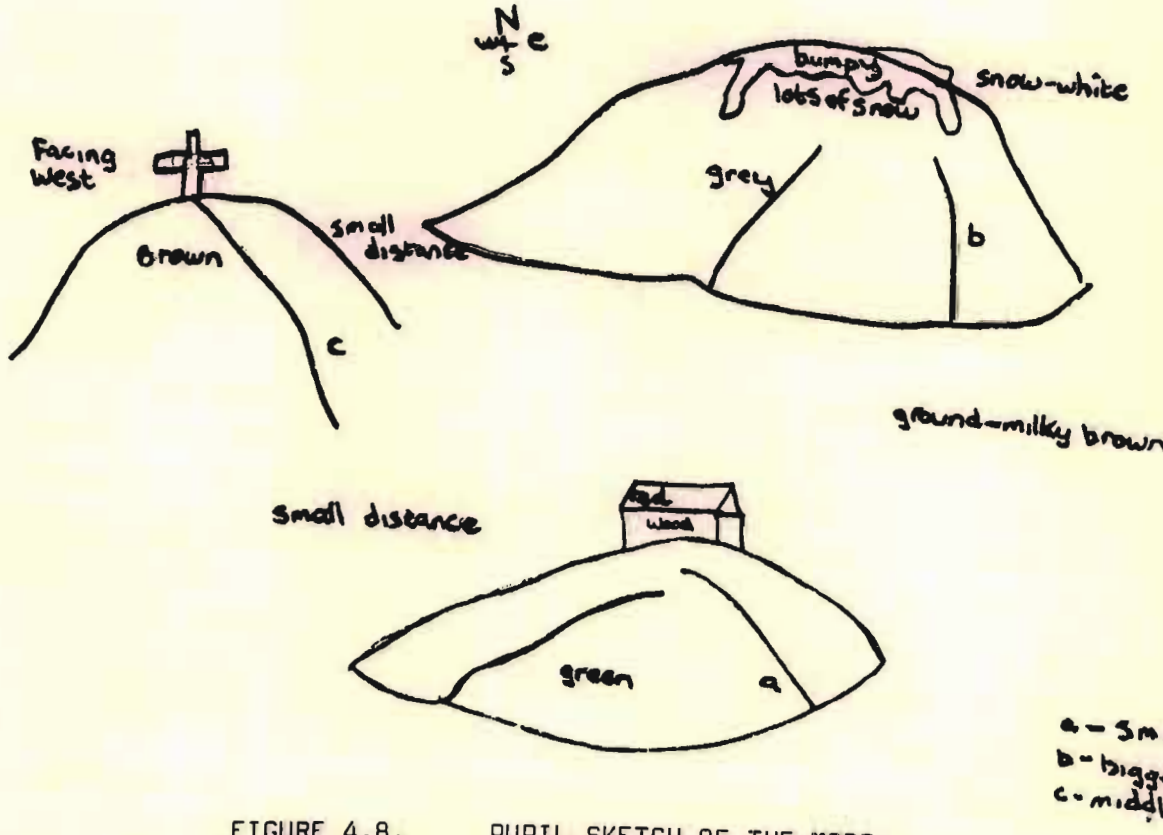


FIGURE 4.8. PUPIL SKETCH OF THE MODEL

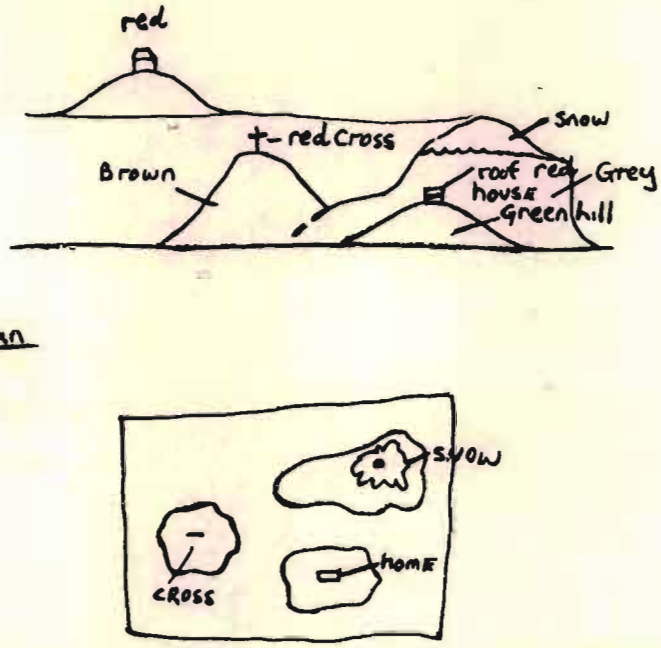


FIGURE 4.9. PUPIL SKETCH OF THE MODEL - STANDARD IV LEVEL.

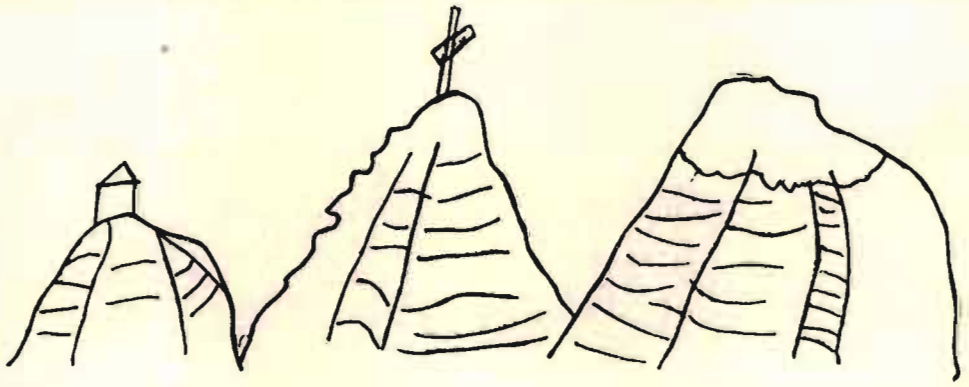


FIGURE 4.10. PUPIL SKETCH OF THE MODEL - STANDARD V LEVEL.

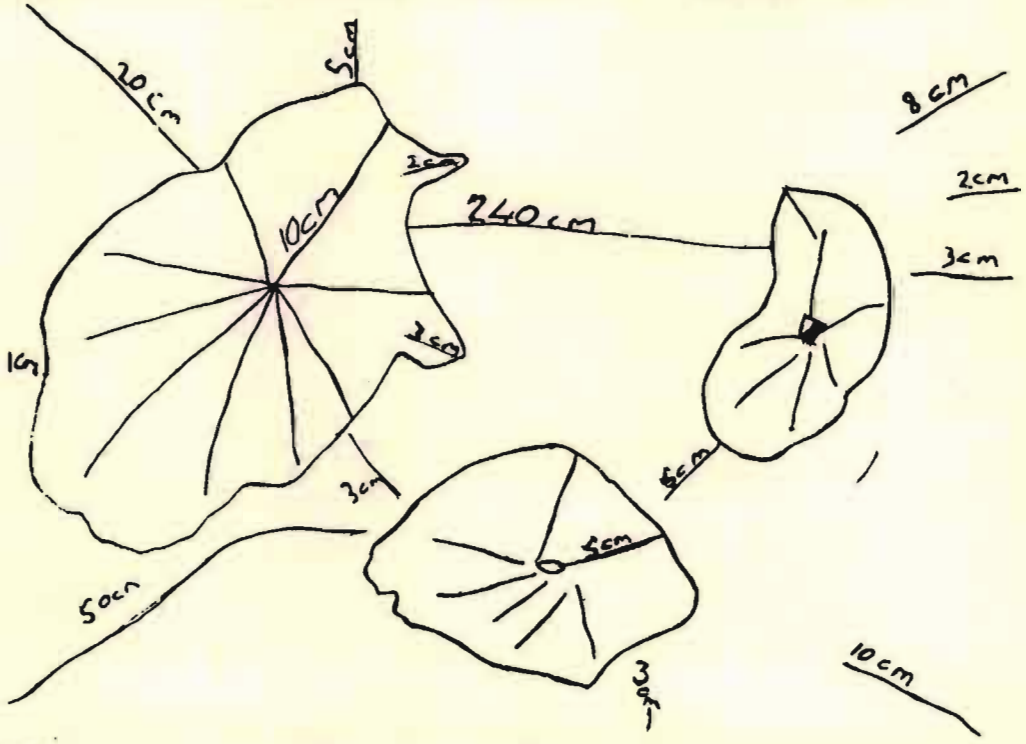


FIGURE 4.11. PUPIL SKETCH OF THE MODEL - STANDARD V LEVEL.

about where they had learned to map, inevitably answered that they had been taught by someone outside of the school environment.

Catling, in an article entitled "The Elements of the Map" (1978b) has identified eight elements that are found in maps. These elements he divides into three classes, i.e., structural, designated and content elements. The results discussed above show that in terms of Catling's (1978b) classification, pupils generally are aware of the structural elements in mapping, (i.e., position and direction) as well as the content elements, (i.e., selection of features and aspects included in the map). What is lacking is an appreciation of the designated elements, i.e., vertically overhead viewpoint, two-dimensional representation (shape, depth, projection and distortion), scale (distance, size, proportion and ratio), and symbolism (represented in coded or iconic form).

It is contended that content and structural elements are those that are learned every day by pupils in their interaction with the environment. Designated elements are not. It is during the teaching of mapwork in schools that pupils would be expected to gain an appreciation of designated elements and the concepts they involve. From the results presented above it seems that generally speaking the pupils have not acquired these concepts and those individuals that have, have learned them in places other than during geography lessons, i.e., woodwork classes, Cubs and Brownies.

To conclude this discussion of the pupils' drawings, the following points are noted :

1. Pupil drawings show a marked lack of appreciation of many of the basic concepts (identified in Catling's scheme (1978b, p.4)) required in mapwork.

2. The greatest lack of competence is exhibited where designated map elements are concerned.

3. These designated elements should be taught during mapwork lessons in geography as specified in the syllabus from Standard II to Standard V.

As a result of the findings above, it is felt that an investigation into the effectiveness of the teaching of mapwork in the primary school is

required. Mapwork should play a major role in the development of spatial concepts in pupils at primary school and as such the inferior test results obtained in the Piagetian test could be due to poor mapwork teaching.

CONCLUSION - THE STATE OF SPATIAL CONCEPT DEVELOPMENT IN NATAL PRIMARY SCHOOLS.

The results of research into the spatial concept development of pupils in Natal Senior Primary Schools has shown that generally females develop spatial concepts at a slower rate than do males. As discussed previously, the reasons for this are likely to be found in the areas of informal spatial learning, i.e., differences in social role and environmental experience. As the other major factor, according to Stea and Taphanel (1974) which affects spatial cognition is formal education, geography lessons could be used to help narrow the gap in male/female performance.

The major finding of this research thus far is the fact that the spatial concept development of the pupils tested is not as advanced as would be expected on the basis of Piaget's findings. Pupils at the age of twelve exhibited little, if any, evidence of being able to abstract correctly with any consistency. It is important to note, however, that developmentally the sequence of spatial concept development exhibited by the pupils is similar to that found by Piaget (1963). As a result of this finding it would seem that a teaching programme based on Bruner's theory could help speed up the process of spatial concept development in the pupils. This programme, it is felt, should take place in geography lessons, as it is the subject in the school programme which claims to have a marked interest in spatial matters.

Mapwork lessons in the senior primary school are not, as discussed previously, achieving much in the way of developing spatial concepts in the pupils. In this, geography teaching is failing both itself and the pupils. A mapwork course for the senior primary school based upon the need to learn specific spatial concepts would help bring the pupils' spatial concept development into line with the results obtained by Piaget.

If geography is to play a part in the development of spatial concepts at the senior primary school level, ways and means of effecting spatial learning need to be investigated. It is the contention of this

thesis that the most logical and suitable starting point for effecting an improvement in spatial concept development in the primary school would be to improve the teaching of mapwork. This contention is expanded upon in the following chapters.

CHAPTER FIVE

THE CONDITION OF GEOGRAPHY TEACHING IN THE SENIOR PRIMARY SCHOOL

INTRODUCTION.

The results of research into the development of spatial concepts in the senior primary school have demonstrated the need for an investigation into the way in which geography is being taught at this level. If spatial concepts are not being developed adequately then geography as the subject in the school which purposes to deal with spatial relationships and graphicacy must shoulder a large portion of the blame. When viewing the situation two areas emerge that need to be investigated if an improvement in the learning of spatial concepts is to occur in the primary school. These are the appropriateness of the syllabus in the fostering of spatial concepts and the effectiveness of the teachers in developing spatial concepts during geography lessons. Both of these areas of concern will be discussed in detail below.

The Syllabus - its effectiveness in the fostering of spatial concepts.

For the purpose of this discussion it is intended to examine the way in which the syllabus caters for the development of spatial concepts in the pupils by means of mapwork. (The Natal Geography syllabi for Standards II to V are attached as Appendix II.)

The syllabus, in all standards, makes ample provision for the teaching of mapwork. This is generally set out in three sections dealing with mapmaking, compass work and understanding of printed maps. The importance of graphicacy is stressed in the syllabus and this becomes obvious when reading the syllabus guide for geography in all standards. The first specific aim of geography, as stated in the syllabus guide for Standards II, III and IV, is "to develop the pupils' understanding, through practical experience in making maps, of the factors contributing to the accuracy of large-scale maps" (1978). The syllabi set out to help the teacher to achieve this aim by supplying a suggested approach and teaching method guide for each section of the work to be covered. This guidance is, however, sketchy and does not supply the teacher with many examples of how to go

about teaching the topic. It also tends to neglect the depth to be achieved by the teacher in any given section of mapwork. However, it should be stated that the syllabus emphasises the need for graphicacy and does provide some very good advice to the teacher regarding the use of different types of maps as well as indicating which maps pupils should be able to draw at different standard levels.

The blame for poor spatial concept development in the primary school, it is felt, cannot be laid totally at the door of the mapwork syllabus. It emphasises the need for graphicacy both in its general and specific aims, and suggests ways and means of achieving these in all standards. However, the teacher could be provided with a more detailed account of methods which could be used in the classroom. As will be shown later in this thesis, teachers in the schools need very detailed guidance if the aims of the syllabus are to be achieved and this is unfortunately lacking at the present time.

Teacher attitudes and practice towards the teaching of geography in the Senior Primary School.

If, as disussed above, the syllabus allows for the teaching of spatial concepts and tests have shown that these are not being adequately acquired by the pupils, it seems likely that the fault lies with the teaching of the subject. From the test results obtained, very little learning of mapwork concepts occurs in schools and pupils develop spatial concepts informally as they interact with their environment or become members of youth organisations such as the Girl Guide or Scout movements. If pupils are not learning spatial concepts during geography lessons, then it may be pertinent to ask what, in fact, they are learning. At the very real risk of over generalising, it is suggested that the answer unfortunately seems to be that primary school teachers, on the whole, tend to teach facts about peoples and regions without accentuating the underlying spatial concepts. Much like Mr. Gradgrind in Dickens' novel "Hard Times", they would claim that the teaching of geography involves the teaching of facts not concepts.

> "Now, what I want is, Facts. Teach these boys and girls nothing but Facts. Facts alone are wanted in life. Plant nothing else, and root out everything else. You can only form the minds of

reasoning animals upon Facts: nothing else will ever be of any service to them. This is the principle on which I bring up my own children, and this is the principle on which I bring up these children. Stick to Facts, Sir!" (Dickens, 1969, p.1).

Catling has remarked that

"it has been recognised that the mere learning of facts is a low-level educational activity which cannot be transferred from one situation to another. The development of concepts, however, enables the child to transfer ideas from one set of circumstances to another" ..... (S. Catling, 1979, p.3).

In discussion with primary school geography teachers the impression is gained that many teachers would disagree with the notion that the teaching of the subject is not as it should be. Often it is contended that the learning of facts is, in itself, useful, as the child learns discipline as well as a wide general knowledge about the world in which it lives. The comment is often heard that 'in my day we knew where Hong Kong was', implying that because children are not specifically expected to know, off by heart, the names and positions of cities, rivers and countries of the world, that their education is lacking. This view of geography as a subject which imparts facts about places and people on the earth's surface, is common and is not confined only to Natal primary schools. Crisp, in "New Approaches to Teaching Geography" (1969), states that the traditional approach to the teaching of geography, i.e., the learning of the established factual content of the subject, is being challenged by a number of influences. The most important of these are

"recent advances in geographical research, the precedent set by American curricula developments, the growing understanding of the nature of scientific enquiry, and the belief that, in our rapidly changing world, styles of learning are ultimately more important than facts" (Crisp, 1969, p.11).

Catling remarks in this regard that

"The emphasis has changed from the teacher building up in the child's mind a fund of geographical facts of 'knowledge', to the teacher developing the child's conceptual understanding and skill in explaining the geographical environment" (Catling, 1979, p.3).

It is imperative, if changes are to occur in the teaching of geography in the primary schools, that the teachers of the subject appreciate and agree with the changes that need to be made. Teachers, and in particular those in charge of geography programmes in the school, must change their attitudes towards the subject if the situation is to improve. Meaningful change could be seen simply as a switch in attitude away from factually-based teaching towards a conceptual approach.

It may, however, be too easy to lay the blame for the lack of spatial concept development solely at the door of the teacher. Questions should be asked about the reasons why teachers do not teach in a manner which emphasises the concepts involved in the topics in geography generally, and in mapwork in particular. Answers are needed so that geography teaching may be improved in the future. The following are felt to be some of the most important reasons for the lack of teacher efficiency - factors which need to be rectified if geography teaching in the primary school is to be improved.

1. Teacher training at the Colleges of Education allows a student to graduate with only one year's training in geography. As a result, the majority of teachers in the primary school have a very scanty idea of the concepts involved in the 'new geography' and no real understanding of mapwork at the primary level.

2. Those teachers who trained before 1975 (the vast majority) have had no training in the new ideas involved in the conceptual approach to geography.

3. Students who have been adequately trained in geography teaching during a 4 year course, tend to revert to the old approaches of geography teaching within a short time of being in a school. Hogben and Petty have discussed this problem in an article "Early Changes in Teacher Attitude" (1979). They note that

> "a fairly consistent finding has been that students in teacher education programmes, tend to become more 'progressive' in attitude during their college or university courses, but that this change is reversed once regular school teaching is experienced" (1976, p.212).

These researchers have also found that progressive attitudes

> "do not last beyond the first few high-pressure weeks of full-time teaching, during which a re-orientation to what might be called the orthodox position, is already well under way" (1976, p.219).

4. There is a lack of guidance for the teacher in the form of good text books and teaching aids. Teachers, due to their lack of knowledge of geography, lean heavily on data supplied by text books. A perusal of these text books shows that by and large they are just 'fact banks' of out-of-date figures and tables. They are rooted in the 'capes and bays' approach to the teaching of geography which teachers use as their model of what should be taught. Generally speaking, the text books in use at the schools at present are out of phase with the spirit of geography teaching as expressed in the geography syllabi for Standards II to V.

5. Most teachers are not specialist geography teachers in the primary school and as such they have to spread their time and energies over a large number of school subjects. As a result of this, the teaching of facts is a more attractive proposition than the pupil-based conceptual approach which demands more effort in terms of time, thought and preparation.

