

A CRITICAL ANALYSIS OF PROBLEMS ENCOUNTERED BY SENIOR SECONDARY SCHOOL PUPILS IN THE READING AND INTERPRETATION OF 1:50,000 TOPOGRAPHICAL MAPS AND AERIAL PHOTOGRAPHS WITH SPECIAL REFERENCE TO BLACK PUPILS IN TRANSKEI.

THESIS

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DECLARATION

I declare that this dissertation describes my original work, and has not been submitted for a degree at any other university

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ABSTRACT

Mapwork is an established part of the geography curriculum, and yet it poses particular problems for pupils and teachers. Maps participate in a complex system of graphic communication: the conceptual abstraction involved in the reading and interpretation of maps requires on the part of pupils a high degree of cognitive and perceptual development; teachers, too, often experience considerable difficulty in imparting the skills necessary for graphic literacy (graphicacy).

The peculiar difficulties associated with map reading and the poor performance of pupils in this area have regrettably encouraged an attitude which dismisses mapwork as irrelevant or dispensable in geographical education. Yet graphicacy is essential not only in the learning of geography but in the overall cognitive development of the child, and therefore cannot be excluded from the curriculum.

This study attempts to identify some of the specific difficulties experienced by pupils in their attempts to read and interpret maps, and to trace the origin of these difficulties. It argues that the complexity and sophistication of the skills necessary to interpret topographical maps and aerial photographs, for instance, should not be underestimated. Teachers need to be made aware of how pupils acquire map reading skills and of the problems they encounter

during this process, so that teaching programmes commensurate with pupils' level of cognitive development can be formulated. It is also important that mapwork be taught in as practical a manner as possible.

The findings and recommendations of this study have implications for geography teachers, textbook writers and educational authorities, especially those involved in curriculum and syllabus design.

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TABLE OF CONTENTS

|                   |   |    |
|-------------------|---|----|
| Declaration       | (i)   |    |
| Abstract          | (ii)  |    |
| Acknowledgement   | (iv)  |    |
| Table of contents | (vi)  |    |
| List of tables    | (xi)  |    |
| List of figures   | (xii)   |    |
| <br>              |   |    |
| CHAPTER 1         | INTRODUCTION AND PROBLEM SETTING  | 1  |
| 1.1.              | Introduction : Background of the research   | 1  |
| 1.2.              | The role of mapwork in R.S.A. school syllabus                                     | 3  |
| 1.3.              | Problems pupils experience in terms of<br>developing map skills                   | 4  |
| 1.4.              | Research goals  | 5  |
| 1.5.              | Outline of the study  | 6  |
| <br>              |   |    |
| CHAPTER 2         | TOPOGRAPHICAL MAPS AND AERIAL PHOTOGRAPHS IN<br>THE DEVELOPMENT OF GRAPHIC SKILLS | 7  |
| 2.1.              | Introduction  | 7  |
| 2.2.              | The nature of maps  | 8  |
| 2.3.              | The properties of maps  | 9  |
| 2.4.              | Essential map skills  | 12 |
| 2.4.1.            | Graphicacy as a mapping skill   | 13 |
| 2.4.2.            | Specific map skills   | 15 |
| 2.5.              | Theories of conceptual development  | 21 |

|            |  |    |
|------------|--|----|
| 2.5.1.     | Piaget's theory of conceptual development                                    | 22 |
| 2.5.2.     | Rhys' development of logical thinking  | 24 |
| 2.5.3.     | Bruner and the conceptual growth of the child                                | 26 |
| 2.6.       | Problems pupils encounter in reading and understanding maps                  | 28 |
| 2.7.       | Some key research reports relating to mapwork problems experienced by pupils | 31 |
| 2.7.1.     | Satterly (1965)  | 31 |
| 2.7.2.     | Burton (1986)  | 32 |
| 2.7.3.     | Okpala (1988)  | 33 |
| 2.7.4.     | Beng Teck (1988)   | 34 |
| 2.7.5.     | Boardman and Towner (1980)   | 36 |
| 2.7.6.     | Harwood (1984)   | 37 |
| 2.8.       | Summary  | 38 |
| CHAPTER 3. | RESEARCH METHODOLOGY   | 40 |
| 3.1.       | Introduction   | 40 |
| 3.2.       | The first phase of the study : The Survey                                    | 41 |
| 3.2.1.     | The construction and administration of the questionnaire                     | 43 |
| 3.2.2.     | Semi-structured interviews   | 46 |
| 3.2.3.     | The development and administration of the interviews                         | 47 |

|            |  |    |
|------------|--|----|
| 3.2.4.     | Data analysis  | 51 |
| 3.3.       | The second phase of the study : The diagnostic test and pupils' interviews | 51 |
| 3.3.1.     | The purpose of the diagnostic test   | 51 |
| 3.3.2.     | The construction and administration of the diagnostic test                 | 53 |
| 3.3.3.     | Data Analysis  | 56 |
| 3.4.       | Unstructured group interviews  | 57 |
| 3.4.1.     | The purpose of the interviews  | 57 |
| 3.4.2.     | The development and administration of group interviews                     | 59 |
| 3.5        | Summary  | 62 |
| CHAPTER 4. | TEACHERS' RESPONSES TO THE TEACHING OF MAPWORK AT SECONDARY SCHOOL         | 63 |
| 4.1.       | Introduction   | 63 |
| 4.2.       | Analysis of teacher questionnaire  | 63 |
| 4.2.1.     | The composition of the group   | 64 |
| 4.2.2.     | Analysis of teachers' attitudes towards the teaching of mapwork            | 70 |
| 4.2.3.     | Time allocated to mapwork in the secondary school phase                    | 74 |
| 4.2.4.     | Teaching strategies used   | 76 |
| 4.2.5.     | Analysis of teachers' attitudes towards the teaching of aerial photographs | 79 |

|            |  |     |
|------------|--|-----|
| 4.2.6.     | Time allocated to aerial photographs<br>in secondary schools         | 81  |
| 4.2.7.     | Teaching strategies used   | 82  |
| 4.2.8.     | Summary of questionnaire   | 84  |
| 4.3.       | Analysis of interviews   | 85  |
| 4.3.1.     | Teachers' perceptions of the teaching<br>of mapwork                  | 86  |
| 4.3.2.     | Teachers' perceptions of the teaching<br>of aerial photographs       | 90  |
| 4.4.       | General comment on the survey  | 92  |
| CHAPTER 5. | RESULTS OF THE DIAGNOSTIC TEST AND GROUP<br>INTERVIEWS               | 94  |
| 5.1.       | Analysis of results of the diagnostic test                           | 94  |
| 5.1.1.     | Analysis of the structure of the<br>questions of the diagnostic test | 94  |
| 5.1.2.     | Global results of the diagnostic<br>test                             | 98  |
| 5.1.3.     | Analysis of individual test<br>questions                             | 100 |
| 5.1.4.     | Analysis of pupils' results in<br>relation to specific skill areas   | 110 |
| 5.2.       | The results of group interviews                                      | 114 |
| 5.3.       | Summary of the pupils' survey.                                       | 118 |

|         |      |                                  |     |
|---------|------|----------------------------------|-----|
| CHAPTER | 6.   | CONCLUSION AND RECOMMENDATIONS   | 120 |
|         | 6.1. | Introduction                     | 120 |
|         | 6.2. | Analysis of the research results | 121 |
|         | 6.3. | Limitations of this study        | 124 |
|         | 6.4. | Recommendations                  | 125 |
|         | 6.5. | Conclusion                       | 126 |

|            |  |  |     |
|------------|--|--|-----|
| REFERENCES |  |  | 128 |
|------------|--|--|-----|

|            |      |  |     |
|------------|------|--|-----|
| APPENDICES | 1.   | Provincial Administration of the Cape of Good Hope. Department of Education. Senior Secondary Course. Syllabus for Geography (H.G.) 1985 | 134 |
|            | 3.A. | For Geography Teachers. Questionnaire on the teaching of Map Work and the interpretation of Aerial Photographs                           | 155 |
|            | 3.B. | Letter accompanying questionnaires   | 166 |
|            | 3.C. | Semi - Structured Interview : Geography teachers   | 167 |
|            | 3.D. | Diagnostic test - Based on Map 3228 AC Butterworth   | 168 |
|            | 3.E. | Map 3228 AC Butterworth  | 169 |
|            | 3.F. | Aerial photograph of Butterworth   | 170 |
|            | 3.G. | Unstructured group interviews  | 171 |

LIST OF TABLES

|     |       |  |       |
|-----|-------|--|-------|
| 1.  | Table | 2.1. The properties of maps  | p. 10 |
| 2.  | Table | 2.2. Summary of essential skills needed<br>for map reading           | p. 17 |
| 3.  | Table | 2.3. Piaget's model of mental development                            | p. 23 |
| 4.  | Table | 2.4. Major response levels suggested by Rhys                         | p. 25 |
| 5.  | Table | 4.1. Academic qualifications of the group                            | p. 65 |
| 6.  | Table | 4.2. Highest course attended in geography                            | p. 66 |
| 7.  | Table | 4.3. Highest geography standard taught<br>in 1989                    | p. 69 |
| 8.  | Table | 4.4. Teaching preferences in geography                               | p. 71 |
| 9.  | Table | 4.5. Time spent in mapwork   | p. 75 |
| 10. | Table | 4.6. Use of teaching strategies in mapwork                           | p. 76 |
| 11. | Table | 4.7. Use of resources in teaching mapwork                            | p. 77 |
| 12. | Table | 4.8. Teaching preferences in geography                               | p. 80 |
| 13. | Table | 4.9. Use of resources in teaching aerial<br>photographs              | p. 83 |
| 14. | Table | 5.1. Question analysis   | p. 97 |
| 15. | Table | 5.2. The groups' map test scores                                     | p. 99 |
| 16. | Table | 5.3. Map test questions grouped according to<br>specific skill areas | p.111 |

LIST OF FIGURES

|     |        |   |       |
|-----|--------|---|-------|
| 1.  | Figure | 2.1. A simplified cartographic communication system                           | p. 8  |
| 2.  | Figure | 2.2. Continuum of cartographic signs using the sign for a house as an example | p. 11 |
| 3.  | Figure | 2.3. The four basic skill areas and models of communication                   | p. 14 |
| 4.  | Figure | 2.4. The basic school subjects for the well-educated person                   | p. 15 |
| 5.  | Figure | 2.5. A plan-view of pupils' classroom   | p. 19 |
| 6.  | Figure | 4.1. Teaching experience of the group   | p. 68 |
| 7.  | Figure | 5.1. The groups' responses to the diagnostic test                             | p.101 |
| 8.  | Figure | 5.2. Responses to a diagnostic test - Standard 7                              | p.103 |
| 9.  | Figure | 5.3. Responses to a diagnostic test - Standard 8                              | p.104 |
| 10. | Figure | 5.4. Responses to a diagnostic test - Standard 10                             | p.105 |
| 11. | Figure | 5.5. Pupils' performances in relation to skill areas                          | p.112 |

CHAPTER 1INTRODUCTION AND PROBLEM SETTING**1.1. Introduction : Background of the research**

Graphicacy is defined by Balchin and Coleman as "the communication of spatial information that cannot be conveyed adequately by verbal or numerical means." (in Boardman, 1983, p.1). Balchin and Coleman (1966) indicated that of the four main orders of communication - literacy, numeracy, articulacy and graphicacy, graphicacy with its special skills is particularly pertinent to the study of mapwork.

Geography's concern with spatial patterns and relationships plays an important part in the development of graphicacy in that maps are the most effective way of communicating spatial ideas and information. Maps including topographical maps and aerial photographs are widely used in school geography. The role played by geography in the spatial education of the child is perceived as a primary justification for the inclusion of the subject in the school curriculum. (Bailey, 1987).

Gerber and Wilson (1984) state that as maps are abstracted and generalised scaled representations of part of the earth, pupils as map users may not be familiar and competent with the processes of decoding the messages in maps. Communication via maps is a complex task involving many learned skills based upon an understanding of eight interrelated map properties. These properties of maps which are fundamental elements of graphicacy are the basis for the sound

mastery of this complex communication system. Morrison (in Burton 1986) claims that if the map reader is not fluent in the language of maps then communication breaks down.

Bailey (1974) emphasises the wide range of skills which the understanding of maps demand and that the acquisition of these skills depends upon the pupils' level of cognitive development. Therefore the teaching of mapwork requires an understanding of children's spatial concept development. Learning theories claim that children can learn map skills when taught to them in terms of their personal experiences and environment. Mapping skills are considered to proceed in stages of increasing difficulty which form a hierarchy with lower abilities as prerequisites for the subsequent higher abilities. Skill development is influenced by the child's level of conceptualisation. Gertrude Whipple describes the development of concepts thus :-

*concepts develop from concrete to abstract as the learner draws from his experiences as general ideas apart from the particulars he has noted. No one can give the learner a concept. He must build it out of his own experience. The process is a gradual one that usually takes place over a period of years, as the child has experiences that contribute to growth in meaning. .... Building up the child's background of experiences is of tremendous importance. (in Atkins, 1981, p.230).*

Maps as a complex graphic communication system are highly selective and conventionalised representations of the real world. Therefore their understanding demands of the pupils considerable imagination and the mastery of difficult conceptual skills.

### **1.2. The role of mapwork in the Republic of South Africa school syllabus**

The various education departments have adopted the Joint Matriculation Board core syllabus of 1983. The Cape Education Department senior secondary geography syllabus for 1985 is considered below as representative of South African geography syllabuses in a wider context. (Appendix 1.A.). The specific objectives of this syllabus are classified into four major categories ie. knowledge, skills, perception and appraisal. The syllabus stresses that geographical skills should be taught in relation to the abilities and maturity of pupils. Skills must be developed to help pupils organise knowledge and should be transferable to new situations.

Graphicacy is listed along with oracy, literacy and numeracy as one of the four skill areas with which geography is concerned. The 1985 Cape Education Department syllabus for geography relates the development of graphic skills to the understanding of maps and aerial photographs. The importance of these spatial documents is emphasised by the perceived need to integrate maps and photographs throughout the syllabus.

The reading and interpretation of 1:50,000 topographical maps and aerial photographs currently constitute a compulsory question for the senior certificate geography examination in all education departments.

With independence the Transkei Education Department became a separate department under the auspices of the then Joint Matriculation Board. However Transkei elected to adopt Cape Education Department syllabuses including that of geography. While Transkei has a separate examination system the syllabus continues to operate within the structures of the wider South African context. As a result of this little has been done to adjust the syllabus to suit the specific needs of pupils in Transkei. An analysis of recent Transkei senior secondary geography examinations reveal that in terms of the mapwork questions pupils are required to demonstrate the same skills which Gerber and Wilson (1984) identified as essential for the sound mastery of mapwork.

### **1.3. Problems pupils experience in terms of developing map skills**

Research into the development of map skills by pupils has revealed that this section is not without its problems. The problems identified below reveal that this section presents pupils with a number of difficulties:-

- (i) Perceptual ability is a major factor underlying certain aspects of mapwork and therefore teaching programmes designed to increase perceptual skills should be devised.
- (ii) Pupils' perception of mapping concepts is likely to be affected by the social background and environmental issues to which they have been exposed.
- (iii) A hierarchical sequence of map skill instruction to enhance pupils' understanding of mapping concepts is lacking.
- (iv) Pupils' inability to visualise the three - dimensional equivalents of the two - dimensional representation of reality appears to be a general problem.
- (v) Factual presentation of mapwork through teacher - orientated processes result in rote memorisation with pupils seldom coming to a mature understanding of mapping concepts.

#### **1.4. Research goals**

The main aims of this investigation are to:-

- (i) determine the specific difficulties encountered by pupils in Transkei in the reading and interpretation of 1:50,000 topographical maps and aerial photographs;

- (ii) identify the causes of difficulties experienced by pupils attempting to read and interpret maps and aerial photographs;
- (iii) provide guidelines relating to the teaching of map reading and interpretation in secondary schools.

### **1.5. Outline of the Study**

Chapter 2 focuses on the nature of maps and theories of conceptual development as the underlying factors affecting pupils' map reading and interpretation abilities. Some key research reports relating to mapwork problems experienced by pupils are outlined. In Chapter 3 the research methods used in this investigation are discussed. Chapter 4 gives a detailed analysis of data obtained from the teacher questionnaire and interviews. Chapter 5 focuses on the analysis of data collected from a diagnostic test administered to Standard 7, 8, and 10 geography pupils. Chapter 6 highlights the results of this research and concludes with a number of guidelines aimed at improving the teaching of mapwork.

CHAPTER 2TOPOGRAPHICAL MAPS AND AERIAL PHOTOGRAPHS IN THE DEVELOPMENT OF GRAPHIC SKILLS**2.1. Introduction**

The focus of this study is on problems encountered by pupils in the reading and interpretation of 1:50,000 topographical maps and aerial photographs. Geography students use a wide range of visual materials such as aerial photographs, maps drawings, orthophotomaps and models to study their environment. Of these forms of visual material, the map is perceived as the most difficult to understand. Gerber and Wilson (1984) claim that students confronted with a map face a problem similar to being addressed in a foreign language complete with signs, grammar and expressions beyond their understanding. Consequently pupils attempting to read maps need to be familiar and competent with the underlying mapping concepts and skills essential to develop an individual's map reading abilities.

This chapter seeks to explore the following:-

- (i) the nature of maps;
- (ii) the properties of maps;
- (iii) essential map skills;
- (iv) theories of conceptual development;
- (v) specific problems encountered by pupils in reading mapwork;
- (vi) some key research reports on mapwork problems.

## 2.2. The nature of maps

Maps and photographs have become important not only as teaching - learning aids in geography classrooms, but as a part of the everyday lives of children and adults. Geographers such as Boardman (1983) define maps, including photographs, as spatial documents which are used as a system of communication with their own language for the transmission of information. Maps pose problems for pupils because each map is a coded representation of an area. This process of communication via maps involves decoding a graphic message through the understanding of signs and symbols as shown in Figure 2.1. below:-

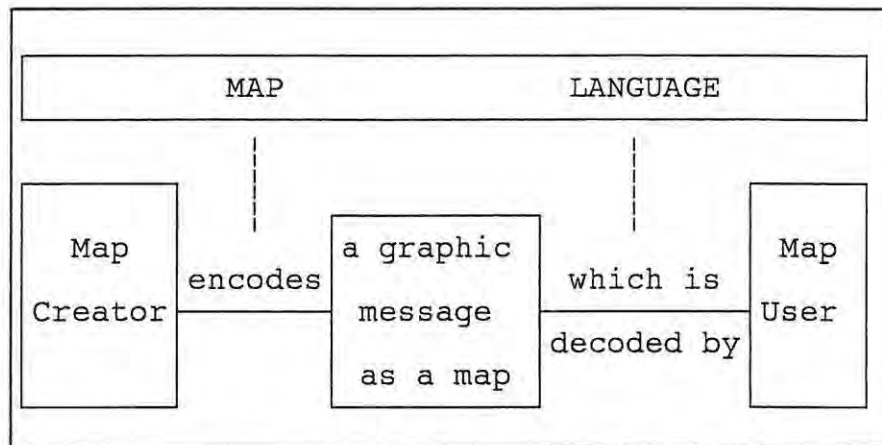


Figure 2.1. A simplified cartographic communication system.

(Adapted from Fien, Gerber & Wilson, 1984, p.148).

Maps have been regarded as preeminently the geographer's tool in the investigation of his problems and the presentation of his


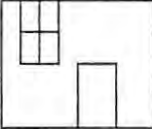


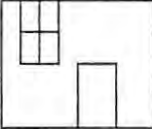


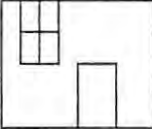

results. (Bailey, 1974, Satterly, 1964, Thompson, 1961, Wooldridge & East, 1951). In recent years this view has been criticised as a restricted interpretation of the map that tends to limit its use and value in the training of basic skills. Keates (1982) suggested that maps will be better understood if their fundamental properties are realised.

### **2.3. The properties of maps**

An analysis of the physical characteristics of the map is necessary in order to understand the complex nature of maps as a communication system. Two American experts in the field of cartography Robinson & Petchenik (1977) claimed that one of the problems of teaching mapwork is an insufficient understanding of how pupils acquire spatial knowledge through mapwork. Understanding the elements which are shared by all maps may help to identify the skills with which maps are associated. This in turn may provide a better understanding of pupils' problems in reading and understanding maps. Table 2.1. below indicates eight properties of maps which have been identified by Gerber & Wilson (1984):-

Table 2.1.                    The properties of maps

| PROPERTY                | DEFINITION  |
|-------------------------|---|
| 1. Orthogonal view      | is an aerial view presenting everything as though directly overhead.  |
| 2. Spatial relationship | involves the understanding of the manner in which maps contain arrangement of phenomena similar to the arrangement of phenomena in reality.   |
| 3. Proportion           | is based on a sound understanding of the concepts of scale and distance.  |
| 4. Generalisation       | is a selection of essential features based upon the purpose of the map. The omission of less important features leads to a generalised view of the area mapped.   |
| 5. Abstraction          | involves the understanding of a system of signs and symbols as representatives of selected environmental features on a map. Abstract symbols and signs bearing no resemblance to the real features they represent are sometimes used. |

| <u>PROPERTY</u>   | <u>DEFINITION</u>   |   |                  |                 |            |  |  |   |  |   |
|---|---|---|------------------|-----------------|------------|--|--|---|--|---|
| 6. Map language   | <p>which is closely related to abstraction is a system of communication used on a map to encode and decode the message. It involves a variety of signs and symbols which range on a continuum from signal, through mimetic to abstract levels. The following diagram is a classification of map language in a continuum:-</p> <div data-bbox="608 875 1422 1227" style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <table style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 33%;">CARTOGRAPHIC SIGNAL</th> <th style="width: 33%;">PICTORIAL SYMBOL</th> <th style="width: 33%;">ABSTRACT SYMBOL</th> </tr> </thead> <tbody> <tr> <td>e.g. House</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> </div> <p><u>Figure 2.2 CONTINUUM OF CARTOGRAPHIC SIGNS USING THE SIGN FOR A HOUSE AS AN EXAMPLE.</u><br/>(Adapted from Gerber, 1980 p. 104).</p> <p>In this continuum the house at signal level is drawn as a duplicate of a plan view, at a mimetic level it is represented as a pictorial symbol while at the abstract level it is represented as a small square which bears no resemblance to the referent house.</p> | CARTOGRAPHIC SIGNAL   | PICTORIAL SYMBOL | ABSTRACT SYMBOL | e.g. House |  |  |  |  |  |
| CARTOGRAPHIC SIGNAL   | PICTORIAL SYMBOL  | ABSTRACT SYMBOL   |                  |                 |            |  |  |   |  |   |
| e.g. House  |   |   |                  |                 |            |  |  |   |  |   |
|  |   |  |                  |                 |            |  |  |   |  |   |

| PROPERTY                 | DEFINITION  |
|--------------------------|---|
| 7. Isomorphic properties | involves the understanding of the fact that maps always retain a structural relationship similar to the area they represent. This means that features on a map are shown in the same pattern as they occur on the earth's surface and this makes a map similar to the area it represents. |
| 8. A way of reading      | involves map scanning which is the jumping of an eye from one location to another. Map reading is influenced by the reader's knowledge of signs and symbols used on a map.  |

A sound understanding of maps therefore requires an understanding of the properties summarised in the above table which implies that teaching procedures should develop as a sequence of skills to assist pupils toward a better understanding of this complex communication system.

#### **2.4. Essential mapping skills**

Considerable investigation has been devoted to the child's developmental processes in acquiring various abilities that might be important in learning map skills. Gerber & Wilson (1984)

suggest that the ability to understand and read maps must be cultivated and developed in pupils. Research reports on map learning procedures suggest that learning a map is based on a sound mastery of the underlying mapping experiences and graphic skills.

#### **2.4.1. Graphicacy as a mapping skill**

The term graphicacy is used by geographers to describe the understanding and communication of spatial information that cannot be conveyed adequately by verbal or numerical means. Balchin & Coleman (1966) give the concept of graphicacy a wider application by viewing it as fundamental in education along with literacy, articulacy and numeracy. A well illustrated diagrammatic representation of the four basis skill areas and modes of communication that form the total underpinning of the academic aspect of education is given in Figure 2.4. below:-

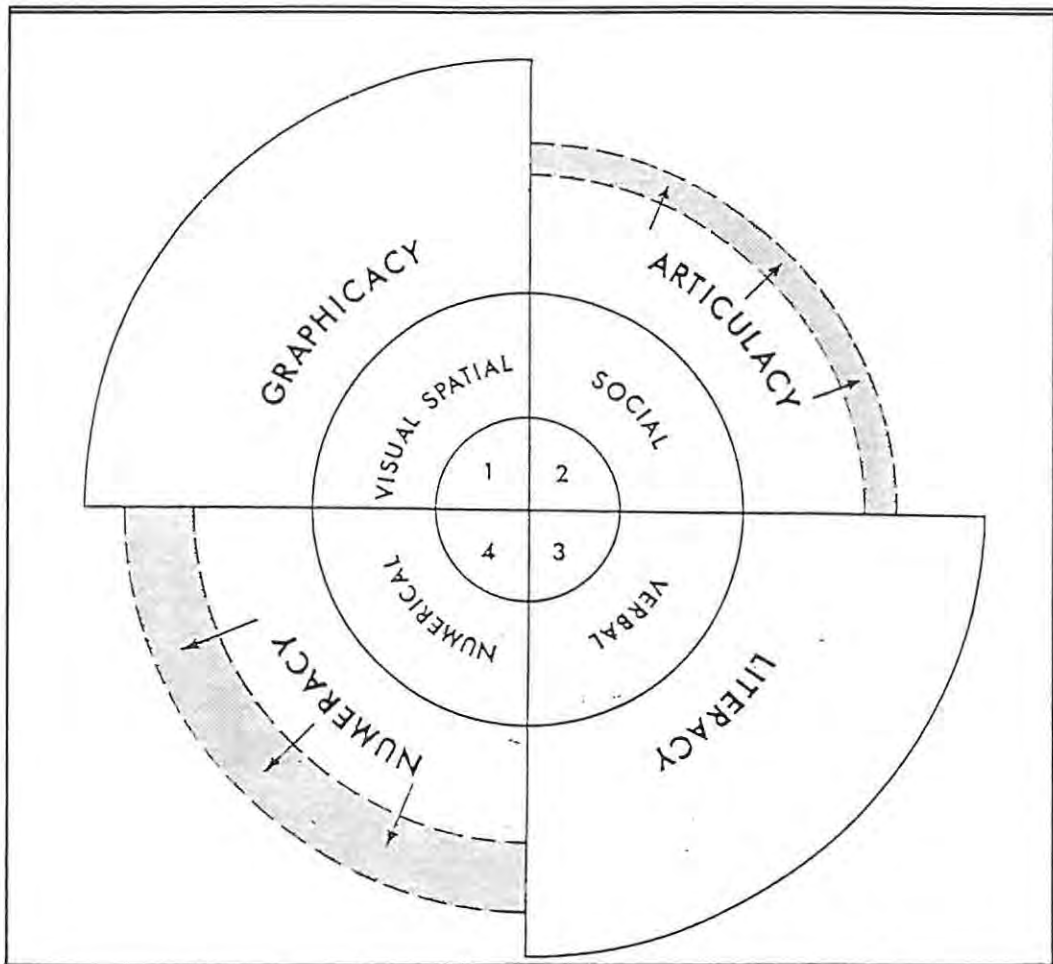


Figure 2.3. The four basic skill areas and modes of communication.

