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Learning to read the South African 1:50 000 topographic map: the development of a self-instruction method

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APPENDIX A
SUPPORT FOR IMPROVED GRAPHICACY

While preparing the initial research proposal, a number of companies were approached for comment on the value of improving the graphicacy of learners through the medium of improved map reading ability. The letters which follow indicate the support of:

A.1 the building industry

A.2 the computer industry

A.3 the mining industry.

Amalgamated Union Of Building Trade Workers
of South Africa
Amalgameerde Unie Van Bouvak-Werkers
van Suid-Afrika

A.1

2de Verdieping, Trades Hall Oos, Andersonstraat 90, Johannesburg - 2nd Floor Trades Hall East, 90 Anderson Street.
UITVOERENDERAAD / EXECUTIVE COUNCIL

TELEFONE/TELEPHONES: 836-9061
FAX : 838-1629

POSBUS/P.O. BOX 5378
Johannesburg
2000

REF:

REF:J.C.S.003/91

MRS. L. INNES
9 VISSER STREET
FARRARMERE
BENONI
1501

13 JUNE 1991

Dear Mrs. Innes

I would like to thank you for approaching our Trade Union for comment on your proposals as we feel that it is of the utmost importance that Trade Unions should play an even bigger role in education at all levels than is being presently practised.
Training in Trades should not only start once the student has left matric but should be implemented in his High School years so that it can facilitate the student in choosing positively his career path at an early age instead of being confused with a career path when leaving school.

The following points should be taken into consideration when designing a education program that can benefit the Building Industry when discussing graphic skills:-

Map Reading in Geography should be linked to your basic drawing Technology in technical drawing classes, so that students can compare and relate Map Reading with technical drawings, there by forming a real life conception of graphics in every day enviroment.

The use of flow-charts,graphs,plans, work sheets ect. should be acquired in High School so that once training begins for a specific career e.g. general Foreman, Construction Supervisors, etc. in other words your contract leaders. They can then relate all of the above to planning the

everyday activities that will take place on a construction site.

Being able to use the different instruments in mapwork assists in future job training where the student will then be using a Theodo Light and Dumpy Level in the planning and setting out of buildings on various types of terrain where topographical layout of proposed sites needs to be percieved in order to set out the buildings and to forecast problems that could arise from the various types of terrain that can be encountered when acquiring a site for proposed construction.

The above are just a few examples of the way we see your project assisting future students with intentions of making the Building Industry their career.

Furthermore I would suggest that you should contact the following people who would be able to support you with further information:

Mr. Richard Hurry	Director of Kirchmann & Hurry Construction and President of Bifsa.
Mr. Mike Kirchmann	Director of Kirchmann & Hurry and Lecturer at Wits.

I hope that the above information will assist you in your efforts in procurring better education standards in South Africa.
If any further assistance is required do not hesitate to contact us and please keep us informed of your progress.

Yours faithfully

J.C.S. DE OLIVEIRA
NATIONAL ORGANISER

Information Services Management

ISM

Johannesburg

PO Box 1419 Johannesburg 2000
124 Main Street Johannesburg 2001
Tel. (011) 224-9111
Telex: SA 485686
Fax (011) 224-3003

A.2

21 May 1991

Mrs L Innes
9 Visser Street
Farrarmere
Benoni
1501

Dear Mrs Innes,

Re: MAPTRIX Research Proposal

Thank you for sharing your ideas concerning this very interesting proposed investigation of yours to improve 'graphicacy skills' in lea rs. Some of my comments are the following:

MAPTRIX (Improving map reading and interpretation skills): These skills are certainly used in a different way in my field of work. Our employees have to understand flow-charts, business information both on high technology equipment and in hard copy format. The ability to assimilate conceptual data is a regular event in the computer industry. The three dimensional aspects of your proposed work also has merit. Each year new technology appears on the market which improves the presentation of data in the Mining, Retailing, and Manufacturing Industries. Hence, if pupils and students have had an improved didactic experience in recognising and interpreting data as you wish to do, it should have a positive transfer effect to the work place once the learners graduate and qualify for improved work opportunities. The areas of Systems Design, Application Development, Project Management, and related fields in the Information Technology Industry would certainly appreciate new staff with improved skills in these areas.

I wish you success in your research endeavours. Should you wish to test any of your ideas with specific (may be modified) areas of application suitable to the High Technology Industry, I shall be willing to give you any guidance or help that you may need.

Yours sincerely,

C. Táim (B.A, DTE, M.Ed cum laude)
(Education/Training Consultant)

Information Services Management (Pty) Ltd
Reg No 82/00208/07

Directors
J F Clarke (Chairman) B D Mehl (Managing)
D M Hennessy B D Ireland R J Khoza
R D Lallvaux D H A Pegg (British) R A Shepherd

Member of Technology Systems International (TSI)

Anglo American Corporation of South Africa Limited

91/385/mm

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A.3

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Telephones:
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Direct line (011) 638-

SCHOLARSHIP & BURSARY UNIT

June 11, 1991

Mrs L Innes
9 Visser Street
Farrarmere
BENONI
1501

Dear Mrs Innes

MAPTRIX RESEARCH PROPOSAL

I have read your proposal on mapwork research with interest as I agree that the need to improve the quality of the communication of spatial information is of great importance in this day and age.

It is the function of the Graduate Recruitment Department to provide the operating Divisions of the Anglo American Corporation and De Beers Consolidated Mines with graduate manpower. Our scholarships in the main are awarded for Engineering and Geology. Whilst Geography is not a pre-requisite for these courses of study, those students who have studied the subject must surely be at an advantage.

Much of the university course material and indeed, the later practical application in the job situation of the engineer and the geologist, involves the use of graphs, maps, drawings and other graphic material. I therefore commend your proposal to research the extent of the poorly developed graphicacy skills of students and to develop a system of teaching which will enhance these skills .

In the light of present circumstances, especially in Black education, I believe your goals of cost effectiveness, discrepancies in achievement and self-instruction are highly relevant and of great importance.

I extend my very best wishes to you and wish you every success in this important venture.

Yours sincerely

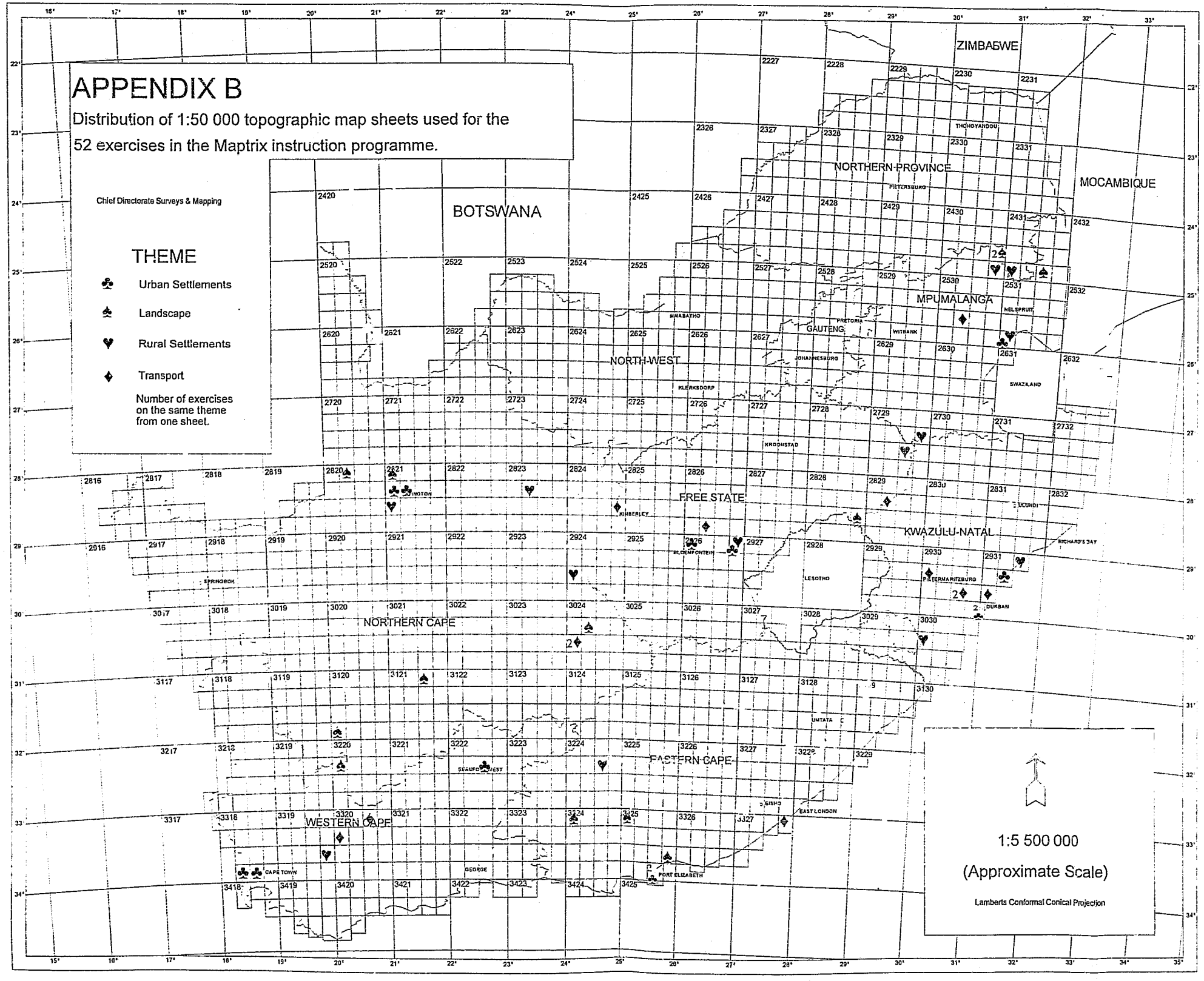
T J HALL (MR)
Divisional Training Manager
Graduate Recruitment Department