6. Teacher attitudes towards geography are, in the majority of cases, deeply rooted in the old regional approach. This attitude is manifested in the questionnaire given to the geography staff of two primary schools which will be discussed later in this thesis.

If the standard of geography teaching in the primary school is to be improved, it is important that the above problems are rectified. Naish, commenting on the problems found in the teaching of geography, states that

> "While it is clear that teachers of geography are aware of the desirability of involving pupils and students in critical and constructive thinking, it seems that a great deal of work needs to be done to devise effective methods of achieving this, and of assessing results." ..... (Naish, 1977, p.81).

The problems as presented above can be divided into two groups. These are problems associated with training and problems associated with

attitude. While training problems can be solved by increasing the flow of information to teachers, the problem of changing attitudes is far more difficult. If teacher attitudes towards geography can be brought more into line with those of the academics of the discipline, the teaching of the subject at primary school level should improve. This would involve the marriage of geographical concepts with educational experience which should result in improved spatial concept development of the pupils.

In order to change teacher attitudes it is necessary first to establish what these are at present and second, to determine what factors influence these attitudes in the school situation.

An Analysis of the Teacher's Role in Geography Teaching in Senior Primary Schools.

To determine the general attitudes of primary school geography teachers towards the subject, a questionnaire was devised along the lines of one used by Cracknell in a study of geography teaching in a number of junior schools in Bexley, Kent (Cracknell, 1976). The questionnaire was then given to all the geography teachers of the two schools previously used in the Piagetian perspectives test. (The questionnaire is attached as Appendix III.)

From the questionnaires it was established that teachers of geography at the schools tested have, on the average, one or two years' training in geography at college level. Responses to the questions showed that teaching methods need improving. Teachers seldom, if ever, take their classes on field trips. Maps are often used in the teaching situation, but they are of the small or medium scale variety. Large scale maps are not used. It is also disturbing to note that the world globe is hardly, if ever, used, even at the Standard II and III level. Cracknell (1976) found a similar situation existing in the British junior schools he tested. His findings, he stated, "suggest that in most schools, little is being done to develop map skills through regular contact with the appropriate maps" (Cracknell, 1976, p.153).

In the questionnaire, 15 teachers were asked to rank a list of 12 teaching techniques according to how often they employed them. These results are found in Table 5.1.

TABLE 5.1. TEACHER RANKING OF THE USE OF TEACHING TECHNIQUES.

TEACHING METHODS	TEACHER RANKING 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	Avg. Rank
Photographs	5	7	5	4	7	10	6	9	8	4	10	8	8	6	7	104	8
Pictures	2	5	6	3	4	4	5	4	4	1	6	5	4	5	3	61	3
Case Studies	11	4	1	9	9	5	7	12	11	12	8	6	9	12	9	125	9
Overhead Projector	1	6	7	6	3	1	4	6	7	6	4	10	1	8	1	71	4
Textbook	12	11	11	8	5	8	2	1	1	8	3	2	6	1	5	84	5
Films & Slides	3	3	4	5	8	7	8	5	6	5	7	7	7	7	8	90	6
Passages from Books	7	10	9	7	6	6	9	7	5	7	5	3	5	4	6	95	7
Geographical Games	10	9	8	12	10	11	12	11	10	9	12	11	12	12	10	159	12
Chalk Board	4	2	3	1	1	2	3	3	2	4	2	9	2	2	2	42	2
Field Trips	9	8	10	10	11	9	10	8	9	3	9	12	11	11	12	142	10
Worksheets	6	1	2	2	2	3	1	2	3	2	1	1	3	3	4	36	1
Sample Table	8	12	12	11	12	12	11	10	12	10	11	4	10	10	11	156	11

From the table the following points can be noted:-

1. Teachers of geography at the schools tested preferred to use methods that are conservative in nature, e.g., worksheets, chalk board, pictures, overhead projector and textbooks. At first glance the choice of worksheets as the most popular method of teaching is encouraging, but upon deeper investigation the worksheets employed are linked almost entirely to the textbook and involve the pupil in factual regurgitation. Very few open-ended questions are used.

2. Teaching methods used most often by the teachers are those that are teacher-centred rather than child-centred. Preferred methods are those that can most easily be employed when teaching a large class as a single unit, and those least employed are those which are normally group and activity orientated, e.g., geographical games and field work. Crisp (1969), remarking on the reasons for teacher preference for expository modes of teaching states

"Expository modes of instruction employ techniques such as dictation which require pupils to be passive listeners or copiers. When used in teaching geography, expository methods

favour rote-learning in which facts and concepts tend to be accumulated for accumulations' sake " (Crisp, 1969, p.11).

When discussing the reasons for teachers' choice of expository teaching methods, he states

"The expository type of teaching has several advantages. Lessons are easier to prepare, factual information is rapidly communicated, if not fully digested, and marking and testing are easy because of the uniformity of thought imposed upon the pupils. Problem-solving lessons have the obvious disadvantages of being difficult to prepare and time-consuming " (Crisp, 1969, p.12).

3. Methods which employ visual presentation, such as films and pictures, are used fairly frequently, which is encouraging in the light of Piaget's finding regarding the need for correct visual stimuli.

It is interesting to compare the way Natal teachers rank the use of teaching techniques with those in British Schools. Table 5.2. below has been constructed to show the results obtained by Cracknell (1976)

TABLE 5.2. CONSTRUCTION OF CRACKNELL'S (1976) RESULTS SHOWING BRITISH TEACHERS' RANKING OF TEACHING TECHNIQUES.

Teaching Techniques	% Use	Rank
Studying pictures and photographs	85	1
Use of a geography textbook	51	3
Use of film and slides	67	2
Reading passages from travel books	33	5
Use of rock samples & raw materials	45	4
Use of sample/case studies	10	6
Use of geographical games	7	7

Source: Cracknell, 1976.

In discussing his results, Cracknell remarked that

> "some cause for concern exists, however, in the small number who use case/sample studies. The Plowden Report saw the case study as an essential method of introducing children to the variety of people and places at a small scale, hence avoiding the tendency prevalent up to that time of making meaningless general statements about large regions of the world" (Cracknell, 1976, p.154).

From the table above, similarities can be found between British teachers and their Natal colleagues in the choice of teaching methods preferre Both use case studies infrequently, while preferring expository modes of teach ing methods such as the use of textbooks and pictures. The use of geographica games is infrequent in both countries.

To conclude, Cracknell's finding that

> "little field work is undertaken in the schools, case studies are rarely adopted, few teachers use large and medium scale maps and conceptual structure is lacking" (1976, p.150)

mirrors the findings in Natal schools, presented above.

To gauge teacher attitude towards the value of geography teaching as well as ascertain which areas of the syllabus were felt to be the most important, teachers were asked to rank five statements according to how they perceived their importance in the creation of a geography course. The result are found in Table 5.3. below.

TABLE 5.3. TEACHER RANKING OF THE IMPORTANCE OF AREAS OF STUDY IN SYLLABUS CONSTRUCTION.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	Ave. Rank
Knowledge of local conditions & places	1	3	1	2	2	1	1	1	2	1	2	1	1	2	3	24	1
Knowledge of other lands & their people	2	1	4	4	5	3	3	4	3	3	3	3	3	1	4	46	3
The learning of geographic skills, e.g. mapping	5	4	2	3	1	4	4	3	5	4	5	4	5	3	2	54	4
The learning of man-environment relationships	3	2	3	1	3	2	2	2	1	2	1	2	2	5	1	32	2
Knowledge of the physical processes in and about the world.	4	5	5	5	4	5	5	5	4	5	4	5	4	4	5	69	5

Knowledge of local conditions and places was ranked overall as the most important requirement of the geography course, with man-environment relationships second. Knowledge of physical processes was perceived as being the least important. Of interest is the fact that the learning of geographic skills such as mapwork is not perceived as being important. This helps explain the absence of graphicacy skills in the pupils tested on the Piaget perspective test and mapping exercise.

It is encouraging to see that knowledge of local conditions and places is ranked highly. As discussed previously, Piaget, Bruner and other psychologists have demonstrated that pupils at this level are mainly ego-centric and are able to appreciate environments they have experienced far better than those they have not. However, the same problem found by Cracknell exists in the schools, i.e.,

> "Forty-one percent of the respondents to the question concerning the nature of the geography taught at school indicated that local geography was important, yet results from the question concerning visits made locally suggest an alternative picture " (Cracknell, 1976, p.1

The importance of local study is perceived by the teachers but the desire to implement it is lacking.

Teachers' comments about the present geography syllabus and teaching environment give insight into areas that need attention if geography teaching in the primary school is to be improved. In many cases comments reinforce the contention that at present, geography teachers in the primary schools lack guidance in terms of material available which pertains to the syllabus, as well as guidance in the methods which may be used most effectively for teaching. Examples of comments by the teachers are presented below :-

"We need a general library from which we can borrow slides, tapes, games and books."

"More simulation games pertaining to the South African situation are needed."

"There is a lack of money allocated to the geography department at our school."

"The suitability of the syllabus content is good. There are interesting and varied topics."

"Teaching material is not easily obtainable."

"We need more guidance in the teaching of mapwork."

"Textbooks are outdated and very few new ones are available for class needs."

"Please give more in-service courses, at least one a year. We need to be updated and re-inspired."

"Far too much work needs to be covered in a year. More time should be spent on mapping, as children do not have much idea when they come to Std. IV."

"We need more guidance on the making and use of geographical games."

"I need basic, simple, practical help on drawing up of actual lessons which can be used in the classroom."

A general synposis of teacher comment shows that they are content with the geography syllabus although a few teachers feel that the amount to be tackled in a year could be reduced. However, teachers show a distinct anxiety about the lack of relevant teaching material available. Teacher concern about the suitability of geography textbooks and other source material in their schools is a positive sign that they are interested in improving their classroom teaching. The improvement of geography sections in primary school libraries would seem to be desirable if improvements are to occur in geography teaching. New books and journals should be available to stimulate those teachers who desire to improve their methods of teaching.

To conclude the discussion on teacher attitude towards, and practice of geography in the primary schools, the following salient points can be made :-

First, the overall impression of the kind of geography taught in the schools tested lacks a conceptual structure. Teachers are biased towards the teaching of facts rather than geographical concepts. The results of the questionnaire mirror the findings of Cracknell (1976), that answers

> "point towards many lost opportunities to develop geographical understanding and to a very slow diffusion of knowledge of the changes that have taken place in geography and geographical teaching in the past 15 years " (Cracknell, 1976, p.154).

Second, teachers are aware of their shortcomings as regards their teaching of geography and are generally prepared and interested in improving

the quality of their teaching.

Third, at the present time, teachers of geography in the Natal primary schools are not provided with sufficient means of improving their teaching, as there is a lack of in-service courses, new text books and other resource material pertaining to the syllabus.

Although the research results presented above have been obtained from teachers in Natal schools, there is little reason to suppose that the major findings would not pertain to primary schools elsewhere in South Afric

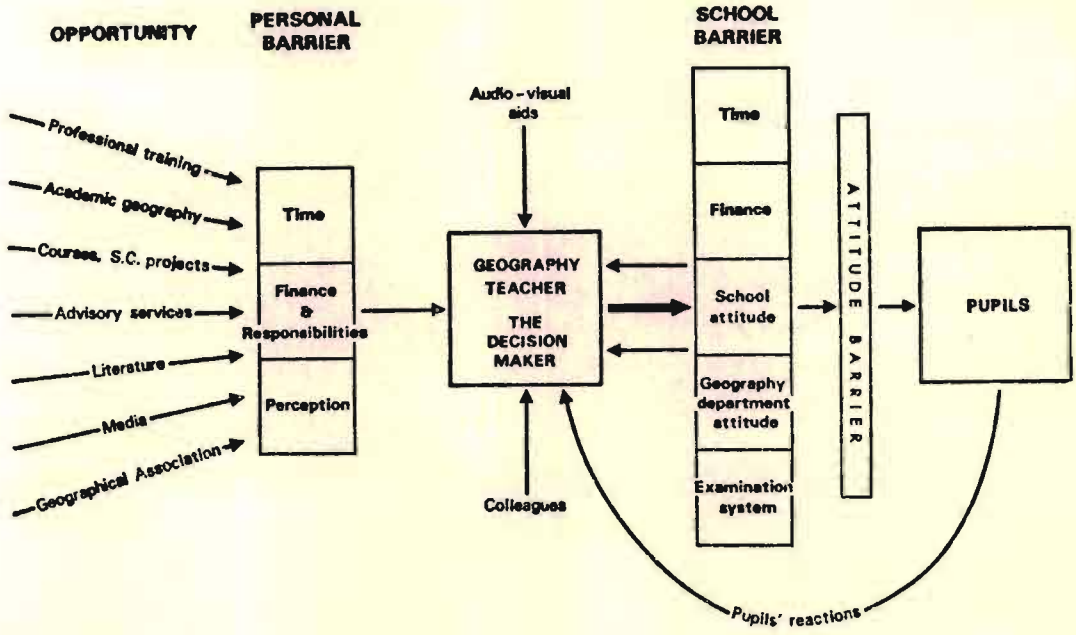
It is essential that if geography teaching in the primary school is to be improved, University and College of Education lecturers, Subject Advisors and Geographical Societies need to combine to provide the stimulus and research material necessary to change the attitude of those teaching in the classroom situation. A co-ordinated approach to the problems found in primary school geography needs to be implemented. This approach would need to be problem-orientated and co-ordinated to ensure that the fruits of the research and work undertaken are relevant to those who are to receive them, i.e., the geography teachers and ultimately, the pupils.

Factors Influencing the Role of the Geography Teacher.

In order to change attitudes towards the teaching of geography one needs to be aware of the factors which combine to create them. These factors are important as they result in an overall attitude towards geography which forms the platform upon which teachers base their actions, i.e., teaching strategies. An analysis of the teaching situation reveals the factors that combine to influence teacher attitudes towards the subject and the likely resultant behaviour. Sheila Jones, in an article entitled "The Challenge of Change in Geography Teaching" (1976) has analysed the role of the teacher in the classroom. Figure 5.1. below illustrates the factors that influence the teaching situation, and as such forms a useful framework for discussion.

FIGURE 5.1. /.....

FIGURE 5.1. THE GEOGRAPHY TEACHING SITUATION.



Source: (S. Jones, 1976, p.204).

Figure 5.1. presents a complex picture of the factors that influence the way in which geography is taught in a school, and as such forms a useful basis for discussion regarding teacher attitudes. On the left of the diagram are those factors which influence the teacher externally. These are the aids that the teacher can call on in an attempt to first learn about the subject, and second obtain guidance about the imparting of knowledge. The use of these aids is affected by the time, finance, responsibilities and perception of the teacher. Before the teacher imparts knowledge to the pupil, school barriers are encountered which may alter the approach to teaching as well as the methods used. The school barrier influences the teacher's attitude towards the subject. From the diagram it is possible to generalise about the situation as regards teachers of geography in senior primary schools.

The following are some of the factors which will have affected the attitudes of some of the geography teachers to a lesser or greater degree towards the teaching of the subject :-

1. Professional training - one or more years training in geography at a College of Education.

2. Academic geographers - these have provided little or no guidance for the primary school teacher except, perhaps, at irregular in-service courses. However, this advice is usually orientated towards subject content rather than methods of teaching.

3. In-service courses - these are held for teachers, but for very short periods, (one day, normally) and are not encouraged by the Education Department due to the cost factor and the inconvenience they cause in the schools due to the class system of teaching normally in use.

4. Advisory services - these are provided in the form of a subject advisor. However, the person is already very over-loaded with work and cannot devote a great amount of time to the primary schools.

5. Literature on geography pertaining to the primary school is difficult to find.

6. Media provide talks, films and slide-tape productions which can be used by the teacher. However, the booking of this material from the Department of Education is difficult, as it has to be ordered one term in advance and rarely, if ever, arrives when required.

7. The Natal Geographical Association provides guidance for the primary school teacher in the form of occasional afternoon courses, the provision of slide sets and a journal published three times a year.

The personal barriers of time, finance, responsibilities and perception as indicated in Figure 5.1. will vary from one teacher to the next. For example, there will be a difference in time devoted to preparation by those who are married and those who are not. Many teachers of geography in the primary school are female and married. As such, they normally have a multiple role of wife, mother and teacher to perform. This means that the time and effort spent on the preparation of school work is often not as great as that spent by a teacher who is single.

The internal factors which influence the teacher's attitude

towards geography in the schools are those summarised in Figure 5.1. under the heading of School Barrier. These factors vary from school to school, but again it is possible to generalise about them. The time devoted to geography teaching in the primary school is minimal, i.e., one hour a week in Standards II to V. The teacher, therefore, obviously devotes more time and effort to the teaching of subjects such as English, Afrikaans and Mathematics. The attitude of the school towards geography will, to a large extent, determine the finance available for the department for use in field study outings, text books and other aids.

The examination system in use at most primary schools is such that apart from term tests, examinations are normally written at least once a year, if not twice. Teaching of the subject even at the level of Standards II and III is often examination-orientated and as such the teacher is very bound to the syllabus.

The generalisations offered above highlight, to a large extent, some of the reasons for the poor state of geography teaching found in primary schools.

CONCLUSIONS REGARDING THE TEACHING OF GEOGRAPHY IN THE SENIOR PRIMARY SCHOOL.

From the discussion above regarding teacher attitudes and the role of the teacher in the learning situation, a major question arises. This is 'what type of teaching should be taking place in senior primary geography lessons'? Cracknell, on the basis of research and experience feels that "it is possible to characterise the kind of geography teaching that can and should be taking place in junior schools" (Cracknell, 1976, p.155). The following features, according to Cracknell, characterise good geography teaching :

1. *Geography teaching should not be taught as a separate entity but integrated with other subjects such as history, biblical studies, english and mathematics.*

2. *The subject matter taught should be in step with modern geographical thought. Spatial concepts must be taught and a move away from the pure accumulation of facts must occur. Examples of concepts that should be taught in the primary schools are distance, direction,*

scale, spatial location, spatial distribution, spatial relationships, movement and spatial change.

3. *Teaching methods used in the primary school must be child-centred rather than teacher-centred. They should also be in line with Piaget's idea of active rather than passive learning.*

4. *Explanation and problem solving, rather than mere description of regions, should occur in the geography classroom.*

5. *Teaching examples must be chosen to illustrate the concepts taught and these should be drawn from local as well as world regions. These regional studies should build up sympathetic attitudes towards other nations and appreciation of their problems.*

6. *Mapwork and graphicacy should form a major part of any geography course in the junior school.*

If geography teaching in Natal senior primary schools is to exhibit similar features to the model proposed by Cracknell, certain changes need to be implemented.

First, it is necessary to update the teachers' understanding of the subject and change their conservative attitudes. Teaching examples should be supplied which can be used by teachers at different standard levels in the schools. Examples of how to teach topics could be supplied at in-service courses or by providing promotion posts for a few selected teachers who would be responsible for advising on geography teaching methods and programmes for a number of schools in a geographic area. These individuals could fall under, and be guided by, the subject advisor for geography. In this way a more personal and effective strategy for the teaching of geography in the primary schools could be implemented by those who have been trained and have direct experience in the primary phase of education.