(Adapted from Balchin, 1971, p. 187).

Balchin (1971) claims that in human beings the potential for the skill areas is inborn but none of them can develop fully without education. Balchin suggests that the three most important subjects in the school curriculum should be geography, english and mathematics as summarised in Figure 2.4. below:-

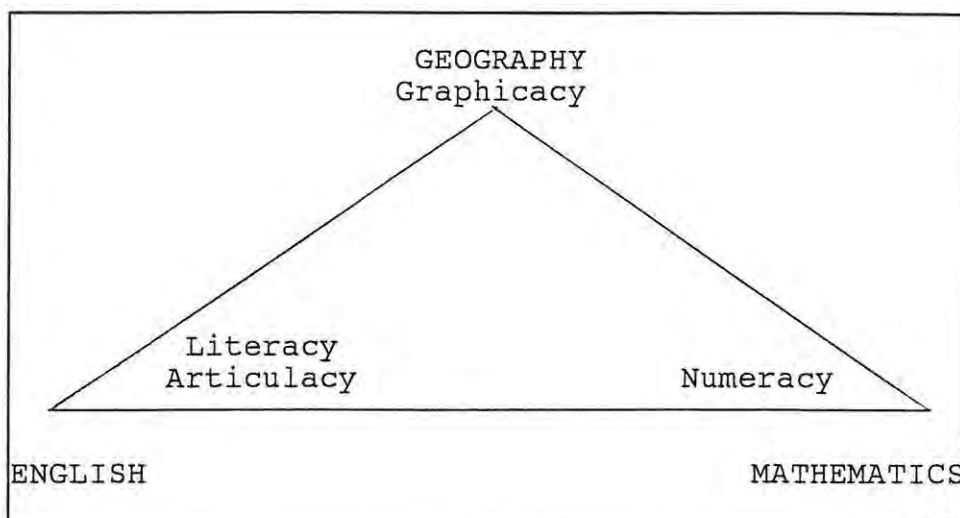


Figure 2.4. The basic school subject for the well-educated person.

(Adapted from Balchin, 1971, p. 194).

Boardman (1986) claims that graphicacy is largely associated with skills involved in reading and drawing maps although it is not confined to them. In geography graphicacy includes the ability to recognise and interpret features shown on maps and landscape photographs. This requires sophisticated cognitive skills that call for the application of all previously acquired knowledge and processes. These skills are discussed below.

#### **2.4.2. Specific map skills**

Catling (1984) claims that there are map experiences which pupils should encounter if they are to have a sound understanding of maps. These basic concepts and experiences in map understanding are vitally important to students because they provide the means

whereby learning takes place. The development of map skills is justified for the following reasons:-

- (i) to facilitate one's ability to navigate one's environment successfully;
- (ii) to facilitate instruction in geography;
- (iii) to facilitate the use of maps that may be pertinent to daily life such as bus maps, street maps, road maps, etc.

Previous research into map skills suggest that a sequence of abilities may be involved in developing map skills.

Table 2.2. Summary of essential skills needed for map reading.

| Skill                | Author |         |        |          |        |        |                |                 |          |                    |
|----------------------|--------|---------|--------|----------|--------|--------|----------------|-----------------|----------|--------------------|
|                      | Kohn   | Thralls | Warman | Sabaroff | Davies | Farrar | Ken-<br>nammer | Hanna<br>et al. | Stringer | Askov<br>&<br>Kamm |
| Orientation          | *      |         |        | *        | *      | *      | *              | *               | *        |                    |
| Direction            | *      |         | *      | *        | *      | *      | *              | *               | *        | *                  |
| Scale                | *      |         | *      |          | *      | *      | *              | *               | *        | *                  |
| Distance             | *      |         |        |          | *      | *      | *              | *               |          |                    |
| Location             | *      |         |        | *        | *      | *      | *              | *               | *        | *                  |
| Relative<br>location | *      |         |        | *        | *      |        | *              | *               |          | *                  |
| Distribution         | *      | *       | *      | *        | *      | *      | *              | *               | *        |                    |
| Symbolisation        | *      |         |        |          |        |        | *              |                 |          |                    |
| Map comparison       | *      | *       |        |          |        | *      | *              |                 | *        |                    |
| Inferencing          |        | *       |        |          | *      | *      |                |                 |          |                    |
| Map language         |        | *       |        |          | *      | *      |                |                 | *        |                    |
| Map drawing          |        |         | *      |          | *      | *      | *              | *               |          |                    |
| Projection           |        |         | *      |          |        |        | *              | *               |          |                    |
| Legend               |        |         | *      |          |        |        |                |                 |          |                    |
| Map titles           |        |         |        |          | *      |        | *              | *               |          |                    |
| Observe<br>landscape |        |         |        | *        | *      |        |                | *               |          |                    |
| Globe as model       |        |         |        |          |        |        |                | *               |          |                    |

\* = listed by author

(Adapted from Gerber &amp; Wilson, 1984, p. 150).

Gerber & Wilson (1984) suggest that initially mapping skills can be developed individually and then integrated in order to form a logical sequence of cumulative map understanding. A sequence to introduce the skills for mapping has been suggested by Gerber & Wilson using four of the eight properties of maps outlined above namely :-

- (i) orthogonal view
- (ii) spatial arrangement
- (iii) proportion
- (iv) map language

(i) Orthogonal view

The ability to conceptualise objects from an aerial view is the most important skill to be developed and understood in mapwork. This is what Bentley (1989) refers to as the "bird's eye view" of a map. Gerber & Wilson (1984) state that pupils should begin mapping by developing the concept of a "plan view". A possible suggestion is for pupils to be encouraged to show their classroom layout according to such a plan. Catling (1984) suggests that in such an activity, pupils should be encouraged to colour the room plan to show the variety of features such as tables, chairs, cupboards, etc. A key can be introduced to encourage pupils to become aware of the symbols on the map. The following diagram is a classroom plan that can be used as an aid to understanding the "bird's eye view" necessary for mapwork:-

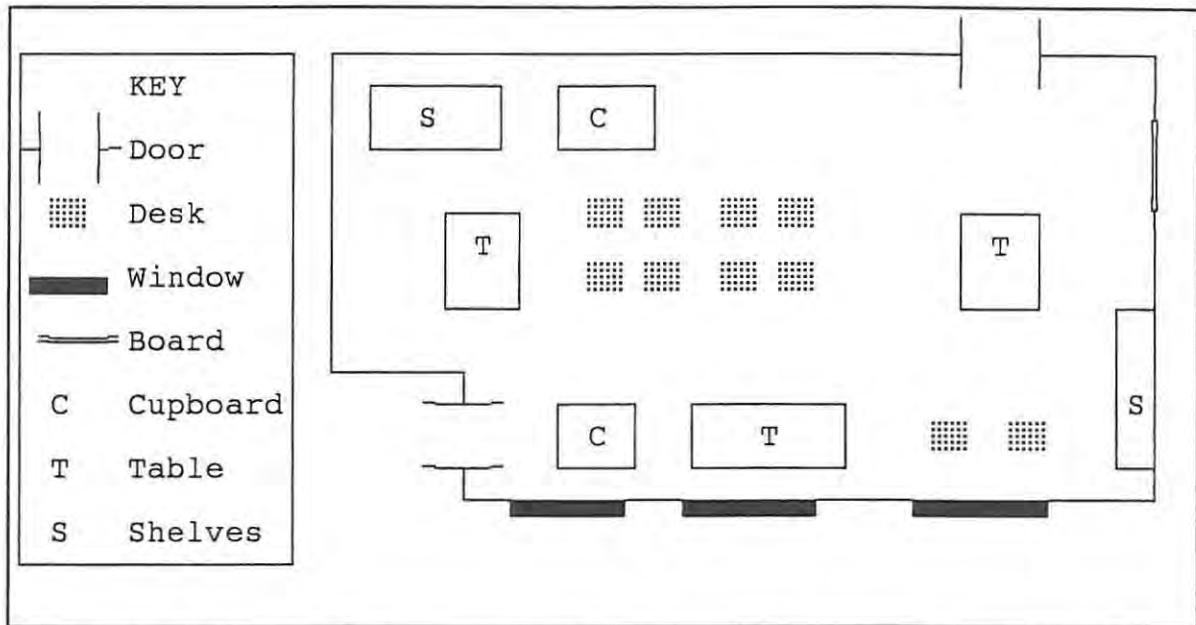


Figure 2.5. A plan view of pupils' classroom

(Adapted from Catling, (1984) p. 26)

An extension to this activity can include the drawing of a plan of larger objects such as the school buildings and grounds. This exercise can further be extended to include the use of vertical aerial photographs of the school grounds which should form an integral part of early work in mapping.

(ii) Arrangement

An understanding of the concept of arrangement involves the students' understanding:-

- (a) the arrangement of objects on a map in the pattern they occur in reality;
- (b) direction; and
- (c) reference systems

The arrangement of objects on a map representing their actual location on the earth's surface is another important underlying concept of mapping. In order to understand maps pupils should be able to observe the spatial arrangement of objects since the relative position of features shown on a map has to correspond exactly to those in the real world.

The concept of direction is also vital to understanding maps. Boardman(1983) suggests that before the concept of direction can be fully understood it is particularly important that children learn to distinguish left from right. In learning to describe direction, pupils have to master the four cardinal points of north, south, east and west. Boardman claims that it is common for pupils to confuse east and west if they are unsure about the distinction between left and right.

The reference system or grid enables pupils to locate features accurately on a map. In mapwork pupils have to learn to locate places precisely within squares by means of a six figure grid reference. Towler (1970) states that unless pupils have some concept of how spatial relations may be described with reference to one another, it will be difficult for them to understand the theoretical reference system of latitude and longitude. The ability to use grid lines in identifying locations is necessary for pupils to orient themselves accurately in the real three - dimensional world. Gerber (1981) suggests that young children

require considerable experience with a concrete spatial reference system established in the school grounds before they can use the grid superimposed on maps.

(iii) Proportion

The concept of proportion involves the understanding of distance, scale and the techniques of measuring these concepts. Map distances must be understood as proportional to real distances. To be able to read maps pupils must be able to determine distance from one place to another. Meyer (1973) claims that to relate a map to a real world situation, pupils will need to understand proportionality and use the concept of scale correctly. The concept of scale is perceived as complicated and needs to be grounded on a sound understanding of distance.

(iv) Map language

In mapwork there is a need for a common ground for communication. Pupils have to develop a sound understanding of the use of agreed map symbols and signs to represent objects. Pupils should be introduced to a map key that enables map readers to disentangle the abstract map language used to represent objects in maps.

## **2.5. Theories of conceptual development**

For effective teaching to take place teachers need to relate the ideas and knowledge they present and the methods they use to the learning capabilities of their pupils. The capabilities of pupils

for understanding ideas and to engage in abstract reasoning develops continuously. Ballantyne (1984) claims that as mapwork is concept-based, teachers must concern themselves with the manner in which pupils develop concepts in general, and spatial concepts in particular, if they are to impart knowledge successfully. It is therefore vital that geography teachers take cognisance of theories of developmental psychology. This study will concentrate on the developmental theories evolved by Piaget and Rhys who emphasise the role of the environment.

#### **2.5.1. Piaget's theory of conceptual development**

Piaget claims that for the first 15 years of life, which includes most of the years of statutory education, the child moves progressively through different stages, each of which is defined by a characteristic way of thinking. These stages are classified as sensorimotor, preoperational, concrete operational and formal operational. Piaget emphasises that the understanding of spatial concepts occurs in a series of stages as the child advances from a state of egocentrism to one where he is able to abstract. The stages of development are perceived to take place in a sequence which is stable and every child must pass through the same stages. (Beard, 1969). Piaget's stages of mental development are summarised in Table 2.3. below:-

Table 2.3. Piaget's model of mental development.

(Adapted from Burton, 1986, p. 29).

| SENSORIMOTOR PERIOD   | CONCRETE OPERATIONS PERIOD  |  |  | FORMAL OPERATIONS PERIOD  |   |
|---|---|--|--|---|---|
| 0 - 18 months   | Pre-conceptual substage<br>18 months - 4,5 years  | Intuitive substage<br>4,5 to 7 years   | Concrete operations substage<br>7 - 12 years   |   | 12 years +  |
| Begins to know immediate environment, factually and visually. | <p>Beginning of symbolic representation : words, actions, drawing, writing.</p> <p>Not able to form concepts - is inconsistent.</p> | <p>Simple descriptive concepts based on experience of environment.</p> <p>Difficult to review a situation mentally - needs the object of discussion present.</p> <p>Thinking is ego - centric - difficult to conceive of a situation in which they are not involved.</p> <p>Difficult to understand relationship between the part and the whole.</p> <p>Experience difficulty with relative terms.</p> | <p>Can manage more complex concepts and learn to deal with concept hierarchy.</p> <p>Can review a situation mentally.</p> <p>Able to arrange data according to size.</p> <p>Can grasp symmetrical relationships.</p> <p>Classify things according to two or more criteria.</p> | <p>Difficulty in arguing from verbal propositions.</p> <p>Tend to reject a premise which seems to contradict their experience.</p> <p>Cannot easily conceive of an hypothetical situation.</p> <p>Does not understand the meaning of general laws.</p> <p>Cannot explain in terms of a general principle, theory or law.</p> <p>Cannot easily give verbal definitions - difficulty in explaining what " the general case" is.</p> | <p>Able to think in a hypothetico - deductive manner.</p> <p>Problems may be solved by internal processes of thinking and physical experiment, rather than by trial and error.</p> <p>Inductive thinking - regularities or laws may be inferred from evidence provided.</p> <p>Becomes aware of need for and importance of precision in defining concepts in terms of attributes as a class of objects or ideas.</p> <p>Can conceive mentally of "relations between relations: - multi - variate situation.</p> |

The first two stages cover the years from birth to seven and do not concern the teaching of mapwork since the child's thinking during these infant school years is still egocentric and events are still interpreted in relation to his needs and actions. (Boardman, 1983). Burton (1986) emphasises that the concrete and formal operational stages are vital to the teaching of mapwork since the child is released from the need to relate everything to his immediate environment. Pupils develop the ability to mentally manipulate objects which are not physically present. Pupils now become formal thinkers since they consider possible relations implied by the data or information and then attempt logical analysis in order to make a judgement. (Boardman, 1983). The important point for the secondary school teacher to note is that pupils are not cognitive miniatures of adults, but that they think in their own way. The stages in pupils' cognitive development emphasise the need for teaching strategies to be adjusted accordingly. It is also important to note that the transition from one stage to another will be a gradual one and its onset will vary among pupils during the subsequent years of statutory education. Burton (1986) suggests that Piaget's theory of mental development needs to be accepted as a framework for the understanding of the development of thinking rather than as a rigid prescription.

#### **2.5.2. Rhys' development of logical thinking**

Rhys' theory of logical thinking investigated the quality of judgement that could be obtained from pupils at successive levels

of understanding, by presenting problem-situations to a representative group of pupils whose ages ranged from nine to sixteen years. The principal feature that characterised each of the successive stages of development can be illustrated by reference to the response sequence that follows:-

| Cate-<br>gory | Age            | Mental Age     | Principal Features  |
|---------------|----------------|----------------|---|
| I             | 11.0 and below | 12.0 and below | Not reality orientated  |
| II            | 12.0 to 12.6   | 13.0 to 13.6   | Reality orientated;<br>single piece of<br>evidence used                       |
| III           | circa 13.6     | 14.0 to 14.6   | Several pieces of<br>evidence combined;<br>able to relate cause<br>and effect |
| IV            | 14.6 and above | 15.6 and above | Comprehensive<br>judgement based upon<br>hypothetico-deductive<br>reasoning.  |

Table 2.4. Major response levels suggested by Rhys.

(Adapted from Rhys, W., (1972), p. 96).

Rhys' findings confirmed Piaget's theory that pupils under the age

of twelve experience problems imposed by their concrete - operational thinking. He claims that the objective reference system which a 10 year old may employ is essentially the product of direct personal exploration and as such is severely limited in its scope. His research reveals that from the age of twelve to fifteen, pupils' powers of operational thought are no longer confined to practical problems and concrete situations since they are able to make use of deductive reasoning to deal with problems and possibilities which they have not encountered before. Rhys (1972) claims that a gradual transition may be discerned during adolescence, with a largely descriptive form of thought based on single pieces of evidence used at first, giving way to comprehensive, detailed and fully adequate powers of explanation. Thus children's cognitive advances are made possible through a process of interaction between children and their environments. Rhys concludes that :-

*It remains true, however, that even the most enlightened teaching will be of little avail unless the child is in possession of those structures of thought which allow him to absorb the material provided and profit from the experience. (Rhys, 1972, p. 105).*

### **2.5.3. Bruner and the conceptual growth of the child**

Bruner claims that "the basic principles of any subject can be taught to any child in an intellectually honest form". (Ballantyne,

1984, p. 79). Bruner's theory emphasises the environmental factor in development rather than the maturation factor supported by Piaget. This leads one to the conclusion that concept development can be speeded up if learning situations are manipulated. However the converse may also be true, viz. that a poor learning environment may well retard conceptual development.

According to Bruner the child becomes familiar with his world first by habitual actions, later by imagery and finally by translating actions and images into language. According to Bruner :-

*any domain of knowledge can be represented in three ways: by a set of actions appropriate for achieving a certain result (enactive representation); by a set of summary images or graphics that stand for a concept without defining it fully (iconic representation); and by a set of symbolic or logical proposition drawn into language... (symbolic representation). (in Atkins, (1981), p. 229).*

Bruner suggests that children can understand new concepts if their representation follows this sequential order (ie. they pass from actions to pictures to language.) and if their mode of presentation fits the child's level of experience. This theory claims that the three modes of representation work together to form concepts. Bruner's view is that concepts need to be revisited by pupils a few times as they progress through the school. (Ballantyne, 1984).

The nature of geographic work in schools relates to current insights into how pupils learn. The above theories are of considerable importance to geography teachers as they are made to understand that whilst the concepts of observation may be learned in the early stages of cognitive development, concepts which are formally defined by language and symbols are unlikely to be understood until learners have reached the stage when they can reason in an abstract manner. This implies that the understanding of the higher - level concepts in mapwork is a slow process related to mental maturation and the development of sophisticated map language. Piaget's and Bruner's models of cognitive development should help teachers to understand how children view their environment and what kinds of mental operations in handling information they are capable of at various stages. The teaching of map concepts should initially be approached in such a way that concrete methods of teaching through models, field work etc. are used. Once children have been acquainted with the concrete situation the teacher can approach the concepts in a symbolic and abstract manner.

#### **2.6. Problems pupils encounter in reading and understanding maps**

The properties of maps incorporate a considerable degree of perceptual and conceptual understanding which the pupils require in order to make sense of the information on maps. Satterly (1964) claims that it is too lightly assumed that the child has an idea of the reality behind maps. Map characteristics which produce

learning problems among children include the following:-

(i) Selectivity

Since maps are not a photographic representation of the earth's surface they cannot show all the features of a mapped area. A selection of features based upon the purpose of the map has to be made. Bailey (1974) claims that this selectivity can be a source of bewilderment to pupils who when left alone to draw a map would try to include everything. The interpretation of the skeletal picture of reality represented by maps requires a wealth of background knowledge which pupils do not have.

(ii) Map Conventions

Since maps cannot replicate reality in a natural way, all environmental features incorporated into maps are placed in a symbolic fashion. A common map reading error is to misinterpret cartographic symbols as being the geographic reality they are meant to represent. For example the round city symbol does not necessarily mean that the shape of the city is circular. Colour presents an even more serious problem since cartographers may use colour schemes interchangeably to depict both value range and aerial differentiation.

(iii) The overhead view

Pupils find it difficult to recognise features in a plan view perspective. Maps and aerial photographs show everything as though

directly overhead. This bird's eye view is foreign to pupils who find it difficult to visualise the landscape which they normally view from the side. Piaget found that not until the age of about eight could pupils visualise what objects would look like from view points other than their own. It is very important that teachers should realise that pupils do not necessarily grasp the idea of the overhead view automatically. Bailey (1974) claims that pupils should be taught to understand and use this complex skill.

(iv) Scale

This is another difficult concept for children to grasp. Boardman (1986) claims that the concept of scale as consistent proportional representation is one which younger pupils may take time to master. When drawing a scale plan, pupils have to work out not only position and distance, using a system of co-ordinates, but also perspective and proportion, using a system of measurement conversion. The concept of scale including the accurate measurement of distance and proportional reduction to scale as well as the correct positioning of objects in relation to one another, requires careful teaching. According to Piagetian theory children are unable to grasp this concept until the age of eleven or even fourteen. (Bailey, 1974).

(v) Relief and contours

The representation of relief by contours implies a whole series of underlying concepts that can be very difficult to grasp even when

the pupils grasp the principles such as colour and symbols. Pupils frequently have difficulty in grasping the relationship between slopes and the closeness of contour lines. (Burton, 1986). The concept of relief and slopes is a complex one which includes visualisation of a three-dimensional landscape from a two-dimensional map in order to appreciate the height of the land and the slope forms. (Satterly, 1964). Bailey (1974) suggests that the principles of contouring need to be taught early in the secondary school and regularly reiterated.

#### **2.7. Some key research reports relating to mapwork problems experienced by pupils**

While considerable attention has been given to the problems pupils encounter in the reading and understanding of maps relatively few geographers have attempted to link pupils' performances in topographical maps with aerial photographs. Some consideration will be given to selected research findings on pupils' difficulties in the reading and interpretation of topographical maps and aerial photographs. The first four studies are concerned with map problems while those of Harwood (1984) and Boardman & Towner (1980) are concerned with aerial photographs.

##### **2.7.1. Satterly (1965)**

Satterly's study aimed at discovering whether performance in map reading could be associated with certain psychological variables. The subjects of his investigation were 60 fourth form secondary

school pupils from Bristol. Pupils were given psychological tests to examine their ability in spatial concepts, spatial skills and spatial perception.

The results revealed that a statistically strong and significant correlation existed between the psychological variables measured and performance in mapwork. His study further revealed that the best single predictor of mapwork ability is provided by performance in the perception of embedded shapes. Pupils who are able to discriminate between similar shapes are likely to perform better in mapwork tests.

Satterly concluded that perceptual ability is a major factor underlying success in certain aspects of mapwork and therefore suggested that a teaching programme designed to increase perception skills should be devised.

#### **2.7.2. Burton (1986)**

Burton's research revealed that three-dimensional mapwork skills are introduced haphazardly in South African schools with no real reference to the receptivity of the pupils and that the examination of mapwork skills is likewise haphazard and lacked structure. Burton's research revealed that there is a link between inability to think three-dimensionally and inability to perform well in relation to understanding contours. He claims that topographical maps require the capacity of three-dimensional thinking where

pupils have to perform the skill of mentally turning an overhead view of a map, with its abstract symbols, to a side view in order to understand the solid reality of landscape that the map is portraying. An understanding of the representation of height, slope and relief on a map is probably the aspect of graphicacy that is most difficult to develop and grasp. (Burton, 1986). A combination of several experiments were used to investigate a range of mental procedures with contour maps and to prove that there was a correlation between three-dimensional thinking ability and contour mapwork performance.

Burton's study revealed that there is a close correlation between the ability to think three-dimensionally from a two-dimensional image and the ability to perform well in contour exercises. He concluded that if mapwork teaching is to be effective, knowledge of pupils' conceptual abilities and previous knowledge is essential. Burton further suggested that work in the third dimension should be restricted to reality orientated studies and examinations should concentrate on interpretive skills instead of recall skills.

### **2.7.3. Okpala (1988)**

In order to identify pupils' problems in mapwork, Okpala investigated the teaching styles involved in teaching mapwork in secondary schools in Nigeria. She claimed that few attempts have been made in the past to observe the teaching-learning process which is the most central element in education. Mapwork lessons

taught by eight geography teachers from eight Nigerian schools over a period of six weeks were observed. (Okpala, 1988).