TJH/ck/385/mm

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APPENDIX B

Distribution of 1:50 000 topographic map sheets used for the 52 exercises in the Maptrix instruction programme.



APPENDIX C
AN EXAMPLE OF SOME OF THE ITEMS USED TO COMPILE A WORK CARD AND AN ANSWER CARD (5♠)

(as listed in figure 5.2)

Items used for the front of the work card:

- **C.1** A monochrome copy of the selected map extract showing the alpha-numeric grid and the reference list (map key)
- **C.2** The exercise including the introductory text and ten graded questions

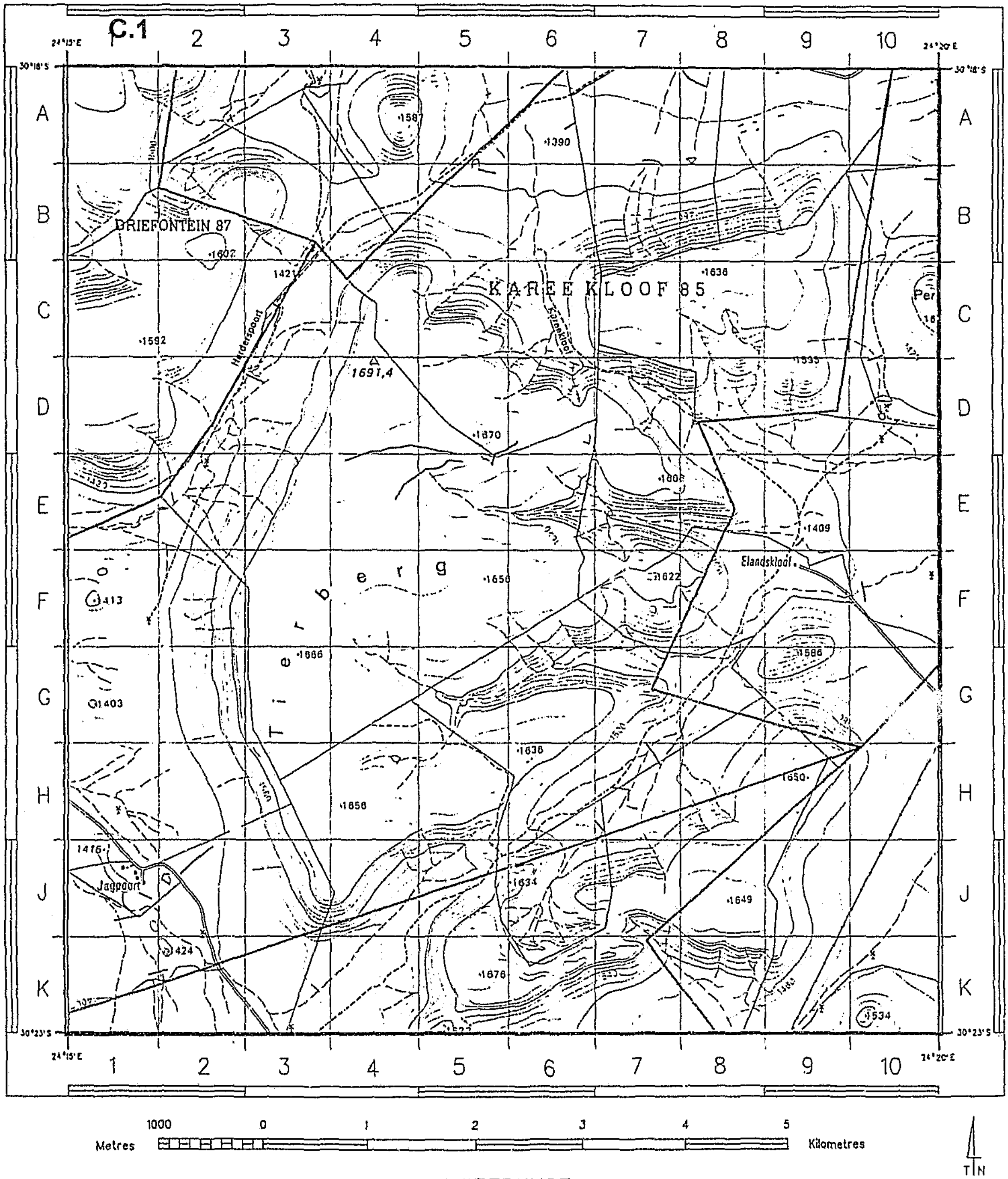
Items for the back of the work card

- **C.3** The selection of ten illustrated symbol explanations (reduced to A3)
- The lesson text for 5♠ is included in appendix E.3

Items used for the answer card

- **C.4** The ten answers
- The 5♠ playing card is not illustrated.

♠ 5 EXTRACT FROM PHILIPSTOWN 3024AD 1:50 000



REFERENCE

- National Freeway; National Route
- Arterial Route
- Main Road
- Secondary Road; Bench Mark
- Other Road; Bridge
- Track and Hiking Trail
- Railway; Station or Siding
- Other Railway; Tunnel
- Embankment; Cutting
- Power Line
- Built-Up Area
- Buildings; Ruin
- Post Office; Police Station; Store
- Place of Worship; School; Hotel
- International Boundary and Beacon
- Provincial Boundary
- Game, Nature Reserve & State Forest Boundary
- Perennial River
- Perennial Water
- Non-perennial River
- Non-perennial Water
- Dry Water Course
- Dry Pan
- Marsh and Vlei
- Pipeline (above ground)
- Water Tower; Reservoir; Water Point
- Coastal Rocks
- Prominent Rock Outcrop
- Fence; Wall
- Windpump; Monument
- Communication Tower
- Mine Dump; Excavation
- Trigonometrical Station; Marine Beacon
- Lighthouse and Marine Light
- Cemetery; Grave
- Erosion; Sand
- Woodland
- Cultivated Land
- Orchard or Vineyard
- Recreation Ground
- Row of Trees
- Original Farms

APPENDIX C.2

LANDSCAPE

5♠

PHILIPSTOWN 3024AD Map Extract 30°18'S; 24°15'E

This area is near Philipstown in the north eastern corner of the Karoo. The sandy, flat-topped hills and sparse semi-desert vegetation make this area difficult to live in. The landscape is easy to examine on the map because there are very few signs showing settlement or economic activity.

1. The highest point on each topographic map sheet is shown in bold, dark numbers. Name the map symbol and give the height of the point in D4.

2. River valleys in a hilly area provide flat ground for easier travelling. What will you drive on if you go through *Herderspoort* (D2, C3)?

3. A butte is another name for a flat topped hill. There is a good example of a butte in A4. Give the height on top of this butte.

4. The map area consists of flat topped hills rising from a flat plain. Using the spot heights as a guide, write down which two of the following blocks are part of the flat plain: G3, K1, C1, E9, J8.

5. In this semi-desert landscape water provision is very important. Name the 2 features in A3 which help ensure a permanent water supply.