Second, text books should be improved to incorporate some of the new ideas, and reflect the conceptual emphasis, of the syllabus. All schools should be supplied with books such as the "New Ways in Geography" series by Cole and Beynon, and the "Oxford Geography Project", which would stimulate the teachers to think of new methods of teaching the subject. Syllabus data could be interpreted in a framework which stressed the

acquisition of concepts together with facts, rather than facts alone.

Third, subject societies such as the "Natal Geographical Association" should involve themselves more fully in the preparation of teaching aids and the dissemination of new ideas to primary school teachers. Although the Natal Geographical Association has tried valiantly in the past to help primary school teachers, it is felt that more could be accomplished in the future.

Finally, to improve the development of spatial concepts it is imperative that the teaching of mapwork during the senior primary school phase be improved. Up to the present, mapwork, for a variety of reasons, has been the cinderella of the geography programme in the schools. This thesis aims to present ways and means of co-ordinating a systematic approach to the teaching of mapwork in the senior primary school. In this way it is felt that the spatial concept development of pupils will be improved and children in the future will conform more closely to the norm as proposed by Piaget.

To conclude, as a result of research into spatial concept development, teacher attitudes and the role of the geography teacher, it is suggested that the teaching of geography at the senior primary school level needs to be improved. It is the contention here that if spatial concept development is to be improved the area most in need of attention at present is the teaching of mapwork. An improvement in the teaching of mapwork, as mentioned previously, would lead directly to increased learning and appreciation of spatial concepts by the pupils. In the following chapters this thesis first attempts to demonstrate the need for mapwork in the primary school, second, establish what elements comprise 'a map', and finally suggest a systematic conceptual framework for the teaching of mapwork in the senior primary school.

CHAPTER SIX

THE TEACHING OF MAPWORK IN THE PRIMARY SCHOOL

INTRODUCTION.

Balchin and Coleman (1973), when discussing the teaching of graphicacy in the primary school, claim that mapwork should be placed together with the acquisition of reading, writing and arithmetic skills in importance. Literacy and numeracy do not alone form the total underpinnings of the academic aspect of education as they both lack the ability to express information of a spatial nature in a concise manner. The importance of graphicacy is that it helps one express "the communication of relationships that cannot be successfully communicated by words or mathematical notation alone" (Balchin and Coleman, 1973, p.81).

The learning of mapwork and other forms of graphicacy should therefore be emphasised at school if the child is to receive a balanced education. To minimise the importance of mapwork teaching at the primary school level is to deprive the child of one of the essential underpinnings of education. However, it has been found that

> "Primary and secondary school geography classes still spend an overwhelming amount of time on the nonspatial aspects of geography, cartography as such is often not taught at all, and maps serve as an adjunct to other aspects of study - when they are not being used merely as colouring exercises " (Stea and Blaut, 1973, p.233).

Traditionally the bulk of mapwork has been taught in secondary schools, but over the past few years geographers involved in mapwork research, e.g., Blaut, Stea (1973, 1974) and Catling (1978, 1978b), have called for more mapwork to be introduced at the primary school level. The general feeling about the teaching of mapwork is expressed by the Schools Council Environmental Studies Project:

> "some levels of map reading and interpretation are unlikely to be achieved until children are at secondary school, but most of the basic concepts of maps can, and should, be developed at primary school level. Especially is this true when children

> are making direct investigations of their environments and needing maps as tools, for recording and communicating information." (1972, p.9).

Today prominent geographers such as Catling (1978, 1978b), Blaut, Stea and Downs (1973, 1974, 1977), Satterly (1973), Balchin (1972), and Coleman (1973), all agree about the importance of teaching mapwork in the primary school. However, there is some confusion as to what these researchers call maps and how they define them. Research findings of Blaut and Stea (1973, 1974) and Catling (1978, 1978b) have shown that there is a body of opinion that feels that maps can be understood by very young children. Upon closer observation, however, it becomes clear that these "maps" are not the same as those discussed by researchers such as Satterly (1973). The difference in understanding about what constitutes a map is a matter of complexity rather than of kind, but it is nonetheless important to define more precisely what is meant by the term 'map'. This is necessary in order to avoid misunderstanding the seemingly contradictory ideas of geographers such as Blaut, Stea and Satterly and the ideas of psychologists like Piaget and Bruner as applied to the teaching of mapwork.

In their work on preliterate children, Blaut and Stea have explained that, of necessity, their definition of a map "incorporates all the basic functions and properties of the ordinary cartographic product but excludes the purely conventional properties, those that must be formally taught to anyone, regardless of age " (Blaut and Stea, 1973, p.88). They continue to show how they defined the functions of mapping

> "in terms of a simple communication model: the transmission and receipt, in any medium, of information about distance, direction, and landscape feature or site, information of the sort contained in a 'cognitive map'." ..... (1973, p.89).

Using aerial photographs and modelling techniques they found that children as young as 3 years of age can represent a cognitive map. (1974).

Maps which form part of the cognitive type are, of necessity, different from conventional maps, not in underlying concepts such as scale, direction and abstract signs, but rather the abstraction of these underlying factors. Catling has defined cognitive maps as "free-hand memory maps of a local walk or area " (Catling, 1978, p.120). Using Blaut

and Stea's ideas he states that

> "the child's free-drawn map of a place displays his image of an area that he is unable to perceive as a whole from a single earthbound vantage point and which, therefore, requires a cognitive map for comprehension and navigation. The representation of this image that the child draws is called a cognitive map." ..... (Catling, 1978, p.120).

Downs and Stea define cognitive mapping as

> "an abstraction covering those cognitive or mental abilities that enable us to collect, organise, store, recall and manipulate information about the spatial environment. These abilities change with age (or development) and use (or learning)." ..... (Downs and Stea, 1977, p.6).

Cognitive maps, then, are a product of "a person's organised representation of some part of the spatial environment " (Downs and Stea, 1977, p.6).

Work done by Blaut and Stea has made it apparent that cognitive mapping is a skill that young children must develop if they are to interact successfully with their environment. This view is seemingly in conflict with Piaget's ideas regarding stages of development. However, if when referring to maps one is talking about conventional maps such as a topographical map, it becomes obvious that the ideas of Piaget and Blaut and Stea are not opposed. A conventional map is an abstraction from the real world and as such the viewer must be able to deal with abstract concepts. The ability of a child to interpret and understand a conventional map takes a long time to develop, as any teacher in the secondary school knows. However, this does not mean that cognitive maps are of no value to those concerned with mapwork teaching. On the contrary, they should form the first step in any course on mapwork in the primary school as they involve the same basic concepts but at a lower level of understanding than those demanded by a conventional map.

It is important to understand the differences between cognitive maps and conventional maps when discussing the teaching of mapwork in the primary school. Generally speaking, mapwork books tend to use cognitive maps to introduce mapping concepts to children and gradually build on these

using different exercises until the child is able to abstract and understand conventional maps.

For the purpose of this thesis Catling's definition of a map will be used. A map is defined as "a two-dimensional graphic representation of a selection of features or aspects of a surface, drawn at a reduced scale, and implying a vertically-overhead viewpoint corresponding to that surface " (Catling, 1978b, p.2). This definition has been selected as it best fits the needs of mapwork teaching in the primary school in that it allows for the growth of mapwork concepts at different levels of understanding. The definition also allows for the use of cognitive and conventional maps in a primary school mapwork course. Thus the pupils' understanding of mapwork concepts should increase year by year until they are able to abstract and interpret detailed conventional maps.

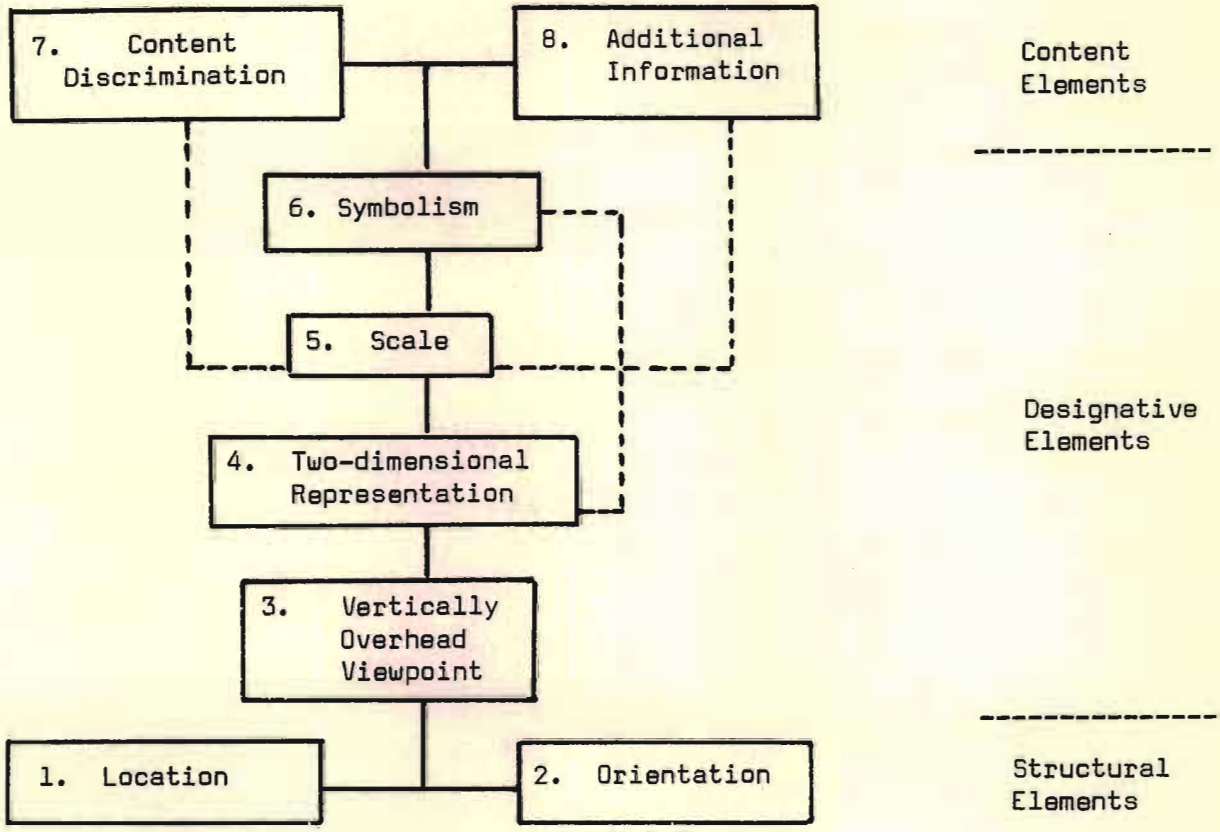
Catling feels that the strength of his definition lies in the fact that it is

> "broad enough to allow a map to show relief, settlement, communications, drainage ..... ; to indicate for instance land use, traffic flow and housing density; to outline an individual's view of a route or place, actual, perceived or imagined; and to be of whatever scale of specificity is felt most valid." ..... (1978b, p.2).

Maps, as defined above, have common elements which can be identified. It is important to know what these elements are as they form the underlying concepts that pupils must develop in a mapwork course. Catling, (1978b) identifies eight mapwork elements which he groups into three classes, i.e., structural, designative and content. See Fig. 6.1. below.

FIGURE 6.1. /.....

FIGURE 6.1. THE STRUCTURAL RELATIONSHIP OF MAP ELEMENTS



(Catling, 1978b, p.4).

Each element in Figure 6.1. is necessary if correct map concepts are to be taught. In designing a mapwork course for the primary school these eight elements form a useful framework within which to work. Their use ensures that all aspects of the topic are covered. Before suggesting a mapwork curriculum for the primary school it is important to discuss each of the elements of a map briefly, as an understanding of them and how they combine is a prerequisite for successful teaching.

Location and orientation, which combine to make up the structural elements of the map, must be seen in relation to one another. All objects occupy a point or constitute a place and are able, therefore, to be located. Maps are mainly concerned with the graphic representation of objects in a given area. Location can be described in relative terms, e.g., my house is near the Pinetown bus terminus; or in exact terms, e.g., my house is located at No. 10, Doone Road, Pinetown.

Catling describes the interconnection between location and orien-

tation in the following manner :-

> "Nothing can be described as having location except in terms of position relative to (near, or a specific direction or distance from) or within (a grid reference system) something else."
>
> ..... (Catling, 1978b, p.5).

A person viewing a map needs to orientate the objects on the map with respect to those on the ground. The location of objects on the map relative to one another must be accurate otherwise the map loses its value. Basic concepts which can be identified from the study of location and orientation of maps are those of absolute and relative location and orientation by means of absolute (concrete) and relative (cartographic grids) methods. The designative elements identified by Catling i.e., vertically overhead viewpoint, two-dimensional representation, scale and symbolism (1978b) are those that need to be developed by the pupils as they move away from intuitive cognitive maps to an understanding of conventional maps which require a different kind of conceptual ability.

The concepts of absolute and relative location and orientation can be learned informally in the process of interaction with space, but it is unlikely that concepts involving designative elements can be learned effectively in any situation that does not require some programme of formal learning experiences.

The overhead viewpoint is a concept that a child must learn early on if maps are to be understood. The reasoning behind this viewpoint, i.e., the need for a view with no hidden objects, must be grasped early on when, according to Piaget, the child is at the concrete stage of development. The methods implemented in the teaching of this concept must therefore be concrete in nature. However, although the child must realise that a map utilises an overhead viewpoint this does not mean that all objects in the area need be depicted on the map. Data are selected according to the aim of the cartographer. If everything on the ground was represented on the map, confusion would result.

Two-dimensional representation is a problem which children involved in a mapping exercise will come across early on. The problem is twofold, incorporating representation of height and depth; and projection. As a map is a two-dimensional object, ways and means of indicating the third

dimension, height, are necessary. This combined with the need for an overhead viewpoint makes the concept of height representation a difficult one to appreciate for pupils at the primary school level. Problems of projection will not usually be apparent due to the fact that the maps which pupils use at the primary school level should be large scale and based on euclidean geometry. However, if maps such as the London Underground or Paris Metro system are used, enormous difficulties arise with concepts of scale and direction, as anyone who has used them will be aware. The use of small-scale maps which, of necessity, incorporate certain distortions in either scale, area, direction or shape, can confuse pupils at the primary level due to their concrete relationship with the environment.

Of all the elements of a map, scale is perhaps the one that is first noticed by young pupils engaged in a mapping exercise. According to Catling, "scale merely indicates, in general terms, that a feature is drawn smaller than it appears in the real world " (1978b, p.6). Scale can be a proportional ratio relating size on the ground to size on the map, as well as a relative statement which indicates "the general relationships between places in terms of distance and size " (Catling, 1978b, p.6). As mentioned above, scale is but one of four factors involved in map projections and therefore may be distorted in favour of, for example, the need to have correct direction as in a Mercator projection.

Symbolism is a necessity on maps as it helps to simplify the visual impact by reducing the problem of cluttering, while maintaining the ability to convey information. Symbols on large scale maps may be realistic, while in small scale maps they are normally highly iconic and therefore a key is necessary. At primary school level map symbolism should be realistic in Standard 2, becoming more iconic as the child progresses to Standard 5.

The designative elements of a map are those on which teachers should concentrate when teaching pupils at primary school level. The interrelated concepts of vertical viewpoint, two-dimensional representation, scale and symbolism should be gained by pupils before they enter high school.

Content elements, i.e., content discrimination and additional information, are concerned with the selective nature of maps. Catling states that "the map-maker is selective and depicts on a map those features or relationships that he wishes to make known to the user " (1978b, p.7). The

selective nature of maps in terms of content discrimination and additional information, although important to the child's general concept of a map, is not as essential as is an understanding of the relationships between the designative elements.

In concluding his discussion on map elements, Catling states that

> "if children are to develop a sound understanding of what maps are, how to use them and what information they provide, it is vital that teachers be aware of the structure of the map, and how it is able to perform its specific function." ..... (1978b, p.8).

Any mapwork course should therefore include an explanation, for the teacher, regarding the conceptual structures which the course is designed to promote.

Some Thoughts Regarding the Formulation of a Mapwork Course for Senior Primary Schools.

Any attempt to formulate a systematic conceptual framework for the teaching of mapwork in the primary school must consider the theories of spatial concept development. To recapitulate briefly, the major findings of significance to the geographic educator are seen as follows :-

1. Piaget's research has stressed that spatial learning takes place as a result of child activity in the environment in the process of assimilation and accommodation. Understanding of spatial concepts occurs in a series of stages as the child advances from a state of egocentrism to one where it is able to abstract. Stages of development take place in a sequence which is stable and every child must pass through the same stages. Children differ in their cognition from adults quantitatively and qualitatively. According to Piaget, then, the child will need concrete teaching methods up until the age of eleven due to the fact that abstraction only occurs after this age.

2. Bruner differs from Piaget in that he feels any subject can be taught effectively in some intellectually honest way to any child at any stage of development. (1960). This view opposes that of Piaget's stages of development and replaces it with a continuum of concept formation. Bruner would prefer a curriculum in which the central concepts of the subject are identified and revisited by students at different times during their education. This is the so-called spiral approach to curriculum planning.

3. Blaut and Stea have demonstrated that children are able to appreciate spatial relationships at a very early age. They feel that large-scale environmental cognition occurs at a very early age and that cognitive abilities in this sphere are well-developed before the child goes to school.

As mentioned previously, it seems reasonable to combine the major ideas of Piaget and Bruner into a single approach to the teaching of spatial concepts. In constructing a mapwork course for the primary school Bruner's approach to the teaching of concepts could be employed with the ultimate aim of the pupil satisfactorily achieving Piaget's formal operational stage of development by the age of twelve years. The mapwork course would proceed from areas with which the pupils are familiar, i.e., along the lines of exercises discussed by Blaut and Stea (1973, 1974) when dealing with cognitive mapping. The cognitive mapping concepts could be developed into an understanding of conventional maps and their uses by the end of Standard 5.

In formulating a mapwork course for the senior primary school cognisance must be taken of the findings of the thesis thus far. Briefly these findings have indicated the following points which need to be incorporated into the planning of any mapwork courses for primary school pupils.

1. The child at the primary school level is largely egocentric in outlook and at the concrete stage of development. This will affect the methods of teaching that should be employed by the teacher.

2. Any mapwork course has to take into account the fact that individuals have different academic abilities and therefore teaching methods which cater for individual needs will be most successful rather than those employed in class unit teaching.

3. The pupil must be actively involved in the learning situation and therefore discovery methods of learning should be used.

4. Mapwork concepts should be identified and taught at an ever-increasing depth as the child passes through the primary school.

5. Emphasis in a mapwork course must be on the concepts involved and not upon the mere manipulation of figures.

6. Research suggests that an understanding of the cognitive mapping process should form the base of any mapwork course in the primary school.

7. If teaching is to be successful the stage of learning reached in each year must be clearly laid down for the teachers.

8. A systematic approach to mapwork teaching is necessary so that teachers know to what extent pupils can be expected to understand mapwork due to their learning in previous years. This approach will also standardise the teaching of mapwork in primary schools and thus help both the pupil and the teacher when pupils move from one school to another.