Her study revealed that the teaching of mapwork in Nigerian schools was teacher-orientated and the teaching procedures used in the mapwork lessons observed, stressed the regurgitation of facts and drilling for the answering of school examination questions. No practical demonstrations were given in order to help pupils to understand map concepts. Mapwork which is based on reality was taught in a theoretical way. Okpala suggested that topographical maps would be better perceived by the pupils if the fundamental structure of maps became the basis for teaching. She emphasised the fact that there was a dire need for a change in teaching strategies involved in mapwork lessons from the talk and chalk theoretical approach to an involvement of pupils in practical work, group work, inquiry learning, games and simulations. Okpala claimed that the theoretical nature of the Nigerian examination system encouraged the observed teaching strategies and suggested that until examination questions were based on problems related to the pupils' environment, the desired changes in teaching approaches would not take place.

#### **2.7.4. Beng Teck (1988)**

Beng Teck's investigation was conducted in Singapore in 1988. He supported the notion that practical experience and a hierarchical sequence of map skills instruction was likely to help pupils'

progress more effectively in the acquisition of map skills. He further claimed that map skills were considered to proceed in stages of increasing difficulty, which form a hierarchy with low abilities as prerequisites for the subsequent higher abilities. He proposed the following as key elements for sequential instruction:-

- (i) orientation and direction
- (ii) location and reference systems
- (iii) distance and scale
- (iv) symbols (Beng Teck, 1988).

His study aimed at investigating whether pupils who were taught map skills using the hierarchical sequence combined with practical-learning approaches would have a significantly better retention rate than those using the non-hierarchical sequence and direct teaching approaches. A total of 153 subjects were drawn from a secondary school in Singapore. Data were obtained from the pre-test and post-test performances of pupils.

The findings of his study supported the contention that practical experience and sequential skills enhance the learning of map skills and also improve the retention and durability of the acquired skills. He concluded that pupils who follow a hierarchical sequence of curriculum structure and a practical - learning approach to map skills acquisition are likely to show a better overall performance and retention.

#### **2.7.5. Boardman and Towner (1980)**

Boardman and Towner investigated some of the problems encountered by older pupils in correlating vertical aerial photographs with an Ordnance Survey map. Their subjects were 578 pupils aged 15 to 16 years from twelve Birmingham schools. Pupils were presented with questions which required them to orientate the map and the photograph and to correlate and identify features on both maps.

The main sources of information for their study were a map test and individual follow-up interviews with a 15% sample of pupils. The result of the map test revealed that the correlation of the map and photograph proved to be the most difficult section in the test. The ability to orientate the map and photograph and to match up features on both appeared to be related to the pupils' general ability in geography. From the analysis of the scores on the map reading test it was possible to discover the type of questions that many pupils found difficult, but not the reason why they proved difficult. Interviews were therefore carried out to discover the nature of the problems. The results revealed that many pupils overestimated the area shown by the photograph on the map. Another problem was that pupils could not remember conventional map signs. Boardman and Towner's research revealed that most secondary schools have introductory mapwork courses in their first year on symbols, grid reference, distance and direction. The failure of pupils to recognise these concepts in the map test revealed that there might be a tendency for those basic skills to be neglected in subsequent

years. Boardman and Towner suggested that these skills need to be repeatedly practised and reinforced during the entire course of secondary schooling. Boardman and Towner's research revealed that the ability to rotate the viewpoint of a map and to recognise features from different angles either on a photograph or on the landscape itself has to be one of the basic skills of graphicacy.

#### **2.7.6. Harwood (1984)**

Harwood designed a programme whereby pupils with learning difficulties, aged between 12 and 14 years, were introduced to mapwork through the use of aerial photographs. The aim of the project was to introduce pupils with learning difficulties to the idea of the orthogonal view and symbols, as used on local maps. The scheme involved taking pupils through different stages, from the aerial photograph to successive scale reductions of a map of the same area. At each stage pupils were assessed and taught individually so that details of each pupil's specific learning difficulties and responses to teaching could be recorded. Thirteen pupils were involved in the programme. None of the pupils had received any previous teaching of mapwork or seen an aerial photograph before.

In the initial assessment after pupils had been exposed to an aerial photograph, it was clear that they were experiencing problems in identifying features. After only two days of teaching pupils became more confident in naming and pointing out objects.

After two and a half weeks of teaching, pupils were confronted with a different aerial photograph to see if their observation and recognition skills could be transferred to a new situation. Harwood observed that there was no significant decline in the level of competency. Harwood suggested therefore that teaching about the landscape through the use of aerial photographs could help pupils identify features in a plan-view perspective as well as in enlarging their conceptual understanding.

### **2.8. Summary**

The exponents of mapwork regard maps and aerial photographs as an integral part of geographical education. These resources are widely used in geography and the ability to handle them is of crucial importance if pupils are to acquire competence in graphicacy. Pupils' understanding of maps, which are part of a complicated graphic communication system, is based upon their mastery of the key properties of maps which in turn depends upon the development of a matrix of mapping skills across the secondary school phase.

Reference has been made to various studies in this chapter in order to draw attention to some of the difficulties which pupils encounter in the reading and interpretation of these resources. Research reveals that pupils differ significantly in their ability to read and interpret maps. The development of graphic skills is associated with pupils' abilities to conceptualise space. This

therefore implies that the teaching of maps and aerial photographs need to be based on a sequential hierarchy of concepts and skills. Throughout this chapter emphasis is placed on the involvement of pupils in practical activities to assist them in understanding abstract ideas as they make the transition from concrete to formal operational thinking.

CHAPTER 3RESEARCH METHODOLOGY**3.1. Introduction**

The aim of this study was to identify common problems and difficulties encountered by senior secondary school pupils in Transkei in the reading and interpretation of 1:50,000 topographical maps and aerial photographs. The main objectives were to :-

- (i) examine the nature of the pupils' problems;
- (ii) identify and classify specific problem areas in map reading and interpretation;
- (iii) establish the origin of the identified problems associated with map reading and interpretation;
- (iv) provide guidelines for the teaching of map reading and interpretation in the senior secondary phase in Transkei schools.

The investigation was divided into two parts. The first part of the study surveyed senior secondary geography teachers through the administration of a questionnaire and the conducting of interviews. The second part of the investigation involved Standard 7, 8 and 10 geography pupils in a diagnostic test. The test was followed by interviews with a 10% sample of the pupils who had completed the diagnostic test.

### 3.2. The first phase of the study : The survey.

This study, in attempting to establish the origin and nature of the problems experienced by pupils in the reading and interpretation of 1:50,000 topographical maps and aerial photographs, needed to investigate:-

- (i) teachers' attitudes towards the teaching of this aspect of the syllabus;
- (ii) the teaching strategies employed in the teaching of this section;
- (iii) the length of time spent on this section;
- (iv) the resources available for the teaching of mapwork.

Therefore a survey approach appeared to be the most appropriate research method for investigating geography teachers' perceptions of the teaching of mapwork since this method of gathering data has the following advantages:-

- (i) a wide variety of opinions may be ascertained.  
(Babbie, 1973);
- (ii) data may be collected from members of the survey population in order to determine the current status of that population with respect to one or more variables.  
(Gay, 1987);
- (iii) data may be gathered with the intention of describing the nature of existing conditions.  
(Cohen & Manion, 1989).

Surveys, however, are not without problems. Two of the most serious problems identified with regard to surveys as research instruments are reliability and validity. Validity is the extent to which the research instrument measures what it is intended to measure while reliability is the degree to which an instrument will give similar results from the same individuals at different times. (Wiersma, 1986). Cohen and Manion (1989), however, indicate that the problems of validity and reliability may be reduced by using more than one data collecting instrument in the course of the survey and through the selection of an appropriate sample. Therefore this study included interviews as well as a questionnaire in the survey.

Since a 30% sample is considered to be representative of the population under study (Cohen and Manion, (1989)), this study selected 56 senior secondary geography teachers to take part in the survey. This represents 40% of the total geography teachers employed by the Transkei Department of Education. The sampling methods chosen for this study were convenience and purposive sampling. (Cohen and Manion, 1989). The survey population was chosen from a group of geography teachers attending an in-service course at a central locale as this served to reduce the costs and the time needed for gathering and analysing data. Senior secondary school geography teachers were chosen for the survey because they are directly involved in preparing matric pupils in the reading and interpretation of 1:50,000 topographical maps and aerial

photographs since Gay (1987) claims that individuals who possess the information but for whom the topic being investigated has little meaning are not likely to respond to the questionnaire.

The subjects for the interview were chosen from the questionnaire respondents who had indicated their willingness to be interviewed. The researcher aimed at interviewing 10% of the teachers who had responded to the questionnaire but the eventual number of teachers interviewed was in fact 12 which represents 21.4% of the questionnaire sample. The group of teachers interviewed was selected from the southern region of Transkei as these teachers were easily accessible to the researcher.

### **3.2.1. The construction and administration of the questionnaire**

According to Behr (1983) when properly constructed and administered the questionnaire remains the best available instrument for obtaining information from widely spread resources, therefore this study made use of the questionnaire as the major data collecting instrument. Cohen and Manion (1989) claim that the questionnaire has the following advantages:-

- (i) an extensive number of respondents may be reached;
- (ii) because it is anonymous, it encourages greater honesty;
- (iii) it is more economical than the interview in terms of time and money.

Questionnaires, however, have the following disadvantages:-

- (i) they are subject to a low percentage return;
- (ii) they are often filled in hurriedly, thereby offering inaccurate information;
- (iii) if posted, confusion over questions cannot be remedied during the administration.

The questionnaire format for this study included both closed and open questions for the following reasons:-

- (i) structured questions facilitate coding and analysis;
- (ii) they reduce the time needed to answer the questionnaire, thereby eliciting greater response;
- (iii) open questions, however, allow respondents greater freedom of expression and evoke a fuller and richer response by probing deeper than closed questions.

A potential disadvantage of a fixed form of alternative answers is the possibility that the subject's true response may not be listed among the alternatives. In this study attempts were made to overcome this problem by providing space for the inclusion of open-ended responses.

The questionnaire format was arranged as follows:-

- (i) Section A, in dealing with personal data, attempted to establish the educational environment as well as the qualifications of geography teachers;
- (ii) Sections B and C dealt with teachers' perceptions of

the teaching of mapwork and aerial photographs respectively with regard to teaching strategies and problem areas. (Appendix 3.A.)

Before administering the questionnaire it was scrutinized by three colleagues as well as by university staff members. Every questionnaire was accompanied by a covering letter explaining the purpose of the survey and appealing to respondents for their support. (Appendix 3.B.). The letter assured the respondents of the anonymity and confidential nature of the questionnaire since Gay (1987) states that complete anonymity increases the truthfulness of responses as well as percentage of returns.

The researcher chose to administer the questionnaire personally. The interaction of a personally-administered questionnaire provided an opportunity for the explanation of the purpose of the study. Behr (1983) claims that only if a respondent is made to feel that the investigation is worthwhile, will it command his attention, interest and sympathy and will he be motivated to answer the questions to the best of his knowledge and ability.

Although every effort was made in the construction and development of the questionnaire to avoid problems, the following limitations are recognised:-

- (i) the administration of the questionnaire at the end of a two-day course resulted in inaccurate responses from approximately 3% of the respondents due to fatigue;
- (ii) 5% of the responses were incomplete.

Incorrect answers provided unusable data and missing answers necessitated some form of follow-up.

### **3.2.2. Semi-structured interviews**

Apart from the need to increase the validity of the survey, interviews were chosen as a data-gathering technique in this study for the following reasons:-

- (i) the interview method permits the researcher to gain greater clarity relating to the subjects' responses, Kerlinger (1986) states that when information is difficult to get with other methods and when it is necessary to probe, the interview can be invaluable;
- (ii) it was felt that interviews would further highlight geography teachers' attitudes to this section of the syllabus and the specific problems they encounter in the teaching of mapwork;
- (iii) it was furthermore necessary to use a follow-up strategy to the questionnaire because of unexpected responses emanating from the questionnaire.

A particular advantage of the interview is that because of its personal nature the method allows for greater interaction which reduces the "don't know" type of responses thereby providing more complete data. (Sanders and Pinhey, 1983).

### **3.2.3. The development and administration of the interviews**

Semi-structured interviews were chosen for this survey. Gay (1987) defines a semi-structured interview as an approach that involves asking structured questions followed by unstructured questions in order to facilitate explanation and understanding of the responses to the structured questions. Semi-structured interviews are a common approach in surveys as they allow the interviewer to make a clearer assessment of the respondent's perceptions than structured questions, as probing is possible.

Behr (1988) claims that when the sequence of the interview is planned in advance important matters will not be overlooked and continuity in the interview will be facilitated, therefore a written guide was constructed in order to indicate what questions were to be asked and in what order they should be asked.

(Appendix 3.C.)

In constructing the interview guide, care was taken to ensure that questions were clear and unambiguous. Leading questions suggesting answers were avoided. In phrasing questions care was taken not to offer alternative questions that might imply what the researcher

thought was the correct answer. Negative items were avoided in order to minimise misunderstanding and error. The researcher attempted to use simple language. Easy and neutral questions were placed at the beginning of the schedule while more direct questions were placed towards the end of the schedule.

Care was taken to make the interview schedule as brief as possible since Rummel (1958) warns that if the interview becomes time consuming the respondent becomes bored, gives superficial responses and a negative attitude is created.

When the interview guide was completed it was tested on three colleagues. Feedback from these interviews necessitated some corrections relating to the question construction.

All interviews were administrated by the researcher. Appointments with the respondents were made either by telephone or personally long before due dates. Reminders were sent to each of them before the interview.

The first few moments of contact between the interviewer and interviewee were found to be crucial. On meeting each respondent it was necessary to brief each as to the nature and purpose of the study. The respondents were also informed of how they were selected and were always assured of the short duration and confidentiality of the interview. Part of the introductory period

was used to assure the interviewees of the importance of their input to the study.

Before the first question was asked, some time was spent in establishing rapport and putting the interviewee at ease. The manner in which data would be recorded was explained to each respondent. Permission was asked from each respondent for the use of a tape recorder for recording data, 25% of the respondents felt suspicious and threatened when the researcher indicated the use of a tape recorder. For those who felt threatened data was hand written by the researcher.

Each respondent was supplied with the prepared list of questions. The interviewer asked the questions exactly as written instead of letting the respondent read them on his own. When asking questions care was taken not to imply that there were preferable responses. The researcher found it necessary to observe each respondent's non-verbal behaviour, facial expressions and tone of voice since Behr (1983) claims that an interviewee will frequently indicate his feelings by changing his tone of voice and showing different facial expressions.

Throughout the interview it was necessary to keep a friendly and courteous atmosphere. Care was taken not to show surprise and disapproval of respondent's responses.

Responses were recorded in the course of the interview in order to avoid errors and omissions. The recordings included probes by the interviewer, conversation which occurred during the interview and comments made by respondents on questions.

When the hand-written data was recorded, care was taken to quote respondents directly since Kidder & Judd (1986) state that interviewers in paraphrasing the reply, summarising it in their own words or polishing up any slang not only risk distorting the respondent's meaning but also lose the emphasis of the replies.

Transcripts of interviews were made and data was analysed qualitatively.

Although interviews tend to provide a more reliable and valid measurement for data gathering, the following factors presented problems:-

- (i) the loss of anonymity associated with face-to-face interaction in interviews caused three respondents to doubt the confidentiality of this survey and were reluctant to divulge truthful information when it came to delicate issues.
- (ii) One of the respondents showed dislike for the interview content claiming that the topic was outdated.

#### **3.2.4 Data analysis**

The questionnaires were analysed both quantitatively and qualitatively. Open-ended questions were computed with data being presented in a form of percentages and according to the numerical mean. Chi-square tests were applied to this information to identify statistically significant differences between responses. The open-ended items of the questionnaire and the interviews were transcribed and analysed.

### **3.3 The second phase of the study : the diagnostic test and pupils' interviews**

#### **3.3.1. The purpose of the diagnostic test**

The broad aim of employing a diagnostic test in this study was to identify common learning problems among secondary school geography pupils in Transkei in the reading and interpretation of 1:50,000 topographical maps and aerial photographs. The objectives of the diagnostic test were to identify:-

- (i) the specific nature of pupils' problems in mapping skills and concepts;
- (ii) the age or standard at which such difficulties originate;
- (iii) specific problem areas in this section of the geography syllabus;
- (iv) the causes of the identified difficulties.

A diagnostic test in geography is defined as an instrument to

measure "the capabilities of each member of a particular class in geography" (Gerber, 1984, p. 186). Gerber further states that the purpose of diagnosing students' capabilities in geography is to improve their learning. If teachers know their students' capabilities, appropriate learning experiences can be arranged.

In this study the diagnostic test was essentially designed to pinpoint deficiencies in students' learning relating to mapping. Nisbet and Entwistle (in Behr, 1983) claim that an important approach towards understanding how pupils learn can be made by analysing the errors they make.

The diagnostic test used in this study (Appendix 3.D.) was not concerned with the final mark but attempted to shift the emphasis from outcome to causes. Gronlund (1976) claims that such tests ought to search for the underlying causes of the identified problems while Montgomery (1990) emphasises that a key feature of a diagnosis is that it should lead to some form of successful intervention in order to remedy the identified problems.

This study, it was hoped, would lead not only to the identification of problems and their causes but to the development of guidelines for the teaching of the section of the syllabus which are relevant to this particular group of pupils.

The participants in the survey were 183 secondary school geography

pupils from Transkei schools. All the participants were scholars in the Butterworth circuit. This, therefore, was a convenience sample. The researcher visited four schools to meet the participants. Standard 7,8, and 10 pupils were used in the survey in order to ascertain the standard or grade in which pupils' problems begin.

### **3.3.2. The construction and administration of the diagnostic test**

The test was designed to identify learning errors made by pupils in the reading and interpretation of 1:50,000 topographical maps and aerial photographs. As the test was designed according to the requirements of the senior certificate examination, it was limited to specific skills related to this section of the syllabus.

In constructing test items care was taken to keep the vocabulary level as simple as possible since the test was designed for second language English speakers. This was also necessary since vocabulary and sentence structure which is too complicated for the pupils taking the test will result in the test measuring reading comprehension rather than the aspects of pupil behaviour and skills that the test was intended to measure.

Care was taken to make the test items clear and unambiguous as Gronlund (1976) claims that ambiguous statements in test items contribute to misinterpretation and confusion. Care was also taken to avoid the use of negative statements since Thorndike and Hagen

(1969) warn that the time required to answer a negatively phrased test item is longer than for an equivalent positively phrased test item.

The test items were arranged in order of difficulty with the easiest items put first. Placing difficult and involved items early in the test could cause pupils to spend too much time on them and prevent them from reaching items they could easily answer. The test was designed to be completed in a single 30 minute period.

The test was given to three colleagues for further scrutiny. This elicited a wide assortment of questions and suggestions. In administering the test the following procedures were used:-

- (i) Attempts were made to motivate pupils by assuring them that the test results would be used to help them in their learning. This was done since Gronlund (1976) emphasises that although some persons will respond to any test as a challenge to their ability, others will not work seriously at the task unless they are convinced that the test results will be beneficial to them.
- (ii) Care was taken not to make the pupils over anxious.
- (iii) The researcher made efforts to make sure that each pupil was conveniently able to manipulate his or her test materials. (Appendices 3.E. and 3.F.). Pupils were sufficiently separated to ensure that no

unauthorised assistance was given.

- (iv) The researcher made every effort to make the procedure and the task clear by reading the instructions in a clear and concise manner. Care was taken not to paraphrase the instructions or add anything to them since changes in instructions would have differential effects on pupils' performances and would invalidate the standard conditions of the test.
- (vi) A written record of the starting and stopping time was always kept on the chalkboard for the pupils to observe. Pupils were reassured that the time limit was adequate to allow them to complete the test. The time limit was always adhered to as deviation would reduce the validity of the test.
- (vii) Once the test was in progress questions from the pupils were discouraged. Unfair assistance to individual pupils who asked for it was avoided. If certain test items needed clarification, this was done for the entire group and not to individual pupils.

The following limitations and problems were recognised with respect to the diagnostic test:-

- (i) Since the test was related to matriculation examinations requirements it is accepted that not all map skills were tested. Furthermore, time constraints made it impossible to include more than one item

testing each skill.

- (ii) While Gronlund (1976) warns that a single diagnostic test cannot provide sufficient evidence for an effective remedial programme this test served to illuminate the problems which pupils are experiencing and formed the basis for the identification of the basis of the pupils' problems. Thus, though the researcher was aware of the limitations of one test, the interviews conducted with the pupils as well as interviews and surveys conducted with geography teachers attempted to provide possible causes of pupils' problems in understanding mapwork.

### **3.3.3. Data Analysis**

Pupils responses to the diagnostic test were analysed both quantitatively and qualitatively and were transformed into scores and percentages in order to allow for statistical analysis to be made. Similarities and differences among group responses were made, while note was taken of the way in which pupils answered the questions as it was thought this would allow the researcher to draw analytic conclusion regarding problems encountered by pupils in understanding mapwork. Pupils' responses were further analysed according to map skills and map properties tested. The results were transformed and presented in bar graphs for comparison purposes.

### **3.4. Unstructured group interviews**

#### **3.4.1. The purpose of the interviews**

The unstructured interview method was used as a follow-up strategy to the diagnostic test. After a closer scrutiny of pupils' responses to the test, the researcher wanted to probe beneath the mass of information obtained through the diagnostic evaluation. Although the diagnostic evaluation was important in revealing problem areas it failed to provide reasons for pupils' limitations in mapwork. The researcher aimed at discovering the primary causes of pupils' problems in mapwork so that whatever remedial education was needed could focus on these.

The unstructured approach was preferred to other data-gathering techniques for the following reasons :

- (i) it has the ability to break the limitations imposed by the structured approach that prevent the respondents from developing their own reasoned arguments;
- (ii) Kidder & Judd (1986) claim that the flexibility of unstructured interviews helps to bring out the affective and value - laden aspects of respondents' answers to determine the personal significance of their attitudes;
- (iii) the informal atmosphere of the unstructured interview allows the interviewer greater freedom to probe deeper into the subjects' problems;

- (iv) Kidder & Judd (1986) further claim that in an unstructured interview the subjects' responses are spontaneous rather than forced, are specific and concrete rather than general, and are self-revealing and personal rather than superficial.

In this investigation the informal structure of the interview, where the interviewer raised key issues in a conversational style, was preferred since the respondents involved needed guidance to appropriate response behaviour as a survey was a rare experience to them. Since in an unstructured interview the sequence and wording of questions are in the hands of the interviewer, this approach proved suitable for use in this study since it involved pupils of different age groups and standards.

In this study, the group interview technique was used as a method of gathering data for the following reasons:-

- (i) the subjects under investigation involved young pupils who might be incapable of filling in the questionnaire or felt uneasy and insecure in a one-to-one interview;
- (ii) group interviews are more economical in terms of money and time than the one-to-one approach;
- (iii) group discussions can stimulate participation in even withdrawn and shy respondents;
- (iv) Cohen and Manion (1989) claim that when the subjects are grouped together for an interview there is a

potential for discussion to develop, thus yielding a wide range of responses.

In this investigation the pupils were permitted to explain their problems in mapwork in their own way. The interviewer's task was that of establishing and facilitating the discussion in which all participants were able to speak their minds. (Watts, M. and Ebbutt, D., 1987, p. 25).

#### **3.4.2. The development and administration of group interviews**

The researcher aimed at interviewing a 50% sample of the pupils who had completed the diagnostic test. A total of 183 pupils participated in this study. Of this number, 94 were standard 10, 43 standard 8 and 46 standard 7 pupils. The participants came from the four schools visited for the diagnostic test. The participants were not selected in that all available geography pupils in the schools visited were asked to participate.

Although the interview was meant to be an informal conversation with the respondents, a prepared interview schedule was necessary in order to prevent breakdowns in the conversation which could result in the interview process becoming a haphazard and frustrating experience. (Appendix 3.G.). Cohen and Manion (1989) warn that the unstructured interview is not a casual affair, for in its own way it has to be carefully planned. The interview schedule was also needed to allow the interviewer to have a clear idea of

the sort of information needed.

Open questions were used in order to encourage the respondents to talk freely and explain their experiences and difficulties in mapwork. Kerlinger (1988) claims that open questions make better estimates of respondents' true intentions, beliefs and attitudes.

Questions were framed in simple language to ensure effective communication between the interviewer and the respondents. This was particularly important in this study since all respondents were second language English speakers.

Care was taken to avoid questions which suggested preferred answers. The questions were framed in order to facilitate an unstructured response mode. This was necessary in order to allow the respondents freedom to give their answers as fully as they chose rather than being constrained in some way by the nature of the questions.

Appointments to meet the respondents were done through the school authorities. The interviews were conducted by the researcher in person.

On meeting each group of respondents some time was spent in establishing friendly relations. The researcher engaged in pleasant conversation with respondents as it was important to

establish a relationship of mutual confidence and frankness by stating the purpose of the interview and by linking the topic of the inquiry to the interest of the respondents. Miller and Connell (in Keeves, 1988) suggest that in order to obtain valid information, the interviewer must gain the trust and perhaps the affection of the respondents. It was very important to gain the co-operation and confidence of the respondents by creating a friendly and relaxed atmosphere. The combination of an informal interview method and a friendly attitude was supposed to relieve the respondents of any pressure to maintain self-preservation. The researcher aimed at making the respondents feel at ease and ready to talk.

The researcher indicated to the respondents that their answers were important and that it would be desirable to record them as completely and accurately as possible. Therefore permission was asked for the use of a tape recorder for recording pupils responses.

Transcripts were analysed in order to uncover similarities shared by respondents as they described their problems and experiences in mapwork.

Although the unstructured group interviews have some advantages to offer the following limitations were encountered in this investigation :-

- (i) the researcher found it difficult to record pupils' responses as they were excited and wanted to talk at the same time;
- (ii) interviewing pupils in groups seemed to suppress individual differences as this method fosters conformity and is vulnerable to manipulation by influential members.