6. When there is a thunderstorm in an arid area, there is very little vegetation to protect the sandy surface. Most of the rain water runs off over the surface carrying away the soil. At first the erosion forms a small gulley, this grows deeper each time it rains to form a donga which eventually deepens to form a gorge (*kloof*). Name the gorge in C6.

7. The gorges in C6 and D7 are being eroded by two non-perennial streams which flow in different directions when it rains. Give the block reference where the stream draining towards the east leaves the map area.

8. The dark contour line at the base of the butte in A4 is 1400 m. How high is the butte above the surrounding country side?

9. Water flows fastest down the steepest slope. In which of the following blocks are there the most, fast flowing non-perennial streams; E6, B7, J6, H1?

10. Tierberg (G3 to F4), a high flat-topped tableland known as a mesa, covers most of the farm Karee Kloof (named in C5, C6, C7). Follow the original farm boundary from the edge of the map (A10) towards H10 where three boundaries meet. Give the references for two blocks where this part of the Karee Kloof farm boundary bends on the points of narrow spurs.

APPENDIX C.4

LANDSCAPE

5♠

PHILIPSTOWN 3024AD

1. trigonometric station, 1 691,4 m
2. track
3. 1 587 m
4. K1, E9
5. wind pump and dam
6. Kareekloof
7. E10
8. (1 587 m - 1 400 m =) 187 m.
9. J6
10. E8 and G7

APPENDIX D
TWELVE STEPS IN DESIGNING THE MAPTRIX INSTRUCTION PROGRAMME

(after Gagné and Briggs, 1974)

Step 1 Analysis and identification of needs

The broad problem of poor mapwork performance and the need for improvement are discussed and the focus on topographic map reading is justified.

Step 2 Definition of goals and objectives

A hierarchy of component skills is outlined, specific learning units are identified and performance objective statements are constructed and analysed.

Step 3 Identification of alternative ways to meet needs

Various strategies for teaching map reading are evaluated.

Step 4 Design of system components

The main components of the programme are: the assessment component, both formative and summative; the map reading exercises including the questions and answers, and the support material which aids the learners when they begin the programme (but is relied on less as skills improve). The final format of these components includes work cards, answer cards and a pupil booklet accompanied by a local topographic map sheet suitably packaged in a teaching kit.

Step 5 Analyses of resources required, resources available and constraints

Extracts from topographic map sheets and illustrations for map symbols must be acquired. Appropriate computer hardware, software and expertise are identified.

Step 6 Action to remove or modify constraints

Time and a unique employment opportunity eventually overcome financial and other resource constraints. Friends and colleagues make their skills available to overcome other obstacles.

Step 7 Selection or development of instructional materials

The compilation of instructional materials includes the selection of map extracts, overlaying of a reference grid and the authoring of the map reading exercises and answers as well as the authoring and illustrating of the support material, including lesson texts and symbol explanations. Instructions for following the programme are formulated.

APPENDIX D (cont)

Step 8 Design of student assessment procedures

Answer sheets and progress graphs are designed for a pupil booklet to give the learners and their teachers immediate feedback.

Step 9 Field testing; formative evaluation and teacher training

A pre- and post-test are used to assess the efficacy of the programme prior to completion of all components. Learners' responses guide the improvement of the programme while it was still at this formative stage. Teacher training needs are identified during the pilot test and classroom trial.

Step 10 Adjustments, revisions and further evaluation

The completion of the prototype learning programme is guided by the findings of the pilot test. Confusion resulting from the wording of instructions and exercises, is identified and removed. Support material such as symbol explanations and lesson texts are completed.

Step 11 Summative evaluation

A full report on the school trial is prepared.

Step 12 Operational installation

The objective of the research project is to develop a self-instruction method for learning to read the South African topographic map. The prototype resulting from this method has been developed and limited testing has been done. Recommendations for the further development and assessment of this method in schools are made.

APPENDIX E

EXAMPLE OF LESSON TEXTS FOR THE THEME LANDSCAPE ♠

Work cards in the spades suit focus on the landscape. The objective of the exercises is to offer learners the opportunity to read maps showing a wide variety of landscapes using different map signs especially those indicating height. To ensure that variations from rugged to undulating relief are encountered, exercises are divided into three groups. Learners must select a minimum of one card from each group. The map extracts for the subdivisions within this theme have been selected as follows:

- picture cards: Ace, Jack Queen and King show flat and undulating plains.
- odd numbers: 3, 5, 7 and 9 feature individual mountains or mountain ranges.
- even numbers: 2, 4, 6, 8 and 10 focus on valleys.

E.1 DEFINITION OF THE MAIN THEME

(used at the start of all lessons in the theme)

Landscape is what we see everywhere around us. Topographic maps show features of the landscape. We will take a look at different kinds of landscape and then study some of the map symbols which show what the landscapes of different areas are like.

By the time you have mastered this topic, you will be able to

- read the height clues on topographic maps,
- identify different slopes and
- be able to describe different types of landscapes.

E.2 SUB-THEME: PLAINS

(used on work cards Ace♠, King ♠, Queen ♠, and Jack ♠)

PLAINS are landscapes which are flat or have very gentle slopes. They may differ from a low lying coastal plain to an elevated (high) plateau.

LANDSCAPE is a word with many different meanings.

CULTURAL LANDSCAPE, sometimes called *man-made landscape,* describes what people have done to change the natural surroundings.

- Buildings and roads, mine dumps and excavations, bridges and dams are all built to serve our towns and cities. Such built up areas have an *urban landscape.*

- In farming areas we see cultivated lands, orchards, vineyards and plantations. These show that people have changed the natural veld into productive land, producing a *rural landscape.*

NATURAL LANDSCAPE is what we see around us that people have left unchanged. Other ways of describing natural landscape are *physical features* or *relief.* These include rivers, coastlines, mountains and plains where there are few settlements (places where people settle or live). Natural vegetation is also part of the landscape. Some parts of the natural landscape have been declared *nature reserves* so that these areas cannot be changed by people.

HEIGHT CLUES on topographic maps include

- **Rivers** which show where the low lying ground is; remember that water always flows downhill.
- **Spot heights** give the exact height above sea level of a particular spot (place).
- **Bench marks** are found on topographic maps along roads and railway lines. A little arrow and a number give the exact height of a road or railway line at the point of the arrow.
- **Trigonometric or trig stations** are marked by concrete pillars which must be erected for accurate topographic mapping. The trigonometric station, where a beacon is erected, is shown on the map by a triangle. The number below the triangle is the height of the ground, the number beside the triangle is the registration number of the station.
- **Contour lines** on a topographic map join all places of the same height above sea level. There are no contour lines on the landscape. Remember that the higher the value of the number on the contour line, the higher the land lies. Lower value numbers mean lower areas. All the places which lie on the same contour line are at the same height above mean (average) sea level. The numbers are written so that the top of the number is towards the top of the slope.

E.3 SUB-THEME: MOUNTAINS

(used on work cards 3♠, 5♠, 7♠, and 9♠)

MOUNTAINS are the high lying areas of the landscape made up of combinations of different slopes.

LANDSCAPE FEATURES are a combination of different uphill and downhill slopes shown by the pattern of the contour lines and other clues. Read the explanations for contour lines and trig stations on this page *[illustrated symbol selections for this sub-theme all included these two symbols]* and look at the spot heights on the map. Remember that water always flows downhill so rivers must flow from high to low ground.

- **Steep slopes** are shown by contours which are close together.
- **Gentle slopes** are shown by contours which are far apart.
- **Concave slopes** are steep at the top and gentle at the bottom.
- **Convex slopes** are gentle at the top and steep at the bottom.
- **Even or regular slopes** may be steep or gentle but have the same distance between contours.
- **Terraced slopes** are alternately steep and gentle.

A **hill** is identified by contour lines which join up to form roughly circular shapes which get smaller and smaller towards the highest point.

A **valley** is always easy to spot because there is either a perennial or non-perennial stream crossing the point of the V-shaped contours. The lowest contour lines are on the inside of the V.

Mountain **ridges** have contour lines which make sausage shapes at the top. You can clearly see the streams draining downhill on each side, away from the top of the ridge which often forms a watershed (division between drainage basins).

A **spur** is recognised by the long finger shaped contours extending out from the top of a mountain or hill. Spurs are narrow areas of high ground which often separate river valleys.

A **watershed** is an area of high ground (often following a ridge) which causes rain water to flow downhill towards the low ground on either side. There is no separate symbol for a watershed but the fact that streams flow away from an area surrounded by closed contour lines tells us that it is high ground.