9. If a systematic approach to mapwork is carried out in the primary schools the needs of the discipline in the high school must be born in mind.

10. From the research discussed previously it has been found that teachers need a detailed guide to mapwork in the primary schools, which includes practical examples which can be used in the classroom.

From the above it is seen that any successful mapwork course must take into account the needs of the child, the teacher and the discipline and keep them in tension so that no one element is favoured to the detriment of the others.

Bruner has suggested that "each subject, such as Geography, has an underlying structure which consists of its total set of primary ideas, models or concepts" (Crisp, 1969, p.13). Once these are identified curriculum planning can proceed. For a mapwork course, the map elements as stated by Catling (1978) form a useful structure around which a curriculum can be built. The eight elements can be taught every year at an increasing level of complexity as suggested by Bruner.

A curriculum for the teaching of mapwork in the primary school will now be discussed, showing how it is possible to develop the child's spatial concepts so that by the age of twelve years the majority of pupils reach the stage of formal operations predicted by Piaget. A mapwork course for each standard is discussed, giving the aims and level of mapwork understanding that can be expected. Methods for teaching mapping which are suited to the conceptual level of each standard are also presented. In each standard the teaching of three or more of Catling's (1978b) elements are focussed upon, although obviously because of the connectivity between elements, all will be involved in the mapping exercises. The emphasis in the following sections is placed on practical means of teaching mapwork

concepts at each level of the senior primary school based on the threefold needs of the discipline, teacher and child.

CHAPTER SEVEN

THE TEACHING OF MAPWORK CONCEPTS IN STANDARD II.

The overall objectives of a Standard II mapwork course would be to introduce the concepts of overhead view, scale and the usefulness of maps as well as to develop an understanding of direction. The child would be expected to know and understand why maps are drawn from an overhead viewpoint. The problems of hidden features and the use of aerial photographs to reinforce understanding should be utilised. Aerial photographs of the local school area at this stage would be a very useful aid to mapwork learning and can be comprehended by a child at this level (Blaut and Stea, 1974).

Scale needs to be introduced in an informal manner and the teacher should not become too particular about accuracy at this level. The concept of scale should evolve as the child practises the drawing of maps. At the Standard II level it is suggested that scale should be introduced by involving the child with the extremes of scale, i.e., large and small scale maps. In this regard it is proposed that cognitive maps, as suggested by Blaut and Stea (1973a, 1973b) should be used, as well as work on the world globe.

The teaching of the usefulness of maps is important at the Standard II level because if the child understands the reasoning behind the work he is doing, he is likely to be motivated to learn more about it.

The final idea to be introduced at the Standard II level is the concept of orientation. This concept is not all that important at this stage but needs to be brought to the attention of the child. Direction, at the Standard II level needs to be discussed in relation to cognitive maps and the globe.

During the teaching of mapwork concepts at the Standard II level, teachers must bear in mind the importance that Piaget and Bruner place on the child being active in the learning situation. As Bentley et al state, "the more the child can be encouraged to make maps, however simple, the quicker he will grasp and understand these principles " (1975, p.6).

(i) Teaching the Concept of an Overhead Viewpoint.

Bentley et al comment that "unless a child understands that all maps are drawn from the 'birds-eye-view', the map will not make sense " (1975, p.4). It is very important, then, that right at the beginning of any mapwork course, the child should understand the perspective of the map. Piaget's 'three mountains test' has shown that a child at a Standard II level is unable to appreciate viewpoints other than its own, and as such, methods used to teach the overhead viewpoint must be concrete in nature. The child must be made to feel and understand that when it deals with maps, its viewpoint should always be from overhead. Personal viewpoint and overhead viewpoint must become synonomous when the child deals with maps.

If pupils at this level are asked to draw a map of the classroom, they will invariably draw the objects in the room as they see them, i.e., from a vertical viewpoint. It is suggested that for the first few mapping exercises, the teacher should allow the pupils freedom in their choice of viewpoint as they will very soon become aware of the problems involved in trying to map, for example, the classroom. Although pupils may not be able to explain what the problems are (as these involve the interaction of scale, viewpoint, two-dimensional representation and symbolism), they will begin to realise that 'something is wrong'. Reactions such as 'I can't fit all the desks in', and 'how do I draw the windows and doors?' indicate the child's awareness of mapping problems. The feeling of frustration which occurs as a result of an inability to solve these complex problems, allows the teacher to guide the pupil towards an understanding of the correct concepts. The learning process, it is felt, should be a problem solving one with the pupils discovering better ways of mapping. The teacher's job is to plan learning situations where "children can be aided to develop concepts which are required for any valid use of maps for recording and interpretation" (Schools Council Environmental Studies Project, 1972, p.10). Once a class expresses frustration at the mapping of the classroom, the teacher can suggest ways of improving the situation. It is felt that at this point the teacher's suggestions should be geared towards the introduction of an overhead viewpoint. In a practical manner the teacher can then show how this helps solve some of the problems encountered by the pupils, such as not enough space in which to draw the objects and hidden features.

Methods employed in the teaching of the overhead viewpoint should

be pupil orientated or individualistic in nature and based upon concrete reasoning. Individual, group or class mapping tasks can be constructed to make children aware of the overhead viewpoint. Pupils can, for example, draw objects viewed from above either by looking over a balcony at them or by placing toy objects such as a dolls house or a 'Dinky car' on the desk. This can be an enjoyable exercise for the pupils if used in conjunction with a worksheet reinforcing the concept of a planned view in which pupils are asked to draw objects and identify unusual ones drawn from above. Some ideas which a teacher could incorporate in a worksheet to introduce the concepts of an overhead viewpoint, are listed below:

(a) The child can place a small object on a piece of paper and then draw around it, thereby creating a plan view (Schools Council Environmental Studies Project, 1972).

(b) With the use of an overhead projector the teacher can exhibit model objects and ask the pupils to imagine what these would look like if they flew over them in an aeroplane. The correct plan outline is then obtained by placing the objects on the overhead projector which will then project the plan view onto the screen for the pupils to compare with their own drawings.

(c) Pupils could be asked to imagine that they are birds flying over familiar objects, e.g., school buildings or a model that the teacher has made, and then draw what they would see.

(d) The teacher can construct plan views of objects in the classroom and run them off on a Roneo machine for the pupils to cut out. These cut out objects can then be labelled and utilised in a modelling situation in which the child might construct a map of the class.

Bentley et al (1975) suggest an interesting way of testing whether pupils have understood the idea of the overhead viewpoint. A map of the classroom is given to the pupils and they are asked to draw in where the windows should go. The results of the exercise will show the teacher how much the class has understood the concept of an overhead viewpoint.

(ii) <u>Introduction to the Concept of Scale</u>.

At the beginning of the Standard II year children already have an

appreciation of the concept of scale due to their use of cognitive maps, their manipulation of toys and the viewing of television and other phenomena they have encountered. The child "recognises the relative reduction in size of objects; that is, a scale" (Bentley et al, 1975, p.6), although accuracy of reduction is missing. The teacher's job is to refine the generalised concept of scale possessed by the child at this age to an accurate representation and appreciation of distance and size from maps by the time it reaches Standard V.

> "Recognition of scale in mapping should be seen as having a progression from simply 'drawn smaller' or 'larger' to a measured and calculated relationship of increasing complexity, to show distances and relative positions of features."
> .... (Schools Council Environmental Studies Project, 1972, p.11).

The approach to the teaching of scale, as suggested by the research of Piaget and Blaut and Stea, should be one which relies heavily on the child's concrete experiences of the environment. This means that the teacher should use large scale maps, either drawn free-hand from memory in the form of cognitive maps, or maps of a very small area which the child can see, to reinforce the concept of scale. Commenting on the use of large scale as opposed to small scale maps at this age, the Schools Council Environmental Project Group remarks that

> "in terms of mapping it is still apparent that accurate scale ideas are best developed through making and using large scale maps of the immediate locality before progressing to smaller scale maps." ..... (1972, p.11).

The emphasis at the Standard II level regarding the use of large scale maps is on free-hand drawings by the pupils rather than the use of printed maps. This involves the child in the learning situation which enhances the understanding of the concepts involved. This conforms to the teaching methods suggested by Piaget and Bruner's theories discussed previously. However, although the process of developing an accurate concept and understanding of scale is best achieved by using large scale free-hand maps, the child also needs to be introduced, albeit briefly, to small scale maps. It is important that children have an appreciation of the world they live in and knowledge about its size, shape, continents and countries. Understanding is necessary if they are to comprehend work undertaken in other subjects, e.g., history,

which unfortunately tends to deal with small scale environments at this level. A rudimentary understanding of scale is necessary if the child is to appreciate the travels of Alexander the Great or the exploits of Hannibal. It is suggested that at this age pupils should be actively involved with locating places of immediate interest on the world globe.

A problem to be faced by the teacher in Standard II is that the Geography syllabus calls for the teaching of activities, e.g., coal mining, in medium scale environments, which require the pupil to locate the activity on regional maps. This problem cannot be overcome, but as far as possible the teacher should try to relate the area under discussion to the globe. It is suggested that the majority of the methods for teaching mapwork during Standard II should be related to activities involving the class in free-hand map drawing. In free-hand mapping, the teacher aims to develop the child's concept of distance and size. Children should be taught that maps must correspond as far as possible to reality, which means that distances between objects and their relative sizes, must be accurate otherwise the value of the map to others is severely limited. Although free-hand drawings utilise a relative rather than absolute scale, it is important that the child at this level becomes aware of concepts of proportion and ratio. Free-hand mapping exercises which teachers can employ to introduce the concept of scale are as follows :-

(a) Stories can be read to the class and then placed in a map framework. Rex Walford, when lecturing at Edgewood College of Education during 1978, demonstrated how a story such as "Little Red Riding Hood" could be placed in a map framework. His suggestion will be explained in detail later when discussing exercises which demonstrate the usefulness of maps.

(b) At the beginning of Standard II the teacher can distribute copies of a plan of the classroom with certain objects correctly located and drawn to scale, e.g., a desk or two and the teacher's table. The pupils are then required to complete the map of the class. Children will employ the same scale as that utilised by the teacher. Using this method pupils will learn about the need for accuracy of relative distance and size in the location of objects. This exercise could be extended by making the pupils measure the actual size of objects depicted on the maps. The size of objects could then be roughly

compared with their size on the map. An idea of proportion and ratio could be gained from this exercise.

(c) Pupils can be asked to draw mental maps of their routes to school. These maps will all involve different scales depending on the distance which the child lives away from the school. Pupils would be expected to label the streets along which they travel and to include important landmarks. If the teacher has an above-average intelligence group, these maps could form the basis for discussion about concepts such as time/distance relationships.

(d) Children can be asked to draw maps of their kitchens at home. The child can then be asked to work out the amount of movement that would be necessary if he or she had to make a cup of tea. From this, discussion about the efficiency of the spatial layout of individual kitchens may arise as regards the distances involved in accomplishing individual tasks. This exercise is an interesting one in that it inevitably involves parents in the learning situation, e.g., children would suggest to their mothers new spatial layouts for the kitchen.

(e) At all times the teacher should use the world globe when dealing with regions of the world, regardless of the subject being taught. Noteworthy items of world news could be read out daily and the children could then identify the continent, country and town which they have discussed, on the globe.

(iii) <u>The Usefulness of Maps</u>.

The third concept which the teacher should try to develop in the pupil at the Standard II level is an appreciation of the importance of maps. If children understand that maps help them by supplying information as well as storing it, they will be motivated to learn more about them. The usefulness of maps is related to the accuracy with which they represent reality as well as the discriminative selection of relevant data. Cole and Beynon state that "the map is widely regarded as a vital means of expression in Geography" (1969, p.11). Mapping for the mere sake of mapping is of no value at all. Maps must be judged according to their use in certain situations. It is hoped, therefore, that right from Standard II the teacher will continually link all mapping exercises either to the need to record

certain information or to obtain information. (Cole and Beynon, 1969, p.11). An understanding of the usefulness of maps is gained by the way in which the teacher structures the learning situation. Any mapping exercise that is undertaken by the class must have a purpose, e.g., to find out who lives the furthest from the school in terms of time and distance, what our house looks like from an aeroplane, or how the wolf tricked Little Red Riding Hood. Although the teacher endeavours to teach mapwork concepts these should be learned as far as possible in a problem-solving situation. The following examples of teaching the usefulness of maps are related to the three methods previously suggested to teach scale :-

(a) In the use of stories such as Little Red Riding Hood, pupils can be set simple problems to solve which involve the concept of time and distance.

Using the sketch above, pupils could be asked to answer the following questions :-

(1) Identify which route is taken by Red Riding Hood and which by the wolf. Label them and give reasons for your answer.

(2) Is Little Red Riding Hood's route longer than the wolf's?

(3) Why did the wolf get to Grandma's house before Red Riding Hood?

(4) Tell a friend what you think is the quickest and shortest way to get to the playground and the slowest and longest way, starting from your classroom.

(b) Reasons for mapping the classroom could be to :-

(1) Calculate how many more desks could be fitted in.

(2) Determine which is the best place to sit, i.e., near the teacher, door, window, friend or heater.

(3) Where the best location for the wastepaper basket would be.

(4) Make a map for parents to locate their child's desk on Parent/Teacher days.

(5) Determine where the overhead projector screen should be located.

(6) To find out which area of the floor has the most wear.

(7) Allow pupils to re-arrange the room according to their own needs.

(c) Questions that the teacher could ask regarding the mapping of children's routes to school are as follows :-

(1) Why do you come to school by this route? Is it the shortest or quickest way, or both?

(2) By what means do you come to school? Bus, car, bicycle, or walk?

(3) If you came by another means of transport would you come the same way? Describe which way you would come.

(4) What factors do you take into account when deciding the quickest route to school?

(d) If children are asked to draw a map of their kitchen at home, some of the questions which could be asked are :-

(1) Work out the number of times you have to move from the kettle to make a cup of tea.

(2) What is the distance you would have to move?

(3) How could you re-arrange the outlay of your kitchen to decrease the amount of movement?

The use of questions such as those suggested above, in conjunction with

mapping exercises, will ensure that children appreciate the value of maps. Obviously the wording of the questions would need to be simplified when given to a Standard II class.

(iv) An Introduction to Orientation.

Orientation, in Standard II, is not a concept that should be stressed but rather one used to help locate places on the earth's surface. In this regard, the child needs to be introduced to the four cardinal points of the compass. The orientation towards an external reference system is not easily understood at this age due to the concrete nature of the child's cognitive development. The pupil, however, will be able to grasp the workings of the compass if it is presented in a practical rather than abstract manner. Understanding of the concept will occur later as the child develops cognitively.

Methods which can be used by the teacher to introduce the concept of orientation are as follows :-

(a) Every day a ten minute period could be set aside for world news. Places mentioned could be located by the pupils on the world globe and reference made as to whether the country or town discussed is to the north, south, east or west of the school. The Schools Council Environmental Studies Project states that this type of exercise has value in that

"constant reference to direction and the general distribution of land masses can enable a child to visualise his immediate location in relationship to the surrounding areas." ... (1972, p.11).

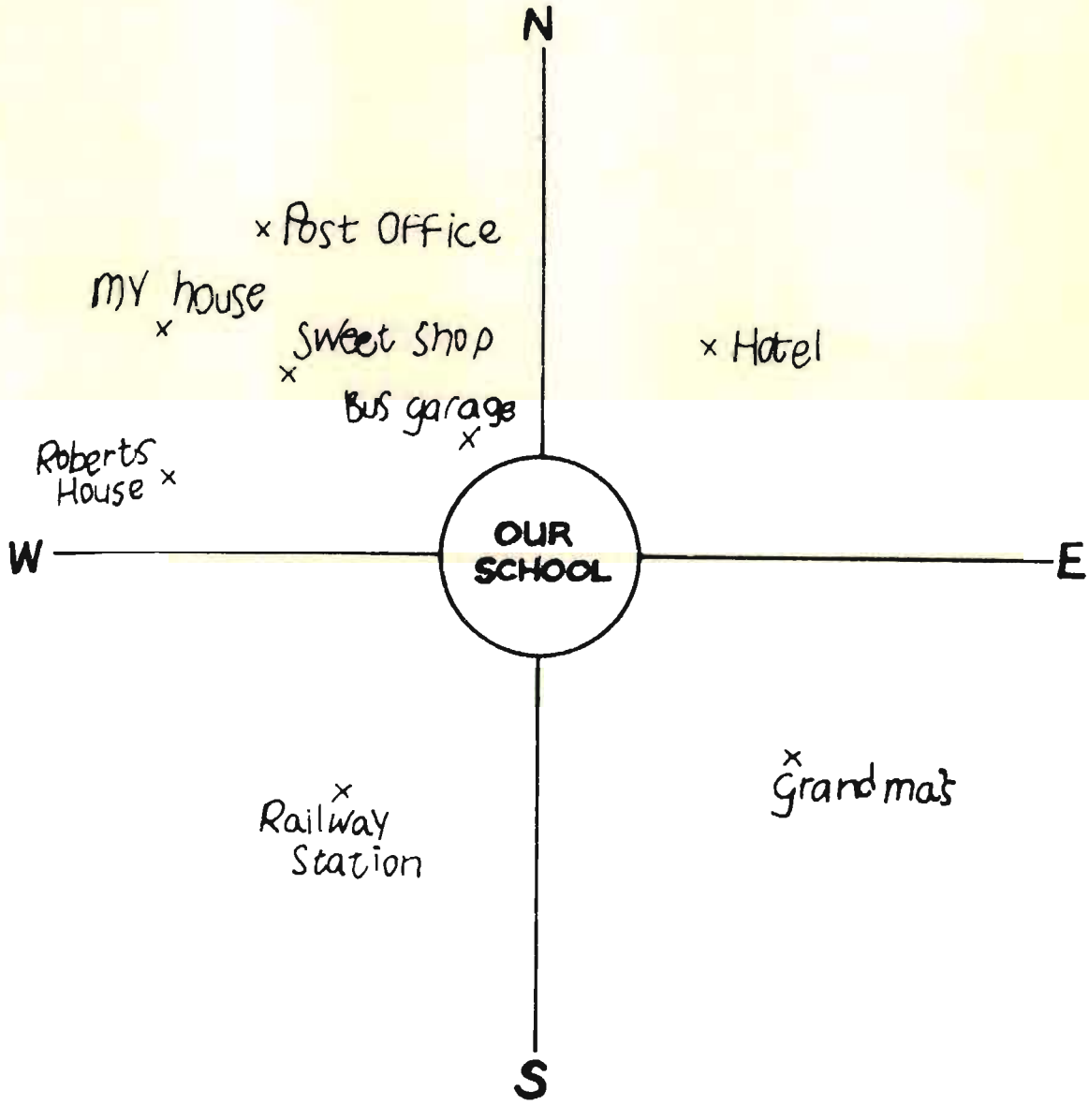
(b) All cognitive maps drawn by the pupils should have the north point represented on them. Tasks involving the use of small compasses to assess the location of north and then transferring the direction onto the map will be enjoyed by the class. Competitions can be organised in which the pupils' mental maps are disorientated and they have to try and orientate them correctly.