### **3.5. Summary**

In this study an attempt was made to use more than one method to obtain data from respondents. A body of knowledge was needed to enable the researcher to pinpoint problem areas encountered by pupils in mapwork and to determine which teaching and learning conditions to suggest in order to produce desirable outcomes in learning mapwork. Therefore the researcher made use of survey instruments and a diagnostic test. Exclusive reliance on one method of collecting data for such a complex concept would provide a limited, distorted and superficial view of the problems encountered by both teachers and pupils.

CHAPTER 4TEACHERS' RESPONSES TO THE TEACHING OF MAPWORK AT SECONDARY SCHOOL**4.1. Introduction**

The study focuses on concerns relating to pupils' performances in the mapwork and aerial photograph section at senior secondary level. The researcher's experiences as a geography teacher revealed that pupils never seem to come to a mature understanding of topographical maps and aerial photographs.

In order to gain greater clarity about the specific problems experienced by pupils in this area of geographical education, it was considered necessary to investigate how other teachers in similar environments perceive this aspect. This chapter therefore presents the results of the survey conducted in Transkei. The results are a reflection of the questionnaire and the follow-up interviews. The questionnaire analysis is presented in the order in which the questionnaire was designed, this is followed by the analysis of the interviews.

**4.2. Analysis of teacher questionnaire**

The questionnaire was designed to establish the following :-

- (i) the attitudes of teachers to the teaching of mapwork and aerial photographs;
- (ii) teachers' use of teaching strategies relating to this section of the syllabus.

#### 4.2.1. The composition of the group

The personal information gathered from the survey population attempted to identify possible problems which teachers experienced regarding mapwork which could be related to qualifications and experience and whether their perceptions of the teaching of mapwork are coloured by the above factors.

The analysis of the questionnaire was therefore done using subsets which were based on academic qualification, highest course attended in geography and geography teaching experience. The results of the subset analysis revealed no statistically significant differences in terms of the group responses. Therefore the analysis relating to teachers' attitudes to and perception of mapwork are presented primarily from the group's perspective.

The analysis given below does, however, provide a number of useful insights regarding teachers of geography in Transkei. The survey population consisted of 55.4% male respondents and 44.6% female respondents. The academic qualifications of the group are summarised in Table 4.1. below :-

**Table 4.1. Highest Academic qualifications of the group**

| Qualifications        | Number | %     |
|-----------------------|--------|-------|
| Senior Certificate    | 24     | 42.9% |
| B.A.                  | 23     | 41.0% |
| B.Sc.                 | 1      | 1.8%  |
| B.Ped.                | -      | -     |
| B.A./B. Sc. Education | 6      | 10.7% |
| B.Ed.                 | 1      | 1.8%  |
| M.A.                  | -      | -     |
| M.Ed.                 | -      | -     |
| D.Ed./Ph.             | 1      | 1.8%  |

Table 4.2. below reflects the respondents' geographical education at tertiary level.

**Table 4.2. Highest course attended in geography**

| Course                | Number | %      |
|-----------------------|--------|--------|
| None                  | 1      | 1.8%   |
| College               | 20     | 35.7%  |
| University Course I   | 4      | 7.1%   |
| University Course II  | 6      | 10.7%  |
| University Course III | 21     | 37.5%  |
| Honours               | 4      | 7.1%   |
| Masters               | -      | -      |
| Total                 | 56     | 100.0% |

A comparison between the above Table and Table 4.1. reveals an apparent anomaly with regard to the qualifications of the survey population. Thus in Table 4.1. it would appear that 42.9% of the teachers do not have a suitable qualification for the teaching of geography at senior secondary level. However, Table 4.2. reveals that only 1.8% of the respondents do not have some qualification for teaching geography in that only one respondent indicated that no geography courses have been attended at tertiary level.

A possible reason for this anomaly is that teachers who have senior secondary qualifications have either attended inservice courses or have completed some years at teacher training colleges. What is

disturbing is the acute shortage of geography teachers with post graduate qualifications in view of the complex problems relating to curriculum development. However, 55% of the survey population have qualifications which are commensurate with requirements for the teaching of geography to Standard 10.

The teaching experiences of the survey population are related in Figure 4.1. which indicates the number of years respondents have taught geography, while Table 4.3. indicates the highest geography standard taught by respondents.

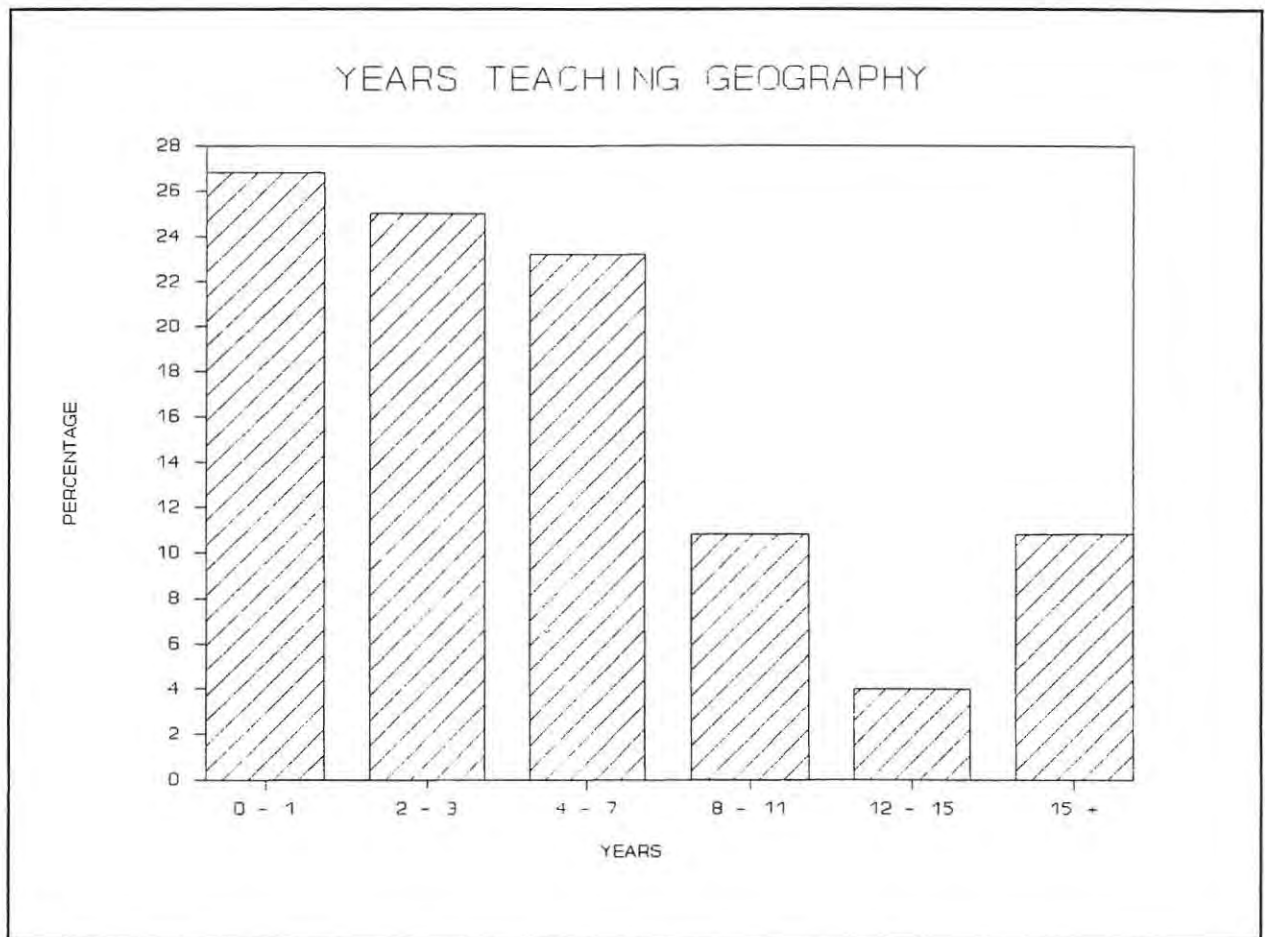


Figure 4.1. Teaching experience of the group.

**Table 4.3. Highest geography standard taught in 1989**

| Standard    | Number | %     |
|-------------|--------|-------|
| Standard 6  |        |       |
| Standard 7  |        |       |
| Standard 8  | 13     | 23.2% |
| Standard 9  | 7      | 12.5% |
| Standard 10 | 36     | 64.3% |
|             | 56     | 100%  |

Figure 4.1. reveals that 51.8% of the respondents had less than four years experience in teaching geography while Table 4.3. reveals that all of the respondents teach geography at secondary level with 64.3% teaching geography to Standard 10. This means that many young teachers are expected to teach geography throughout the senior secondary school early in their careers. When this figure is compared with Table 4.1. the implication is that a number of teachers who do not have the necessary qualifications are expected to prepare pupils for the Senior Certificate examinations.

The analysis of the composition of the group indicated that the survey population represented a wide range of teachers in terms of their qualifications, gender and experience. The survey population

therefore may be considered as a representative sample of Transkei geography teachers.

The final item in this section investigated the teachers' attitudes towards the teaching of geography. The result indicated that of the 56 teachers involved in the survey only 16 indicated that they wished to teach geography exclusively while eight indicated that had they had a choice they would not teach geography at all.

#### **4.2.2. Analysis of the teachers' attitudes towards the teaching of map work**

The second section of the questionnaire attempted to establish the attitudes of the group towards the teaching of mapwork. Item 9 required the respondents to rank the five sections of the Standard 10 geography syllabus in terms of their preferences towards the teaching of the syllabus components. The responses to this question are presented in Table 4.4 below :-

**Table 4.4 Teaching preferences in geography**

| Rank | Mean Value | Section              |
|------|------------|----------------------|
| 1    | 3.84       | Regional Geography   |
| 2    | 3.24       | Climatology          |
| 3    | 3.18       | Mapwork              |
| 4    | 2.41       | Settlement Geography |
| 5    | 2.34       | Geomorphology        |

According to the above table mapwork has been ranked third. However, an analysis of the mean values indicated that no one section of the geography syllabus is preferred by the majority of the teachers. The table has wider implications regarding the relevance of the geography syllabus as the relatively low mean values seem to indicate that teachers experience problems with the current structure of the geography syllabus. This aspect was probed further in the interviews.

Item 10 required the respondents to indicate their feelings towards the teaching of mapwork. This section of the questionnaire sought to establish teachers' perceptions regarding :-

- (i) the degree of difficulty of the mapwork section;
- (ii) the extent to which pupils find mapwork interesting;
- (iii) the level of difficulty with which pupils perceive mapwork.

An analysis of the results revealed that 53.6% of the respondents perceived teaching mapwork to be of average difficulty, 28.6% considered mapwork an easy section to teach while 17.8% considered mapwork a very difficult section to teach. When asked to indicate how their pupils perceive mapwork in terms of interest and with regard to the ease of understanding this section, 87.4% of the respondents indicated that their pupils find mapwork interesting yet 66.1% indicated that their pupils find understanding mapwork difficult.

Geography teachers' responses to Item 12 revealed that 62.5% of the teachers do not experience frustration with the teaching of mapwork while 37.5% indicated that they find teaching mapwork to be frustrating. This aspect was explored further in the interviews with teachers as in the researcher's experience teachers generally do find teaching this section frustrating for a variety of reasons.

Teachers' views relating to the senior secondary pupils' mapwork readiness revealed that 75% of the survey population indicated that pupils coming from the junior secondary phase to the senior secondary phase are not prepared for mapwork studies.

The final item in the section relating to attitudes towards mapwork was an open-ended question which invited teachers to elaborate on the guidance which they believe ought to be given by the syllabus regarding the teaching of mapwork. 78% of the survey population

responded to this question. Their responses were analysed and the following suggestions were noted :-

- (i) 20.5% of the respondents felt that the syllabus should enforce a sequential course of mapwork from the junior secondary to the senior secondary phase;
- (ii) another 20.5% of the respondents indicated that the syllabus ought to incorporate a series of inservice courses for teachers;
- (iii) 18.2% of the respondents indicated that the syllabus should suggest a list of reference material and compel the education system to provide schools with the necessary equipment to teach mapwork;
- (iv) another 18.2% of the respondents indicated that the syllabus should enforce certain hours of practical work when all geography pupils can be engaged in outdoor or indoor mapping exercises and activities;
- (v) 11.4% of the respondents indicted that the present syllabus objectives on mapwork are not clear. The emphasis of the syllabus is on equipping pupils with mapping skills to enable them to answer examination questions;
- (vi) 6.7% of the respondents felt that the marks allocated to mapwork are too low to encourage pupils to work hard in this section. At present the syllabus has allocated 60 marks to Standard Grade Mapwork and 80 marks to Higher Grade mapwork;

- (vii) 4.5% of the respondents indicated that the syllabus should provide a comprehensive guide for teaching mapwork.

#### **4.2.3. Time allocated to mapwork in secondary schools**

The four items in this section of the questionnaire attempted to establish when mapwork is taught, how much time is allocated to mapwork and teachers' perceptions regarding the constraints of the syllabus in relation to the amount of time available for the teaching of mapwork. The analysis of the results revealed that 98.2% of the respondents believed that mapwork should be taught from Standard 6 to 10. This implies that there is a consensus among geography teachers that mapwork should be introduced early in pupils' geographical careers. The analysis of the results relating to when mapwork is taught in schools revealed that 39.3% of the respondents indicated that mapwork is taught in the first term of the year while 28.5% of the respondents indicated that mapwork is taught throughout the year. The fact that 71.4% of the respondents teach mapwork in a specific term indicates that for most teachers mapwork is regarded as a separate section of the syllabus and is therefore not integrated throughout the curriculum.

The analysis of the time spent on the teaching of mapwork is presented in Table 4.5. below :-

**Table 4.5. Time spent in mapwork**

| RANK | TIME SPENT | SCORES IN %   |
|------|------------|---------------|
| 1    | 1 Week     | 7.1% ]        |
| 2    | 3 Weeks    | 37.5% ] 71.4% |
| 3    | 1 Month    | 26.8% ]       |
| 4    | 2 Months   | 8.9%          |
| 5    | + 2 Months | 19.7%         |

The analysis of the results revealed that 71.4% of the respondents allocated between one to four weeks during the school year for the teaching of mapwork.

The teachers' responses to item 18 revealed that 67.9% of the respondents believed that there is not enough time for teaching mapwork in terms of the syllabus.

This section therefore indicates that mapwork is largely taught as a separate section of the syllabus and not integrated throughout the curriculum. This further implies that if mapwork is perceived as a discrete part of the geography curriculum it will of necessity reduce the time available for the teaching of this section in view of the demands made by the syllabus.

#### 4.2.4. Teaching strategies used in the teaching of mapwork

This section of the questionnaire aimed at establishing teaching strategies used in the teaching of mapwork. In response to item 19, 75.4% of the respondents indicated that they introduced mapwork to pupils by using local map sheets. This finding was surprising in view of the researcher's experience regarding the scarcity of local map sheets and therefore further clarification was sought in the interviews.

The teachers' response to item 20 indicated that 55.4% of the respondents use three-dimensional models in the teaching of mapwork.

Item 21 attempted to establish the teaching strategies used in teaching mapwork. The analysis of the results is presented in Table 4.6. below :-

**Table 4.6. Use of teaching strategies in mapwork**

(ranked according to mean)

| RANK | MEAN VALUE | STRATEGY             |
|------|------------|----------------------|
| 1    | 1.95       | games and simulation |
| 2    | 1.68       | "teacher tell"       |
| 3    | 1.48       | discussion           |
| 4    | 1.29       | question - answer    |

The low mean values would seem to indicate that this item of the questionnaire did not include the teaching strategies most commonly used for this section. Greater clarity was provided by the interviews.

The respondents were required to indicate the frequency with which teachers apply various resources in the teaching of mapwork. the results are presented in table 4.7. below :-

**Table 4.7. Use of resources in teaching mapwork**

(ranked according to the group mean)

| RANK | MEAN VALUE | ITEM | RESOURCE       |
|------|------------|------|----------------|
| 1    | 4.30       | 7    | Talk and Chalk |
| 2    | 4.05       | 4    | Textbook       |
| 3    | 3.35       | 1    | Pictures       |
| 4    | 3.20       | 3    | Worksheets     |
| 5    | 2.29       | 2    | Fieldwork      |
| 6    | 2.04       | 9    | Roneo'd notes  |
| 7    | 1.59       | 6    | Slides         |
| 8    | 1.57       | 5    | Films          |
| 9    | 1.42       | 8    | Video Films    |

The above table reveals that the most commonly used resources in the teaching of mapwork are that of "talk and chalk" and textbooks. These results imply that teachers rely most heavily on teacher-centred approaches in the teaching of mapwork. The interviews discussed later in the chapter indicate the difficulty experienced by teachers in obtaining other resources.

The results of item 23 indicated that 89.3% of the respondents do not have special geography classrooms. This implies that teachers could experience problems in storing 1:50,000 topographical maps which are bulky, especially when most of the schools have no libraries or resource centres.

In response to the penultimate question in this section, 69.6% of the respondents indicated that they find it easy to integrate mapwork with other sections of geography. This result does not support the results of a previous question which indicated that 71.4% of the respondents teach mapwork in a specific term.

The respondents were required in an open-ended question to suggest ways of integrating mapwork with other sections of the syllabus. Although not all teachers responded to this question 67.9% of the survey population responded to this item. The following suggestions were made :-

- (i) Of the 38 respondents 21 indicated that mapwork should form part of all the sections of geography.

- (ii) 13 respondents indicated that mapwork should be incorporated with fieldwork and that this section should form part of a practical examination.
- (iii) 4 respondents felt that continuous practical work periods should be a part of normal geography teaching where pupils would be introduced to mapping skills and concepts.

#### **4.2.5. Analysis of teachers' attitudes towards the teaching of aerial photographs**

In order to determine teachers' attitudes towards the teaching of aerial photographs, the questionnaire followed a similar format to that relating to teachers' attitudes to mapwork. The first section of this part of the questionnaire required the respondents to rank five sections of the geography syllabus in terms of their teaching preferences. The responses to this item are presented in Table 4.8. below :-

**Table 4.8. Teaching preferences in geography**

| RANK | MEAN VALUE | ITEM | SECTION              |
|------|------------|------|----------------------|
| 1    | 3.65       | 3    | Aerial photographs   |
| 2    | 3.65       | 5    | Regional geography   |
| 3    | 3.04       | 1    | Climatology          |
| 4    | 2.39       | 2    | Geomorphology        |
| 5    | 2.16       | 4    | Settlement geography |

When these results are compared with teachers' responses to mapwork it can be concluded that aerial photographs are considered easier to teach than 1:50,000 topographical maps. Item 27 which investigated this aspect, revealed that 51.8% of the survey population perceived teaching aerial photographs to be of average difficulty while 25.0% perceived aerial photographs to be easy and 24.2% perceived this section to be difficult.

When responding to the question relating to how pupils perceive aerial photographs in terms of interest and with regard to their ability to understand aerial photographs 46.4% of the survey population indicated that their pupils find aerial photographs interesting while 60.7% indicated that their pupils find aerial photographs to be difficult to understand. This response was similar to that relating to teachers' perceptions regarding mapwork.

Item 29, when compared to a similar item regarding the degree of frustration experienced by teachers in the teaching of mapwork, revealed that more teachers experience a sense of frustration in the teaching of aerial photographs than they do with the teaching of mapwork. This aspect was explored further in the interviews which followed the questionnaire analysis.

Teachers further indicated, as was the case with mapwork, that pupils are not fully prepared in the junior secondary phase for the reading and interpretation of aerial photographs.

#### **4.2.6. Time allocated to aerial photographs in secondary schools**

This section of the questionnaire attempted to establish when aerial photographs are taught, how much time is allocated to this section and teachers' perceptions regarding the constraints of the syllabus in relation to the amount of time available for the teaching of this section.

Teachers' responses to item 32 revealed that 94.6% of the respondents believed that aerial photographs should be taught from Standard 6 to 10. A similar response was given by the teachers for mapwork. In response to the time when aerial photographs are taught 76.8% of the respondents indicated that aerial photographs are taught in a specific term of the year while only 23.2% indicated that aerial photographs are taught throughout the year. This indicated that for most teachers aerial photographs, as in

mapwork, are taught as a separate section and not integrated into the syllabus.

Item 34 required the respondents to indicate the time spent on aerial photographs. The analysis of the results revealed that 84% of the respondents spend between one to four weeks teaching aerial photographs.

#### **4.2.7. Teaching strategies used in the teaching of aerial photographs.**

This part of the questionnaire attempted to establish the teaching strategies used in teaching aerial photographs. The respondents were asked to indicate whether they used pupils' local areas in teaching aerial photographs. In response to this item 73.2% of the respondents indicated that they use local photographs when introducing aerial photographs. Item 37 required the respondents to indicate whether they used three - dimensional models in the teaching of aerial photographs to which 59.3% replied positively.

An analysis of the frequency with which the respondents apply various resources to the body of aerial photographs is presented in Table 4.9. below :-

**Table 4.9. Use of resources in teaching aerial photographs.**

| RANK | MEAN VALUE | ITEM | RESOURCES      |
|------|------------|------|----------------|
| 1    | 4.24       | 7    | Talk and chalk |
| 2    | 4.04       | 4    | Textbook       |
| 3    | 3.50       | 1    | Pictures       |
| 4    | 3.25       | 3    | Worksheets     |
| 5    | 2.32       | 2    | Field trips    |
| 6    | 2.07       | 9    | Roneo'd notes  |
| 7    | 1.52       | 5    | Films          |
| 8    | 1.52       | 6    | Slides         |
| 9    | 1.46       | 8    | Video films    |

The results reveal a similar pattern to the previous question relating to resources used in the teaching of mapwork. The resources used most frequently are less expensive than the other resources listed.

The final item of this section invited the respondents to record their comments on any other component of the study not listed in the questionnaire. Responses from seventeen teachers were recorded and the following viewpoints were noted :-

- (i) of the 17 respondents, 8 indicated that the schools

lack resources, which affects the performance by both teachers and pupils.

- (ii) 4 of the respondents emphasised the need for the geography syllabus to be developed by geography teachers rather than by people not directly involved in the teaching-learning situation.
- (iii) 3 respondents felt that mapwork should follow a sequential course starting from primary through junior to secondary phase.
- (iv) 1 respondent indicated that mathematics ought to be a prerequisite for geography as pupils without mathematics, in this respondent's view, cannot cope with the calculation techniques involved in mapwork.
- (v) 1 respondent indicated that the syllabus ought to give a comprehensive guide on how to teach mapwork.

#### **4.2.8. Summary of the questionnaire findings**

The questionnaire analysed above has highlighted the following :-

- (i) that teachers are aware that there are problems facing both teachers and pupils in the teaching-learning situation relating to mapwork and aerial photographs.
- (ii) that mapwork and aerial photographs are primarily taught through teacher-centred teaching approaches.
- (iii) that there seem to be various limiting factors involved which impede effective teaching of mapwork such as time constraints, examinations, lack of funds and lack of

necessary resources.

The analysis of the results of the questionnaire revealed the following limitations :-

- (i) although the questionnaire revealed teachers' perceptions of the teaching of mapwork and aerial photographs, reasons for pupils' poor performances could not be established;
- (ii) a solution to pupils' poor performance problems from the teachers' viewpoint was needed.
- (iii) certain anomalies in the questionnaire needed further clarification. These included :-
  - \* use of local maps
  - \* teaching strategies used
  - \* time allocated to the teaching of mapwork.

The interviews therefore were designed to focus on the above aspects.

#### **4.3. Analysis of interviews**

The interview was divided into two sections, Section A dealing with the teaching of mapwork and Section B with the teaching of aerial photographs. In each section the interview attempted to establish the following :-

- (i) teachers' perceptions of the use of pupils' local map sheets and aerial photographs;

- (ii) teaching strategies used and the reason for the use of the identified strategies;
- (iii) reasons for pupils' problems in learning these sections;
- (iv) suggestions for the solution of pupils' problems.

#### **4.3.1. Teachers' perceptions of the teaching of mapwork**

The initial section of the interview attempted to establish whether the respondents use 1:50,000 topographical maps when teaching mapwork whether local or other. Of the 12 respondents 8 indicated that they use 1:50,000 topographical maps but not necessarily of the local area. The remaining 4 respondents indicated that they use textbook maps due to lack of funds.

When asked whether they use questions provided by the textbooks all the respondents indicated the use of past examination questions and questions provided by the textbook in this section. The implication is that examinations determine the content to be taught in mapwork lessons particularly for Standard 10 classes.

The teachers interviewed indicated that local maps are unobtainable, due either to lack of funds to purchase them or because these maps are unavailable when needed. All the respondents indicated that fieldwork is the area of geography which suffers the most due to time constraints. The respondents also indicated that they accept that fieldwork is an important part of

mapwork but due to its time-consuming nature it is seldom done. All the respondents emphasised that the 30 minute teaching periods are too short and the syllabus too wide.

Questions which considered teaching strategies used in the teaching of mapwork affirmed that "talk and chalk" is a widely used method. The most common reason given by respondents for using these teacher-centred approaches was that such strategies are less expensive in terms of money and time. Respondents considered that the length of the syllabus in relation to the time allocated to geography lessons causes them to adopt teacher-centred approaches to get pupils through the examinations. Another reason mentioned which affects teaching strategies is the pupil - teacher ratio in Black schools. One teacher responded thus "to use games and simulations in my class of 65 pupils would cause pandemonium".

It was established that available maps and aerial photographs in schools are squeezed into staff-room cupboards as there are no geography classrooms. This generally invites the displeasure of the principals who subsequently refuse to approve the purchase of further equipment or teaching aids.