E.4 SUB-THEME: VALLEYS

(used on work cards 2♠, 4♠, 6♠, 8♠ and 10♠)

VALLEYS are low-lying landforms where rivers flow.

RIVERS carry water and are shown by blue lines on a map. Water always flows downhill so streams and rivers always flow from high ground down to lower ground. *Rivers can sometimes tell us how steeply or gently the land slopes. Rivers will* usually flow straight down a steep slope but they will flow from side to side across a flat area.

DRAINAGE BASINS are the areas drained by a river system. The watershed forms the highest edge of the drainage basin and is where the source of the river is. From the high ground the river and its tributaries join and flow downhill towards the mouth which is the lowest part of the drainage basin and is usually the sea.

RELIEF refers to the shape of the land and is described by measuring height above sea level or *altitude*. We need to understand how the uphill and downhill shape of the land is shown on the flat surface of a map. Apart from the clues that water gives us about high and low lying parts of the landscape, here are four more clues to use when gathering information about the shape of the landscape.

Spot heights give the exact height above sea level of a particular spot (place).

Bench marks are found on topographic maps along roads and railway lines. A little arrow and a number give the exact height of a road or railway line at the point of the arrow.

Trigonometric or trig stations are marked by concrete pillars which must be erected for accurate topographic mapping. The trigonometric station, where a beacon is erected, is shown on the map by a triangle. The number below the triangle is the height of the ground, the number beside the triangle is the registration number of the station.

Contour lines on a topographic map join all places of the same height above sea level. There are no contour lines on the landscape. Remember that the higher the value of the number on the contour line, the higher the land is. Lower value numbers mean lower areas. All the places which lie on the same contour line are at the same height above sea level.

APPENDIX F
INSTRUCTIONS FOR FOLLOWING THE PROGRAMME

(on the front cover of the pupil booklet)

Instructions

1. Pick a card - any card
2. Open your answer book in the section displaying the same sign as the card you have selected: ♦, ♣, ♥, ♠
3. Write down the time
4. Write down the card number
5. Study the map and answer the questions in the spaces provided herein
6. Use the lesson and explanations only if necessary
7. When you have attempted each question write down your finish time
8. Put the card back in the correct box
9. Take the correct answer card
10. Mark your answers
11. Add up your score and indicate the total
12. Fill in your progress chart at the back
13. Choose another card from the box of the same suit and repeat steps 3 to 12
14. You are required to answer at least one picture card, one odd number card and one even number card
15. After this minimum of three cards, continue answering cards from the same suit until you score 8/10. This means you have mastered a Topic - Well Done!
16. Go to the next suit and repeat steps 1 to 15.

Good Luck!

APPENDIX G

MAPTRIX PROOF READING REPORT

NAME_____DATE_____

Card Code ♣ ♦ ♥ ♠
(please ✓) Urban settlement Transport Rural Settlement Landscape

Card No. (✓)Ace 2 3 4 5 6 7 8 9 10 Jack Queen King

Name of Map Extract_____

Introductory Text Interesting? (please ✓) ☺ 😐 ☹

Suggestions?_____

Questions and Answers Start time_____

Question number	Please fill in your answer	Check ✓ or X	Comments (see options below or else comment freely)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Questions and Answers Finish time_____

Options
A Question was not clear (please suggest an improvement if possible)
B Answer on sheet was incorrect (give correct answer if possible)
C Block reference in question was wrong (should be....)
D Block reference in answer was wrong (should be....)

Exercise Text Interesting? ☺ 😐 ☹ Difficult? ☺ 😐 ☹

Suggestions?_____

APPENDIX H
PRE- AND POST-TESTS

(each test consists of two pages)

H.1 TEST MAP FROM MOWBRAY STYLE CHART

H.2 MAPTRIX TEST S with answer sheet as used for pilot test

H.3 MAPTRIX TEST E with answer sheet as used for pilot test

H.4 Cover letter used to introduce the Maptrix programme during the school trial

H.5 MAPTRIX TEST S used for school trial

H.6 MAPTRIX TEST E used for school trial

H.7 ANSWER SHEET used for school trial

H.2 MAPTRIX TEST S

Name the transport features shown in black, in the blocks below.

1. I11

2. D15

3. E3

4. What do you think the black squares and rectangles in H9 are used for?

5. If you went to stay at Montana (C3-D3) in False Bay, what kind of holiday accommodation would be available?

6. Apart from the shop in New Era (C10-B10), name one other place where you could go and purchase some small items.

7. What is the unnamed feature associated with mining found in G10?

8. Name the feature stretching from A2 to E5.

9. What kind of construction is indicated along the transport feature in B6?

10. The blue line around Somerpunt (E1) is smooth, suggesting an even coastline, perhaps a beach. What does the black line around Stanley Point (G5) indicate?

11. The line between D5 and E5 is drawn over an area of crosses. What do these crosses indicate?

12. Identify the site indicated in the unusual writing (Gothic script) in block C19.

13. How many dams are there in block C12?

14. In which of the following blocks does a non-perennial river occur, D10, I14 or B19?

15. What feature occupies the area between Mowbray Aerodrome (H9-H10) and Salt River Station (H10)?

16. From where do the people at Ratsegae (I21) get their water?

17. In block D8 there is a man made weir across the river. What natural river feature can also be seen in this block?

18. Water is being drawn from the dam in G11, how does it reach the buildings in G9?

19. What height does the darker contour line in H19 indicate?

H.2 (cont)

20. In which of the following blocks does a dry pan occur, C2, A2 or E21 ?

21. Serious soil erosion has occurred near Mentzdam (G14). In which block has most erosion occurred?

22. What kind of farming is done at Boschrant (H15)?

23. Of the two farms named Antrim in I11 and I12, the one with the water point is better protected from wind. What map evidence supports this statement?

24. Follow the green line which starts in A19 and name the feature which this boundary encloses.

25. What sign in G4 helps guide ships into the harbour?

H.2 (cont)

MAPTRIX TEST S

ANSWER SHEET

Please fill in your answers in the spaces below, try to fill all the spaces even if you take a calculated guess! Please fill in the start time at the beginning and the time when you finish. Thank you!

START TIME	13
1	14
2	15
3	16
4	17
5	18
6	19
7	20
8	21
9	22
10	23
11	24
12	25

FINISH TIME _____

MAPTRIX TEST E.

Identify the transport features shown in black in the following blocks.

1. F16

2. E11

3. A21

4. What do you think the black squares and rectangles in G9 and G10 are used for?

5. At Pumalanga (G20) most people are farmers. What building indicates that someone is making a living without farming?

6. At which special function building in F6 will you find large numbers of young people?

7. There are two similar unnamed features in F10 which are associated with mining, what are they?

8. What is the feature stretching from G9 to G10 used for?

9. What kind of construction is indicated along the transport feature in A6?

10. Which side of Bantry Bay would not be safe for swimming, the part in E4 or F4? In your answer give the block reference and in one word give the reason.

11. Which feature in block D14 could have provided shelter for the original settlers in this area?

12. What is indicated by the symbol in H12 which is labelled in unusual lettering (Gothic script) in H12?

13. Name the largest dam in the map area.

14. A confluence is where two rivers join. In which block does a non-perennial tributary join a perennial river: F13, I14 or D18?

15. What natural feature does the Brinkspruit flow through in I10?

16. Clewer Agricultural Holdings (C4) is well supplied with water. Apart from a dam, river and wind pump, from where else do they draw water?

17. What feature occurs in the Vaal River in block B13?

H.3 (cont)

18. A canal has been built to irrigate the farms near Mentzdam. This canal crosses a stream bed (in the corner of H15). Name the construction which makes this possible.

19. What height does the contour line in B20 indicate?

20. In which of the following blocks does a sandy river bed occur, B19, H18 or B1?

21. Although the Drakensburg is higher, Ntabende (D17) is rockier. Which conventional sign indicates this fact?

22. The farm Rotsvas (C9) produces grain and not fruit like the surrounding farms. What evidence from the map supports this statement?

23. What kind of vegetation grows in the Tugela valley along most of the river's course (C19 to I12)?

24. What sports facility is indicated in E8?

25. What is the sign in H6 which warns ships about the dangerous rocks?

H.3 (cont)

MAPTRIX TEST E

ANSWER SHEET

Please fill in your answers in the spaces below, try to fill all the spaces even if you take a calculated guess! Please fill in the start time at the beginning and the time when you finish. Thank you!