(c) A game can be played in which pupils are paired off and one child in each group tries to guide the other, who is blindfolded, through an obstacle course of desks or other pupils by means of the four cardinal

points, e.g., a command could be "take three paces to the east and now one pace to the north", etc.

(d) Using an outline of the four cardinal points, children can locate by memory important features and buildings near the school. See Figure 7.1. below.

FIGURE 7.1. MY MEMORY MAP OF IMPORTANT BUILDINGS NEAR OUR SCHOOL.



(Bentley et al, 1975, p.25).

The above examples of exercises which may be used by the teacher to introduce the concept of orientation should not be used too often because of the concrete manner in which the child will view the exercises. The danger

is, as Thake points out, that "premature introduction of cardinal directions perpetuates such symbolic equivalents as left equals west, and up equals north" (1977, p.4). The general feeling of researchers such as Thake, is that "as long as the child can orientate himself, the use of north, south, east and west could be left until a later stage" (1977, p.4).

The examples given above for the teaching of the concepts of overhead viewpoints, scale, the usefulness of maps and direction, are very limited and many more could be devised. Books such as "The New Ways in Geography" series (Cole and Beynon, 1968 to 1972), "The Use of Maps in School" (Bentley et al, 1975) and "Starting from Maps" (Schools Council Environmental Studies Project, 1972), all have numerous ideas on the introduction of mapwork concepts to young learners.

During Standard II the part played by the teacher in the learning situation as regards the teaching of mapwork is a vital one. The teacher's role is one of a manager and creator of stimulating learning situations. This implies that the teacher understands what to expect from the child in terms of mapping skills as well as the ability to guide the child in a practical way to develop the concepts of an overhead view, scale, appreciation of the usefulness of maps and direction. If teachers consult books such as those mentioned above, they will be able to blend practical exercises with geographic concepts. This approach is in line with the research findings of psychologists such as Piaget and Bruner.

CHAPTER EIGHT

THE TEACHING OF MAPWORK CONCEPTS IN STANDARD III

In Standard III the new concepts focussed upon in the mapwork course are those of two-dimensional representation and the use of symbols. The course would also include the increased development of the concepts of scale, overhead viewpoint, usefulness of maps and orientation.

(i) Development of the Concept of Orientation.

Although the concept of orientation will have been introduced during the Standard II course, the teacher would not have attempted to develop anything more than an understanding of direction relative to the child. In Standard III the child develops the concept of orientation to include the location of objects in the environment from observation of a map. Catling sees the importance of orientation in that it "enables us to indicate place through statements of direction and relationships" (1978b, p.5). Orientation is an important concept to understand as it "enables the child to 'set' himself when referring to local and world maps" (Thake, 1977, p.4).

In terms of large-scale maps, the child can orientate itself and therefore the map, towards the blackboard or local landmarks. However, as the scale of the map decreases, so the need for an appreciation of compass points and grid references grows. At the Standard II level, any learning of orientation would be undertaken in an informal manner in relation to visible features or the use of the four cardinal compass points when dealing with mental maps. At the Standard III level the teacher has to develop and reinforce the concept of orientation of the map towards the eight ~~cardinal~~ main points of the compass. This step, although sounding simple, is not an easy task for the child to accomplish, as it is still very egocentric in outlook and relates objects in the environment to itself rather than some external reference point. To teach the child to memorise the eight cardinal points is straightforward, but to create an understanding of the concept of orientation is far more difficult due to the stage of conceptual development of the child at this age. Thake (1977) mentions that studies by Lord (1973) have shown that children of the age of 7 to 9 years

are aware of the four major cardinal directions. However, this knowledge is applied only to orientation in relation to small-scale maps rather than large-scale ones, where the child's egocentrism becomes dominant and a personal directional system is employed. Thake proceeds to comment that as a result of the research findings of Lord (1973) "it is during practical work, such as mapping the school grounds, that the north point and its implications should be explained" (Thake, 1977, p.7).

The following exercises are examples of the kind that can be used by the teacher in Standard III to develop the concept of orientation :-

(a) To help the teacher to create an understanding of magnetic north, the pupils could make simple compasses. Pins can be magnetised and stuck onto small corks, which, when floated on water, will act as compasses.

(b) Simulation games can be used to good effect at the Standard III level. These games should concern themselves with location exercises in an area by means of compass directions. Pupils, for example, could imagine that they are shipwrecked on an island and they have to plot a safe route to a cave (indicated on a map) using compass directions. Obstacles such as mountains and swamps block their path.

(c) A free-hand mapping exercise to test orientation would be one where the children map the classroom and indicate their own desk by means of a star. The name of the pupil is written on the back of the map and then handed in to the teacher. The class then tries to work out whose map it is by means of orientating the drawing. (Schools Council Environmental Studies Project, 1972, p.20).

(d) The teacher can prepare a treasure hunt for the pupils based on compass directions. The treasure hunt would normally take place around the school buildings and fields. A prize for the winners at the end will add the necessary motivation.

(e) Any field mapping work undertaken by the class during the year should have the north point correctly located on it. If printed maps of the local area are used, one of the first steps should be to get the pupils to orientate it correctly.

The above ideas are but a few of the ways in which an understanding of orientation can be developed. At this level, the teacher must endeavour to create an understanding of the reason for external orientation points through the use of practical mapping exercises.

(ii) Development of the Concept of Scale.

In Standard III the concept of scale is developed from the previous level of 'drawn smaller' or 'larger' to a more precise understanding of proportion and ratio. Although free-hand mapping is still used by the teacher in Standard III the activity should be linked, if possible, to field work. At this age children start to become dissatisfied with their free-hand maps. It is at this point that printed maps can be introduced.

At this level the teacher should concentrate on developing an understanding of large and small scale printed maps. In terms of small scale maps the pupil should move away from reliance on the globe towards an understanding of printed maps of the world, while at the other extreme large-scale printed maps of the local area should be introduced. Free-hand maps should still be drawn but greater emphasis must be placed on accuracy of scale. The methods of teaching scale at the Standard III level must still involve the child in practical exercises with maps. A concept of an accurate rather than relative scale is gained by making the pupils map areas according to a pre-determined scale such as one pace to one centimetre. It is suggested that pupils become involved in drawing the same area two or three times using different scales. By this method, the child can visually appreciate the difference scale makes to the mapping of an area. This learning and understanding will carry over to the appreciation of scale on printed maps. This method of teaching scale would find favour with Rushdoony, who has stated that "map-related concepts must be taught prior to, and continued concurrently with, map skills" (1971, p.429). It is important that before scale on printed maps is taught, the pupil has some practical experience of free-hand mapping to scale. Once pupils have had experience with the drawing of maps to scale in the field, the teacher starts to introduce printed maps to the class. To begin with, maps of the local area are shown to the pupils. These maps will be of the largest scale available to the teacher. The local Municipality will often help to supply these. Once the pupil is familiar with the printed map of the area around the school, the teacher could show many maps of the area drawn with differing scales.

In the previous year, pupils will have been made familiar with the globe. Indirectly, facts concerning the size and shape of the earth as well as the location and names of the continents and some countries will have been learned. During Standard III, the teacher will not use the globe so frequently. Instead, the pupil should be introduced to world maps found in the atlas. A few exercises which can be used in Standard III to teach scale are as follows :-

(a) Pupils can accurately map a small area such as the school soccer or hockey field. The class could be divided into three groups, each of which is given a different scale to work to. Graph paper could be used in this mapping exercise as its structure helps the pupils with their drawings. The teacher can then discuss the different maps drawn by each group. It is important that the teacher tries to create the correct understanding of the different scales and the effect they have on mapping, if the pupils are to progress to an understanding of scale in regard to printed maps.

(b) The teacher can draw an area of the school to scale and then hand out the maps to the class. Pupils are then required to work out a scale for the map by pacing out the area. This is a simple problem which could be integrated with a mathematics lesson. Once the scale has been calculated, other mathematical exercises based upon the completed map are then possible if the length of the child's pace is found, e.g., how many paces do you take to go around the main school building?; or how many metres are covered when walking from one edge of the map to the other? (Schools Council Environmental Studies Project, 1972).

(c) A worksheet could be constructed asking questions about the local area which would require the pupils to use maps of differing scale if they are to find the answers. The pupils can work in small groups each having five or six maps all covering the local area. These maps might include a free-hand map of the school buildings, a municipal map, a topographical map of the area, a regional map, a map of the country, and world map. Questions set would require the pupils to select a map of a particular scale if they wished to find the correct answer. Questions such as 'what country is to the east of our school', or 'how many shopping centres are there in our

municipality', are the types of questions the teacher could ask.

(d) The suggested approach for the introduction of world maps to the pupil should involve the teacher and pupils in a problem-solving exercise. The steps that could be utilised to show pupils the need for printed maps of the world are as follows :-

(1) The teacher can show that the use of the globe is limited and that, due to its size and shape, it is rendered impractical for general use. Reasons such as its difficulty as far as storage is concerned, as well as the relative cost compared with a printed world map, can be explained to the class. As a result, printed maps which are cheap and easily stored are used for individual study.

(2) The first printed map of the world presented to the pupils should represent the area as two hemispheres (orthographic projection). This projection is used as it "represents the earth as it would appear from space, so it would present no new, unfamiliar view of the globe " (Morton, 1976, p.2). The teacher should, however, be aware of the distortion of the areas near the edge of the map and bring this to the attention of the pupils.

(3) Morton (1976) suggests that new projections are introduced to the pupil, which are still globular in outline but are less distorted, by means of asking the class to mark in something on their maps near the edge where the distortion is great. "When the children complain that this is not easy, the teacher then whips out from a drawer a set of new outlines which show the continents in modified form " (Morton, 1976, p.2).

(4) Once pupils are familiar with orthographic projections, an exercise that can be undertaken is to get the pupils to pretend that they are going to sail from, for example, Tierra del Fuego to London. They are required to draw a line to show the journey they would undertake. "Again, some of the children will baulk at drawing their line across the gap between the two circles, and questions will be asked " (Morton, 1976, p.3). This problem allows the teacher to show the class uninterrupted

projections such as the Mercator, which solve the problem.

(5) Once pupils have worked with differing world map projections, they might notice how the size and shape of the continents differ from one another. When questions are asked, the class can be shown in a simple manner why this is so. Bentley et al state that "As soon as world maps are brought into use in the classroom, the distortions which are inherent in them should be pointed out by comparison with a globe " (1975, p.38). An effective way of creating an appreciation of the problems in small scale mapping of the world, is to get the pupils to try and place a piece of paper around the globe. Immediately they will perceive that the paper has to be folded and becomes crumpled. If they are given a piece of thin rubber (a piece of cut-up balloon) they can mould it to the shape of the globe by stretching it. The analogy is then drawn between the pupil distorting the piece of rubber and the cartographer having to distort the continents. "No map can therefore provide a correct representation of the world" (Bentley et al, 1975, p.38) and by the end of Standard III the pupils should understand why this is so.

During Standard III then, the concept of scale is taught initially by supplying the pupil with practical experiences of mapping local areas to scale. This experience is then related to printed maps starting with those having a large scale which include the school environment, and progressing to small scale maps of the world.

(iii) Two-Dimensional Representation.

The representation of three dimensions in a two-dimensional spatial framework is a difficult concept for young pupils to understand. "There is considerable difficulty in a map showing depth and height, because, on account of the viewpoint, it can only overtly show length and breadth" (Catling, 1978b, p.6). In order to show depth in a map, cartographers have utilised different symbols to represent relief. The most common in this regard is the use of contour lines. However, the Schools Council Environmental Studies Project notes that "this three-dimensional element is one of the most difficult for young children to understand" (1972, p.13). It is

felt that, generally speaking, contour lines should not be taught to pupils before the age of 13 years when they are able to abstract sufficiently to understand the concept involved. At the Standard III level the representation of relief is taught by means of colour tints which represent different heights. Once again, the concept of using a different colour to represent differing relief heights should be introduced where possible by the use of free-hand maps. When the concept is understood, reference can be made to atlas maps of local areas, or the provinces, when teaching topics such as the relief of Natal.

A few methods that can be used to teach pupils the concept of two-dimensional representation are as follows :-

(a) Pupils can be asked to map an area around the school which include places of different heights, separated by a bank. Ideally this would be two playing fields next to each other. Once mapping is completed the pupils could be questioned about the different ways in which they represented, if at all, the differing heights of the fields. With the teacher guiding, the concept of a colour key would be suggested and pupils could fill this in on their maps.

(b) Once the concept of a colour code for different heights is understood, the teacher can use printed local maps for which the pupils can devise a rough colour relief key based on their perception of different heights. This exercise should be kept as simple as possible with, perhaps, only three colours being utilised to represent high ground, middle ground and low ground.

(c) When teaching pupils about the province of Natal, which is included in the Standard III syllabus, the atlas should be used to show the comparative relief of the coastal low lands, the midlands and the Drakensberg region. A worksheet could be constructed where the pupils compare Natal's relief with the other provinces in a simple manner using the colour key provided in the atlas.

(iv) Symbolic Representation.

In maps "lines, shapes and colour are used as the symbols to depict features in the real world, or to show facets and relationships that may not be straightforwardly observable" (Catling, 1978b, p.7). The symbols used

depend largely on the scale and purpose of the map. Catling (1978b) has divided symbols into two different types, i.e., iconic and abstract. Symbols can be highly iconic, such as those used on topographical sheets for coniferous trees, or abstract, such as lines of latitude or longitude.

In the previous year, pupils were allowed to use realistic symbols in their free-hand maps of large scale environments. However, as free-hand mapping exercises become more concerned with smaller scale environments, so the need for symbolic representation becomes apparent. In Standard III pupils are therefore expected to understand the need for symbols as well as some of the more common types used. Pupils must also use a symbol key on all their maps. "The noting of the symbols used in a legend accompanying the map is one of the essentials of mapping and should become common practise. Similarly a title noting the purpose of the map should always appear" (Schools Council Environmental Studies Project, 1972, p.11).

There are no specific methods that need to be used by the teacher to introduce symbols to the pupils. Symbolic representation should evolve as a result of the "requirements of scale and non-pictorial representation" (Schools Council Environmental Studies Project, 1972, p.12). On no account should pupils have to learn lists of conventional mapwork signs. The learning of signs should come about as a result of using them in the act of mapping.

(v) <u>The Usefulness of Maps</u>.

Having been introduced to many of the uses of maps in Standard II the pupils should become aware of a few new ones during the course of Standard III. The method of learning will, however, be informal and will rely on the ingenuity of the teacher in devising interesting mapping exercises to teach the concepts of orientation, scale, two-dimensional representation and the use of symbols. If teachers subscribe to Geographical publications such as "The Classroom Geographer", "The Journal of Geography" or "The Natal Geography Teacher" they need never be without new ideas concerning the ways in which maps can be used in interesting ways in the primary school environment.

CHAPTER NINE

THE TEACHING OF MAPWORK CONCEPTS IN STANDARDS IV AND V

A. MAPWORK CONCEPTS IN STANDARD IV.

Mapwork during Standard IV aims to consolidate the concepts learned during the previous two years. The concepts of scale, orientation, two-dimensional representation, symbolism and the usefulness of maps are broadened, mainly by means of mapping exercises during field work. The Standard IV mapwork course should attempt to integrate mapping concepts with the Geography syllabus.

The syllabus for Standard IV in the Natal primary schools lends itself to the use of maps. Topics such as latitude and longitude, the seasons, African topics and urban geography can all be taught with the aid of maps. By integrating the concepts learned during the preceeding years with general course work, the pupil will learn to appreciate maps for the way in which they can be utilised for recording information and aiding in the analysis and interpretation of geographic problems. The methods used in this mapwork course should be practical in nature and as far as possible involve the pupil in field work in the local environment or in the interpretation of atlas maps. Examples of exercises and ideas which could be used to integrate mapwork with the Standard IV geography syllabus are listed below.

(i) Latitude and Longitude.

(a) One way to introduce the concept of reference grids is to involve the class in a game such as 'Battleships', but in a slightly modified form. Pupils could be given a printed sheet with the continents outlined and a grid placed over it. Pupils would then be divided into groups of two and then 'Battleships' could be played in the normal way.

(b) Geographical games, such as 'Railway Pioneers' or 'The Tea Clipper Race' by Rex Walford (1969) can be played by Standard IV pupils and will involve them in the use of location by means of grid references.

(c) Worksheet exercises using the atlas can be devised to teach, as

well as test, the pupil's knowledge of latitude and longitude. These exercises should be made as interesting as possible by relating them to problems which the pupils have to solve. Such a problem might be: "If you were to ride across North America by motorbike, describe with the use of an atlas, the towns you would visit and the route you would take using lines of latitude and longitude." Ocean voyages can also form the basis of good exercises.

(ii) Regional Studies.

The approach to regional work in the primary school is to integrate knowledge about an area rather than teaching facts under headings such as relief, climate, vegetation and human activities. The atlas, if used correctly, is invaluable in helping to integrate knowledge about a region. Regional work is related to specific topics during Standard IV such as the economies of our neighbouring countries and how they are related to our own. This approach lends itself to the use of worksheets.

In suggesting that worksheets are the most desirable method of integrating mapwork with regional work, cognisance has been taken of the many other methods which could be used. However, it is felt that 'good' worksheets incorporate many of the other methods of teaching such as the use of slides, pictures, simulation games, use of statistical tables and diagrams. It is important to note that the worksheet in geography is not simply a testing device but rather a method of teaching which encourages the pupil to discover geographical facts and relationships in a structured manner. Martin (1976), discussing "What is a Good Worksheet?" states that

> "The trend towards 'resource based learning' in itself has needed the production of original worksheets. This provides a central framework around which the separate resource items can revolve. Within a mixed ability system, an individual worksheet becomes even more important to provide a structured progression of activities which can be followed at different rates". ... (1976, p.77).

In geography, therefore, worksheets refer to almost any teacher-produced

material designed to guide a pupil through a series of activities. In devising worksheets for the teaching of regional work, cognisance should be taken of the points made by Martin (1976) in the article mentioned above. These are :

(a) Textbook worksheets have "tended to stretch the pupil no further than basic comprehension of the rapidly dated facts. 'Reformed' thinking involves a deeper conceptual understanding of the material, with a greater emphasis on application" (1976, p.77).

(b) "Geographers are fortunate in that most professional courses involve some graphic work in the form of cartography and statistical representation. Here the emphasis is on clarity and the instant visual communication of information. It is these attitudes which our worksheets so often seem to lack" (1976, p.77).

(c) Worksheets should not contain "line after line of closely-typed or even hand-written instructions" (1976, p.77).

(d) The design of good worksheets takes time and effort but this is rewarded where it counts, i.e., in the teaching situation.

Martin (1976) pleads for worksheet construction which involves as much time spent on design as on content. Only then will we be able to capture the attention of pupils. Of use to the teacher constructing and evaluating worksheets is a table which Martin has devised which suggests solutions for correcting worksheets based upon pupil reaction. See Figure 9.1. below.