During the discussion it was further revealed that pupils generally lack the fundamental mapping concepts and skills necessary for understanding mapwork for a variety of reasons. Reasons given included the following :-

- (i) many geography teachers in both primary and secondary schools are not conversant with the new approach used in geography. They belong to the "capes and bays" school of geography and therefore find it difficult to teach and equip pupils with the necessary and fundamental geographical concepts and skills.
- (ii) lack of funds in relation to the purchase of equipment and teaching aids results in teachers resorting to theoretical approaches in teaching mapwork.
- (iii) pupils themselves resist less formal teaching procedures such as debates, library work and active participation in mapwork because they have been spoon-fed and inactive from the beginning of their geographical education.
- (iv) the poor environmental conditions of pupils were also indicated as playing a role in the problems which pupils experience in mapwork and aerial photographs.
- (v) examinations were frequently cited as influencing the content and teaching strategies in the teaching of mapwork. The respondents indicated that examinations required pupils to reproduce content and this encouraged teachers to use drilling procedures to get pupils to pass examinations.

Finally the researcher invited the respondents to offer suggestions which will help reduce pupils' difficulties regarding mapwork. The

following suggestions were noted :-

- (i) the teaching-learning conditions would be improved by making local maps and funds available to purchase resources necessary to geography teachers.
- (ii) teachers felt strongly that special geography classrooms should be made available.
- (iii) geography should be taught by teachers who are both interested and adequately trained to teach the subject.
- (iv) inservice courses should be provided by experts in the subject.
- (v) fieldwork and practical work should form part of geography and funds should be made available to help teachers use these strategies.
- (vi) teaching procedures should be changed from teacher-centred approaches to pupil-centred approaches from the time that pupils start their schooling.
- (vii) the school situation should supplement the poor environmental conditions in which pupils live by having a variety of teaching aids for pupils to handle.
- (viii) finally the respondents suggested that the syllabus and examinations should change their rigid structures to more flexible ones in order to allow teachers enough time to experiment with various strategies.

#### 4.3.2. Teachers' perceptions of the teaching of aerial photographs

The second part of the interview concentrated on aspects related to aerial photographs. Teachers were asked to respond to how and where they get aerial photographs. Of the twelve teachers five indicated that they get aerial photographs from previous examination papers, four indicated that they purchase aerial photographs from the Department of Local Government in Umtata while the rest indicated that they depend entirely on textbook photographs.

When asked whether they have any stereoscopes, eight respondents indicated that they did not have these, while 4 indicated that only one stereoscope was available for use by not less than 50 pupils per geography lesson.

To the question relating to teaching strategies used in aerial photographs, five of the respondents indicated that they are guided by the syllabus and the previous examination papers while the rest depended entirely on textbooks.

When asked to clarify why pupils experience difficulties in aerial photographs, reasons similar to those given for mapwork were noted. These included the following :-

- (i) that aerial photographs is a "new" section of geography and therefore very few teachers are adequately qualified to teach this section.

- (ii) that without stereoscopes the respondents felt that pupils cannot visualise the three-dimensional characteristics of features and pupils rely entirely on teachers' experiences in learning this aspect.

Teachers were then asked to suggest ways in which the problem could be reduced. The most notable suggestion was that the government should encourage teachers to upgrade their knowledge of geography through incentives such as bursaries to study geography at university level. The respondents furthermore indicated that pupils intending to study geography should be encouraged to study mathematics in order to help them with the calculation techniques required in mapwork.

Finally teachers were required to respond to problems encountered in the collection of geographical teaching aids. The most common problem quoted by the respondents was that of lack of finance. The respondents indicated that they depend on school funds for purchasing expensive equipment such as stereoscopes and maps. This leads to constant clashes between the teacher and the principal who frequently will not approve of such expenditure from school funds. Teachers also indicated that maps of pupils' local area are unobtainable and this creates problems as not only mapwork suffers but that it also limits fieldwork. The problem of storage is acute and almost half of the respondents indicated their intentions of giving up collecting teaching aids as it seems a waste of time,

energy and money.

#### **4.4. General comments on the survey**

The results of the survey highlighted the value of employing more than one instrument to gather data related to attitudes and perceptions. Furthermore by including interviews in this survey the investigator was able to identify distortions which occurred in the analysis of the questionnaire. The questionnaire results presented a false picture with regard to the following :-

- (i) use of local area maps;
- (ii) the time spent in teaching mapwork;
- (iii) the frustrations involved in teaching mapwork;
- (iv) the use of teaching strategies.

These distortions are the result of identified weaknesses in the questionnaire such as respondents sometimes "guessing" at answers rather than providing true feelings.

The interviews furthermore helped to clarify the problems the teachers experience in teaching maps and aerial photographs and gave greater insight into both the conditions under which teachers work and reasons for the pupils problems.

Although not all the members of the survey population responded to the open-ended questions of the questionnaire, the care taken in answering these questions and the length of the answers given by

those who did respond to these questions indicated that teachers are concerned about the problems pupils encounter in this section of the syllabus. The responses to both the questionnaire and the interviews indicated that teachers are able to identify areas which impede effective teaching of this section of the syllabus.

Time constraints are perceived by teachers to be the major factor affecting their choice of teaching strategies in mapwork. From the survey it is also clear that teachers are aware of the shortcomings in relation to their use of teacher-centred strategies. It is also clear that teachers do not feel that they are entirely to blame for the high failure rate of pupils in mapwork. Their approach to mapwork is explained as the outcome of pressures and constraints imposed upon them by factors beyond their control. The whole examination procedure influences teachers to adopt a teacher-centred approach in their teaching of mapwork.

CHAPTER 5RESULTS OF THE DIAGNOSTIC TEST AND GROUP INTERVIEWS**5.1. Analysis and results of the diagnostic test**

The diagnostic test was designed to identify specific problems which pupils experience in terms of 1:50,000 topographical maps and aerial photographs. This test also attempted to identify how teachers' problems were reflected in pupils' performances. This section of the study involved 183 secondary school pupils from Butterworth schools. This was a convenience sample comprising 46 Standard 7 pupils from 2 schools, 43 Standard 8 pupils from 2 schools and 94 Standard 10 pupils from 3 schools.

The broad aims of the diagnostic test were to establish pupils' competence in the reading and interpreting 1:50,000 topographical maps and aerial photographs with regard to their :-

- (i) understanding of the four basic properties of maps;
- (ii) level of development in specific map skills;
- (iii) ability to apply hypothetico-deductive reasoning.

The test also attempted to establish whether the teaching of mapwork and aerial photographs in schools follows a sequential programme.

**5.1.1. Analysis of the structure of questions of the diagnostic test**

In order to investigate classroom practice and pupils'

understanding of topographical maps and aerial photographs the researcher designed the diagnostic test for secondary school pupils based on typical senior certificate examination mapwork questions set for Transkei schools.

The objectives of the diagnostic test were as follows :-

- (i) to test the pupils' understanding of specific mapping concepts and skills;
- (ii) to establish the extent to which pupils of different standards have developed map skills;
- (iii) to identify perceptual and conceptual problems related to mapwork;
- (iv) to determine whether pupils are able to retain concepts taught to them throughout the mapwork programme.

The test design included a variety of questions which incorporated skills associated with the understanding of basic map properties. Since the schools were all in the Butterworth district the researcher used a 1:50,000 topographical map of Butterworth in the belief that pupils, being familiar with the area, would find this map less problematic than others. An aerial photograph of the town and the immediate environment was provided.

The schools were chosen on the basis that pupils had received instruction in mapwork. The test was designed in such a way that it contained concepts and skills pertinent to Standard 7, 8 and 10

mapwork. Standard 7 pupils should have been able to answer 60% of the questions correctly while Standard 8 and 10 pupils should have been able to answer all the questions correctly.

Before the analysis of the test (Appendix 3.D) is presented the questions used in this investigation are analysed according to the map skills and map properties involved in each question. The analysis is presented in Table 5.1. below.

**Table 5.1. Question analysis**

| Question | Skill tested  | Map property involved  |
|----------|---|--|
| 1        | orientation, location, distribution, symbolisation. | orthogonal view, spatial relationship, generalisation, abstraction, isomorphic properties, map language. |
| 2        | inferencing.  | abstraction, generalisation.   |
| 3        | orientation, location, distribution, symbolisation. | plan view, spatial relationship, map language, generalisation, abstraction, isomorphic properties.       |
| 4        | symbolisation, location, orientation.               | abstraction, generalisation, map language, a way of reading.   |
| 5        | inference, direction, location.                     | abstraction, generalisation, map language, way of reading, plan view, isomorphic properties.             |
| 6        | distance, location, distribution.                   | proportion, abstraction.   |
| 7        | scale   | abstraction, proportion, abstraction.  |
| 8        | direction, orientation, location.                   | spatial relationship, proportion, abstraction.   |
| 9        | direction, orientation, legend, location.           | spatial relationship, abstraction, map language, a way of reading.                                       |
| 10       | inference, symbolisation, legend, orientation       | abstraction, way of reading, generalisation, isomorphic properties, map language.                        |
| 11       | inference, orientation.                             | spatial relationship, abstraction, generalisation.   |
| 12       | inference, location.                                | abstraction, generalisation, spatial relationship.   |
| 13       | symbolisation, location, direction.                 | plan view, abstraction, map language, generalisation, isomorphic properties, spatial relationship.       |
| 14       | inference   | abstraction, generalisation, way of reading, map language.   |
| 15       | direction, orientation, distribution                | map language, spatial relationship, abstraction.   |

The table above reflects the extent to which map language and abstraction are vital properties relating to map skills at school level. Two marks were awarded for the use of relevant concepts or

skills in answering questions. A maximum of 50 marks was allocated to the text. The expected pattern in terms of the design of the test was for the percentage of correct answers to increase from Standard 7 to 10.

#### **5.1.2. Global results of the diagnostic test**

The questions were designed to ensure that the pupils had to make use of both the map and the aerial photograph. As the map test was administered by the researcher it was noted that pupils took a considerable amount of time to orientate an air photograph with the topographical map.

The map test scores for each group were analysed according to the symbol scale used in the final senior certificate examination. The analysis of the map test scores is presented in Table 5.2.

below :-

**Table 5.2. The groups' map test scores**

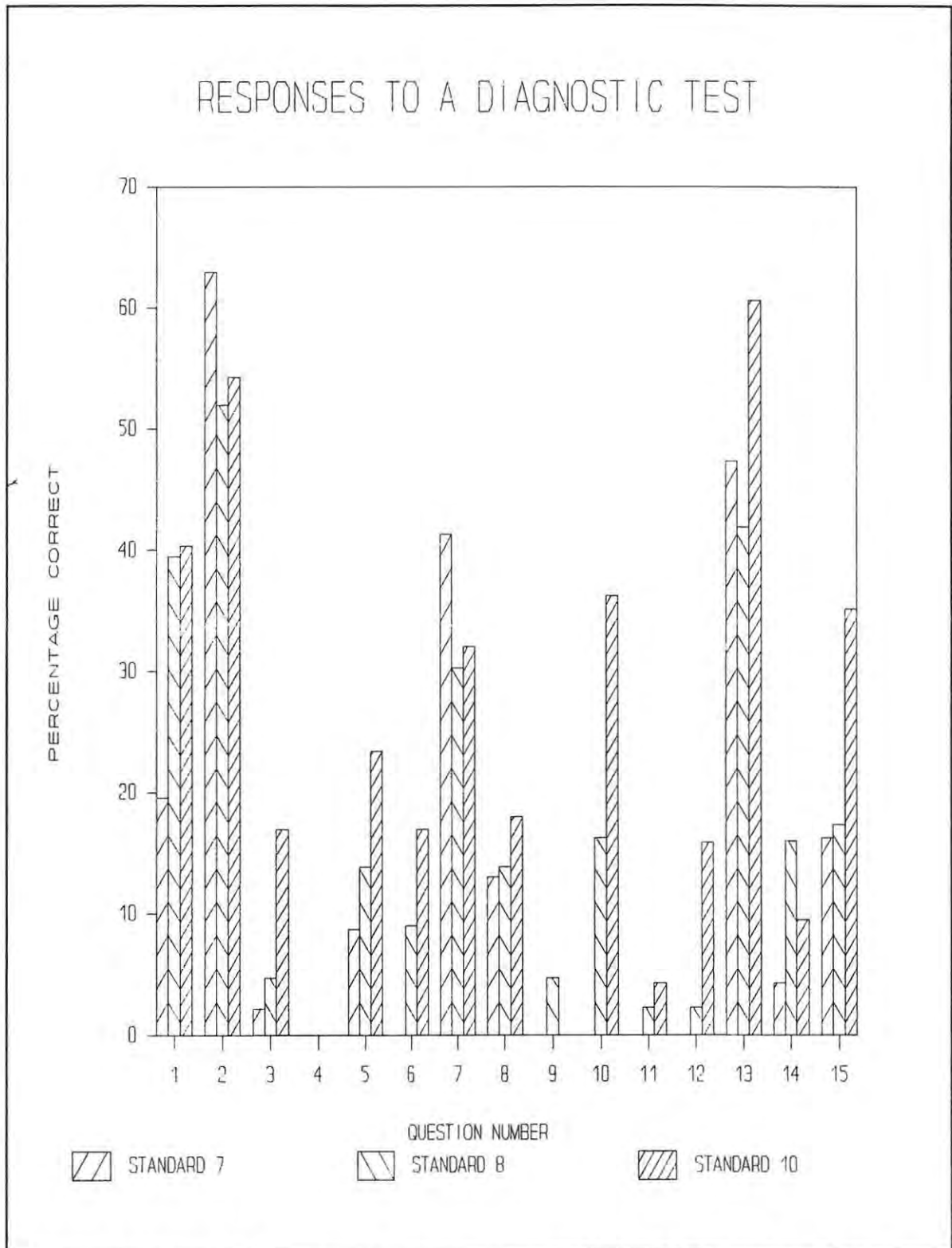
|            |            | Standard 7  |       | Standard 8  |       | Standard 10 |       |
|------------|------------|-------------|-------|-------------|-------|-------------|-------|
| Symbol - % |            | Results - % |       | Results - % |       | Results - % |       |
| A          | 80 - 100%  |             |       |             |       |             |       |
| B          | 70 - 79%   |             |       |             |       |             |       |
| C          | 60 - 69%   |             |       |             |       |             |       |
| D          | 50 - 59%   |             |       |             |       |             |       |
| E          | 40 - 49%   |             |       |             |       | 2           | 2.1%  |
| F          | 33.3 - 39% |             |       |             |       | 4           | 4.3%  |
| FF         | 30 - 33%   |             |       |             |       | 4           | 4.3%  |
| G          | 20 - 29%   | 3           | 6.5%  | 9           | 20.9% | 23          | 24.5% |
| H          | 0 - 19%    | 43          | 93.5% | 34          | 79.1% | 61          | 64.8% |
| TOTAL      |            | 46          |       | 43          |       | 94          |       |

The totals above reveal that only 6.4% of Standard 10 pupils were able to achieve a recognised passing mark for the test. The remaining 93.6% of the pupils scored between 0 and 33% for the test. Of the 93.6%, 4% of the Standard 10 pupils were able to score between 30 - 33%. The global result of the diagnostic test revealed the great discrepancy which exists between expected map proficiencies and actual skill development in relation to the reading and interpretation of maps and aerial photographs. The

diagnostic test analysis further indicated only a marginal increase in proficiency levels from Standard 7 to 10.

### **5.1.3. Analysis of individual test questions**

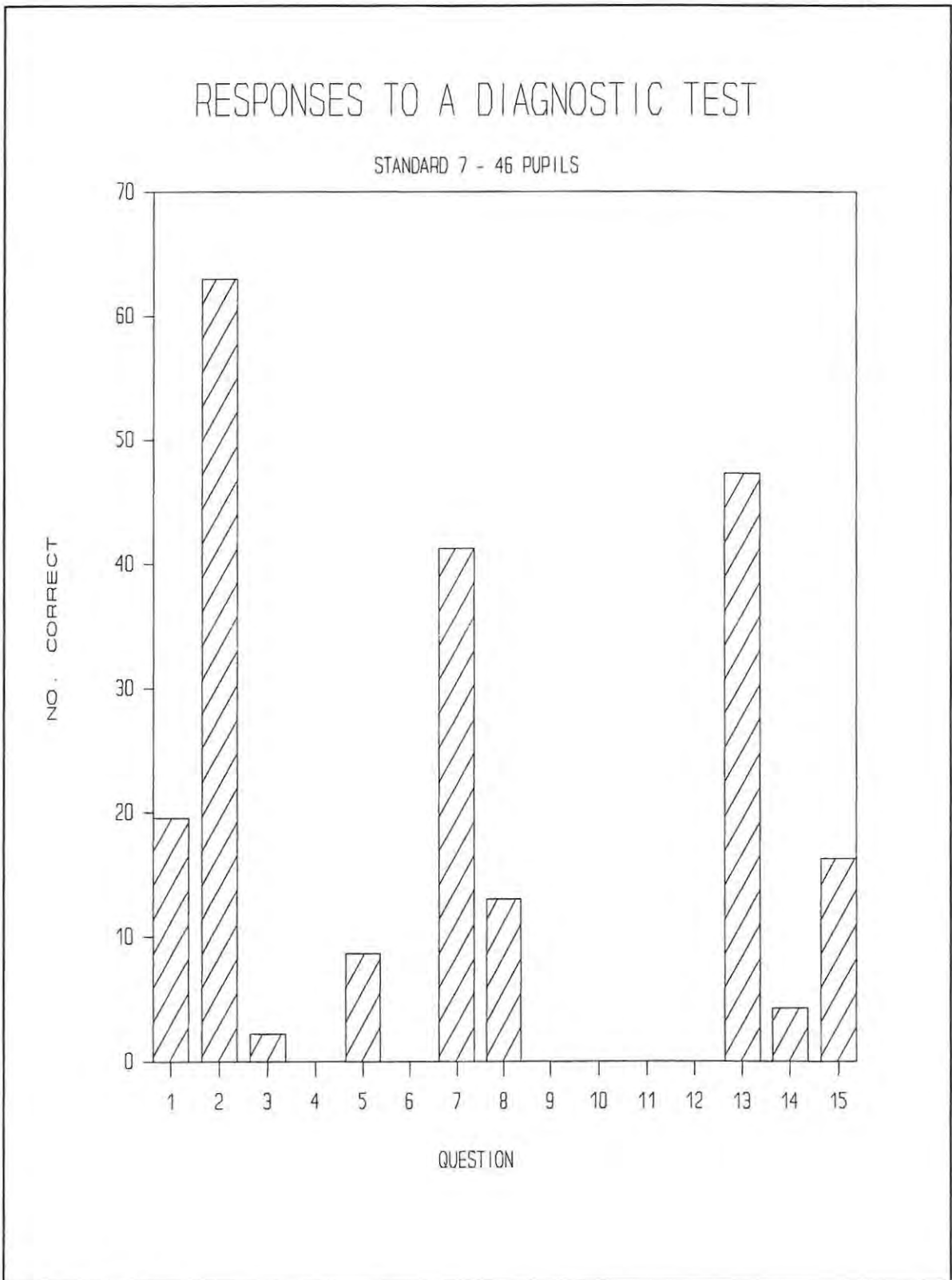
The analysis of the marks scored by the 3 groups in the individual questions of the test revealed that no question was answered correctly by more than 65% of any group. Figure 5.1. below presents the groups' performances in each question of the diagnostic test.



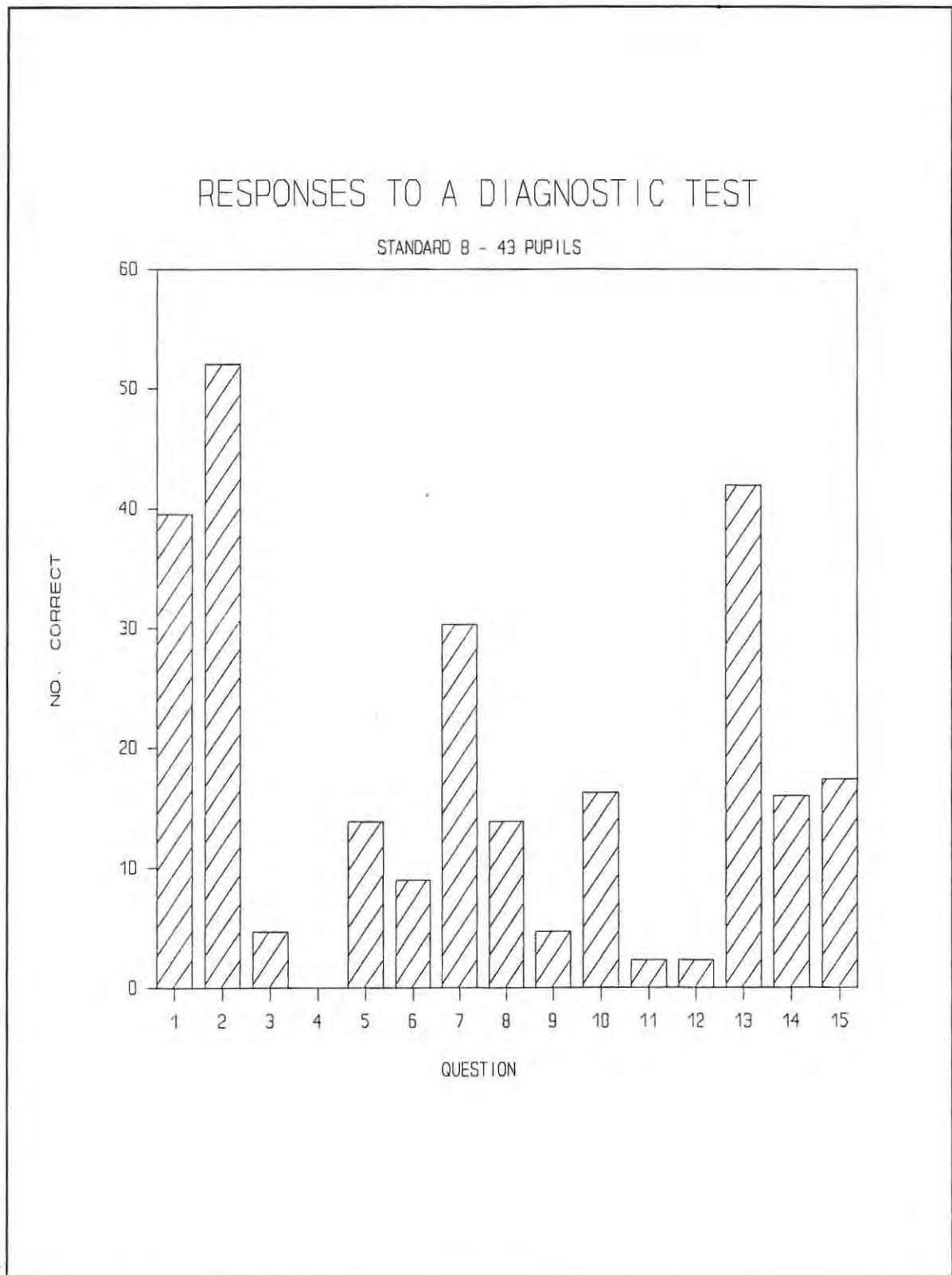
**Figure 5.1. The groups' responses to the diagnostic test**

The above figure reveals that on two occasions Standard 7 pupils performed better than the other two groups while Standard 10 pupils revealed a better performance than the two other groups on ten occasions. The figure further reveals that in three of the questions fewer than 10% of the group were able to answer the questions correctly.

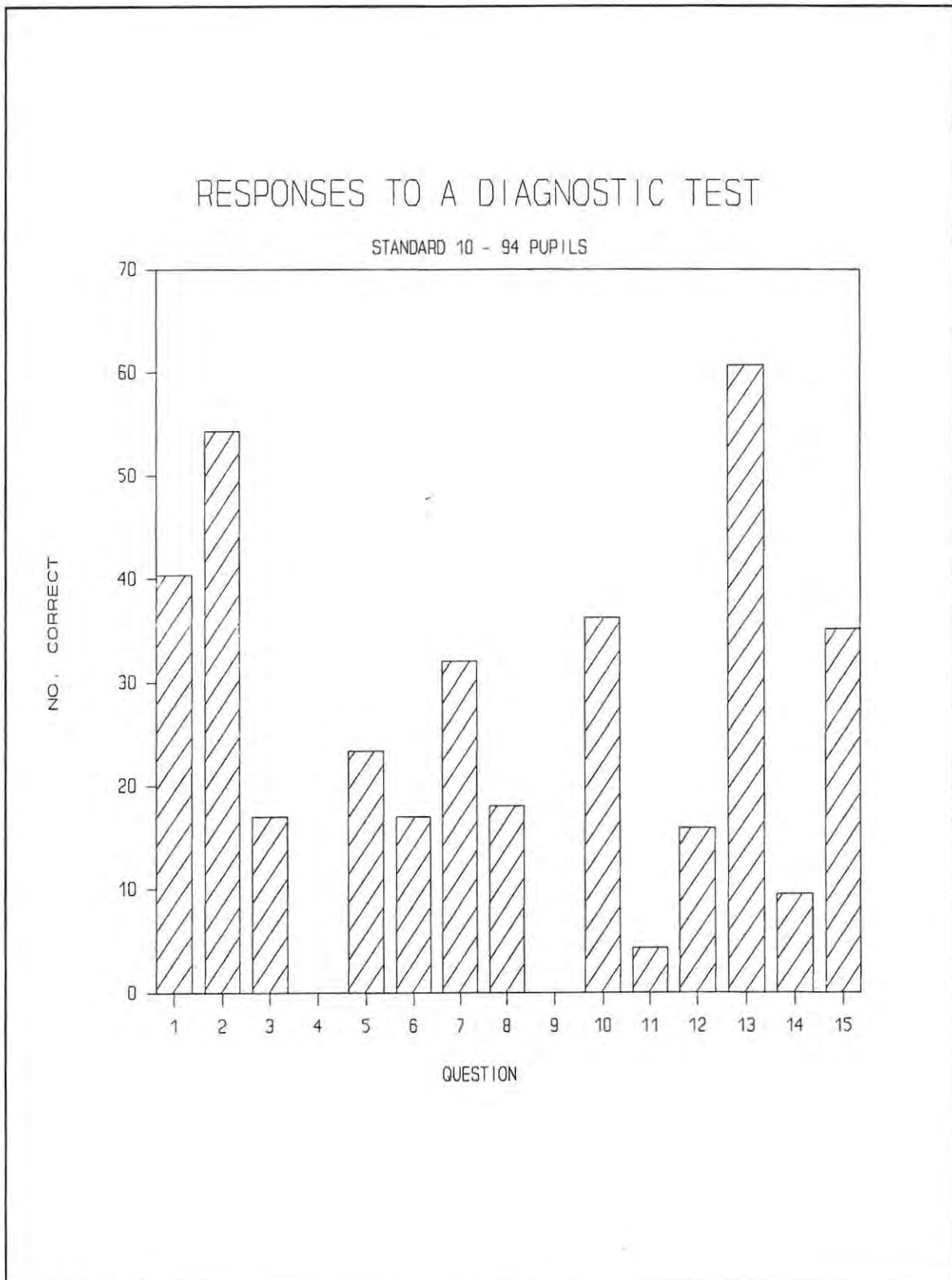
An attempt to analyse the responses given to each question will be made in order to compare the performances of the three groups. Figures 5.2., 5.3., and 5.4. below show the sample groups' performances in the map test.