START TIME	13
1	14
2	15
3	16
4	17
5	18
6	19
7	20
8	21
9	22
10	23
11	24
12	25

FINISH TIME _____



Hi!

Welcome to maptrix

My name is carto, you'll see a lot of me around the maptrix programme. Want to know where it got its name? Well it could be from the matrix or grid of lines drawn over the maps to help you find the information you need or it could be from the tricks you'll learn from the programme to help you read maps.

Before getting into the programme itself, we would like to find out how much you already know about topographic maps. Please answer these questions. Try your best to complete the questions but rather leave the ones you are not sure of and come back to them at the end. If you are still not sure of the answer, please draw a line through the answer block.

Now have a close look at the map. If you know anything about South African geography, and I'm sure you do, you might think that the map is all wrong! The Drakensburg Mountains are definitely not so close to the sea. The Indian Ocean is off the east coast of South Africa and Lesotho is nowhere near the coast. Well it is a little strange. Is has been made up specially from all the signs you would probably find on the latest series of South African topographic maps. It's really just a fun map and therefore just the right place to start working through the maptrix programme.

Please don't make any marks on the map itself. Your answers must be written on the prepared answer sheet. Please don't forget to write down the time when you start and finish.

Thank you for your help

Carto

H.5

maptrix

TEST S

Identify one transport feature shown in **black** in each of the following blocks.

1. I11
2. D15
3. E3
4. What are the black squares and rectangles in H9?
5. If you went to stay at Montana (C3-D3) in False Bay, what kind of holiday accommodation would be available?
6. Apart from the shop in New Era (C10-B10), name one other place where you could go and purchase some small items.
7. What is the unnamed feature associated with mining found in G10?
8. Name the feature stretching from A2 to E5.
9. What kind of construction is indicated along the transport feature in B6?
10. The blue line around Somerpunt (E1) is smooth, suggesting an even coastline, perhaps a beach. What does the black line around Stoney Point (G5) indicate?
11. The line between D5 and E5 is drawn over an area of crosses. What do these crosses indicate?
12. Name the site indicated in the unusual writing (Gothic script) in block C19.
13. How many dams are there in block C12?
14. In which of the following blocks does a non-perennial river occur, D10, I14 or B19?
15. What feature occupies the area between Mowbray Aerodrome (H9-H10) and Salt River Station (H10)?

H.5 (cont)

16. From where do the people at Ra..gae (I21) get their water?

17. In block D8 there is a man made weir across the river. What natural river feature can also be seen in this block?

18. Water is being drawn from the dam in G11, how does it reach the buildings in G9?

19. What height does the darker contour line in H19 indicate?

20. In which of the following blocks does a dry pan occur, C2, A2 or E21 ?

21. Serious soil erosion has occurred near Mentzdam (G14). In which block has most erosion occurred?

22. What kind of farming is done at Boschrant (H15)?

23. Of the two farms named Antrim in I11 and I12, the one with the water point is better protected from wind. What map evidence supports this statement?

24. Follow the green line which starts in A19 and name the conservation area which this boundary encloses.

25. What sign in G4 helps guide ships into the harbour?

H.6

maptrix

TEST E

Identify one transport feature shown in **black** in each of the following blocks.

1. F16
2. E11
3. A21
4. What are the black squares and rectangles in G9 and G10?
5. At Pumalanga (G20) most people are farmers. What building indicates that someone is making a living without farming?
6. Name the special function building in Salem (C21) where young people could go after school to get something to eat.
7. There are two similar unnamed features in F10 which are associated with mining, what are they?
8. What is the feature stretching from G9 to G10 used for?
9. What kind of construction is indicated along the transport feature in A6?
10. Which side of Bantry Bay would not be safe for swimming along the coast: the part in E4 or F4? In your answer give the block reference and in one word give the reason.
11. Which feature in block D18 shows that some of the original settlers in this area have abandoned their home?
12. What is indicated by the symbol in H12 which is labelled in unusual lettering (Gothic script) in H13?
13. Name the largest dam in the map area.
14. A confluence is where two rivers join. In which block does a non-perennial tributary join a perennial river: F13, I14 or D18?
15. What natural feature does the Brinkspruit flow through in I10?

H.6 (cont)

16. Clewer Agricultural Holdings (C5) is well supplied with water. Apart from a dam, river and wind pump, from where else do they draw water?

17. What feature occurs in the Vaal River in block B13?

18. A canal has been built to irrigate the farms near Mentzdam. This canal crosses a stream bed (in the corner of H15). Name the construction which makes this possible.

19. What height does the contour line in B20 indicate?

20. In which of the following blocks does a sandy river bed occur, B19, H18 or B1?

21. Although the Drakensburg is higher, Ntabende (D17) is rockier. Which conventional sign indicates this fact?

22. The farm Rotsvas (C9) produces grain and not fruit like the surrounding farms. What evidence from the map supports this statement?

23. What kind of vegetation grows in the Tugela valley along most of the river's course (C19 to I12)?

24. What sports facility is indicated in E8?

25. What is the sign in H6 which warns ships about the dangerous rocks?

H.7

maptrix

ANSWER SHEET

NAME_____

TEST S / E (PLEASE TICK WHICH ONE YOU WERE GIVEN)

Please fill in your answers in the spaces below, try to fill all the spaces even if you take a calculated guess! Please fill in the start time at the beginning and the time when you finish. Thank you!

START TIME	13
1	14
2	15
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11	24
12	25

FINISH TIME_____

APPENDIX I
LETTER OF ENCOURAGEMENT

Report on mapawareness

I would like to express my greatest pleasure on my involvement in your research programme, Maptrix.I find the exercises so helpful on intepretation and analysis of maps.These exercises improved our feature and speed observations skills.This programme made me realise the importance and purpose of features on maps, you get to analise and to know the area closely as possible [i.e different functions;activities;street patterns;etc.]

In my opinion the programme is essential and very helpful if implemented from lower level to curb the ignorance and illiteracy of maps in our communities.There should be means of reaching-out to the disadvantaged communities throughout the country to promote the programme and preach the gospel effectively. It is very easy to suggest Media but is not really a solution due to the fact that not everybody owns a TV set, Radio, or could afford to purchase newspapers due to economic factors [i.e taking unemployment into consideration].There is quite a lot that I learn from this programme and I appre-iate the development.Keep up the good work and revive the spirit of Map Literacy.

Forward with the "Action Programme Maptrix" Forward!!!! .....I thank you!

Yours faithfully
Allan Diniso

18/07/97



APPENDIX J - Summary of pupil data

Class 1	Pre Test		Post Test		Diff		Gain	Gender	Home Language	Age
Pupil code	/24	%	/24	%	/24	%	%			
1	13.0	55	20.0	80	7.0	29	54	F	English only	15 years 9 months
2	12.0	50	22.0	92	10.0	42	83	F	English and Afrikaans	14 years 9 months
3	17.0	71	18.5	78	1.5	6	9	M	English only	16 years 3 months
4	10.0	42	20.5	86	10.5	44	105	M	English only	16 years 6 months
5	8.0	34	20.0	84	12.0	50	150	F	English only	15 years 3 months
6	9.0	39	17.0	71	8.0	34	89	M	English only	15 years 3 months
7	9.0	39	17.5	74	8.5	36	94	F	English and Afrikaans	15 years
8	18.0	76	20.0	84	2.0	8	11	M	English only	15 years 3 months
9	9.0	39	18.0	76	9.0	39	100	F	English only	15 years 3 months
10	3.0	13	16.5	69	13.5	57	450	F	English only	15 years 9 months
11	14.5	61	23.0	97	8.5	36	59	F	English and Afrikaans	15 years
12	8.0	34	17.5	74	9.5	40	119	F	English only	15 years
13	11.5	48	17.0	71	5.5	23	48	F	English and Afrikaans	15 years
14	6.5	27	12.5	53	6.0	25	92	F	English only	15 years 3 months
15	13.0	55	18.0	76	5.0	21	38	M	English only	15 years
16	14.0	59	21.5	90	7.5	32	54	F	English only	15 years 3 months
17	11.0	46	20.0	84	9.0	39	82	F	English and Afrikaans	15 years 3 months
18	10.5	44	18.5	78	8.0	34	76	M	English and Xhosa	13 years 9 months
19	7.5	32	8.0	34	9.5	2	127	F	English and Afrikaans	15 years 3 months
20	13.0	55	19.0	80	6.0	25	46	F	English and Afrikaans	16 years
21	14.5	61	23.0	97	8.5	36	59	F	English and German	14 years 9 months
22	11.0	46	15.0	63	4.0	17	36	F	English only	15 years
23	17.0	71	19.5	82	2.5	11	15	F	English only	15 years
24	16.0	67	16.0	67	0.0	0	0	F	English and Afrikaans	14 years 9 months
25	11.5	48	17.0	71	5.5	23	48	M	English and Xhosa	14
26	15.5	65	19.5	82	4.0	17	26	F	English and Afrikaans	14 years 6 months
27	9.0	39	17.0	71	8.0	34	89	F	English only	15 years
28	18.0	76	23.0	97	5.0	21	28	M	English and Afrikaans	15 years
29	10.0	42	16.5	69	6.5	27	65	M	English only	15 years 3 months
30	16.0	67	17.5	74	1.5	6	9	F	English only	15 years 3 months
31	10.0	42	19.0	80	9.0	39	90	F	English and Afrikaans	14 years 9 months
32	14.5	61	18.5	78	4.0	17	28	M	English and Afrikaans	15 years 3 months

APPENDIX J (cont.)