FIGURE 9.1. EVALUATION OF /.... WORKSHEETS

FIGURE 9.1. EVALUATION OF WORKSHEETS

Pupil reaction	Reason	Solution
"Its boring"	Sheet is visually impenetrable due to a. too much print b. no variety in layout	i. remove unnecessary writing ii. use wider spacing iii. vary letter size iv. include visual aids, map, diagram, cartoon.
"I can't read it"	Poor duplication due to a. inappropriate process used b. poor handwriting c. writing too small	i. better knowledge of machinery ii. improve handwriting iii. use typewriter iv. increase letter size by stencil or hand printing.
"I can't do it"	Difficult to understand due to a. complex sentences b. difficult words c. inadequately structured d. appears too lengthy	i. become familiar with class reading ages ii. careful progression of tasks iii. provide sense of accomplishment with shorter items.
"What do I do"	Unable to pick out tasks from information due to a. poor location of tasks b. poor identification of tasks c. vague instructions	i. keep information and activities together ii. draw attention to instructions by 1. clear numbering 2. sub-headings 3. ruled boxes 4. underlining 5. symbols, e.g. arrows. iii. give a worked example.

(Martin, 1976, p.77).

Worksheets in Standard IV should involve the pupil as much as possible in the interpretation of atlas maps. The pupil will then be dealing in a practical way with mapwork concepts learned previously. In regional studies, problems should be set which would involve the pupil in mapwork as well as the interpretation of diagrams and statistical graphs.

(iii) Urban Geography.

The Standard IV Urban Geography course is tailor-made for the use of free-hand field work mapping exercises. The two major concepts of the sub discipline -- how a town serves its own people and how it serves its surrounding area -- should be taught, according to the official syllabus guide, by means of field studies (Natal Education Department Geography Syllabus Guide, 1978). This can be done by mapping urban functions and services provided in the local area.

Field work as a teaching method is often frowned upon by teachers due to the time and trouble it takes to organise successfully. Problems such as group size, insurance, discipline, time available and preparation

tend to discourage all but the most enthusiastic of teachers. However, field work is an ideal method for introducing mapwork skills. A suggested method for including mapping in the urban course is to construct field work exercises which involve the pupils in collecting information and recording this in the form of free-hand maps. These maps can then be utilised in follow-up lessons in the classroom. The process can be altered to involve the pupil in data collection with mapping in the classroom being the final activity. If it is possible, other forms of graphicacy should be included in the exercise, such as graphs or sketches to help record information.

It is not intended to list mapping exercises that can be undertaken in the field of urban geography by a Standard IV class, as the appropriateness of these will depend upon the area surrounding the individual schools. There are numerous books and articles which can be used as source material for teachers wishing to incorporate mapwork concepts when dealing with urban field work exercises. Books and articles, for example, by Cole and Beynon (1968 to 1972), Catling (1978), Bentley et al (1975), Schools Council Environmental Studies Project (1972), Manley (1976) and Wise (1973) are useful in this regard.

B. MAPWORK CONCEPTS IN STANDARD V.

The syllabus for Standard V in use at present does not have a separate mapwork section. The regional geography course, however, states that regions taught "should include an introductory study and discussion of maps in the atlas with reference to the following:- position, build, political boundaries, population distribution and communications" (N.E.D. Syllabus for Geography, 1979). The regions taught are Great Britain, Netherlands, The Rhine and Japan or the Great Lakes.

The emphasis of the geography course at this level moves away from local regions towards those on a world scale and as a result the use of visual aids is very important due to the fact that many of the pupils will still not be able to abstract effectively. Pupils who have been engaged in a systematic course of mapwork since Standard II will be able to use the atlas as an invaluable visual aid to the learning of distant regions. Maps from the atlas should be used as resource material by the pupils. The teacher can structure learning by means of worksheets in individual or group study projects. In this way pupils learn to discover knowledge about new environments for themselves in a structured manner.

The Standard V syllabus also includes a section on topical geography In this section, discussion of geographical aspects of local and world news is undertaken. This section of work lends itself to the use of field work and thereby mapping exercises. It is suggested that as a rule teachers should concentrate on the geographical aspects of local news. This is done by consulting the daily newspapers and, more importantly, any local weekly or monthly publications produced in the area. For example, a teacher in Pinetown could consult the "Pinetown Pictorial" and "Highway Mail" as well as the two daily newspapers. Local issues such as traffic problems, establishment of new industries in the area, planning of new housing schemes, flooding of areas due to excessive rainfall, pollution, new shopping centres and the closing of old shops, are examples of geographic news which may be used as a basis for local field work. Mapping should form an integral part of field work and exercises such as traffic counts, determining of central business district functions, weather studies and land-use patterns of the local area. As a result of this type of field work local authority officials can be asked to comment on the pupils' ideas. This helps the pupils become aware of their duty as citizens.

As a result of mapping exercises relating to field work, pupils come to appreciate the usefulness of maps as well as conceptually understanding the elements that comprise them. It is through the process of field work mapping that Catling's elements of content discrimination and additional information are learnt.

CHAPTER TEN

OVERVIEW AND IMPLICATIONS : SOME CONCLUDING REMARKS REGARDING SPATIAL CONCEPT DEVELOPMENT AND THE TEACHING OF MAPWORK IN THE SENIOR PRIMARY SCHOOL

Spatial concept development amongst children, although long of interest to psychologists, (Piaget and Inhelder, 1948) has only recently attracted the attention of geographers. Behavioural geographers (Downs 1973, 1977; Blaut and Stea 1973, 1974; Hart and Moore 1973; Hardwick et al 1976) have investigated spatial concept development in an attempt to understand the formation of cognitive maps, and as a result of their findings, educational geographers such as Catling (1978, 1978b, 1979) have researched the manner in which geography teaching can be adapted to incorporate the thought processes of the child. A review of available literature shows that educational geographers from Britain and the U.S.A. are increasingly attempting to plan learning situations in the light of research into concept development of the child (Balchin 1972; Bentley 1975; Boden 1976; Catling 1978, 1978b, 1979; Crisp 1969; Fitzgerald 1973; Graves 1978; Martin 1976; Naish 1977; Scarfe 1978; Thake 1977; Thomas 1978; Wise 1977). Owing to the fact that spatial concept development, as applied to the teaching of geography, is a new area of concern, relatively few researchers have published material on the subject. As a result the content of this thesis has had to rely heavily on the work of a few geographic theorists such as Hart and Moore (1973), Jones (1976), Cracknell (1976), Martin (1976), Catling (1978, 1978b, 1979) and Bentley et al (1975). Research pertaining to spatial concept development and the teaching of geography is virtually non-existent in South Africa at present and educational geographers are lagging behind their overseas colleagues in this regard. One of the serious effects of the above condition is that geography teachers at school level are still teaching the subject from a factually, rather than conceptually based standpoint. Syllabus changes in the schools over the past few years have allowed new areas of geographic research to be taught, but the teaching style of many teachers has remained largely unchanged. To overcome this problem a concerted effort is required from academics as well as teachers, so that geography in the schools can play an important role in the overall conceptual development of children.

The development theories reviewed in Chapter Two and the application of the major findings they contain, have been applied to the teaching of geography in Senior Primary Schools. The review shows that as far as educational geographers are concerned the ideas of Piaget (1963, 1972) and Bruner (1960, 1967) are not in conflict and can be seen to be compatible if approached from a practical point of view. The major ideas of interest to educational geographers which arise from a consideration of the theories of concept development are :-

1. the importance of action on the part of the child if concepts are to be acquired, and

2. the different stages of development that a child passes through as it matures.

These two major findings affect the way in which teaching strategies should be planned. As discussed in Chapters Three and Six, the use of Bruner's approach to the teaching of geographical concepts, within the framework of Piaget's stages of development, is advocated here. This approach, it is felt, is balanced in its educational emphasis since it allows the needs of the discipline to be placed in tension with the needs of the child.

Research into the present state of spatial concept development in the Senior Primary Schools (Chapter Four) has shown that, on the basis of Piaget's criteria, pupils in Natal are not as advanced in spatial concept development as might be expected. Pupils' results on a drawing test designed to indicate the effectiveness of mapwork teaching in the formation of spatial concepts showed that mapwork concepts are not being acquired by pupils at the schools tested. It is felt that the lack of mapwork skills demonstrated by the pupils contributed to the poor performance shown by the pupils on Piaget's test of perspectives. The view is expressed that the area of mapwork teaching holds the key to any improvement that is envisaged for the acquisition of spatial concepts by pupils in the Senior Primary School.

In Chapter Five an attempt has been made to identify the reasons for the lack of spatial concept competency and mapwork skills in the pupils tested. It is felt that although the geography syllabus is not as explicit as it should be, it is not the primary cause for the lack of spatial concept development and mapwork skills exhibited by the pupils tested. An analysis of teacher attitudes and practise towards the teaching of geography in the

Senior Primary Schools has indicated that teachers are largely to blame for the poor showing of the pupils on Piaget's test of perspectives and the drawing test. Investigation of the teachers' role in the school does, however, indicate reasons for the lack of teacher efficiency in this regard. These reasons include, amongst others,

1. the lack of guidance available to teachers in the form of good textbooks and teaching aids, and

2. the fact that there are few specialist, geography trained teachers in the schools.

The major reason for the lack of development of spatial skills in the Senior Primary Schools is felt to be the poor quality of mapwork teaching at this level. Mapwork -- the section of the geography syllabus which deals exclusively with spatial skills -- is the area of teaching which needs most attention if spatial concept development is to be enhanced in primary schools.

Balchin and Coleman's (1973) contention that mapwork is as important an element in school work as the learning of reading, writing and arithmetic, is discussed in Chapter Six. The term 'map', however, can be interpreted in different ways and as such it is necessary to define what is meant by 'mapwork'. Catling's (1978) definition of a map is preferred as it allows for the use of both cognitive and conventional mapping to occur in a 'mapwork programme'. Once a working definition of mapwork has been decided upon, it remains to determine the major concepts which need to be acquired by the pupils. The major elements of a map as expounded by Catling (1978b) form a useful structure in this regard.

Having determined

1. the way in which spatial concept development occurs in the child

2. the lack of spatial concept competency in Senior Primary School pupils

3. the need for improvement in the teaching of mapwork at this level and

4. the concepts which need to be taught by means of mapwork,

a systematic conceptual mapwork course for Standards II, III, IV and V is

proposed. As a result of the research undertaken in the thesis, ten major points which need to be born in mind when constructing a mapwork course were discussed (p.96). These points form a useful guide in the construction of a mapwork course for the Senior Primary School.

As a result of the conclusions and findings of this thesis in regard to spatial concept development and the need to improve the acquisition of these concepts, Chapters Seven, Eight and Nine concern themselves with a detailed outline for the teaching of mapwork in the Senior Primary School. Catling's (1978b) elements of a map are introduced to different standard levels according to their degree of difficulty in the manner advocated by Bruner (1960, 1967), i.e., the spiral method. In Standard II the concepts introduced are those of overhead viewpoint, scale, direction and the usefulness of maps. In Standard III these concepts are developed further and the new concepts of two-dimensional representation and the use of symbols are introduced. In Standards IV and V it is contended that the best method of improving spatial skills is to integrate the general geography syllabus for each standard with mapwork exercises. In this way topics such as latitude and longitude, regional studies, urban geography and topical geography can be used to teach spatial concepts.

Any mapwork course for the Senior Primary School should incorporate the theoretical ideas of psychological studies into spatial concept development, while at the same time remembering the needs of the teacher who will transmit the skills to the pupils. In this regard, practical examples of how to teach the concepts at each level of complexity together with details of the depth to be reached at the end of each standard are needed. This approach has been adopted in the thesis with the hope that it may form a useful guide for primary school teachers interested in improving the spatial concept development of their pupils by means of mapwork teaching.

Finally, it is hoped that other educationalists and academic geographers might attempt, in the future, to involve themselves with the problems of how best to improve the teaching of geography in our schools. The research field is wide and any efforts by academic geographers would be greatly rewarded, not only by the gratitude of the teachers of the subject, but, in the long term, by an improvement in the quality of students applying for university courses in geography.

BIBLIOGRAPHY

ALMY, M. (1967) Children's Concept of Space and Time Geographic Education Series No. 7. Pub. National Council for Geographic Education.

BALCHIN, W.G.V. (1972) Graphicacy. Geography No. 256. Vol. 57 Part 3. July 1972.

BALCHIN, W.G. and COLEMAN, A.M. (1973) Graphicacy should be the fourth ace in the Pack in Perspectives in Geographical Education. Editors Bale, Graves, Walford Oliver and Boyd 1973.

BENTLEY, J.C. et al (1975) The Use of Maps in School. Blackwell 1975

BLAUT, J.M. and STEA, D. (1973) Studies in Geographic Learning - Chapter in Perspectives in Geographical Education Edited by J. Bale, N. Graves, R. Walford. Oliver and Boyd 1973.

BLAUT, J.M. and STEA, D. (1974) Mapping at the age of three. The Journal of Geography. Vol. 73. October 1974, No.

BODEN, P. (1976) Developments in Geography Teaching. Open Books 1976.

BRUNER, J.S. (1960) The Process of Education. Howard University Press.

BRUNER, J; CELVER, R.; GREENFIELD, P. (1967) Studies in Cognitive Growth. John Wiley & Sons, Inc. pp. 1 - 67.

CATLING, S. (1978) Cognitive Mapping Exercises as a Primary Geographical Experience. Teaching Geogra Vol. 3. Number 3. January 1978

CATLING, S. (1978) The Elements of the Map. Classroom Geographer. March 1978.

CATLING, S. (1979) Foundations for Primary and Middle School Geography. Classroom Geographer. Nov. 19

CHORLEY, R.J. (1969) The standing committee on the role of models and quantitative techniques in geographical teaching. Geography No. 242 Vol. 54. Part 1. January, 1969.

COLE, J.P. (1973) Fresh Primary Themes. Chapter in Perspectives in Geographical Education. Edited by J. Bale, N. Graves, R. Walford. Oliver and Boyd.

COLE, J.P. (1973) Perception in Geography. Chapter in Perspectives in Geographical Education. Edited by J. Bale, N. Graves, R. Walford. Oliver and Boyd.

COLE, J.P. and BEYNON, N.J. (1969) New Ways in Geography Series. A guide for teachers. Blackwell & Matt.

CRACKNELL, J.R. (1976) Geography in Junior Schools. Geography. Vol. 61. Part 3. July 1976.

CRISP, J.A.A. (1969) New approaches to teaching geography. Geography. No. 242. Vol. 54. Part 1. January 1969.

DICKENS, C. (1969) Hard Times. Published 1969. Dent & Dutton

DOWNS, R. and STEA, D. (1973) Image and Environment. Aldine Publishing Company.

DOWNS, R.M. and STEA, D. (1977) Maps in Minds. Reflections on Cognitive Mapping. Harper & Row, Publishers.

DRIVER, R. (1978) When is a stage not a stage? A critique of Piaget's theory of cognitive developmer and its application to science education. Educational Research. Vol. 21. Number 1. November 1978.

ELKIND, D and FLAVELL, J. (1969) Studies in cognitive development. Oxford University Press. pp. 465-488

ENTWISTLE, N.J. (1979) Stages, levels, styles or strategies: dilemmas in the description of thinking. Educational Review. Vol. 31. No. 2.

EVERSON, J. (1969) Some aspects of teaching geography through fieldwork. Geography. No. 242. Vol. 54. Part 1.

FITZGERALD, B.P. (1969) The American High School Geography Project and its implications for geography teaching in Britain. Geography. No. 242. Vol. 54. Part 1. January 1969.

FITZGERALD, B.P. (1973) Trends in Geographical Teaching. Chapter in Perspectives in Geographical Education. Edited by J. Bale, N. Graves, R. Walford. Oliver and Boyd.

FURTH, H.G. (1970) Piaget for Teachers. Prentice-Hall.

GARRISON, K.C. and JONES, F.R. (1969) The Psychology of Human Development. International Textbook Company.

GESELL and ILG (1965) The Child from Five to Ten. Lowe and Brydone.

GOULD, P.R. (1973) The New Geography. Chapter in Perspectives in Geographical Education. Edited by J. Bale, N. Graves, R. Walford. Oliver and Boyd.

GRAVES, N.J. (1978) Changes in attitude towards the training of teachers of geography. Geography. No. 279. Vol. 63. Part 2. April 1978.

GREGORY, S. (1969) Models and quantitative techniques in teaching - attitudes, opinions and prejudices. Geography. No. 242. Vol. 54. Part 1. January 1969.

GRENYER, N. (1972) An introduction to recent developments in Geography Teaching. An annotated bibliography. Geography. No. 257. Vol. 57. Part 4. November 1972.

HAGGETT, P. (1975) Geography : A Modern Synthesis. Harper International Edition.

HALL, D. (1976) Geography and the Geography Teacher. George Allen & Unwin Ltd. 1976.

HARDWICK, D.; McINTYRE, C.; PICK, H. (1976) The content and manipulation of cognitive maps in children and adults. Chicago Pres for the Society for Research in Child Development. Vol. 41. No. 3. 1976.

HART, R.A. and MOORE, G.T. (1973) The Development of Spatial Cognition. A Review in Image and Environment. p. 226 - 288. Aldine Publishing Co. 1973.

HOLLOWAY, G.E.T. (1967) An introduction to the child's concept of geometry. Routledge and Kegan Paul.

HOLLOWAY, G.E.T. (1967) An introduction fo the child's conception of space. Routledge and Kegan Paul.

HURLOCK, E.B. (1959) Developmental Psychology. McGraw-Hill.

JACKSON, R.J. (1976) The Persistance of Outmoded Ideas in High School Geography Texts. The Journal of Geography. October 1976.

JONES, S. (1976) The Challenge of Change in Geography Teaching. Geography. No. 273. Vol. 61. Part 4. November 1976.

KAGAN, J. (1971) Understanding Children. Harcourt, Brace, Jovanovich, Inc.

KENT, A.; ROWE, C. and GRENYER, N. (1977) Oxford Geography Project Books 1 - 3. Oxford University Press.

LAIDIG, K.M. (1967) Research needs in geographic education. Geographic Education Series No. 7. Pub. National Council for Geographic Education.

LAVATELLI, C.S. and STENDLER, F. (1972) Readings in Child Behaviour and Development. Harcourt, Brace, Jovanovich Inc.

LAWTON, R. (1978) Changes in University Geography. Geography. No. 278. Vol. 63. Part 1. January 1978.

LINDGREN, H.C. (1975) Children's Behaviour. Mayfield Pub. Company.

LOVELL, K. (1979) Developmental Psychology. Educational Review. Vol. 31. No. 2.

MANLEY, D. (1976) Maps and Map Games. Pary Books Ltd.

MARTIN, F. (1976) What is a good worksheet? Teaching Geography. Vol. 2. No. 2. November 1976

MIDGLEY, C. (1967) Look at the Map. Wheaton of Exeter.

MIDGLEY, C. (1967) The Magic Map. Wheaton of Exeter.

MORTON, J.G. (1976) Thoughts on the introduction of mapwork to young children. Natal Geography Teacher. No. 33. May 1976.

MORTON, J.G. (1977) My Map Book. Unpublished work for Edgewood College of Education.

MOTTERSHEAD, R. and OWEN, M.D. (1972) Some problems arising in fieldwork in modern geography. Geography. No. 256. Vol. 57. Part 3. July 1972.

McNALLY, D.W. (1974) Piaget, Education and Teaching. Angus and Robertson.

NAISH, M. (1977) The development of children's thinking in school geography. Teaching Geography. Vol. 3. No. 2. November 1977.