**Figure 5.2.**



**Figure 5.3.**



**Figure 5.4.**

In item 1 of the test pupils were expected to show their understanding of the orthogonal view by identifying a specific feature shown on the map and the aerial photograph. An analysis of the results revealed that 19.6% Standard 7 pupils, 39.5% Standard 8 Pupils and 40.4% Standard 10 pupils answered correctly. This indicates that more than 60% of the pupils in each group failed to identify the feature. There is no noteworthy improvement in the performance of Standard 10 pupils when compared with other groups.

Item 2 called on pupils to apply hypothetico-deductive reasoning relating to the effect of water on the human activities of the area. Once again pupils needed to use both the map and the aerial photograph in order to obtain a complete analysis. The results revealed that only 54.3% of the Standard 10 pupils answered this question correctly, while 63% of the Standard 7 pupils gave correct answers. The reason for this anomaly was sought in the follow-up interviews.

Item 3 called on pupils to identify a specific feature shown on the map and the photograph. A map symbol "Rec" was provided in the map as a clue to the correct answer and was a test of pupils' knowledge of map language. The results revealed that this question was poorly answered by pupils with 17% of the Standard 10 pupils, 4.7% of the Standard 8 pupils and 2.2% of the Standard 7 pupils able to give the correct answer.

Item 4 proved to be the most difficult question. It involved the reading of the height of a specific feature. Pupils failed to identify the feature and this resulted in incorrect answers. Pupils who managed to identify the feature could not give the correct height in metres. Responses to this question gave height in centimetres and kilometres which implies that pupils had no idea of what the horizontal and vertical measurements represent. These findings reveal that pupils have no perception of height.

Item 5 required pupils to apply hypothetico-deductive reasoning relating to the effects of hills and mountains to the areas' human activities. An analysis of the results revealed that this question was poorly answered with 23.4% of the Standard 10 pupils, 13.9% of the Standard 8 pupils and 8.7% of Standard 7 pupils able to answer correctly.

Item 6 called on pupils to demonstrate their understanding of calculation techniques as applied to distance. Giving the distance from place A to B proved to be difficult because pupils needed to understand both the spatial arrangement of objects and measurement techniques. Although measurement of distance is within the syllabus of all the groups in the sample, Standard 7 pupils could not manage to give correct responses to this question. The responses given by the other groups revealed that the concept of distance had not been grasped.

It is interesting to note that Standard 7 pupils performance was higher than Standard 10 & 8 pupils in item 7, which required an estimation of the scale. An analysis of results revealed that 41.3% of the Standard 7 pupils answered correctly while 32% of Standard 10 and 30.3% Standard 8 were able to give the correct answer. This discrepancy was viewed as significant and further clarification was sought in the follow-up interviews.

Item 8 tested the pupils' on their knowledge of the concept of direction. The question proved to be difficult for the pupils since they were expected to locate both features in order to give the correct answer. From the incorrect answers given it is obvious that pupils failed to locate either both or one of the features and hence gave incorrect answers.

Item 9 required pupils to demonstrate their knowledge of the six figure grid reference. This question proved to be difficult for all the groups except for 4.7% of the Standard 8 pupils. This finding is noteworthy because the reference system in geography is taught from Standard 6 onwards.

The inability of Standard 7 pupils to respond to Item 10 relating to ways in which local people obtain a living from the land can be ascribed to the fact that such a question is syllabus specific in the senior secondary phase. An analysis of results revealed that this question was poorly answered with 36.2% of the Standard 10's

and 16.3% of the Standard 8's able to answer correctly.

Item 11 required pupils to show their knowledge of settlement geography and to apply deductive reasoning. Standard 7 pupils were not expected to be able to answer this question, since the question was also syllabus specific. An analysis of the results revealed that 4.3% of Standard 10 pupils and 2.3% of the Standard 8 pupils were able to answer correctly. The poor performance highlights the problems these pupils have with abstract concepts and their poor perceptual development.

For item 12 very little was expected from Standard 7 and Standard 8 pupils since the question was designed to test Standard 10 pupils' ability to apply theoretical knowledge gained through the Standard 10 syllabus to similar situations. The results revealed that none of the Standard 7 pupils were able to answer this question correctly and only 2.3% of the Standard 8 and 15.9% of the Standard 10 pupils were able to answer correctly. This indicates that pupils find it difficult to apply factual knowledge to the solution of problems and emphasises the need for pupils to obtain practice in this area.

Item 13 attempted to establish the subjects' ability to visualise a three-dimensional landscape from the two-dimensional map. The general performance of all the groups in this question was better when compared with the groups' performances in other questions of

the map test. An analysis of the result revealed that 60.6% of the Standard 10 pupils, 47.3% of the Standard 7 pupils and 41.9% of the Standard 8 pupils were able to give the correct answers.

When pupils were asked to give map evidence for their responses to question 13, 70% of the pupils were unable to do so.

The final item of the diagnostic test required pupils to give the direction in which the Gauwa river flows. The results revealed that 35.1% of the Standard 10 pupils, 17.4% of the Standard 8 pupils and 16.3% of the Standard 7 pupils were able to answer correctly. The incorrect answers for this question revealed that pupils were unable to imagine a map as a part of the whole.

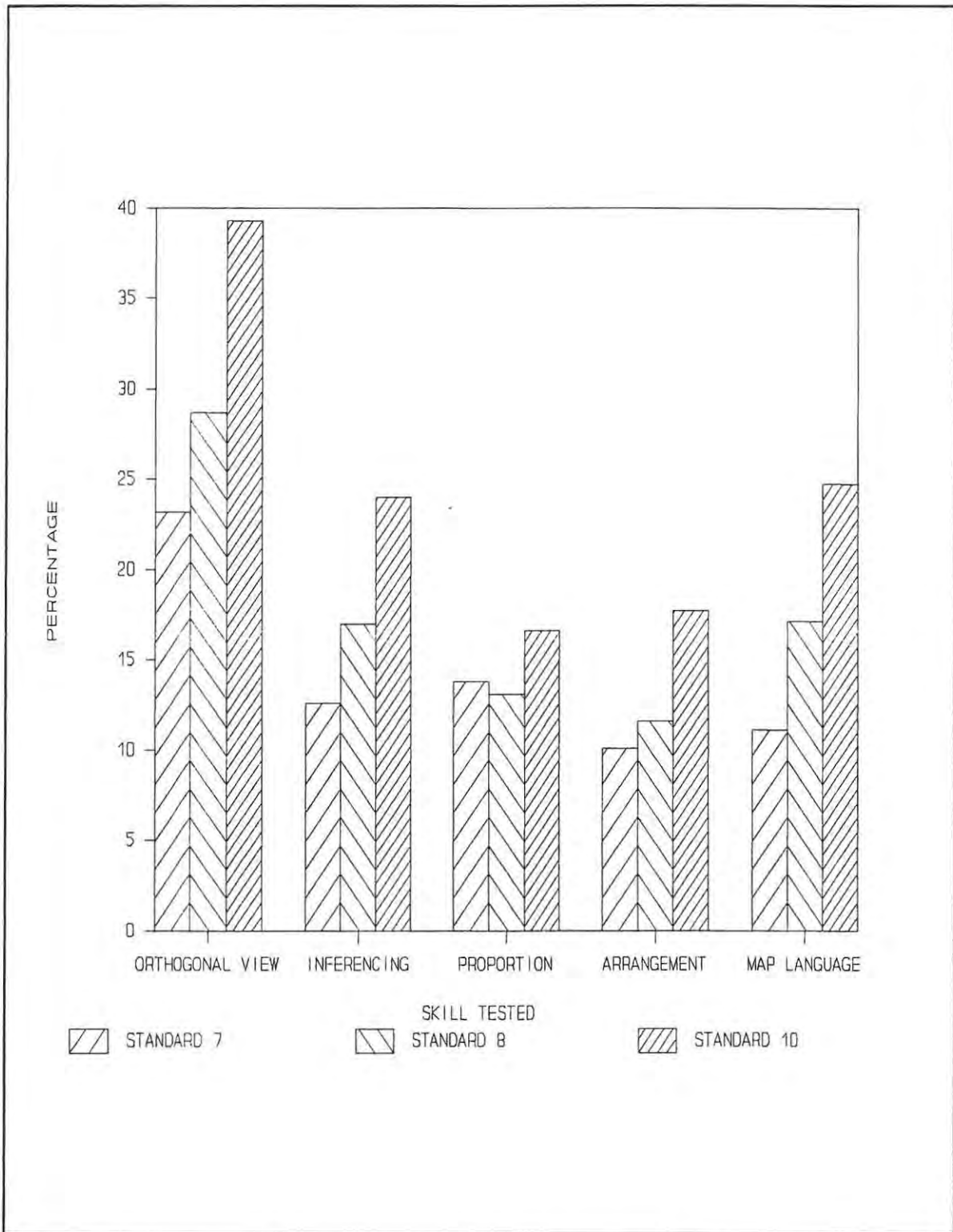
#### **5.1.4. Analysis of pupils' results in relation to specific skill areas**

The map test questions were grouped into skill areas using the mapping skills suggested by Gerber and Wilson (1984) and are presented in Table 5.3. below :-

**Table 5.3. Map test questions grouped according to specific skill areas**

| MAPPING SKILLS  | GROUP OF QUESTIONS TESTING EACH SKILL       |
|---|---|
| 1. Orthogonal view  | Questions 1, 3 and 5.                       |
| 2. Inferencing  | Questions 2, 5, 10, 11, 12 and 14.          |
| 3. Proportion<br>(i) measuring objects<br>(ii) calculating distances<br>(iii) scale | Question 4.<br>Question 6.<br>Question 7    |
| 4. Arrangement of objects<br>(i) direction<br>(ii) reference system                 | Question 8 and 15.<br>Question 9.           |
| 5. Map language   | Questions 1, 3, 4, 5, 9, 10, 13, 14 and 15. |

Pupils' performances in the different skill areas using the above table were analysed and are presented in Figure 5.5 below :-



**Figure 5.5 Pupils' performances in relation to skill areas.**

The above graph reveals that the five basic mapping skills were not generally well understood. The analysis of the pupils' results in terms of the individual skill areas identified, revealed that fewer than 50% of the pupils tested were able to perform competently in any of the skills. It is, however, interesting to note that the pupils generally performed better with regard to the orthogonal view than in relation to other skill areas tested. The analysis of the results revealed that 39.3% of the Standard 10 pupils, 28.7% of the Standard 8 pupils and 23.2% of the Standard 7 pupils had mastered the orthogonal view.

The analysis of the results in terms of inferencing revealed that 24% of the Standard 10 pupils, 17% of the Standard 8 pupils and 12.6% of the Standard 7 pupils were able to answer questions relating to these skills correctly while 24.7% of the Standard 10 pupils, 17.1% of the Standard 8 pupils and 11.1% of the Standard 7 pupils were able to answer the questions relating to map language.

Pupils performed most poorly in terms of proportion and arrangement with 16.6% of the Standard 10 pupils, 13.1% of the Standard 8 pupils and 13.8% of the Standard 7 pupils able to answer questions relating to proportion while 17.7% of the Standard 10 pupils, 11.6% of the Standard 8 pupils and 10.1% of the Standard 7 pupils able to answer questions relating to arrangement correctly.

The results of the diagnostic test are such that it may be

concluded that these pupils have problems with the basic skills needed for the reading and interpretation of topographical maps and aerial photographs.

The diagnostic test was able to identify the serious problems which exist in this section of the syllabus but was not able to identify how these problems originated. The interviews conducted with pupils attempted to gain greater clarity regarding reasons for the poor performance of these pupils.

### **5.2. The results of the group interviews**

120 out of 183 pupils who had completed the map test were interviewed. The interview sample was divided into seven groups as follows :-

- (i) 2 Standard 7 groups comprising of 10 and 16 pupils;
- (ii) 2 Standard 8 groups comprising of 19 and 15 pupils;
- (iii) 3 Standard 10 groups comprising of 18, 20 and 22 pupils.

The pupils were interviewed in groups in order to eliminate problems of insecurity which pupils experience in a one-to-one interview situation. The pupils responded favourably to the informal interview structure and they were all prepared to share their ideas with the researcher.

The first part of the interview attempted to establish pupils'

reactions to the map test. The pupils were required to indicate which questions were found to be easy and which questions were considered difficult. Item 1, 2, 5, 7, 13, and 15 were regarded as manageable because they asked for the identification of features. 70% of the sample admitted encountering problems relating to the orientating of the map and the photograph. The pupils explained that if the photograph was not marked with question symbols they would not have managed to orientate the photo with the map.

Item 3 & 4 were regarded as problematic questions by 80% of the sample since the questions needed careful analysis of both the map and the photograph. Regarding item 3 more than 65% of the interview sample indicated that they could not remember the conventional map signs thus their inability to recall the symbol "Rec" for recreational grounds. In relation to item 4, 80% of the interview sample indicated that they were not aware of the importance of explanatory figures such as metres for height. They thought that 638.8 was an adequate answer. Pupils also indicated that they overestimated the area shown by the photograph on the map.

Items 6, 8, 9, 10, 11, 12 and 14 were regarded as the most difficult questions by all the groups interviewed. Item 6 which involved the measurement of distance and calculations was seen as the most problematic. The pupils indicated that their lack of competence in calculation techniques was due to the fact that they

had no knowledge of mathematics.

Pupils explained their inability to answer the question requiring direction to their inability to orientate the map and the photograph.

The respondents indicated familiarity with terms such as north-south latitude and east-west longitude, but were unfamiliar with the term "grid reference" and were therefore unable to answer item 9 correctly.

Pupils accounted for their poor performance in items 10, 11, 12 and 14 by explaining that these questions were found to be too involved since the items needed some form of background knowledge.

The second part of the interview attempted to establish the frequency with which pupils were exposed to mapwork. The discussions revealed that mapwork exercises were seldom done and usually occurred in the first few weeks of the first term and as revision just before writing the final examinations. Pupils also indicated that they were unfamiliar with maps and photographs of their local area.

The third section of the interview attempted to identify pupils' perceptions of mapwork. It was interesting to note that all the participants in the interview perceived mapwork as being an

important part of their geographical education as they consider mapwork in geography as able to equip them with the ability to read various maps and to understand more about the ways in which communities live. However, 60% of the interview sample indicated that they did not enjoy mapwork lessons due to the manner in which this section is presented to them. The pupils indicated that mapwork is theoretical in their schools with the teacher dominating the lessons.

The last section of the interview involved pupils' evaluation of their learning experiences in mapwork. 80% of the respondents indicated that mapwork is not integrated with other sections of geography. The remaining 20% indicated that they occasionally use mapwork skills when learning regional geography. All the respondents emphasised the fact that mapwork is a practical subject and needs to be presented in a practical way. So too all the respondents emphasised that in the same way that physical science, home economics, needlework, and typing need a special room so geography requires a special location. The pupils also emphasised that mapwork is primarily taught by means of textbooks with teachers talking. All the respondents revealed that they had never seen a stereoscope except in textbook illustrations.

The interview results indicated that pupils experience perceptual difficulties and seem unable to grasp basic concepts or to use elementary techniques. Errors made by pupils were often due to

their failure to conceptualise the key properties of maps and essential mapping skills and concepts. The discussions also revealed that there are no practical demonstrations in order to help pupils to understand the concepts involved in mapwork. It became evident that mapwork which is based on reality is taught in a theoretical way.

### **5.3. Summary of the pupils' survey**

The analysis of pupils' diagnostic test in respect to mapwork competence highlighted the following key points :-

- (i) that secondary school pupils perform particularly poorly in mapwork;
- (ii) that there is a considerable degree of underachievement in pupils' mapwork performance and they cannot be expected on their poor performance to pass senior certificate mapwork examinations;
- (iii) that pupils have not developed a full understanding of the key properties of maps;
- (iv) that pupils do not have the essential mapping skills necessary for a sound understanding of mapwork;
- (v) that a sequential programme of mapping skills which would assist older pupils to succeed at more of the tasks than younger pupils has not been developed in pupils;
- (vi) that pupils find it more difficult to respond to questions relating to abstract thinking than to recall

questions.

The analysis of the interviews with pupils in relation to reasons for mapwork poor performance highlighted the following key points :-

- (i) that while pupils perceive mapwork as an important part of their geographical education, they do not enjoy mapwork lessons because of the theoretical and abstract manner in which lessons are taught.
- (ii) mapwork exercises are seldom done in spite of the fact that these would help to familiarise pupils with new mapping skills and allow them time to practice the already acquired skills.
- (iii) pupils find it difficult to apply their theoretical knowledge to new situations.
- (iv) pupils are unfamiliar with local maps and are unable to use essential geographical equipment such as stereoscopes.
- (v) mapwork in schools is not integrated with other sections of the curriculum.

**CONCLUSION AND RECOMMENDATIONS****6.1. Introduction**

If graphicacy is accepted as fundamental to education along with literacy, articulacy and numeracy, then map studies in the geography curriculum must be regarded as a component of geographical education. Topographical maps and aerial photographs as spatial documents represent an advanced form of graphic communication and as such are an integral part of map studies and therefore the development of graphic skills. The importance of this form of communication emphasises the need to develop those skills that pupils need to comprehend this aspect of geography. Research has, however, revealed that topographical maps and aerial photographs present numerous perceptual and conceptual problems for pupils.

In this study the problems presented by topographical maps and aerial photographs as systems of communication have been examined. Boardman (1983) claims that emphasis must shift from the map as a static graphic display to the cognitive and perceptual activities of the individuals interacting with maps.

Maps, including topographical maps and aerial photographs, are too detailed and are liable to be misread because the significant information which is being sought from them is easily lost in the mass of other data. Research has traced numerous mapping problems

common in map reading and interpretation to a failure on the part of pupils to grasp and effectively deal with the basic map properties and map skills. Strategies for minimizing pupils' problems regarding the understanding of maps seem to rely most heavily on a thorough understanding of these basic mapping experiences. The essence of this research therefore was to investigate the nature of the problems experienced by pupils and the origin of these problems.

## **6.2. Analysis of the research results**

The survey relating to teachers' perceptions of mapwork and the teaching strategies which are used in the teaching of this section of the syllabus highlighted the following :-

- (i) teachers are aware of the problems facing pupils attempting to read and interpret maps;
- (ii) topographical maps and aerial photographs are largely taught through teacher-centred strategies which promote regurgitation of facts and drilling for answering examination questions;
- (iii) the limiting factors involved in the teaching of this section of the syllabus such as time constraints, examinations, lack of funds and unavailability of the necessary resources;
- (iv) the syllabus needs some form of restructuring in order to reduce the content to be taught to allow teachers to engage in effective but of necessity time-consuming

- pupil-centred strategies;
- (v) pupils' poor environmental backgrounds contribute towards their poor performance in mapwork;
  - (vi) geography teachers shouldering the responsibility for the development of pupils' map skills are not fully equipped for the task;
  - (vii) pupils seem to resist informal teaching procedures because they are used to being passive in mapwork lessons;
  - (viii) geography teachers depend on school textbooks as the curriculum framework and the major sources of methodology and material for the teaching of mapwork.

The diagnostic test and interviews conducted with secondary school geography pupils relating to reading and interpretation of 1:50,000 topographical maps and aerial photographs highlighted the following:-

- (i) orientating the map with the photograph proved to be the most difficult skill for pupils to perform as they assumed that the top of the photograph was the north irrespective of the direction in which the camera was pointing when the photograph was taken;
- (ii) map properties which influence the understanding and development of map skills in pupils have not been understood;
- (iii) the hierarchical sequence of map skills which enhance

- the understanding of mapwork concepts has not been developed in pupils;
- (iv) while pupils perceive mapwork as an important part of their geographical education, they do not enjoy mapwork due to the manner in which it is presented to them;
  - (v) lack of previous experience in maps affects pupils' competence and performance in this section;
  - (vi) pupils have no knowledge of maps of their own areas which would help them progress more effectively in the acquisition of mapwork concepts and skills; and
  - (vii) pupils' performances revealed misconceptions about contours as they attempted to interpret relief and estimate height.

The particularly poor performance of these pupils in mapwork has revealed that although the development of graphicacy is closely related to the development of skills in terms of reading and interpreting topographical maps and aerial photographs this particular aim of the geography syllabus in Transkeian schools has not been achieved. The problems identified by means of the survey and the diagnostic test is attributed to a number of factors. Teachers themselves revealed a limited knowledge regarding the nature and properties of maps and therefore do not understand the manner in which map skills are acquired and developed by the learners. The syllabus, textbooks and the existing examination system are perceived by teachers to exacerbate the problem which

they and their pupils experience in terms of the use of maps as a communication system. Due to time constraints and the format of the current examination system teachers resort to teacher - centred strategies in mapwork lessons. During mapwork lessons pupils are not provided with opportunities for reflection and problem solving which would enhance effective conceptualization in mapwork.

The socio-economic background of many Transkei pupils is such that they have not developed the necessary spatial perception which enables them to manipulate abstract ideas associated with map concepts. The learning situation including strategies and resources has to be enriched in order to compensate for this serious deficiency.

The problems identified by this study in terms of the development of graphic skills associated with topographical maps and aerial photographs have highlighted the urgent need for further research into other aspects of graphicacy in Transkei.

### **6.3 Limitations of this Study**

Although the sample population for the questionnaire included teachers from various areas of the Transkei; the nature of the study and insufficient funds did not permit the researcher to increase the sample population for the teachers' interviews and pupils' survey beyond the Butterworth area. The participation of more teachers and pupils in both surveys may have increased the

validity of this study, while the setting and implementation of more than one diagnostic test would have increased the reliability of the study. In the light of the above limitations to this study further investigation involving a larger sample and further testing pertaining to aspects affecting the teaching and learning of mapwork in schools, would be valuable.

#### **6.4 Recommendations**

In spite of the above limitations the results obtained in this study provide the basis for suggestions for improving the teaching of mapwork in schools. The following recommendations are made :-

- (i) The theoretical underpinning which is central to the development of graphicacy ought to be included and emphasised in all teacher-training courses and needs to be directly linked to developmental and learning theories.
- (ii) The curriculum needs restructuring to provide enough time for pupils to develop the necessary mapping skills. Bailey claims that "we have to reduce our content so that we and our pupils may teach and learn better". (Bailey, 1987, p. 13).
- (iii) Since textbooks are the most accessible teaching and learning resource in most Transkeian classrooms they need to provide the teacher and pupil with guidelines and material which will provide a sequential framework for the development of graphicacy.

- (iv) The rigid questioning structure of examination systems should be changed to a flexible one which includes the application of principles and knowledge to solve problems.
- (v) There is a need for a change in teaching strategies used in mapwork lessons from the "talk and chalk" theoretical approach to the involvement of pupils through the use of maps of pupils' local areas, fieldwork and models.
- (vi) In order to compensate for pupils' poor environmental backgrounds, teaching programmes should be developed to increase perceptual skills and improve spatial concept development in pupils.

### **6.5 Conclusion**

In mapwork pupils are expected to collect data and process it into usable information from a wide range of resources including topographical maps and aerial photographs. Research has revealed that in many classrooms specific guidance in this data collection and processing is haphazard.

Bartz warns that

*if maps and map related skills are truly valuable... and if it appears that such skills are not being adequately learned by a sizable proportion of our population ... then there is need for change ... . The groups of people involved include the map publisher ... , the writers of*

*curriculumms, the purchasers of the maps, the teachers who teach with and about maps, and finally, the child himself. (Bartz, 1971, p. 98).*

The 'pencil-and-paper' approach to map reading exercises has to be replaced by the use of reality so that in Transkei pupils' perceptual development is not retarded through either their isolation from modern influences or having to learn through the medium of a second language.

REFERENCES

ATKINS, C. L., (1981). Introducing basic map and globe concepts to young children. Journal of Geography : Vol. 80. No. 6. (228 - 233).

BABBIE, E. R., (1973). Survey Research Methods. California : Wadsworth Publishing Company.

BALLANTYNE, R. R., (1984). Primary School geographers need to consult psychologists. South African Geographer. Vol. 12. No. 1. (77 - 84).

BAILEY, P., (1974). Teaching Geography. London : David and Charles.

BAILEY, P., (1987). What are the geographer's contributions? Geography in the curriculum from 5 to 19 in BAILEY, P. and BINNS, T. (1987). (eds). A case for geography. Sheffield : The Geographical Association.

BALCHIN, W. G. V., (1971). Graphicacy. Geography. Vol. 57. (185 - 195).

BALCHIN, W. G. V. and COLEMAN, A. M., (1966). Graphicacy should be the Fourth Ace in the Pack. The Cartographer. Vol. 3. No. 1. (23 - 28).

BARTZ, B. S., (1970). Maps in the Classroom. Journal of Geography. Vol. 69. No. 1. (18 - 24).