Class 1 (cont.)	Pre Test		Post Test		Diff		Gain	Gender	Home Language	Age
Pupil code	/24	%	/24	%	/24	%	%			
33	16.0	67	16.0	67	0.0	0	0	M	English and Afrikaans	15 years 6 months
34	14.0	59	18.0	76	4.0	17	29	F	English and Afrikaans	15 years 3 months
35	15.0	63	20.0	84	5.0	21	33	M	English and Afrikaans	14 years 9 months
36	9.5	40	16.5	69	7.0	29	74	M	English and Afrikaans	15 years 3 months
37	5.5	23	17.0	71	11.5	48	209	F	English and Afrikaans	15 years 3 months

Class 2	Pre Test		Post Test		Diff		Gain	Gender	Home Language	Age
Pupil code	/24	%	/24	%	/24	%	%			
38	9.0	38	16.5	69	7.5	31	83	M	English and Afrikaans	15 years 3 months
39	12.0	50	16.0	67	4.0	17	33	M	English and Afrikaans	15 years
40	10.0	42	16.0	63	6.0	21	60	M	English and French	15 years 3 months
41	8.0	34	16.5	69	8.5	35	106	M	English and Afrikaans	15 years 3 months
42	4.5	19	12.5	53	8.0	34	178	M	English and Afrikaans	16 years 3 months
43	9.0	39	11.0	46	2.0	7	22	F	English and Afrikaans	15 years 3 months
44	10.5	44	17.0	71	6.5	27	62	M	English only	15 years 9 months
45	12.0	50	13.0	55	1.0	5	8	M	English only	15 years 3 months
46	7.5	32	13.0	55	5.5	23	73	F	English and Afrikaans	15 years
47	5.5	23	20.5	86	15.0	63	273	M	English only	17 years
48	5.0	21	12.0	50	7.0	29	140	F	English and Xhosa	17 years
49	5.0	21	10.0	42	5.0	21	100	M	Xhosa only	15 years 6 months
50	8.0	34	12.5	53	4.5	19	56	F	English and Xhosa	15 years 9 months
51	10.0	42	16.0	67	6.0	25	60	F	English and Xhosa	17 years
52	4.0	17	12.0	50	8.0	33	200	F	English and Xhosa	15 years 6 months
53	13.0	55	19.5	82	6.5	27	50	F	English and Xhosa	14 years 6 months
54	19.5	82	20.5	86	1.0	4	5	M	English and Afrikaans	15 years 9 months
55	8.5	36	13.0	55	4.5	19	53	F	English and Xhosa	17 years
56	6.5	27	6.0	25	-0.5	-2	-8	M	English and Xhosa	16 years 3 months
57	2.0	8	7.0	29	5.0	21	250	M	Xhosa only	16 years 9 months
58	10.5	44	18.0	76	7.5	32	71	F	English and Afrikaans	15 years 9 months
59	5.0	21	18.5	78	13.5	57	270	M	English and Afrikaans	15 years 3 months
60	10.5	44	15.0	63	4.5	19	43	M	Xhosa only	15 years 3 months
61	5.0	21	20.0	84	15.0	63	300	M	English and Afrikaans	14 years 9 months
62	5.0	21	11.0	46	6.0	25	120	F	English and Xhosa	16 years 3 months
63	3.5	15	11.5	48	8.0	33	229	F	Xhosa only	16 years

APPENDIX K - Time reduction for school trial

	Pre-test				Post-test				
Pupil	Answers		Time		Answers		Time		Time
code	attempted	correct	actual	estimated	attempted	correct	actual	estimated	reduction
1	18	13.0	23	30	24	20.0	19	19	11
2	18	12.0	23	30	24	22.0	23	23	7
3	24	17.0	23	23	24	18.5	21	21	2
4	16	10.0	23	34	24	20.5	31	31	3
5	24	8.0	23	23	24	20.0	15	15	8
6	24	9.0	23	23	24	17.0	22	22	1
7	18	9.0	23	30	24	17.5	25	25	5
8	24	18.0	23	23	24	20.0	20	20	3
9	19	9.0	23	29	24	18.0	25	25	4
10	15	3.0	23	36	24	16.5	27	27	9
11	20	14.5	23	27	24	23.0	19	19	8
12	16	6.0	23	34	24	17.5	30	30	4
13	22	11.5	23	25	24	17.0	23	23	2
14	24	6.5	23	23	24	12.5	25	25	-2
15	22	13.0	23	25	24	18.0	23	23	2
16	24	14.0	23	23	24	21.5	20	20	3
17	18	11.0	23	30	24	20.0	18	18	12
18	24	10.5	23	23	24	18.5	22	22	1
19	24	7.5	23	23	24	8.0	15	15	8
20	24	13.0	23	23	24	19.0	20	20	3
21	24	14.5	23	23	24	23.0	20	20	3
22	22	11.0	23	25	24	15.0	25	25	0
23	24	17.0	26	26	24	19.5	20	20	6
24	24	16.0	23	23	24	16.0	20	20	3
25	18	11.5	23	30	24	17.0	27	27	3
26	20	15.5	23	27	24	19.5	22	22	5
27	24	9.0	19	19	24	17.0	16	16	3
28	24	18.0	20	20	24	23.0	17	17	3
29	22	10.0	23	25	24	16.5	20	20	5
30	24	16.0	22	22	24	17.5	20	20	2
31	19	10.0	23	29	24	19.0	18	18	11
32	24	14.5	23	23	24	18.5	20	20	3
33	24	16.0	23	23	24	16.0	17	17	6
34	24	14.0	23	23	24	18.0	20	20	3
35	24	15.0	20	20	24	20.0	17	17	3
36	18	9.5	23	30	24	16.5	22	22	8
37	22	5.5	23	25	24	17.0	25	25	0
38	16	9.0	25	37	24	16.5	29	29	8
39	24	12.0	25	25	34	16.0	27	27	-2
40	13	10.0	25	46	24	15.0	26	26	20
41	17	8.0	25	35	24	16.5	19	19	16
42	16	4.5	25	37	24	12.5	29	29	8
43	16	9.0	25	37	24	11.0	29	29	8
44	21	10.5	25	28	24	17.0	27	27	1
45	24	12.0	25	25	24	13.0	25	25	0
46	22	7.5	28	30	24	13.0	25	25	5
47	15	5.5	25	40	24	20.5	28	28	12
48	16	5.0	25	37	22	12.0	28	30	7
49	24	5.0	25	25	24	10.0	25	25	0
50	15	8.0	25	40	24	12.5	29	29	11

APPENDIX K (cont)

	Pre-test				Post-test				
Pupil	Answers		Time		Answers		Time		Time
code	attempted	correct	actual	estimated	attempted	correct	actual	estimated	reduction
51	17	10.0	25	35	24	16.0	24	24	11
52	24	4.0	25	25	24	12.0	29	29	-4
53	24	13.0	23	23	24	19.5	24	24	-1
54	24	19.5	25	25	24	20.5	24	24	1
55	18	8.5	25	33	24	13.0	28	28	5
56	24	6.5	26	26	24	6.0	28	28	-2
57	12	2.0	25	50	17	7.0	28	39	11
58	21	10.5	25	28	24	18.0	24	24	4
59	16	5.0	25	37	24	18.5	25	25	12
60	24	10.5	25	25	24	15.0	24	24	1
61	19	6.0	25	31	24	20.0	24	24	7
62	15	5.0	25	40	24	11.0	25	25	15
63	17	3.5	25	35	24	11.5	28	28	7
sum	1293	648.5	1495	1805	1513	1047.5	1470	1483	322
mean	20.5	10.3	23.7	28.7	24.0	16.6	23.3	23.5	5.1
std.dev	3.6	4.2	1.5	6.6	1.6	3.8	4.1	4.5	4.8
min	12.0	2.0	19.0	19.0	17.0	6.0	15.0	15.0	-4.0
max	24.0	19.5	28.0	50.0	34.0	23.0	31.0	39.0	20.0