NEWSON, M. (1976) Rivers - we must catch up! Teaching Geography. Vol. 2. No. 2. November 1976

NIGHTINGALE, C.S. (1974) Geography and the School. S.A. Geographer September 1974. Vol. IV. No. 5.

PADGETT, L. (1977) In Maps in Minds. Downs, R.M. & Stea, D. Harper and Rowe Publishers.

PERKINS, A. (1978) A study of the changes in the activity spaces of high school children resident in Kloof and Sea View. Unpublished Honours Seminar (Natal Univ.)

PIAGET, J. (1972) Development and learning (Chp. In Readings in Child Behaviour and Development) C. Stendler and F. Stendler. Pub. Harcour Brace, Jovanovich International Edition. pp. 38 - 46.

PIAGET, J. (1977) The Moral Judgement of the Child. Transcribed by M. Gabain. Pub. Penguin.

PIAGET, J. (1977) The Child's Conception of the World. Paladin.

PIAGET, J. and INHELDER, B. (1963) The Child's Conception of Space. Routledge & Kegan Paul.

PIAGET, J. and INHELDER, B. (1969) The Psychology of the Child. Basic Books Inc.

PIAGET, J.; INHELDER, B. and SZEMINSKA, A. (1960) The Child's Conception of Geometry. Routledge London.

RICHMOND, P.G. (1970) An Introduction to Piaget. Routledge & Kegan Paul Ltd.

RUSHDOONY, H.A. (1971) The Geographer, the teacher, and a child' perception of maps and mapping. Journal of Geography. October 1971. No.

SATTERLEY, D.J. (1973) Skills and Concepts involved in Map Drawi and Map Interpretation. Chapter in Perspectives in Geographical Education. Edited by J. Bale, N. Graves, R. Walford. Oliver and Boyd.

SAUVY, J.S. (1972) The Child's Discovery of Space. Penguin Education.

SCHNEIDER, D.O. (1976) The performance of elementary teachers and students on a test of map and globe skills. The Journal of Geography. September 1976.

SCHNELL, R.E. (1975) Developmental Psychology Today. Random House, Inc.

(1972) Schools Council Environmental Studies Project. Starting from Maps. Rupert Hart-Davis Educational Publications.

SHAYER, M.; KÜCHEMANN, D.E.; WYLAM, H. (1976) The Distribution of Piagetian Stages of Thinking in British Middle and Secondary School Children. British Journal of Educational Psychology. Vol. 46. p.164-1

SIME, M. (1973) A Child's Eye View - Piaget for Young Parents and Teachers. Thames & Hudson.

STEA, D. and BLAUT, J.M. (1973) Some Preliminary Observations on Spatial Learning in School Children. In Image an Environment. p.226 - 234. Aldine Pub. C

STEA, D. and TAPHANEL, S. (1974) Theory and Experiment on the Relation Between Environmental Modelling (Toy play and Environmental Cognition. In Psycholo and Environment. D. Canter & T. Lee. Architectural Press.

STENDLER, C.; LAVATELLI and STENDLER, F. (1954) Readings in Child Behaviour and Development. Harcourt, Brace, Jovanovich.

THAKE, J. (1977) Child's Play? Mapping Concepts for 7 - 9 Year Olds. Classroom Geographer. May 1977.

THOMAS, P.R. (1978) Curriculum change or classroom survival: the quest for priorities in secondary school geography. Geography. No. 278. Vol. 63. Part 1. January 1978.

THOMAS, P.R. (1970) Education and the New Geography. Geography. Vol. 55, pp. 274 - 80.

TISHER, R.P. (1971) A Piagetian Questionnaire applied to Pupils in a Secondary School. Child Development. 42, pp. 1633 - 1636.

VARMA, V. and WILLIAMS, P. (1976) Piaget, Psychology and Education. Hodder & Stoughton.

WALFORD, R. (1969) Operational games and geography teaching. Geography. No. 242. Vol. 54. Part 1. January 1969.

WALFORD, R. (1969) Games in Geography. Longman.

WALFORD, R. (1973) Decision Making. Chapter in Perspectives in Geographical Education. Edited by J. E N. Graves, R. Walford. Oliver and Boyd.

WERNER, H. (1965) Comparative Psychology of Mental Development. Science Editions, Inc.

WERNER, H. (1972) The Concept of Development from a Comparative and Organismic Point of View. Development and Learning (Chp. in Readings in Child Behaviour and Developmen C. Stendler & F. Stendler. Pub. Harcourt, Brace, Jovanovich.

WISE, M.J. (1973) Environmental Studies : Geographical Objectives. Geography. No. 261. Vol. 58 Part 4. November 1973.

WISE, M.J. (1977) Geography in Universities and Schools. Geography. No. 277. Vol. 62. Part 4. November 1977.

A P P E N D I X I

% CORRECT/INCORRECT RESPONSES FOR PUPILS AT SCHOOLS A AND B ACCORDING TO STANDARD AND AGE.

% Correct/incorrect responses for total sample of pupils at School A

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	84	0	1	1	3	8	0	0
2	15	55	3	6	7	6	2	1
3	17	3	48	0	6	6	9	7
4	14	6	17	41	5	11	2	0
5	29	3	0	0	48	13	0	3
6	46	1	3	3	8	36	0	0
7	19	0	6	12	10	9	40	0
8	7	2	13	3	10	5	6	51

% Correct/incorrect responses according to pupil's standard

Standard 2

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	76	0	5	5	5	7	0	0
2	17	51	2	12	5	10	0	0
3	12	7	43	0	7	12	2	12
4	20	5	17	25	7	17	5	0
5	43	7	0	0	28	17	0	2
6	53	0	2	7	7	28	0	0
7	28	0	7	17	10	10	25	0
8	20	2	7	7	15	5	10	30

Standard 3

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	90	0	0	0	0	10	0	0
2	26	26	10	10	16	6	0	3
3	33	6	40	0	6	3	6	3
4	26	3	23	30	6	10	0	0
5	26	3	0	3	50	13	0	3
6	56	3	6	0	16	16	0	0
7	16	0	10	13	6	13	36	3
8	3	3	16	3	6	6	6	53

Standard 4

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	80	3	0	0	3	13	0	0
2	13	70	3	0	3	3	6	0
3	20	0	50	0	3	6	16	3
4	6	10	16	53	0	6	3	3
5	30	3	0	0	46	13	3	3
6	30	3	3	6	3	53	0	0
7	20	3	3	10	10	6	46	0
8	3	0	10	0	6	6	3	70

% Correct/incorrect responses according to pupil's standard

Standard 5

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	93	0	0	0	3	3	0	0
2	3	73	0	3	6	6	3	3
3	3	0	63	0	6	3	13	10
4	3	6	10	63	6	10	0	0
5	13	0	0	0	73	10	0	3
6	43	0	0	0	6	50	0	0
7	10	0	6	6	13	6	56	0
8	0	3	20	0	10	3	3	60

% Correct/incorrect responses according to pupil age

Pupil Age (9 Years)

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	70	0	5	5	2	8	0	0
2	16	50	2	13	5	11	0	0
3	11	8	41	0	8	13	2	13
4	16	5	19	25	8	19	5	0
5	41	8	0	0	27	19	0	2
6	52	0	2	8	5	30	0	0
7	25	0	8	16	11	11	27	0
8	19	2	8	8	16	5	8	30

Pupil Age (10 Years)

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	85	0	0	0	5	10	0	0
2	30	30	15	10	10	0	0	5
3	40	10	40	0	5	5	0	0
4	35	0	20	30	5	10	0	0
5	30	5	0	5	45	10	0	5
6	40	5	10	0	25	20	0	0
7	25	0	15	20	10	5	25	0
8	10	5	5	0	5	10	10	55

Pupil Age (11 Years)

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	80	2	0	0	2	14	0	0
2	20	51	2	2	11	8	2	0
3	25	0	45	0	5	2	17	2
4	14	11	20	37	2	8	2	2
5	34	2	0	0	48	11	0	2
6	57	2	2	0	5	31	0	0
7	20	2	0	8	8	11	45	2
8	0	0	20	2	8	5	5	57

% Correct/incorrect responses according to pupil age

Pupil Age (12 Years)

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	92	0	0	0	3	3	0	0
2	0	85	0	3	0	3	3	3
3	3	0	60	0	3	7	17	7
4	0	7	14	71	3	3	0	0
5	14	0	0	0	64	14	3	3
6	32	0	0	7	3	57	0	0
7	10	0	10	7	10	7	53	0
8	3	3	17	0	3	0	0	71

Pupil Age (13 Years)

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	100	0	0	0	0	0	0	0
2	11	44	0	0	22	11	11	0
3	0	0	66	0	11	0	0	22
4	11	0	0	55	11	22	0	0
5	11	0	0	0	77	11	0	0
6	33	0	0	0	11	55	0	0
7	11	0	0	11	11	11	55	0
8	0	0	11	0	22	11	11	44

Pupil Age (14 Years)

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	100	0	0	0	0	0	0	0
2	0	100	0	0	0	0	0	0
3	0	0	100	0	0	0	0	0
4	0	0	0	100	0	0	0	0
5	0	0	0	0	100	0	0	0
6	100	0	0	0	0	0	0	0
7	0	0	0	0	0	0	100	0
8	0	0	0	0	0	0	0	100

% Correct/incorrect responses for total sample of pupils at School B.

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	83	0	0	1	6	6	0	2
2	16	60	1	2	11	6	1	1
3	11	1	59	0	1	2	18	6
4	11	3	6	61	3	11	2	0
5	20	1	0	0	70	7	0	0
6	54	0	2	4	4	32	0	1
7	17	0	7	11	11	3	48	1
8	6	2	22	1	4	7	1	54

% Correct/incorrect responses according to pupil's standard

Standard 2

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	80	0	0	5	5	5	0	5
2	35	40	0	0	10	10	5	0
3	15	0	50	0	5	0	10	20
4	20	15	5	30	0	20	10	0
5	30	0	0	0	55	15	0	0
6	55	0	0	5	20	15	0	5
7	35	0	5	15	20	0	25	0
8	15	0	15	0	15	10	5	40

Standard 3

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	90	0	0	0	9	0	0	0
2	14	66	0	4	9	0	0	4
3	9	0	61	0	0	0	28	0
4	9	0	4	66	0	19	0	0
5	19	0	0	0	76	4	0	0
6	52	0	4	4	0	38	0	0
7	14	0	9	19	4	0	52	0
8	4	0	38	4	0	4	0	47

Standard 4

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	85	0	0	0	5	10	0	0
2	5	70	0	5	10	10	0	0
3	10	0	80	0	0	0	5	5
4	10	0	15	75	0	0	0	0
5	30	5	0	0	65	0	0	0
6	65	0	0	10	0	25	0	0
7	10	0	15	10	10	5	50	0
8	0	5	25	0	0	5	0	65

% Correct/incorrect responses according to pupil's standard

Standard 5

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	80	0	0	0	5	10	0	5
2	10	65	5	0	15	5	0	0
3	10	5	45	0	0	10	30	0
4	5	0	0	75	15	5	0	0
5	5	0	0	0	85	10	0	0
6	45	0	5	0	0	50	0	0
7	10	0	0	0	10	10	65	5
8	5	5	10	0	5	10	0	65

% Correct/incorrect responses according to pupil age

Pupil Age (9 Years)

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	85	0	0	0	7	0	0	7
2	35	35	0	0	14	7	7	0
3	7	0	57	0	0	0	14	21
4	7	21	7	35	0	21	7	0
5	28	0	0	0	50	21	0	0
6	50	0	0	7	21	14	0	7
7	28	0	7	14	21	0	28	0
8	7	0	7	0	21	14	7	42

Pupil Age (10 Years)

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	84	0	0	3	7	3	0	0
2	19	61	0	3	7	3	0	0
3	15	0	53	0	3	0	23	3
4	19	0	3	53	0	19	3	0
5	23	0	0	0	73	3	0	0
6	57	0	3	3	3	30	0	0
7	23	0	7	19	7	0	42	0
8	11	0	34	3	0	3	0	46

Pupil Age (11 Years)

Photographs Presented	Pupil Choices 1	2	3	4	5	6	7	8
1	85	0	0	0	5	10	0	0
2	10	65	0	5	10	10	0	0
3	10	0	75	0	0	0	10	5
4	10	0	5	85	0	0	0	0
5	25	5	0	0	70	0	0	0
6	50	0	0	10	0	40	0	0
7	15	0	15	0	10	5	55	0
8	5	5	30	0	0	5	0	55

% Correct/incorrect responses according to pupil age

Pupil Age (12 Years)

Photographs Presented	Pupil Choices							
	1	2	3	4	5	6	7	8
1	81	0	0	0	6	6	0	6
2	6	75	0	0	12	6	0	0
3	6	6	50	0	0	6	31	0
4	6	0	12	56	18	6	0	0
5	12	0	0	0	75	12	0	0
6	56	0	0	0	0	43	0	0
7	6	0	0	12	6	12	62	0
8	0	6	6	0	6	6	0	75

Pupil Age (13 Years)

Photographs Presented	Pupil Choices							
	1	2	3	4	5	6	7	8
1	80	0	0	0	0	20	0	0
2	0	60	20	0	20	0	0	0
3	20	0	60	0	0	20	0	0
4	0	0	0	100	0	0	0	0
5	0	0	0	0	100	0	0	0
6	60	0	20	0	0	20	0	0
7	0	0	0	0	20	0	60	20
8	0	0	20	0	0	20	0	60

A P P E N D I X II

THE NATAL GEOGRAPHY SYLLABI

FOR

STANDARDS II TO V

STANDARD 2.

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHODS	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	EDUCATIONAL AIDS, RESOURCES AND REFERENCES
.0 MAP WORK					
.1 Making Maps	The aim in the Std 2 year is to teach the pupil to draw an accurate map of a limited area such as "my desk lid", "my classroom", the school hall, the boys' playground. This is the first stage in the reduction of a three-dimensional world to a two-dimensional sheet of paper. This continuous work started in the first phase (refer Junior Primary History & Geography Syllabus). Several exercises should be set in the course of the year concentrating on areas which can be seen in their entirety from one point. Difficulties will be experienced, e.g. incorrect location, size, shape and the wrong number of items but with practice the pupil should improve in attention to these details. Scale should not be mentioned at this stage.	Location Size/Area Shape Number (of items) Distribution	All comments in column 2.	It is essential that map-making be taught as a series of practical exercises.	Schools' Council Environmental Studies Project (1972) Starting from maps. Hart-Davis. Hopkins, M.F.S. (1968) Learning through the Environment. Longman. Cain, H.R. Geography in the Making Books I & II Longman.
2 The Compass four main points	Four cardinal points of the compass should be taught. A magnetic compass should be handled by the pupils though at this stage no distinction should be made between true North and Magnetic North. On any maps drawn the four compass points must be included.	Direction		Link use of four cardinal points of the compass with recording wind direction - see 2.0 below	Several magnetic compasses showing direction in cardinal points
3 World map-names, shape and position of oceans and continents	Introduction to world maps by familiarising pupils first with the globe, which, for the first half of the year, should be the sole reference when locating places around the world. Games and exercises on positions and shapes of the continents. Eventual introduction to wall map of the world, and from this	Spherical earth. Distribution of continents and oceans.	All comments in column 2.		Available from Provincial Stores :- (1) Washable chalkboard globes showing continents and oceans only.

LLABUS	SUGGESTED APPROACH AND TEACHING METHODS	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	EDUCATIONAL AIDS, RESOURCES AND REFERENCES
3 Contd.	to wall maps of the country and then the province Regular use must be made of the globe and eventually the world map so that as pupils gain confidence in looking for places the positions and main features of the continents will be learned.		Link this work to discussion of news items - see 4.0		(2) Relief globes in English & Afrikaans. Schools should obtain wall maps (George Philip or other series). (1) The World- Relief (2) South Africa - Relief (3) Natal -- Relief & Communications. Article in Natal Geography Teacher No. 33. May.
WEATHER STUDY :oduction to :her elements)erature; l;).	Simple observation of weather should be made. Weather charts employing symbols designed by the pupils should be kept for at least a fortnight in summer and a fortnight in winter for the purpose of comparison. Temperatures after readings have been taken, could be classified as "hot" or "cold" and coloured red or blue, rainfall collected in a rainguage could be measured and a wind rose showing four cardinal points could be compiled. There should be a close link between this study and the study of air in General Science. Duplication should obviously be avoided.	Awareness of weather elements		Practical observation and recording of weather on prepared weather charts Drawing of wind roses - link with compass 1.2	Weather chart prepared by teacher. Simple thermometer. Rain guage and measuring cylinder. Simple wind vane and wind sock. P. Sauvain (1975) Winds. Franklin Watts. Walsh, J.W. (1971) Weather. Schofield & Sims.

3.0 RESOURCES /....

YLLABUS	SUGGESTED APPROACH AND TEACHING METHODS	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	EDUCATIONAL AIDS, RESOURCES AND REFERENCES
O RESOURCES	(There is no need to mention the word "resource" in class. The purpose of this section is to build up the pupil's geographical vocabulary and concepts and to lay foundations for later work.)	Man's responses to environmental resources. Renewable and non-renewable resources.			Gregor, H.F. (1962) Environment and Economic Life. Van Nostrand.
1 Water - a case study of a renewable resource	A simple study of a river aimed at teaching:- - the concept of a river and its flow. - associated terminology and landforms (e.g. source, mountains, hills, stream, river, valley, tributary, mouth). - conservation and use of water. - water pollution, which shows how even a renewable resource can be drastically reduced in value. Slides, pictures, filmstrips, films could be used in teaching this section. There is again a close link with the General Science syllabus to which teachers are referred.	A renewable resource. Conservation of resources. Flow. Pollution. Wastage.	Study wall map of Natal and look for rivers : - direction of flow and reasons. - sources and mouths - big river systems and small river systems.	A visit to a nearby stream or river (beware danger, especially bilharzia) is essential. Observe landscape features and stream flow. Visit, if possible, a dam, a river mouth, and a stream source.	N.B. Whenever field studies are done worksheets should be provided for the pupils. Sand tray or open ground to simulate river flow. Moore, W.G. (1961) Rivers and their work. Hutchinson. Walsh, J.W. Assignment 6: A River Study. Schofield & Sims.
Coal mining case study a non-renewe resource	Simple explanations illustrated by slides, pictures, films of - how coal was formed - how coal is mined - transport by rail & sea - uses of coal. The need for careful exploitation to delay depletion.	Non-renewable resource. Exploitation.	Simple map exercise - find routes moving coal from N.Natal Coalfields to coastal ports.	No coal mine will take very small children underground. It is essential therefore to make use of slides and	J. Devenish (1975) : Pride of S.A. : Coal Purnell. H. Donaldson & H.B. Locke (1965) Coal. Longman.