BEARD, R., (1969). An outline of Piaget's Developmental Psychology. London : Routledge and Kegan Paul.

BEHR, A. L., (1983). Empirical Research Methods for the human sciences. Durban : Butterworths.

BENTLEY, J. C., (1975). The use of maps in schools. London : Blackwell.

BENG TECK, L., (1988). Effects of practical experience and sequential skills in map reading in GERBER, R. and LIDSTONE, J. (1988). (eds). Developing skills in geographical education. Brisbane : International Geographical Union.

BOARDMAN, D. and TOWNER, E., (1980). Problems of correlating air photographs with ordinance survey maps. Teaching Geography. Vol. 6. No. 2. (76 - 79).

BOARDMAN, D., (1983). Graphicacy and Geography Teaching. London : Croom Helm.

BOARDMAN, D., (1986). A handbook for geography teachers. Sheffield : The Geographical Association.

BURTON, M. St. J. W., (1986). Graphicacy and the third dimension : an investigation into the problem of poor performance in relief mapwork in South African secondary schools. Unpublished M. Ed. Thesis : Rhodes University.

CATLING, S., (1984). Building less able children's map skills in  
DILKES, J. L. and NICHOLLS, A. (1988). (eds). Low attainers and the teaching of geography. Sheffield : The Geographical Association.

COHEN, L. and MANION, L., (1989). Research Methods in Education. London : Routledge.

GAY, L. R., (1987). Educational Research : competencies for Analysis and Application. Ohio : Merrill Publishing Company.

GERBER, R., (1981). Young children's Understanding of the Elements of Maps. Teaching Geography. Vol. 6. No. 3. (128 - 133).

GERBER, R. and WILSON, P., (1984). Maps in the Classroom in FIEN, J., GERBER, R. and WILSON, P., (1984). (eds). The geography teachers' guide to the classroom. Melbourne : The MacMillan Company.

GRONLUND, N. E., (1976). Measurement and evaluation in teaching. New York : the MacMillian Company.

HARWOOD, D., (1984). Introducing mapwork to ESN(M) children : stage one in DILKES, J. L. and NICHOLLS, A. (1988). (eds). Low attainers and the teaching of geography. Sheffield : The Geographical Association.

KEATES, J. S., (1982). Understanding Maps. London : Longman.

KERLINGER, F. n., (1986). Foundations of Behavioural Research. Tokyo : CBS Publishing.

KIDDER, L. H. and JUDD, C. M., (1986). Research Methods in Social Relations. New York : Holt, Rinehart and Winston.

MEYER, J. M. W., (1973). Map skills instruction and the child's developing cognitive abilities. Journal of Geography. Vol. 72. No. 6. (27 - 35).

MILLER, P. V. and CANNELL, C. F., (1988). Interviews in Sample Surveys in KEEVES, J. P. (ed). (1988). Educational Research, Methodology, and Measurement : An International Handbook. New York : Pergamon Press.

MONTGOMERY, D., (1990). Children with learning difficulties. London : Cassell.

OKPALA, J., (1988). Teaching styles in reading and interpreting topographical maps - the Nigerian experience in GERBER, R. and LINDSTONE, J. (1988). (eds). Developing skills in geographical education. Brisbane : International Geographical Union.

RHYS, W., (1972). The development of Logical Thinking in GRAVES, N. J. (1972). (ed). New Movements in the Study and Teaching of Geography. London : Temple Smith.

ROBINSON, A. H. and PETCHENIK, B. B., (1975). The Map as a Communication System. Cartographic Journal. Vol. 12. No. 1. (7 - 15).

RUMMEL, J. F., (1958). An Introduction to Research Procedures in Education. New York : Harper and Brothers.

SANDERS, W. S. and PINHEY, T. K., (1983). The Conduct of Social Research. New York : Holt, Rinehart and Winston.

SATTERLY, D., (1964). Skills and Concepts Involved in Map drawing and Map Interpretation. New Era. Vol. 45. No. 9. (260 - 263).

THOMPSON, D. C., (1961). The Regional concept of School Geography in Practice. Journal for Geography. Vol. 1. No. 8. (39 - 47).

THORNDIKE, R. L. and HAGEN, E., (1969). Measurement and evaluation in psychology and education. New York : John Wiley.

TOWLER, J. O., (1970). The Elementary School Child's concept of Scale. Journal of Geography. Vol. 69. No. 2. (89 - 93).

WATTS, M. and EBBUTT, D., (1987). More than the sum of the parts : research methods in group interviewing. British Educational Research Journal. Vol. 13. No. 1. (25 - 34).

WIERSMA, W., (1986). Research methods in Education. Massachusetts : Allyn and Bacon.

WOOLDRIGDE, S. W. and EAST, W. G., (1958). The spirit and purpose of Geography. London : Hutchinson.

APPENDIX 1

PROVINCIAL ADMINISTRATION OF THE CAPE OF GOOD HOPE

DEPARTMENT OF EDUCATION

SENIOR SECONDARY COURSE

SYLLABUS

FOR

GEOGRAPHY

HIGHER GRADE

1985

**SENIOR SECONDARY COURSE: SYLLABUS FOR GEOGRAPHY HIGHER GRADE**

The following syllabus for Geography Higher Grade for the Senior Secondary Course will be introduced as from 1 January 1985.

The syllabus will be introduced in Standard 8 in 1985 and the first Senior Certificate Examination on this syllabus will be held in November/December 1987.

**SENIOR SECONDARY COURSE: SYLLABUS FOR GEOGRAPHY HIGHER GRADE**

1. PRINCIPLES ON WHICH THE SYLLABUS IS BASED

1.1 Nature of Geography

Geography as a subject has many areas of overlap with other subjects in both the natural and the social fields of study. This syllabus takes into account the essential nature of Geography. It ensures that:

1.1.1 the four major traditions in Geography are upheld. These are:

- (a) man - land relationships
- (b) the spatial perspective
- (c) the regional viewpoint
- (d) the earth-science component

1.1.2 a balance is maintained between Physical Geography and Human Geography;

1.1.3 provision is made for both the theoretical and the practical aspects of the subject;

1.1.4 sufficient flexibility exists to allow for the changing nature of the subject.

1.2 General education of the pupil

Education is concerned with the development of the 'whole being' and not merely with imparting knowledge.

1.2.1 The most important aims, in the long term, are for pupils to:

- (a) acquire and develop intellectual skills and abilities which will promote on-going education

(b)/...

- (b) adjust to a society that is undergoing rapid and far-reaching social, economic and political changes.
  - (c) enter the world-of-work that is becoming increasingly more technologically orientated.
  - (d) develop their moral and emotional (affective) attributes.
- 1.2.2 The teaching of Geography should neither be specifically vocationally orientated, nor entirely university orientated. The syllabus should provide for two groups of pupils:
- (a) those who will receive no further instruction in the subject, and
  - (b) those who will continue with the study of Geography at a tertiary level.
- 1.2.3 Although the syllabus is divided into a Junior Secondary Phase and a Senior Secondary Phase, the two phases must be related, and must allow for the progressive development of geographical knowledge, skills and attitudes.

## 2. OBJECTIVES

- 2.1 In lesson preparation teachers should bear in mind the higher abilities of comprehension, analysis, application, synthesis and evaluation.
- 2.2 This subject should be taught in such a way that pupils develop an eagerness for further study and individual inquiry.
- 2.3 Teachers should be aware of the contribution Geography is making to the general education of the pupil. It is this awareness that gives direction to day-to-day teaching.
- 2.4 Objectives should be meaningful to pupils and teachers alike, and must constitute both realistic and achievable targets.
- 2.5 The type and number of short-term objectives in Geography are numerous, and those selected for a lesson should be closely correlated with the nature of the subject matter and the resources available to the teacher.
- 2.6 Objectives can be classified into four main categories:

2.6.1/...

2.6.1 Knowledge

- (a) Pupils should acquire a fundamental body of knowledge which is meaningful and useful to them and which can be applied and reproduced in whatever form is required.
- (b) Pupils should recognize the unity of knowledge through the links that Geography has with other subjects.

2.6.2 Skills

- (a) No list of skills can be complete. The following should, however, be kept in mind:
  - (i) The importance attached to different skills should be related to the abilities and maturity of the pupils.
  - (ii) The development of skills should enable pupils to deal with knowledge in an organized manner.
  - (iii) Pupils should gain proficiency in the use of skills through repetition and the application of these skills to new situations.
- (b) Geography makes a particular contribution to the following skills:
  - (i) Oracy and literacy: thinking logically, writing concisely, speaking with assurance and accuracy.
  - (ii) Numeracy: facility with simple statistical methods, graphs and tables.
  - (iii) Graphicacy: the ability to draw, read and interpret.
  - (iv) Interpretation: of pictures, photographs and maps.
  - (v) Fieldwork techniques: using either the traditional (survey) or the scientific approach.

2.6.3 Perception

The way in which the environment is 'perceived' in relation to the 'actual' environment influences the pupil's concept of space (spatial conceptualization).

- (a) In order to heighten the pupils' perception of their environment, it is necessary for them to:

(i)/...

- (i) recognize the relationships that exist between people and their environment;
  - (ii) identify spatial patterns, spatial relationships and interaction. (This is closely linked with an understanding of location, distance and accessibility);
  - (iii) be aware of the underlying processes which act upon spatial patterns and relationships and which bring about change;
  - (iv) be aware of the world's place to place variety; to recognize the uniqueness of place.
- (b) Many studies require pupils to examine the spatial aspects of social and economic problems. Such studies provide opportunities for pupils to respond to problem-solving and decision-making situations through critical, divergent and creative thinking.

#### 2.6.4 Appraisal

- (a) Studies in Geography should promote the formation and reinforcement of positive attitudes and values.

This is an emotional objective, for, without appealing to the emotions and without sufficient motivation, learning seldom takes place.

- (b) Pupils need to develop a social awareness. This means that they are expected to:
- (i) recognise the interdependence of man;
  - (ii) acquire a tolerant attitude towards others with different social, economic and political circumstances.
- (c) Pupils need to develop an environmental awareness. They need to feel a commitment towards the environment by developing a 'caring attitude'. This means they are expected to:
- (i) recognize the need for conservation;
  - (ii) understand that the balance of nature is largely dependent on man's wise management of his environment;

They should be aware of how man uses/abuses his environment, particularly the resources available to him; the options and constraints that are placed on his actions.

(iii)/...

- (iii) realize that the quality of life is influenced by the aesthetic aspects of man's environment as well as by an appreciation of the grandeur and wonder of Creation.

### 3. TEACHING GUIDELINES

#### 3.1 Teaching approaches

Teachers should make every effort to create effective learning experiences for their pupils. Whatever teaching approach is used, it is essential to develop a sense of reality in the teaching situation.

##### 3.1.1 The holistic or global approach

- (a) It is particularly important that the components of the syllabus be viewed as parts of a whole and not as isolated compartments of knowledge.
- (b) The divisions of the syllabus should be regarded as a convenient means of grouping the characteristics of the individual components.
- (c) Wherever possible, the relationship and interaction between components should be stressed.

##### 3.1.2 The descriptive versus the problem-solving approach

- (a) Although there is still room for some of the descriptive techniques of the old traditional Geography, emphasis should be given to a more problem-orientated approach.
- (b) Pupils should gain insight into the process of decision-making by participating in exercises such as simulation games.

##### 3.1.3 The systems approach

- (a) It is recommended that teachers introduce the concept of systems into their teaching.
- (b) Pupils should be aware that Geography encompasses the study of a very complex man-environmental ecosystem. This complex system is broken down into a number of subsystems to facilitate its study.
- (c) Several components of the syllabus could be taught as subsystems such as those associated with weather, drainage and urban subsystems.

3.1.4/...

### 3.1.4 The interdisciplinary approach

- (a) Concepts studied in Geography may overlap with those of other subjects such as Biology, Science and Economics.
- (b) Inter-disciplinary studies should form part of the broad teaching strategy. This will enhance the value of both the learning content and the learning objectives.

### 3.1.5 The scientific approach

Pupils should be trained in the scientific method of inquiry (statement of hypothesis, followed by the collection and classification of information, and finally, the testing of the hypothesis).

## 3.2 Teaching techniques

It is recommended that, where appropriate, teachers should:

- 3.2.1 integrate the reading and analysis of photographs and maps with the relevant sections of the syllabus. This includes:
  - (a) photographs: vertical, oblique and horizontal (i.e. aerial and ordinary)
  - (b) maps: such as wall, atlas, topographic maps of Southern Africa (particularly the 1 : 50 000 SA series) and municipal maps of the local area
  - (c) satellite images
- 3.2.2 ensure that pupils become competent in the use of various measuring instruments and other apparatus;
- 3.2.3 make use of diagrammatic representation of statistics. For example, climatic figures, economic data and population characteristics can be illustrated by means of curves, columns rectangles, circle segments, dots, colour, pictorial diagrams and isolines;
- 3.2.4 introduce quantitative techniques such as means, deviations (range), simple correlations, scattergrams, regression lines and probabilities. Emphasis should be on understanding what the different techniques reflect. Complicated calculations and constructions need not be required.

3.2.5/...

3.2.5 refer to models. These include:

- (a) theoretical models (such as urban and economic models) which need to be tested against the real world and enable generalisations to be made. These enable geography to be studied by means of a more problem-orientated approach, and
- (b) physical models (such as globes, tellurions and paper-mâche/sand-tray models) which provide effective representations of the real world.

3.2.6 undertake well planned and meaningful fieldwork;

This includes: observation and measurement in the field; the recording and processing of data; the interpretation of written and graphical information.

3.2.7 encourage individual and group research techniques;

- (a) Pupil involvement, independent activity, initiative, creativity and independence should constantly be extended.
- (b) Pupils should learn to rely on personal observation in the field (primary source) and to make use of secondary sources such as: reference books; maps, photographs and diagrams; films, tapes and slides; computers as well as television, the radio and the press.
- (c) Pupils need to develop worthwhile attitudes towards learning such as: respect for evidence; a critical appraisal of reporting; a suspicion of simplistic explanations; and a willingness to engage in rational discussion.
- (d) Pupils need to distinguish between central issues of importance and peripheral issues.

NOTE: Pupils should undertake short independent study topics throughout the year on work related to the requirements of the syllabus.

3.3 Differentiation

3.3.1 Teachers should not expect the same amount and quality of work from all pupils. Differences in ability must be taken into account. However, each pupil can be expected to work at the highest possible level of his own ability.

3.3.2 Most of the topics studied are common to all grades. However, pupils in different grades will not be expected to study these in the same depth. The approach to, and the control of work for less able pupils should be more direct.

3.4/...

### 3.4 Evaluation

Evaluation is concerned with both:

- 3.4.1 the measurement of pupil achievement, and
- 3.4.2 the effectiveness of lesson preparation, class management and the achievement of lesson objectives.

## 4. EXAMINATIONS

- 4.1 There should be continuous evaluation for all standards:
- 4.2 Pupils in Standards 8 and 9 must write an internal examination at the end of each year.
- 4.3 A final external examination will be set at the end of the Standard 10 year.
  - 4.3.1 Although the examination will be set on the Standard 10 syllabus, candidates will be expected to draw on their overall knowledge of concepts and skills developed in previous years.
  - 4.3.2 This examination will consist of two papers:
    - (a) PAPER 1: 1½ HOURS (Sufficient time for a study of the map and photograph(s) is included)
      - (i) Compulsory questions on photo and map reading, analysis and interpretation will be set.
      - (ii) The emphasis will be on interpretation, and questions will relate to aspects of Physical, Settlement and Regional Geography. (80)
    - (b) PAPER 2: 3 HOURS (320)
      - (i) This paper will be divided into three sections.
      - (ii) Four questions must be answered: One from each section and the fourth question may be chosen from sections A, B or C. (4 x 80)
      - (iii) Lay-out of paper:
        - SECTION A - PHYSICAL GEOGRAPHY
          - Two questions set, at least one must be answered.
        - SECTION B - SETTLEMENT GEOGRAPHY
          - Two questions set, at least one must be answered.

SECTION C/...

## SECTION C - REGIONAL GEOGRAPHY

Three questions set, at least one must be answered.

- (iv) Combined questions may be set in each section; for example, a question in Section A may comprise the Geomorphology, Ecology and Climatology components.
- (v) Questions may either be systematic or of the composite variety. A composite question in one section (e.g. Section A) may include aspects from one or both the other two sections (B and/or C), provided the marks allocated to aspects from other sections do not exceed 25% of the total marks for the question.

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NOTE: Underlined statements in the syllabus are guidelines suggesting an approach. These should allow for greater flexibility when teaching the subject.

## 5. SYLLABUS

## 5.1 STANDARD 8

(Refer to paragraphs 1 - 4)

## 5.1.1 GENERAL GEOGRAPHIC TECHNIQUES

- . Continuation of work done in Standards 6 and 7

(a) Reading, analysis and interpretation of maps

(i) Background study to maps in general

Requirements; types and functions; scales and keys

(ii) 1:50 000 topographic maps of South Africa

Direction and bearing; horizontal distance; contours; landforms; cross-sections; gradients and vertical intervals; vertical exaggeration and intervisibility; conventional signs; cultural landscape.

(b) Reading and analysis of oblique and vertical (aerial) photographs

(i) Different perspectives; uses; scale; physical and cultural phenomena

(ii) Comparisons with 1:50 000 topographic maps

- . Wherever possible the application of maps, aerial photographs and satellite images should be integrated with relevant sections of the syllabus.

- . Well planned and appropriate fieldwork should be undertaken whenever possible.

## 5.1.2 CLIMATOLOGY

- . Use should be made of synoptic weather charts, satellite images, actual observation, recording instruments and graphical representation.

(a) The atmosphere

Composition and structure

(b)/...

## (b) Temperature

Heating of the atmosphere; factors influencing horizontal temperature gradient; vertical temperature gradient

## (c) Moisture in the atmosphere

Relationship between temperature and moisture in the atmosphere; absolute and relative humidity; dewpoint temperature; simple cloud classification; precipitation

## 5.1.3 GEOMORPHOLOGY

- . Revision of rock types is recommended.

## (a) Weathering and erosion

## (b) Internal forces and resultant landforms

(i) Isostasy

(ii) Continental drift and plate tectonics

(iii) Warping, folding and faulting

(iv) Earthquakes

(v) Vulcanism

## 5.1.4 POPULATION GEOGRAPHY

- . Make use of graphical representation, where appropriate (calculations are not required).

(a) Concepts in population geography such as: arithmetical density, nutritional density, age-sex structure, birth rate, death rate, growth rate, occupation structure.

(b) Population movements and factors responsible for them.

(c) Population growth

(i) Factors influencing the growth of world population since the Industrial Revolution.

(ii) Problems associated with population growth and possible solutions.

## 5.1.5 REGIONAL GEOGRAPHY

Study ONE developed and ONE developing country

- . Countries selected for illustrative purposes should be chosen in terms of aspects such as: their links with South Africa; their prominence in current world affairs; their association with major (international) blocs.
- . The use of maps and other visual materials is important in these studies.
- . Principles studied in paragraph 5.1.4 should be applied and integrated.
- (a) A developed country: Japan or the Netherlands or a country of your own choice\*
- (b) A developing country: India or Brazil or a country of your own choice\*

N.B.:\* The country of your own choice for each standard may not be

- (i) a country that was studied in a previous standard, or
- (ii) a country to be studied in a later standard.

## 5.1.6 ASSIGNMENTS

Refer to paragraph 3.2.7.

## 5.1.7 EXAMINATION

Refer to paragraphs 4.1 and 4.2.

## 5.2 STANDARD 9

Refer to paragraphs 1 - 4

## 5.2.1 GENERAL GEOGRAPHIC TECHNIQUES

- . Continuation of work done in Standard 8
- (a) Reading, analysis and interpretation of aerial (oblique and vertical) photographs
- (b) Reading, analysis and interpretation of 1:50 000 topographic maps of South Africa

Wherever/...

- . Wherever possible, the application of maps, aerial photographs, satellite images and quantitative techniques (including graphical representation) should be integrated with relevant sections of the syllabus.
- . Well planned and meaningful fieldwork should be undertaken, whenever possible. The scientific method could be applied.

#### 5.2.2 CLIMATOLOGY

- . Synoptic weather charts, satellite images, relevant recording instruments and quantitative techniques should be used where appropriate.
- (a) Atmospheric pressure  
Definition, measurement and representation
- (b) Geostrophic flow
- (c) General circulation of the atmosphere  
Primary, secondary and tertiary circulations
- (d) Weather processes  
Causes of uplift; lapse rates; thermal stability and instability
- (e) Thunderstorms and tornadoes  
Growth, decay and associated weather; consequences
- . These should be studied on a global scale.

#### 5.2.3 GEOMORPHOLOGY

Select at least two of the topics from paragraphs (b) to (e) ((a) is compulsory).

- . Topographic maps and aerial photographs should be used, where appropriate.
- . Cross-sections and long profiles should be drawn and interpreted where applicable.
- . Well planned and meaningful fieldwork should be undertaken.
- (a) Fluvial processes and landforms typical of fluvial erosion and deposition

(b)/...

- (b) Solution processes and resultant landforms (Karst geomorphology)
- (c) Marine action and resultant landforms
- (d) Wind action and resultant landforms
- (e) Glacial action and resultant landforms

#### 5.2.4 SIGNIFICANCE OF THE OCEANS

- (a) Ocean currents and tides.
- (b) The oceans as a major source of: moisture for the atmosphere; renewable oxygen supply for the atmosphere; protein food; energy supply
- (c) The role of the oceans in: climate control; world trade; mineral exploitation
- (d) Associated problems, such as ocean pollution and over-exploitation, and possible solutions

#### 5.2.5 ECONOMIC GEOGRAPHY

- (a) Renewable and non-renewable resources
- (b) World energy resources; economic and political implication
- (c) Primary activities
  - (i) Farming
 

Subsistence and commercial farming; crop and stock farming; the RSA's production of major products as seen in relation to world production; specific study of one crop type in the RSA (maize, wheat, sugar, fruit) and one stock type in the RSA (beef, dairy, wool)
  - (ii) Mining
 

Basic economics of exploitation; the RSA's production of important minerals as seen in relation to world production; specific study of at least two minerals (gold, diamonds, coal, iron-ore)
- (d) Secondary activities
 

Light and heavy industry; factors favouring the location of industry; case study of either a heavy or a light industry in the RSA

(e)/...

## (e) Tertiary activities

The service industries with specific reference to transport or electricity supply or water supply in the RSA

## 5.2.6 REGIONAL GEOGRAPHY

Study one developed and one developing country

- . Countries selected for illustrative purposes should be chosen in terms of aspects such as: their links with South Africa; their prominence in current world affairs; their association with major (international) blocs.
- . The use of maps and other visual materials is important in these studies.
- . Principles studied in paragraph 5.2.5 should be applied.
- (a) Socio-economic characteristics of developed and developing countries: A generalized presentation.
- (b) Application of these general characteristics and principles to regional studies:
  - (i) A developed country: the USA or the USSR or Nigeria or a country of your own choice\*
  - (ii) A developing country: Mozambique or Zimbabwe or a country of your own choice\*

N.B.\* The country of your own choice for each standard may not be

- . a country that was studied in a previous standard, or
- . a country to be studied in a later standard.

## 5.2.7 ASSIGNMENTS

Refer to paragraph 3.2.7

## 5.2.8 EXAMINATION

Refer to paragraphs 4.1 and 4.2

## 5.3 STANDARD 10

Refer to paragraphs 1 to 4

5.3.1/...

## 5.3.1 GENERAL GEOGRAPHIC TECHNIQUES

- . Continuation of work done in Standards 8 and 9
  - . Wherever possible, the application of maps, satellite images, aerial photographs and quantitative techniques (including graphical representation) should be integrated with relevant sections of the syllabus.
  - . Well planned and meaningful fieldwork should be undertaken whenever possible. The scientific method should be applied.
- (a) Reading, analysis and interpretation of 1:50 000 topographic maps of South Africa.
- (b) Reading, analysis and interpretation of aerial (oblique and vertical) photographs and orthophotos.

## 5.3.2 CLIMATOLOGY

- . Relevant concepts learnt in Standards 8 and 9 should be applied.
- (a) Mid-latitude and tropical cyclones
- Growth, decay and associated weather; consequences
- . These should be studied on a global scale.
- (b) Weather and climatic explanations
- (i) Regional scale
- Travelling disturbances and anticyclonic circulations and their effect on weather patterns in Southern Africa. Line thunderstorms and their effect on the weather pattern of the RSA.
- (ii) Local scale
- Valley climate and city climates
- . Use Southern African examples where possible.
  - . Synoptic charts and satellite images should be used where applicable.

## 5.3.3 GEOMORPHOLOGY

In this section attention should be given to:

- . the drawing and interpretation of cross-sections and profiles/...

profiles

- . the use and interpretation of topographic maps and aerial photographs
- . well planned and meaningful fieldwork where possible
- . South African examples should be used wherever possible.
- (a) Drainage basins; long- and cross-profiles; stream channel characteristics; flow characteristics (normal and abnormal); river capture; superimposed and antecedant streams.
- (b) Topography associated with: horizontal and inclined strata; massive igneous rocks.
- (c) Slope characteristics.
- (d) Landscape evolution.
  - (i) Cyclic explanation (peneplanation and pediplanation)
  - (ii) Non-cyclic explanation (e.g. dynamic equilibrium)

## 5.3.4 ECOSYSTEMS, ENVIRONMENTAL BALANCE AND CONSERVATION

- . Relate to South Africa [paragraph 5.3.6.1(a)]
- . Fieldwork is encouraged
- (a) Soils
  - Soil profile; soil forming factors
- (b) Concept of an ecosystem
- (c) Ecological processes: energy flow; nutrient cycling; self-regulation
- (d) Human impact on the ecosystem: imbalance of the ecosystem; environmental conservation and management
- . Par. 5.3.4 is included in Section A for examination purposes.