APPENDIX L - Exercise analysis

Pupil	Hearts													Spades												Diamonds												Clubs												
code	A	2	3	4	5	6	7	8	9	10	J	Q	K	A	2	3	4	5	6	7	8	9	10	J	Q	K	A	2	3	4	5	6	7	8	9	10	J	Q	K	A	2	3	4	5	6	7	8	9	10	J	Q	K	n
1					4				9				9																																						6
2	8						5	8									6	5								9		9							9		7															10
3														5							7						8																		8			7				8
4		7																												10				9											8			10			10	6
5			7							10			10	9		8	6																9	10			9						7			9			8			12
6				7	6								8						8			9			8		9								10												10			5			11
7			8			5							9	5				6					8	6												9		6														10
8								10	10		9			9							7		10			9				10	9																					13
9					8					6			5					5				8				7																										7
10										6			9	7		9			7								4	5	6				8			5																10
11									8		6			9				8			9												10	8			9														11
12																											5	6	6			9		7		7			8	6	7			8								10
13		8							9				9								6	9				8				7		8			8			9		10	8						6				13
14					4			5				9																												9			4			7			8	7
15		9							9			10		9	10							9					9							9	9			9							10			9		10		13
16			8					8				8								8	9				8				9				9				8							10			10				11
17	10	9					9																				10						7			10		8		9	8										9
18						8			9				9						8		7				7			7	7				7						9											10
19													9		7		6		6			8						7		7		8							7											9
20					3			7				8			5	7					5									9			10			7				8											12
21				8					8			9							8		8	5				10			9			9																		12
22					5			6			9		7															7	6			8			7				6		8			8							11
23	7					9			9								5				8		6										8	9		7		8					9							11
24		10						9	8		9					10		10	9					5			9						9	9	10			8					9			9		10		16
25				7	7					6				6	9				8		5						9	9					7																	10
26					8			10			8											7	7		6															8							8			9	9
27			7	8							8				5			5						8		8			7			8															9	7			10	12
28								10	9			8							9			9			7			8	8						8						10	8			9		9				13
29			4	6						7												8					10					7						9												10
30					4	9						8										9					6	8									10		5			6			9						10
31		8			5							10					6			7			6																8			8				7			9
32		7							8			9		9		8		6										6						8			8								10	8		9		12
Mean	8	8	7	7	6	7	8	8	9	7	8	9	9	8	7	8	6	6	7	8	7	8	8	8	8	8	8	8	7	8	6	9	8	6	9	9	7	8	9	7	9	8	8	9	8	9	8	9	9	7	9	9	Sub.

APPENDIX L (cont)

Pupil	Hearts													Spades												Diamonds												Clubs												
code	A	2	3	4	5	6	7	8	9	10	J	Q	K	A	2	3	4	5	6	7	8	9	10	J	Q	K	A	2	3	4	5	6	7	8	9	10	J	Q	K	A	2	3	4	5	6	7	8	9	10	J	Q	K	n
33	9	8							9						7							8		10										9	10				9								9						12
34		4							7		9			9	7		9						7				9			10				8				9									6				14
35				6	7								8			6					10			9					10	8						8															12
36		5							10			8																								8															8
37							9			8		7		8		7	7														5																				7
38																			8	7					5																										6
39	8																													8	5						7														7
40																	9			8							8		8			9				3														7
41																				2										10			10			8				9										7
42		7		7								9																													7	6						9			6
43			4	7								9					9																																7			7
44				8																							8		8			8									8							8			7
45															5					5															8	9	7														8
46	8			9									10		8	9								10												7	9	8														12
47	7				8					6																																										6
48		9			8							8					6	6	9						7		8	8									8														11
49																																			5	6	7														7
50				10			9								7					7				9												10															6
51															5						5		7																												5
52		5			7	9						4			2					9				4				4						5		8														10
53			8							7		7															8	8				8																		8
54					9	10						9		9	10					9								8		9						7														13
55														7			8	8		6																														5
56																	7	6					10												8	10	4														7
57																											7	8	7	6								7														6
58		7		3			9						10															7								9			10	9		10										10
59			8			8							9	9	8	10											10		10	8												8		8						9		12
60		7							8		9						8	6							7		2	8	5																					9
61																			8	8				7				8				8			8														9
62		9												6		9					8										9		9				9														7
63				8					7			6						7	8			7					7																								7
Mean	8	7	6	7	7	8	8	8	8	8	9	8	9	8	6	7	7	7	7	8	7	8	8	8	8	7	7	7	7	8	8	8	8	8	9	9	7	8	8	8	7	7	8	7	8	8	7	8	9	8	8	9	Total

APPENDIX M.1 - Question analysis (Hearts)

Wrong Answer Frequency for 2 Hearts										
Question number	1	2	3	4	5	6	7	8	9	10
	1	0	1	1	1	1	1	1	1	1
	1	1	1	0	1	1	1	1	1	1
	1	0	1	1	1	0	1	1	1	1
	1	0	1	0	1	0	1	1	1	0
	1	0	1	1	1	0	1	1	1	0
	1	0	1	1	1	0	1	1	1	1
	1	0	1	1	1	0	1	1	1	0
	1	0	1	1	1	0	1	1	1	1
	1	0	1	0	1	0	0	1	0	0
	1	0	1	0	1	1	0	1	0	0
	1	0	1	1	0	1	0	1	1	1
	1	1	1	1	1	1	0	1	1	1
	1	0	1	1	0	0	1	1	0	0
	1	1	1	0	1	0	1	1	1	0
	1	0	1	1	1	0	1	1	1	0
	1	1	1	0	1	1	1	1	1	1
Total Correct:	16	4	16	10	14	6	12	16	13	8
Total Incorrect:	0	12	0	6	2	10	4	0	3	8
Percentage Error:	0	75	0	37.5	12.5	62.5	25	0	18.75	50

Wrong Answer Frequency for 5 Hearts										
Question number	1	2	3	4	5	6	7	8	9	10
	1	1	1	0	1	1	1	0	0	1
	1	1	0	1	1	0	1	1	1	1
	1	1	1	1	1	0	0	1	1	1
	1	1	0	1	1	1	1	1	1	1
	1	1	1	1	1	1	0	1	1	1
	1	1	0	1	0	1	1	0	1	1
	0	0	1	0	0	1	1	0	0	0
	0	1	0	1	1	0	1	0	0	0
	1	1	1	0	0	0	1	0	1	0
	1	1	0	0	1	1	1	0	1	1
	0	1	0	1	0	1	0	0	1	1
	0	1	0	0	1	1	1	0	0	0
Total Correct:	8	11	5	7	8	8	9	4	8	8
Total Incorrect:	4	1	7	5	4	4	3	8	4	4
Percentage Error:	33.3	8.3	58.3	41.7	33.3	33.3	25.0	66.7	33.3	33.3

Wrong Answer Frequency for King of Hearts										
Question number	1	2	3	4	5	6	7	8	9	10
	1	1	1	1	1	1	1	1	1	1
	0	1	1	0	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	0
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	0	1
	1	1	1	1	0	1	1	0	1	1
	1	1	1	1	1	1	1	0	1	1
	1	0	1	1	1	1	1	0	0	1
	1	1	1	1	1	0	1	0	1	1
	1	1	1	1	1	1	1	1	0	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	0
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	0
Total Correct:	13	13	14	13	13	13	14	10	11	11
Total Incorrect:	1	1	0	1	1	1	0	4	3	3
Percentage Error:	7.14	7.14	0.00	7.14	7.14	7.14	0.00	28.57	21.43	21.43

APPENDIX M.2 - Question analysis (Spades)