YLLABUS	SUGGESTED APPROACH AND TEACHING METHODS	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	EDUCATIONAL AIDS, RESOURCES AND REFERENCES
.3 Foodstuffs	The difference between crop and animal (pastoral) farming should be apparent after making the following two case studies.	Arable farming Pastoral farming			
3.1 Either ıize farming : wheat farm- ıg	A study of the cultivation of either maize or wheat in order to clarify the terms: ploughing, planting, weeding, fertilising, harvesting, marketing. Products made from the chosen cereal. No production areas should be studied as this is dealt with in Std. 3. A recommended manner of dealing with this topic is to make a case study (sample study) of a particular farm so that the pupil understands the farmer's year on a real farm.	One is attempting to teach the processes involved in crop farming. Spatial patterns typical of crop farming. The cycle of activities in a crop farmers year.		Pupils should visit a farm to observe the activities e.g. ploughing, cultivating, as well as the care and handling of animals. Simple worksheets should be compiled. A model of a farm might be made so that pupils could see the various requirements of the farmer (e.g. Fences, roads, water supply, etc.) and by moving model sheep,tractors etc. could simulate the movement of	Ferris & Toyne (1970) World Problems.Hulton. Alnwick, H. (1965) Our food and our clothes Harrap. Walsh, J.W. 91971) Farming. Schofield & Sims. Rice, W.F. (1973) Patterns in Geography Ore. Longman. (Although British examples are given, ideas may be gained from the approaches in this book.)

LLABUS	SUGGESTED APPROACH AND TEACHING METHODS	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	EDUCATIONAL AIDS, RESOURCES AND REFERENCES
3.1 Contd.				men, animals & materials on the farm. (Link with Second Language Teaching).	
3.2 Pastoral rming. A udy of one of ry, beef, ton and wool duction.	As an introduction the types of animals used for dairying, beef, mutton and wool production should be understood. The study should then concentrate on the pastoral farming activities on a farm - i.e. care of animals, feeding, handling (milking, shearing, slaughtering) products, transporting. Again it is recommended that a case study be made of a typical pastoral farm so that the study be as real as possible.	Spatial patterns typical of pastoral farming. Cycle of activities in a pastoral farmer's year.			
Resources the sea.	A simple study of how fish are caught in nets of various types and by line. An explanation of how fish are processed and marketed. Importance of research, conservation and protection; avoidance of pollution and overfishing. (N.B. The fishing industry based in the S.W. Cape will be studied next year so repetition should be avoided. Concentrate in Std 2 on fishing methods, boats, fishermen and others in the industry.)	Renewable resources. Conservation. Pollution.		Primary schools in or near Durvan and eventually Richards Bay may be able to visit a fishing quay. Link with Art & Handicrafts in making three dimensional model of fishing boats in	

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	EDUCATIONAL AIDS, RESOURCES AND REFERENCES
3.5 Timber - a study of a plantation.	A simple study of the activities on a plantation so that pupils understand how we obtain timber. Explanations, which should be well illustrated, should cover the seedling nursery, planting and care, felling and transport, the sawmill and its products, the dangers threatening the plantation.	The cycle involved in the timber industry: preparation - planting - growth - felling preparation for next planting etc.		Many country primary schools in Natal are near plantations and a visit may be possible.	Filmstrip : Forestry in S.A.
3.6 Manufacturing.	This should be a study of what a factory is (the concept of a factory which processes raw materials) in terms of labour, raw materials, transport, power and water. This is not a study of internal factory processes but an introduction to industrial location, preferably by a visit to a local factory.	Manufacturing		A short visit to look at a factory <u>from outside</u> the <u>gates</u>, identifying raw materials, power, water and labour entering the factory and manufactured products leaving as well as the means of transporting all the above. A simple worksheet will add value to the visit	

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	EDUCATIONAL AIDS, RESOURCES AND REFERENCES
.0 TOPICAL EOGRAPHY	This should involve a discussion of the geographical (i.e. spatial)aspects of current news items. Care should be taken that not too much time is spent on general news discussion.		This is an important means of discovering where events have occurred in the world. The globe and, towards the end of the year, a world map should be used to locate places where these events occurred.		A simple world map (after mid-year) showing where events have occurred.

STANDARD 3

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHODS	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
..0 MAP WORK	In Std 2 maps were drawn of areas within the immediate vision of the pupil. In Std 3 maps should be drawn of areas which cannot be seen in their entirety from one point. This practical mapping should be of limited areas first, followed by larger areas as techniques improve - e.g. - map of school buildings and part of the school grounds: - my route from home to school; - simple map of a park; - map of my garden at home; - map of the streets around the school. It is not expected that pupils should attempt all of these. Two or three <u>in the course of the year</u> should be sufficient. Increasing accuracy in map making should be expected and thus in Std 3 the use of a scale should be introduced. Drawing maps on squared paper helps pupils grasp the concept of scale.	Location Distribution Shape Scale Direction	Refer to column 2.	Map-making must be taught as a series of practical exercises at intervals through the year. Measurement of distances and reducing to scale should be linked with work in mathematics lessons.	Schools' Council Environmental Studies Project 91972) <u>Starting from Maps</u> Hart-Davis Hopkins, M.F.S. (1968) <u>Learning through the Environment</u>. Longman.
2 The Compass-ght main ints	Eight cardinal points to be included on all maps the pupils draw.			A simple compass traverse employing the 8 compass directions may be made in the school grounds.	Magnetic compass showing cardinal points.

1.3 Atlas Maps /....

YLLABUS	SUGGESTED APPROACH AND TEACHING METHODS	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
.3 Atlas maps political relief climate vegetation	Pupils must understand the meaning of conventional signs and layer tints on relief maps, simple climate maps and vegetation maps, particularly of Natal and South Africa.		As from the beginning of the Std 3 year each pupil should have an atlas and make regular reference to it during geography lessons.		Wall maps : Natal - Relief & Communication. South Africa - Relief & Communications.
distribution	A simple introduction to distribution maps, leading on to a study of population distribution in Natal and R.S.A.	Distribution. Clustering.			
O WEATHER TUDY asurement of mperature, nd direction, nd velocity, infall.	Weather observations started in Std 2 should be continued. Weather charts should be kept for a minimum of two weeks in summer and two weeks in winter. This should be closely related to topics 1, 2 and 3 in the Std 3 General Science syllabus. Duplication should be avoided.	Awareness of weather elements		Pupils must be involved in making weather observations taking readings and compiling the weather chart. Drawing of wind roses. Drawing of graphs analysing weather conditions.	Weather chart drawn by the teacher. Simple thermometer. Rain gauge and measuring cylinder.
) DAY AND GHT	The globe should be used to teach pupils how the earth's rotation causes day and night. (The O.H.P. makes a very effective sun!)	Earth movement - Rotation.			Globe Torch or O.H.P.

4.0 TRANSPORT /.....

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
4.0 TRANSPORT					
4.1 A railway network - A case study of Natal	A map of the Natal railway network - links with other provinces - exercises involving the shortest routes. This will provide an understanding of the location of the main towns in Natal and other cities in South Africa in an interesting manner, at the same time emphasising the links connecting them.	Networks and links Nodes Break of bulk-points	Use to be made of the atlas in studying Natal and South Africa's railway network.		Young, E.W. (1973) Basic Studies in Geography S7, Settlement, Trade and Transport. Edward Arude.
4.2 A study of Durban as a port	Why Durban is a protected harbour. Men who do work in Durban harbour, e.g. tug captain, pilot, dredger operator, dry dock engineer, crane driver. Loading, unloading and handling of cargoes, e.g. manganese ore, coal, petroleum, maize, fruit, vegetable oils, sugar. Containerisation. Moving cargoes to the hinterland.	Understanding the essential operations in a port and thus what a port is.		A study visit to the harbour could be made.	
5.0 SELECTED SOUTH AFRICAN REGIONS. At least 3 of the following regions, not more than 2 of which should be in Natal, should be studied :- 5.1 The Coastal Belt of Natal; 5.2 Natal Midlands	Certain regions lend themselves to a study of rural land use and others to a study of industrial development. The teacher is left to his/her discretion as to where the emphasis is placed. The outmoded regional approach of position, build, climate, etc., is strongly discouraged. It is suggested instead that studies be made of whichever of the following topics the teacher considers applicable to the regions they have chosen :- - people, population and settlement; - rural land use patterns and farming methods; - transport systems and links;	Variety of rural and industrial land use patterns locally and country-wide. Factors affecting these land use patterns. The industrial area as a focus into which men, materials & power move, and	Regular use must be made of the atlas in studying this section.		Wall maps of Natal and South Africa. Barnard, Smit and van Zyl. Suid-Afrika : die land en sy Streke. Nasou. Nicholson & Morton (1975) Man's Environment Std 10. Shuters. G.R. Schwarz, C.G. Shah et al. (1976) Practical Geography for Std 6. Juta.

Contd./..

Contd./..

Contd./

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
5.0 Contd. 5.3 Northern Natal and the Tugela Basin; 5.4 S.W. Cape; 5.5 Karoo; 5.6 Highveld; 5.7 Transvaal Bushveld; 5.8 Eastern Transvaal and the Lowveld.	- industrial development, and the factors affecting industrial location within the region; - movement of raw materials, manufactured products, power resources, and people in and out of this region; - movements within the region.	out of which products issue. Interaction and inter-dependence both within the region and between regions.			Swanvelder, Kotzé e.a. (1975) Senior Geography for Std 10. Nasou.
6.0 TOPICAL GEOGRAPHY	Discussion of news items of a geographical nature. The emphasis should be on the geography in the news, and time should not be wasted on general news discussion.		Places in the news should be located in the atlas and marked on a world map pinned up in the classroom.		

STANDARD 4

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
1.0 MAP WORK					
1.1 Map making	mapping of areas which cannot be seen from one point, commenced in Std 3, continues in order to improve accuracy in drawing maps, and particularly in handling scale. - map of my garden at home; - map of the streets around the school; - interpreting a map of section of the town; - land use map of a farm. The local 1:50 000 sheet should be displayed for class reference, but no mention should be made of the contour system. The representation of relief on maps is introduced only in Std 5.	Location. Scale. Direction. Shape. Size. Distribution.		At intervals through the year the pupils must be given practice in drawing maps so that increasing accuracy of scale is achieved.	Oblique aerial photograph of the local area may be useful.
1.2 Direction: determining direction with aid of the magnetic compass, watch and the shadowstick.	Revision of the 8 cardinal points learned in Std 3. Use of the shadowstick experiment to determine true north. Use of a watch to obtain a rough idea of north. Introduce pupils to True North and Magnetic North through using a compass. Once pupils have learned about angles in their mathematics lessons they should learn about magnetic bearings.			Shadowstick experiment. Direction from a watch. Taking bearings on various objects in the playground. Following a simple compass traverse around the playground.	

1.3 Atlas maps. /.....

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
1.3 Atlas maps 1.3.1 Latitude & Longitude	Constant use of the atlas must be made throughout the regional course. Africa should be introduced through atlas study :- Sea routes from African ports to some of the more notable trading partners overseas. Sea, air, road and rail routes from S.A. to various African states with a view to familiarising pupils with the position of some of the more notable of such states. The use of the atlas index and the latitude and longitude grid for locating places on maps must be mastered.	Longitude and latitude grid.	Refer to column 2.	Practical exercises in determining latitude and longitude using globe and atlas.	
2.0 WEATHER STUDY. Measurement of maximum and minimum temperatures; wind direction; wind velocity, rainfall.	Weather observations of a more sophisticated type than in Std 3 must be made. Pupils must use the following instruments :- maximum and minimum thermometer, raingauge, wind vane. Weather during summer and winter to be studied, with weather charts to be kept, as a prelude to a simple discussion of the seasons. Simple weather graphs to be compiled.	The link between weather elements and the seasons.	Reference to climate maps, particularly of R.S.A., in the atlas.	Completing weather charts.	S.F. King (1976) Science and Weather. Rupert Hart-Davies.

3.0 SEASONS /.....

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
3.0 SEASONS Their causes and consequences.	A simple explanation using the globe should be given as to the cause of the seasons, and a simple discussion of some of the consequences.	Revolution of the earth.			
4.0 AFRICA - Selected topics from Africa.	This section can be expanded, if desired, by including a regional study of a country under each of the sections 4.1, 4.2, 4.3, 4.4, 4.5., but not more than one country should be studied in each case.				Wall maps of Africa - relief, and Africa - political. Publications of the Africa Institute.
4.1 Our neighbours, Lesotho, Botswana, Swaziland, Transkei, Bophutatswana, South West Africa	These are to be studied by examining the extent to which their economics are related to the S.A. economy, not under the headings of relief, climate, vegetation, etc.	Economic development. Contrasts in development.			R. Clayton (1972) Southern Africa Rupert Hart-Davis.
4.2 Life in the Tropical Savannas.	Simple case studies of farming and mining activities. The export of minerals from African savanna states to Europe and North America.	- Export & Import. - Exploitation of non-renewable resources - Climatic regions. - Climatic influences upon human life.	Atlas to be used regularly throughout the regional geography studies.		Pritchard, J.M. (1973) Africa : A Study Geography for Advanced Students. Longman.
4.3 Life in the hot, wet forests	A sample study of palm and cacao cultivators in Nigeria. The contribution of African equatorial regions to world economy. The Pygmies - a people with a simple response to their environment.				White, R.G. (1973) Africa : Studies for East African Students. Heinemann. Suggete, L.S. (Rev. ed. 1974) Africa. Harrap.
4.4 Life in North West Africa.	This may be typified by studying Algeria or Morocco. Similarities in climate and economy between N.W. Africa and S.W. Cape should be drawn. Emphasise the mineral wealth (e.g. iron ore, phosphates and petroleum) and its export to Europe.				Sherriff, D.A. Africa Oxford Visual Geographics.

Contd /

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
4.0 AFRICA Contd.					
4.5 Life in the Sahara	Contrast the old way of life (Bedouin and Tuareg) with the new life based largely on mineral deposits. Study irrigation and agriculture along Nile valley.				Sinclair & Jenkins (1969) North Cape to Agulhas. Cheshire, Australia. Beddis, R.A. (1968) Focal Points in Geography 2. ULP. Rice, W.F. (1975) Patterns in Geography Longman.
5.0 URBAN GEOGRAPHY					
5.1 How a town serves its own people.	Intra-urban functions in a simple way, i.e., how a town satisfies our needs for food, shelter, sanitation, water supply, transport, education etc.	Central place. Sphere of influence. Urban services and functions. Provision of municipal services		This section in particular lends itself to simple field studies in the vicinity of the school :- e.g. Land use mapping - mapping urban functions - mapping services provided.	Bell, S. & Williams, M. (1972) Using the Urbar Environment. Heinemanr Walsh, J.W. (1971) Assignment 3. Urban Studies. Schofield & Sims. Ward, C. & Fyson, A. (1973) Streetwork - The Exploding School. R.K.P. Pluckrose, H. (1971) Let's use the locality Mills & Boon Briggs, K. (1970) Field Work in Urban Geography. Oliver & Boyd.
5.2 How a town serves its surrounding areas.	Central place functions in a simple way, i.e., market centre, supply centre for farmers.				

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
5.0 URBAN GEOGRAPHY Contd.					Driscoll, K.J. (1971) Town Study. George Philip. Barnard, Smit en v.Zyl (1972) Die Stad en sy Omgewing Nasou. Swanevelder, Kotzé et al (1975) Senior Geography for Std 10. Nasou. Nicholson & Morton (1975) Man's Environment Std 10. Shuter
6.0 ECONOMIC GEOGRAPHY - Sources of power : wind Coal Water Electricity Oil	- Simple reasons for air movement; historical uses; present uses of wind. - Formation; mining; uses as a source of energy; conservation. - The water cycle; uses in history; present source of power. - Types of power stations (Thermal, hydro- and nuclear). Distribution of power. - Formation, main areas of occurrence, mining, transport, refining, uses.	Sources of energy. Importance of energy to man's existence.		Primary School libraries have a large supply of resources on these topics. It is suggested that these be set as group or individual research topics following outlines prepared by the teacher.	

7.0 TOPICAL GEOGRAPHY/.....

SYLLABUS	SUGGESTED APPROACH AND TEACHING METHOD	SPECIFIC AIMS AND CONCEPTS	ATLAS AND MAP WORK	FIELD STUDIES & PRACTICAL WORK	AIDS, RESOURCES & REFERENCES
7.0 TOPICAL GEOGRAPHY	Important current events of a geographical nature and of interest to pupils should be examined critically as they occur.		Must be linked to the identification of places in an atlas, and the use of the atlas index.		

NATAL EDUCATION DEPARTMENT

SYLLABUS
FOR
GEOGRAPHY
STANDARDS 5, 6 and 7
AS FROM 1979

A. STANDARD 5

1. REGIONAL GEOGRAPHY

The study of the selected regions below should include an introductory study and discussion of maps in the atlas with reference to the following :-

(i) Position : latitude and longitude

(ii) Build

(iii) Political boundaries

(iv) Population distribution and influencing factors

(v) Communications : within regions and between these regions and other parts of the world, especially their trade and/or historical links with South Africa; forms of communication

1.1 Selected regions

1.1.1 Great Britain
- (i) London
- (ii) Lancashire - Cheshire
- (iii) The Midlands' pottery or motor industry
- (iv) Edinburgh and a short visit to the Scottish Highlands

1.1.2 Netherlands : Farming and Land Reclamation

1.1.3 A journey down the Rhine

1.1.4 Japan : Farming and Fishing

OR

A journey along the St. Lawrence Seaway and over the Great Lakes.

2. TOPICAL GEOGRAPHY

Discussion of geographical aspects of the news

3. ASSIGNMENTS

At least one assignment must be done in the course of the year, either as individual or as group work.

A P P E N D I X III

TEACHER ATTITUDE QUESTIONNAIRE

GEOGRAPHY TEACHER QUESTIONNAIRE

You need not write your name on the questionnaire if you wish to remain anonymous. The answers to these questions will remain private, so please reflect your own personal ideas and opinions.

Place a cross in the appropriate box.

1. How many years of geography training have you undergone?

HIGH SCHOOL					COLLEGE					UNIVERSITY				
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

2. To which standards do you teach geography?

CLASS	1	2	STANDARD	1	2	3	4	5

3. How often do you take your classes on field trips?

OFTEN	SELDOM	NEVER

4. How often do you use maps when teaching?

ALWAYS	OFTEN	SELDOM	NEVER

5. What type of map do you use most often?

ATLAS	GLOBE	WALL MAP	TOPOGRAPHICAL MAP

6. State which of the following techniques you use most when teaching geography. (Number 1 = most used; Number 12 = least used).

PHOTOGRAPHS		OVERHEAD PROJECTOR		PASSAGES FROM BOOKS		FIELD TRIPS	
PICTURES		TEXTBOOK		GEOGRAPHICAL GAMES		WORKSHEETS	
CASE STUDIES		FILMS AND SLIDES		CHALK BOARD		SAMPLE TABLE	

7. Assuming that ...../

7. Assuming that you could devise a geography course, in what order of importance would you rank the following areas of study?

Number your choices from 1 (most important) to 5 (least important).

	Knowledge of local conditions and places
	Knowledge of other lands and their people.
	The learning of geographic skills, e.g. mapping.
	The learning of man-environment relationships.
	Knowledge of the physical processes in and about the world.

8. What are your feelings about the present geography syllabus?

a) Suitability of content:

b) Amount of work to be covered:

c) Availability of teaching material pertaining to the syllabus:

d) Are there any new techniques or areas in the syllabus about which you feel you would like more guidance?

e) Any other comments:

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