## 5.3.5 SETTLEMENT GEOGRAPHY

- . Where possible, meaningful fieldwork should be undertaken. The scientific method should be applied.

General/...

- . General patterns as well as deviations should be indicated so as to present a global view.
  - . South African examples should be used where appropriate.
- (a) Rural Settlement
- (i) Definition and function
  - (ii) Types: nucleated and dispersed
  - (iii) Factors influencing site, situation and form
  - (iv) Depopulation of rural areas
  - (v) Planning and development strategies for rural areas
    - . e.g. basic needs philosophy
- (b) Urban Settlement
- (i) Processes and characteristics of urbanization
    - . Should be done in a comparative context to present a global view.
  - (ii) Factors influencing the following: function, situation and site
  - (iii) Distribution of urban centres: central places; spheres of influence; threshold and range of services; urban hierarchies
  - (iv) Land-use zones (including the rural-urban fringe)
    - . Should be considered in terms of underlying forces and processes
  - (v) Urban morphology
  - (vi) Urban problems and possible solutions
  - (vii) Planning improved urban environments

### 5.3.6 REGIONAL GEOGRAPHY

#### 5.3.6.1 The Republic of South Africa

- . Pupils should be familiar with distribution maps, which form an integral part of the regional course, such as: political divisions; chief towns and transportation routes; relief and drainage; major climatic regions.

Extensive/...

- . Extensive use should be made of the atlas.
- (a) Environmental problems and possible solutions: refer to droughts and floods; soil erosion; vegetation imbalance; pollution; wild life extinction; interbasin transfer of water.
- . The concepts of ecosystems and environmental balance should be applied. (Refer to paragraph 5.3.4.)
- (b) Population
  - Density, distribution, composition, growth and movement
- (c) The economy
  - . Relevant concepts studied in Standard 9 should be applied.
  - (i) Contribution to the gross domestic product (G.D.P.) by the primary, secondary and tertiary sectors.
  - (ii) Primary activities (detailed studies of specific activities not required).
    - . Role of agriculture and mining in the economy.
    - . Factors promoting or hindering
      - Agriculture: e.g. climatic extremes
        - soils
        - over-production
        - boycotts
        - methods
        - labour
      - Mining: e.g. rising cost
        - water
        - non-renewable resources
        - price fluctuations
        - international exchange rates
        - communications
        - methods
        - labour

(iii)/...

## (iii) Secondary activities

The PWV complex and one other major industrial region (Durban - Pinetown; South Western Cape; Port Elizaeth - Uitenhage)

- . Attention should be given to problems and possible solutions.
- . Reference should be made to the other major industrial regions.

(iv) The position of the RSA in the world trade system: Refer to the balance of payments

(v) Economic development: concepts of centralization and decentralization, concentration and deconcentration, including border industries and growth points.

5.3.6.2 South West Africa (Namibia) and one of Transkei, Venda Bophuthatwana, Ciskei

(a) Factors influencing economic development

(b) Economic links with the RSA

- . A detailed systematic treatment is not required.

5.3.7 EXAMINATION

Refer to paragraph 4.3

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SBS/GRC

DOE/014H07SY(Geog)

APPENDIX 3.A.

FOR GEOGRAPHY TEACHERS

QUESTIONNAIRE ON THE TEACHING OF MAP WORK AND THE INTERPRETATION OF AERIAL PHOTOGRAPHS

|  |  |  |
|--|--|--|
|  |  |  |
|--|--|--|

1 - 3

INSTRUCTIONS

1. Kindly TICK the chosen answer.
2. Choose ONE answer per question.
3. Please raise your hand when there is something you do not understand.
4. Do not discuss the questions with other teachers.

For Official Use Only

SECTION A

PERSONAL DATA

1. Sex:

|        |   |
|--------|---|
| Male   | 1 |
| Female | 2 |

|  |   |
|--|---|
|  | 4 |
|--|---|

2. Academic qualification:

|                      |   |
|----------------------|---|
| Matriculation        | 1 |
| B.A.                 | 2 |
| B.Sc                 | 3 |
| B.Ped                | 4 |
| B.A./B.Sc. Education | 5 |
| B.Ed.                | 6 |
| M.A./M               | 7 |
| M.Ed                 | 8 |
| D.Ed./Ph.D.          | 9 |

|  |   |
|--|---|
|  | 5 |
|--|---|

3. Highest course attended in geography:

|                       |   |
|-----------------------|---|
| None                  | 1 |
| College               | 2 |
| University Course I   | 3 |
| University Course II  | 4 |
| University Course III | 5 |
| Honours               | 6 |
| Masters               | 7 |

 6

4. Present teaching post:

|                    |   |
|--------------------|---|
| First year teacher | 1 |
| Teacher            | 2 |
| Senior teacher     | 3 |
| H.O.D.             | 4 |
| Deputy Principal   | 5 |
| Principal          | 6 |

 7

5. Highest geography standard taught in 1989:

|        |   |
|--------|---|
| Std 6  | 1 |
| Std 7  | 2 |
| Std 8  | 3 |
| Std 9  | 4 |
| Std 10 | 5 |

 8

6. Years teaching geography:

|         |   |
|---------|---|
| 0 - 1   | 1 |
| 2 - 3   | 2 |
| 4 - 7   | 3 |
| 8 - 11  | 4 |
| 12 - 15 | 5 |
| Over 15 | 6 |

 9

7. On appointment to your present school were you interested in:

|  |   |
|--|---|
| Teaching geography only                            | 1 |
| Teaching geography AND one other subject           | 2 |
| Teaching geography AND more than one other subject | 3 |

 10

8. If you had the choice, would you prefer NOT to teach geography:

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 11 |
|--|----|

SECTION B

ATTITUDES TO THE TEACHING OF MAP WORK

9. Which of the following sections of geography do you like teaching most? Kindly rank them in order of your preference. Write one (1) next to the one you like most and two (2) next to your second choice, etc.

|                      |   |
|----------------------|---|
| Climatology          | 1 |
| Geomorphology        | 2 |
| Map work             | 3 |
| Settlement geography | 4 |
| Regional geography   | 5 |

|  |    |
|--|----|
|  | 12 |
|  | 13 |
|  | 14 |
|  | 15 |
|  | 16 |

10. Rate the following ideas, ticking the one you think best describes your feelings about the following:

(i) Teaching map work is:

|                       |   |
|-----------------------|---|
| Very easy             | 1 |
| Easy                  | 2 |
| Of average difficulty | 3 |
| Difficult             | 4 |
| Very difficult        | 5 |

|  |    |
|--|----|
|  | 17 |
|--|----|

(ii) Your pupils find map work:

|                     |   |
|---------------------|---|
| Very interesting    | 1 |
| Interesting         | 2 |
| Of average interest | 3 |
| Uninteresting       | 4 |
| Very uninteresting  | 5 |

|  |    |
|--|----|
|  | 18 |
|--|----|

(iii) Your pupils find map work:

- Very easy to understand
- Easy to understand
- Difficult to understand
- Very difficult to understand
- Most difficult to understand

|   |
|---|
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |

|  |    |
|--|----|
|  | 19 |
|--|----|

11. "Your pupils perform better in map work than their average performance in other sections of geography." Do you agree? Circle your choice below:

- Strongly agree (1); Agree (2);
- Undecided (3); Disagree (4);
- Strongly disagree (5)

|  |    |
|--|----|
|  | 20 |
|--|----|

12. "Teaching map work is frustrating." Do you agree? Circle your choice below.

- Strongly agree (1); Agree (2); Undecided (3);
- Disagree (4); Strongly disagree (5)

|  |    |
|--|----|
|  | 21 |
|--|----|

13. When pupils enter the Senior Secondary School, in your experience are they adequately prepared to study map work?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 22 |
|--|----|

14. What sort of guide do you feel the syllabus ought to give about the teaching of map interpretation?

.....

.....

.....

|    |    |
|----|----|
|    |    |
| 23 | 24 |

WHEN TO TEACH MAP WORK

15. Do you think that map work should be taught to each standard from 6 - 10?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 25 |
|--|----|

16. In which school term do you teach map work most?

First term

|   |
|---|
| 1 |
|---|

Second term

|   |
|---|
| 2 |
|---|

Third term

|   |
|---|
| 3 |
|---|

Fourth term

|   |
|---|
| 4 |
|---|

Throughout the year

|   |
|---|
| 5 |
|---|

|  |    |
|--|----|
|  | 26 |
|--|----|

17. How much time do you spend on map work in the term you devote most time to map work?

One week

|   |
|---|
| 1 |
|---|

Three weeks

|   |
|---|
| 2 |
|---|

One month

|   |
|---|
| 3 |
|---|

Two months

|   |
|---|
| 4 |
|---|

More than two months

|   |
|---|
| 5 |
|---|

|  |    |
|--|----|
|  | 27 |
|--|----|

18. Is there sufficient time for you to teach map work adequately?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 28 |
|--|----|

### STRATEGIES

19. When teaching map work do you start with the local map sheet?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 29 |
|--|----|

20. Do you use three dimensional landscape models to illustrate features?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 30 |
|--|----|

21. Which of the following methods do you use?  
Anser YES or NO

| <u>Method</u>       | <u>Yes</u> | <u>No</u> |
|---------------------|------------|-----------|
| 'Teacher tell'      |            | 1         |
| Discussion          |            | 2         |
| Question - answer   |            | 3         |
| Games & simulations |            | 4         |

|  |    |
|--|----|
|  | 31 |
|  | 32 |
|  | 33 |
|  | 34 |

22. Please indicate the frequency with which you use the following teaching techniques for teaching map work. Please circle your choice.

1. Never
2. Very seldom
3. Seldom
4. Often
5. Very often

| <u>Technique</u> |   | <u>Level of frequency</u> |   |   |   |             |
|------------------|---|---------------------------|---|---|---|-------------|
|                  |   | <u>Low</u>                |   |   |   | <u>high</u> |
| Pictures         | 1 | 1                         | 2 | 3 | 4 | 5           |
| Field trips      | 2 | 1                         | 2 | 3 | 4 | 5           |
| Worksheets       | 3 | 1                         | 2 | 3 | 4 | 5           |
| Textbook         | 4 | 1                         | 2 | 3 | 4 | 5           |
| Films            | 5 | 1                         | 2 | 3 | 4 | 5           |
| Slides           | 6 | 1                         | 2 | 3 | 4 | 5           |
| Talk & chalk     | 7 | 1                         | 2 | 3 | 4 | 5           |
| Video films      | 8 | 1                         | 2 | 3 | 4 | 5           |
| Roneo'd notes    | 9 | 1                         | 2 | 3 | 4 | 5           |

|  |    |
|--|----|
|  | 35 |
|  | 36 |
|  | 37 |
|  | 38 |
|  | 39 |
|  | 40 |
|  | 41 |
|  | 42 |
|  | 43 |

23. Do you have a special classroom for geography?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 44 |
|--|----|

24. The syllabus (3.2.1) suggests that teachers should integrate the reading and analysis of photographs and maps with the relevant sections of the syllabus.

(i) Do you find this easy to do?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 45 |
|--|----|

(ii) Please suggest ways of doing this.

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

|    |    |
|----|----|
| 46 | 47 |
|----|----|

25. "The syllabus should give more attention to map work than it does at present." Do you agree? Please circle your choice below.

Strongly agree (1); Agree (2); Undecided (3);  
 Disagree (4); Strongly disagree (5)

|  |    |
|--|----|
|  | 48 |
|--|----|

SECTION C  
AERIAL PHOTOS

ATTITUDE TO THE TEACHING OF AERIAL PHOTOGRAPHS

26. Which of the following sections of geography do you like teaching most? Kindly rank them in order of your preference. Write one (1) next to the one you like most and two (2) next to the second one, etc.

|                      |   |
|----------------------|---|
| Climatology          | 1 |
| Geomorphology        | 2 |
| Aerial Photographs   | 3 |
| Settlement geography | 4 |
| Regional geography   | 5 |

|  |    |
|--|----|
|  | 49 |
|  | 50 |
|  | 51 |
|  | 52 |
|  | 53 |

27. Rate the following ideas, ticking the one you think best describes your feelings about the following:

(i) Teaching aerial photographs is:

|                       |   |
|-----------------------|---|
| Very easy             | 1 |
| Easy                  | 2 |
| Of average difficulty | 3 |
| Difficult             | 4 |
| Very difficult        | 5 |

|  |    |
|--|----|
|  | 54 |
|--|----|

(ii) Your pupils find aerial photographs:

- Very interesting 

|   |
|---|
| 1 |
|---|
- Interesting 

|   |
|---|
| 2 |
|---|
- Of average interest 

|   |
|---|
| 3 |
|---|
- Uninteresting 

|   |
|---|
| 4 |
|---|
- Very uninteresting 

|   |
|---|
| 5 |
|---|

|  |  |
|--|--|
|  |  |
|--|--|

 55

(iii) Your pupils find aerial photographs:

- Very easy to understand 

|   |
|---|
| 1 |
|---|
- Easy to understand 

|   |
|---|
| 2 |
|---|
- Difficult to understand 

|   |
|---|
| 3 |
|---|
- Very difficult to understand 

|   |
|---|
| 4 |
|---|
- Most difficult to understand 

|   |
|---|
| 5 |
|---|

|  |  |
|--|--|
|  |  |
|--|--|

 56

28. "Your pupils perform better <sup>interpreting</sup> in aerial photographs than their average performance in other sections of geography." Do you agree? Please circle your choice below.

Strongly agree (1); Agree (2); Undecided (3);  
Disagree (4); Strongly disagree (5)

|  |  |
|--|--|
|  |  |
|--|--|

 57

29. "Teaching aerial photographs is frustrating." Do you agree? Please circle your choice below.

Strongly agree (1); Agree (2); Undecided (3);  
Disagree (4); Strongly disagree (5)

|  |  |
|--|--|
|  |  |
|--|--|

 58

30. When pupils enter the Senior Secondary School, in your experience are they adequately prepared to study aerial photographs?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |  |
|--|--|
|  |  |
|--|--|

 59

31. What sort of guide do you feel the syllabus ought to give in teaching of aerial photographs? Please comment.

.....

.....

.....

|  |  |
|--|--|
|  |  |
|--|--|

60      61

WHEN TO TEACH AERIAL PHOTOGRAPHS

32. Should be taught to each standard from 6-10?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 62 |
|--|----|

33. In which school term do you teach aerial photographs most?

- First term
- Second term
- Third term
- Fourth term
- Throughout the year

|   |
|---|
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |

|  |    |
|--|----|
|  | 63 |
|--|----|

34. How much time do you spend on aerial photographs in the term you devote most to aerial photographs?

- One week
- Three weeks
- One month
- Two months
- More than two months

|   |
|---|
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |

|  |    |
|--|----|
|  | 64 |
|--|----|

35. Is there sufficient time to teach aerial photographs adequately?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 65 |
|--|----|

STRATEGIES

36. When teaching aerial photographs do you start with local photographs?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 66 |
|--|----|

37. Do you use three-dimensional landscape models to illustrate features?

|     |   |
|-----|---|
| Yes | 1 |
| No  | 2 |

|  |    |
|--|----|
|  | 67 |
|--|----|

38. Which of the following methods do you use?  
Answer YES or NO

| <u>Method</u>      | <u>Yes</u> | <u>No</u> |
|--------------------|------------|-----------|
| 'Teacher tell"     |            | 1         |
| Discussion         |            | 2         |
| Question-answer    |            | 3         |
| Games & simulation |            | 4         |

|  |    |
|--|----|
|  | 68 |
|  | 69 |
|  | 70 |
|  | 71 |

39. Please indicate the frequency with which you use the following teaching techniques for teaching aerial photographs. Please circle your choice.

- 1 = Never
- 2 = Very seldom
- 3 = Seldom
- 4 = Often
- 5 = Very often

| <u>Technique</u> |   | <u>Level of Frequency</u> |   |   |   |             |
|------------------|---|---------------------------|---|---|---|-------------|
|                  |   | <u>low</u>                |   |   |   | <u>high</u> |
| Pictures         | 1 | 1                         | 2 | 3 | 4 | 5           |
| Field trips      | 2 | 1                         | 2 | 3 | 4 | 5           |
| Worksheets       | 3 | 1                         | 2 | 3 | 4 | 5           |
| Textbook         | 4 | 1                         | 2 | 3 | 4 | 5           |
| Films            | 5 | 1                         | 2 | 3 | 4 | 5           |
| Slides           | 6 | 1                         | 2 | 3 | 4 | 5           |
| Talk and chalk   | 7 | 1                         | 2 | 3 | 4 | 5           |
| Video films      | 8 | 1                         | 2 | 3 | 4 | 5           |
| Roneo'd notes    | 9 | 1                         | 2 | 3 | 4 | 5           |

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40. "The syllabus should give more time to the teaching of aerial photographs than it does at present." Do you agree? Please circle your choice.

Strongly agree (1); Agree (2); Undecided (3);  
Disagree (4); Strongly disagree (5)

|  |   |
|--|---|
|  | 1 |
|--|---|

41. Please feel free to record any thoughts that you may consider relevant to my study:

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

|   |   |
|---|---|
|   |   |
| 2 | 3 |

o0o

I would much appreciate the opportunity to discuss the teaching of map interpretation and aerial photographs with geography teachers in the Southern Region of Transkei. Would you be prepared to spare me half an hour at your school? I will telephone you to make an appointment.

Are you, therefore, prepared to discuss the teaching of map interpretation and photo analysis with me?

|     |  |
|-----|--|
| Yes |  |
| No  |  |

|  |   |
|--|---|
|  | 4 |
|--|---|

If "Yes", please fill in your name, address and telephone No.

Name: .....

Address: .....

Tel. No. ....

Thank you for your co-operation.

Monica Ndlwana  
M Ed Candidate  
Rhodes University

c/o Macibe Senior Secondary School  
P O Box 21  
KENTANE  
Transkei

## APPENDIX 3.B.

RHODES UNIVERSITYDEPARTMENT OF EDUCATION

Dear Colleague

As part of my Master of Education Degree at Rhodes University, I am preparing a half-thesis on "Problems encountered by Senior Secondary School pupils in the reading and interpretation of 1:50,000 topographical maps and aerial photographs with special reference to Black pupils in Transkei".

I have hence constructed a survey which needs to be administered to geography teachers in the Southern Transkei. Please would you assist me by completing the enclosed questionnaire on the teaching of map interpretation and photo analysis. As your name is not required on the form you can be assured of anonymity.

The structure of the questionnaire is such that it can be completed without taking too much of your time. When you have complete the questionnaire please return it to me. I will collect it after the end of the in-service course.

The success of this survey will largely depend on your co-operation. Your assistance in this regard will be greatly appreciated.

Yours sincerely

Monica Ndlwana

## APPENDIX 3.C.

SEMI - STRUCTURED INTERVIEW : GEOGRAPHY TEACHERSTEACHING OF MAPWORK

1. Which maps do you commonly use? e.g. 1:50,000 and/or textbook maps.
2. How do you use textbook maps? Do you use questions provided by the text book?
3. When using a 1:50,000 map of your local area do you take pupils out for fieldwork?
4. What strategies do you use when teaching mapwork? e.g. class exercises, discussions, fieldwork.
5. How do you manage to store your 1:50,000 maps if there are no classrooms set aside for geography only?
6. What do you think are the main reasons for pupils' difficulties in understanding mapwork?
7. What do you think would help to reduce these difficulties?

TEACHING OF AERIAL PHOTOGRAPHS

8. Where and how do you get your aerial photos?
9. Do you have stereo pairs?
10. How do you teach aerial photos?
11. What do you think are the main reasons for pupils' difficulties in understanding aerial photographs?
12. What do you think would help to reduce these difficulties.

GENERAL

13. When collecting teaching aids for geography what sort of problems do you encounter?

Monica Ndlwana  
M. Ed. Student  
Rhodes University

## APPENDIX 3.D.

## DIAGNOSTIC TEST

Based on map 3228 AC Butterworth

## SECTION A

## INSTRUCTIONS:

- a) Questions on this section are found on the answer sheet.

## SECTION B

## INSTRUCTIONS:

- a) Use both map and photograph to answer the questions.  
b) The figures referred to in the questions are found on the photograph.

## QUESTIONS

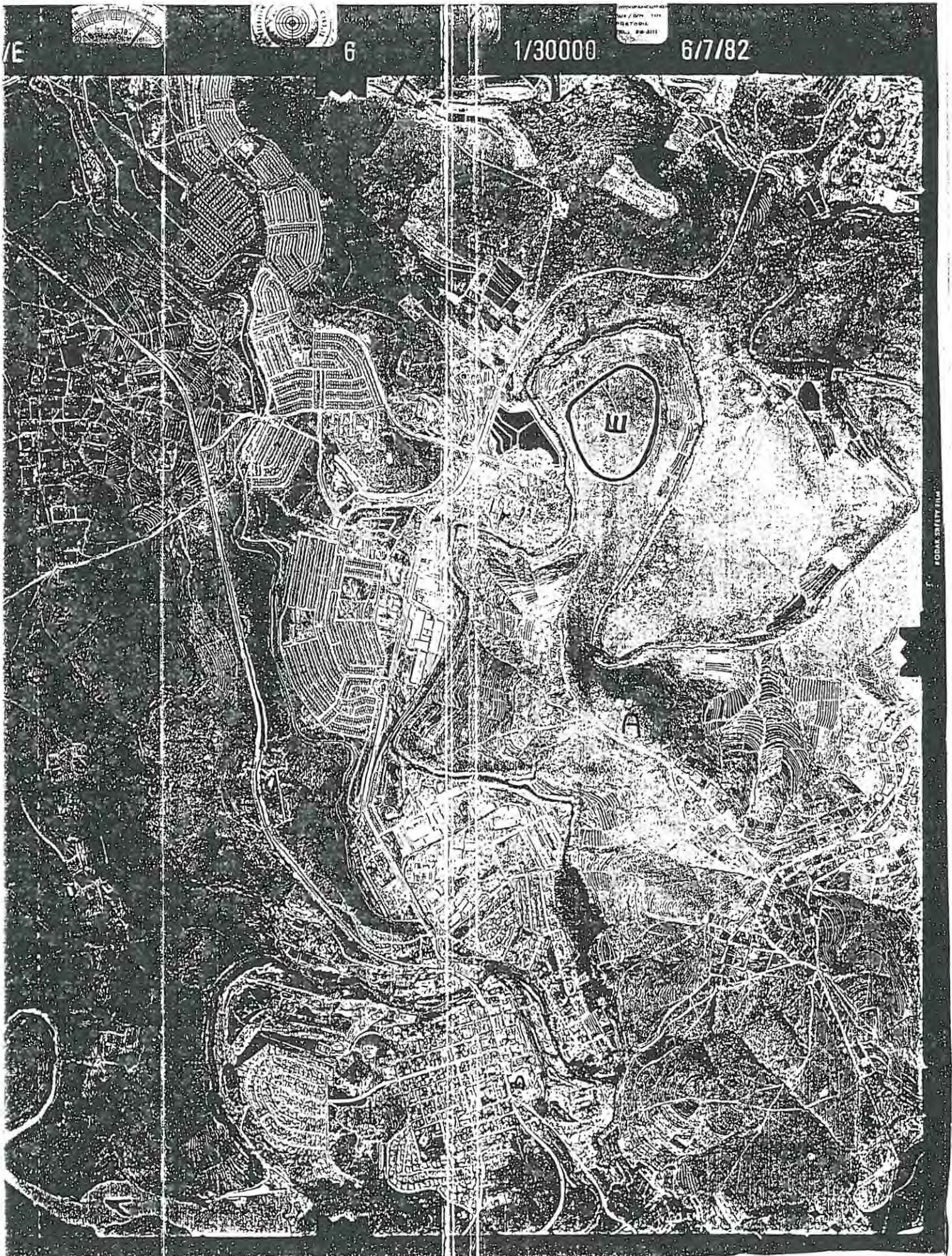
1. Identify the feature marked A.
2. Give two reasons why this feature is regarded valuable to this town.
3. Identify the feature marked B.
4. Give the height of the area marked D.
5. Why is the area marked E not cultivated?
6. Calculate the distance from the station to the Fortini settlement which lies SE of the town.
7. If this map should have been drawn on a scale of 1:5,000, would it be smaller or larger than it is now?
8. What is the compass direction of the station from the hospital?
9. Give the grid reference for Butterworth hospital.
10. What evidence is there of the ways in which local people get a living from the land?
11. What factors have influenced the linear shape of the settlements in this map?
12. Give a careful account of the factors which have influenced industrial development in this area.
13. Describe the type of slope found at Y.
14. Quote map evidence to support your answer.
15. In which direction does the Gcuwa River flow?

Appendix 3.E.

Map 3328 AC BUTTERWORTH

(See Pocket)

AERIAL PHOTOGRAPH OF BUTTERWORTH



FOCAL: 51.477 IN

## APPENDIX 3.G.

Unstructured group interviewsA. Reactions to the test:

- (i) Which questions of the exercise did you find easy? Why?
- (ii) Which questions of the exercise did you find difficult?  
Why did they prove difficult?

B. Familiarity with mapwork:

- (i) Do you do exercises like these in your geography lessons?
- (ii) How often do you do exercises in mapwork?
- (iii) Have you ever seen a map of your home area or school area?

C. Reactions to mapwork:

- (i) Do you think that we should learn mapwork?
- (ii) Why do you think we have to learn mapwork? Probe - Of which help is mapwork to mankind?
- (iii) Do you enjoy mapwork at all?
- (iv) Why?
- (v) Which aspects of mapwork do you find interesting? Why?
- (vi) Which aspects of mapwork do you find difficult? Why?

D. Integration of mapwork to other sections of geography syllabus:

- (i) When were you introduced to 1:50,000 and aerial photographs?
- (ii) With which sections of the geography syllabus do you use mapwork with?
- (iii) How would you like mapwork to be taught?
- (iv) Would you like to continue with this subject after matric?