Wrong Answer Frequency for 2 Spades										
Question number	1	2	3	4	5	6	7	8	9	10
	0	1	1	1	1	0	1	0	0	0
	0	1	1	0	1	1	1	1	1	1
	0	1	1	1	0	1	0	0	1	1
	1	1	1	1	1	1	1	1	1	1
	1	0	1	0	0	0	0	0	0	0
	0	1	1	0	1	1	1	1	1	1
	1	1	1	1	0	0	1	0	1	1
	1	1	1	0	0	1	1	0	0	0
	1	1	1	1	1	1	1	1	1	0
	1	1	1	1	1	1	1	0	1	1
	1	0	1	1	0	1	0	1	1	1
	1	1	0	1	1	1	1	1	0	0
Total Correct:	8	10	11	8	7	9	9	6	8	7
Total Incorrect:	4	2	1	4	5	3	3	6	4	5
Percentage Error:	33.3	16.7	8.3	33.3	41.7	25.0	25.0	50.0	33.3	41.7

Wrong Answer frequency for 3 Spades										
Question number	1	2	3	4	5	6	7	8	9	10
	1	1	1	1	1	1	1	1	1	1
	1		1	1	0	1	1	0	0	0
	1	1	1	1	1	1	1	1	1	0
	0	1	1	1	1	1	0	0	0	1
	0	1	1	1	0	1	1	0	0	0
	0	1	1	0	1	1	0	1	1	1
	1	1	0	1	1	1	0	1	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	0	1	1
	0	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	0	0
	1	1	1	1	1	1	1	1	0	1
	1	1	1	0	0	1	1	0	0	0
	1	0	1	1	1	1	0	1	1	0
Total Correct:	11	14	14	13	12	15	11	10	9	9
Total Incorrect	4	1	1	2	3	0	4	5	6	6
Percentage Error:	26.7	6.7	6.7	13.3	20.0	0.0	26.7	33.3	40.0	40.0

Wrong Answer Frequency for Jack of Spades										
Question number	1	2	3	4	5	6	7	8	9	10
	1	1	1	1	1	1	1	0	1	1
	1	1	1	1	1	1	0	0	1	1
	1	1	1	1	1	1	1	1	1	0
	1	1	1	1	1	1	0	0	0	1
	1	1	1	1	0	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	0	0	0
	1	1	1	1	1	0	0	1	0	0
	0	1	1	0	1	0	1	1	1	1
	1	1	1	1	1	1	0	0	1	1
	1	1	1	1	1	1	1	1	1	1
Total Correct:	10	11	11	10	10	9	7	6	8	8
Total Incorrect	1	0	0	1	1	2	4	5	3	3
Percentage Error:	9.1	0.0	0.0	9.1	9.1	18.2	36.4	45.5	27.3	27.3

APPENDIX M.3 - Question analysis (Diamonds)

Wrong Answer Frequency for 2 Diamonds										
Question number	1	2	3	4	5	6	7	8	9	10
	1	0	1	1	1	0	0	1	1	0
	1	1	1	1	1	1	1	1	1	0
	1	0	0	1	1	1	1	0	1	1
	1	0	1	1	1	1	0	0	1	1
	1	1	0	1	1	1	1	1	1	0
	1	1	1	1	1	1	1	1	1	1
	1	1	1	0	0	0	0	1	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	0	0	1	0	0	0
	1	1	1	1	0	1	1	1	1	1
	1	1	0	1	1	1	1	1	1	1
	1	1	1	1	1	0	0	1	1	1
	1	1	1	1	1	1	0	0	1	1
	1	1	1	1	0	0	1	1	1	1
	1	1	1	1	1	1	1	1	1	1
Total Correct:	15	12	12	14	11	10	10	11	14	11
Total Incorrect:	0	3	3	1	4	5	5	4	1	4
Percentage Error:	0.0	20.0	20.0	6.7	26.7	33.3	33.3	26.7	6.7	26.7

Wrong Answer Frequency for 3 Diamonds										
Question number	1	2	3	4	5	6	7	8	9	10
	1	0	1	0	1	1	1	1	1	1
	1	1	1	1	1	1	1	0	0	0
	1	0	0	1	0	1	1	1	1	1
	1	0	0	0	1	1	1	0	1	1
	0	0	0	0	1	1	1	1	1	1
	1	0	1	0	1	1	1	0	1	1
	1	1	1	0	1	1	0	1	1	1
	0	0	1	0	1	1	1	0	0	0
	1	0	1	1	1	1	0	0	1	1
	1	1	0	0	1	1	1	1	1	1
	1	0	1	0	1	1	1	1	1	1
	1	0	0	1	1	1	1	1	1	0
	1	0	0	0	1	1	1	1	0	1
	1	0	0	1	1	1	0	1	1	1
	1	0	0	0	1	1	1	0	1	1
	1	0	1	0	1	1	1	1	1	1
	1	0	0	1	1	0	0	1	1	1
Total Correct:	15	3	8	6	16	16	13	11	14	14
Total Incorrect:	2	14	9	11	1	1	4	6	3	3
Percentage Error:	11.8	82.4	52.9	64.7	5.9	5.9	23.5	35.3	17.6	17.6

APPENDIX M.3 (cont.)

Wrong Answer Frequency for Ace of Diamonds										
Question numbers	1	2	3	4	5	6	7	8	9	10
	1	1	1	0	1	0	0	1	1	1
	1	1	1	0	1	1	1	1	1	0
	1	1	0	1	1	0	1	1	1	1
	1	1	0	0	1	1	1	1	1	0
	0	1	1	1	1	1	1	1	1	0
	1	1	1	0	1	0	1	1	1	0
	1	1	1	0	0	0	1	0	0	1
	1	0	1	1	0	0	0	0	0	0
	1	0	1	1	1	1	0	0	0	1
	0	1	1	1	1	1	0	1	1	0
	1	1	0	1	1	0	1	1	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	0
	1	1	1	0	1	1	1	1	0	1
	1	1	0	0	0	0	1	1	1	1
Total Correct:	14	14	12	9	13	9	12	13	12	9
Total Incorrect	2	2	4	7	3	7	4	3	4	7
Percentage Error:	12.5	12.5	25.0	43.8	18.8	43.8	25.0	18.8	25.0	43.8

APPENDIX M.4 - Question analysis (Clubs)

Wrong Answer Frequency for 6 Clubs										
Question numbers	1	2	3	4	5	6	7	8	9	10
	1	1	1	1	1	1	1	0	0	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	0	1	1	1	1	1
	1	1	1	0	1	1	1	1	0	1
	1	1	1	1	1	1	1	1	1	1
	1	0	0	1	0	1	1	0	0	0
	1	1	1	1	0	1	1	1	1	1
	1	1	1	1	1	1	0	0	0	0
	1	0	1	1	0	1	1	0	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	0	1
Total Correct	11	9	10	10	7	11	10	7	6	9
Total Incorrect	0	2	1	1	4	0	1	4	5	2
Percentage Error	0.0	18.2	9.1	9.1	36.4	0.0	9.1	36.4	45.5	18.2

Wrong Answer Frequency for 9 Clubs										
Question numbers	1	2	3	4	5	6	7	8	9	10
	0	1	1	1	1	1	0	1	1	1
	1	1	1	1	1	1	1	0	1	1
	0	1	1	1	0	1	1	1	1	1
	0	1	1	0	1	1	0	0	1	0
	1	1	1	1	1	1	1	1	1	0
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	0	0	0	0
	1	1	1	1	1	1	1	0	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	0
	1	1	1	1	1	1	1	0	1	1
	1	1	1	1	1	1	1	1	1	0
Total Correct	9	12	12	11	11	12	9	7	11	7
Total Incorrect	3	0	0	1	1	0	3	5	1	5
Percentage Error	25.0	0.0	0.0	8.3	8.3	0.0	25.0	41.7	8.3	41.7

Wrong Answer Frequency for Queen of Clubs										
Question numbers	1	2	3	4	5	6	7	8	9	10
	1	1	1	1	0	1	1	1	1	0
	1	1	1	1	1	0	1	1	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	0	1	1	0	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	0	1	1	1	1	1
	1	1	1	1	0	1	0	1	1	1
	1	1	1	1	1	1	1	1	1	1
	0	1	1	1	1	1	0	0	1	1
	1	1	1	1	0	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	0	1	1	1	1
	1	1	1	1	0	1	1	1	1	1
	1	1	1	1	0	1	1	0	1	1
Total Correct:	14	15	15	15	8	13	13	12	15	14
Total Incorrect:	1	0	0	0	7	2	2	3	0	1
Percentage Error:	6.7	0.0	0.0	0.0	46.7	13.3	13.3	20.0	0.0	6.7

Author Innes L M
Name of thesis Learning To Read The South African 1:50 000 Topographic Map: The Development Of A Self-Instruction Method Innes L M 1998

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