



# **THE MIND-MAPPING APPROACH:**

## **A MODEL AND FRAMEWORK FOR GEODESIC LEARNING**

**BY  
CAROLINE MARY LEAF**

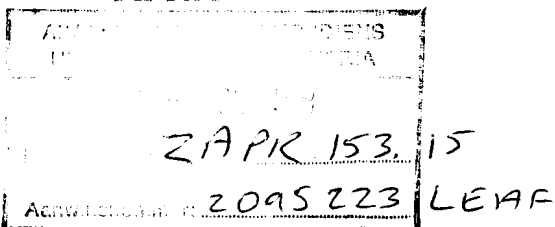
**A DISSERTATION SUBMITTED  
IN  
PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR  
THE DEGREE OF DOCTOR OF PHILOSOPHY  
IN THE  
DEPARTMENT OF  
COMMUNICATION PATHOLOGY,  
FACULTY OF ARTS  
UNIVERSITY OF PRETORIA,  
PRETORIA**

**MARCH 1997**

346986

The financial assistance of the Centre for Science Development towards this research is hereby gratefully acknowledged. Opinions expressed in this thesis and conclusions arrived at are those of the author and are not necessarily to be attributed to the Centre for Science Development.

AFRICANA



*This thesis is dedicated to ...*

*my husband Mac,*

*and my children*

*Jessica, Dominique and Jeffrey*

*for more love, support and inspiration*

*than can be measured.*

*This thesis is also dedicated to*

*discovering the gift of potential in every person.*

*In a gentle way you can shake the world.*

*Ghandi*

## ACKNOWLEDGEMENTS

**I owe special thanks to many special people:**

**PROFESSOR UYS AND PROFESSOR LOUW:** Prof Uys and Brenda, working with you both has been an inspiration, an opportunity and a gift. Sir Isaac Newton said if we achieve something of value it is because we stand on the shoulders of giants who have come before us. I recognise my indebtedness to you both. Your guidance has shaped my thinking and taught me all I know about research. You have instilled an awareness and excitement in myself of the ongoing challenge that practical research is. Prof Uys, by saying very little you have taught me to see the broader picture. Brenda, by drawing my attention to the detail, I have learnt to see the parts that make up the broader picture. Your support has given me confidence. Thank you!

**JACQUI GRIMBEECK:** Jacqui, thank you for the many hours you spent guiding me through the statistics of this study - your advice, patience and expertise were invaluable.

**DENISE HOLTON:** Denise, your constructive advice and expertise regarding the computerisation of this study were also invaluable. Thank you!

**THE SCHOOL OF ACHIEVEMENT, BELLAVISTA AND PROTEA:** To the staff and pupils of the School of Achievement, Protea and Bellavista, I owe you all special thanks for your enthusiasm and willingness to participate in this study. I appreciate the time you gave me and I hope the gift of potential will be released in you all - thank you.

**JULIE SCOTT:** Julie, thank you for the beautiful graphics and all the extras! Your patience, help and professionalism have been invaluable.

**MARY HAZELTON:** Mary, I thank you for an editing job extremely well done.

**FINALLY,** and closest to my heart, I extend my thanks to my family - my husband, Mac, who shares my fears, hopes and dreams; to my children, Jessica, Dominique and Jeffrey, who have been my inspiration; and to my parents, my brother, Peter, and sisters, Jo-Anne and Christiane for their unconditional love and confidence.

## ABSTRACT

**TITLE:** The Mind-Mapping Approach: A Model and Framework for Geodesic Learning

**NAME:** Caroline Leaf

**PROMOTER:** Prof. I.C. Uys

**CO-PROMOTER:** Prof. B. Louw

**DEPARTMENT:** Communication Pathology

**DEGREE:** D. Phil.

The current study identifies the reasons why change in traditional perceptions of learning is needed by tracing the philosophies of traditional methods and their effect on the perception of learning, and proposes an alternative geodesic approach, the Mind-Mapping Approach (MMA). Inherent in the model is the implication that traditional methods do not facilitate effective holistic thinking and as a result, do not produce effective lifelong learners. Extrapolated from the MMA model and its assumptions, is a practical framework, the MMA, that, when implemented within learning environments, will foster geodesic thinking which is in natural compliance with the functioning of the brain and therefore to be preferred.

The study tested the validity of the above assumption by providing training in an alternative geodesic approach, the MMA, to a group of 45 teachers and therapists that work with learning disabled pupils - this comprised the first experiment of this study. The teachers and therapists in turn used the MMA methods with their pupils (639) - this comprised the second experiment of the study. In this way both the MMA as a geodesic framework, and the actual effectiveness of the MMA training programme in conveying geodesic principles, were evaluated.

The results indicated that although significant benefit was derived by the teachers and therapists from the MMA training, these were conservative. Furthermore, the overall longitudinal trends of the pupils' results also indicated that a significant positive change was experienced by the pupils with the introduction of the MMA methods, but not to the extent predicted. It is speculated that this conservative, although significantly positive improvement



in the teachers, therapists and pupils is attributed to the fact that the MMA methods are geodesic facilitating improved thinking, problem-solving and research skills, and innovative learning. However traditional methods of teacher training, testing and evaluating do not facilitate these skills as their emphasis is on the accrual as opposed to creation of facts. It is possible therefore that the conservatively positive results of this study reflect the “carry-over” effect of geodesic training. It can be said that the partial application of the MMA methods by the teachers and therapists did improve the performance of the pupils and that this study was therefore successful, but that the results would have been more positive had the pupils been evaluated in a way that matched the geodesic training. In addition, the study provides valuable information regarding the effect of geodesic systems on traditional systems of learning.

## OPSOMMING

<b>TITLE:</b>	Die Breinkaartbenadering: 'n Model en Raamwerk vir Geodetiese Leer
<b>NAAM:</b>	Caroline Leaf
<b>PROMOTOR:</b>	Prof. I.C. Uys
<b>MEDEPROMOTOR:</b>	Prof. B. Louw
<b>DEPARTEMENT:</b>	Kommunikasiepatologie
<b>GRAAD:</b>	D. Phil.

Hierdie studie identifiseer die redes vir die noodsaaklikheid om tradisionele leerpersepsies te verander deur die filosofie van tradisionele metodes en hul effek op die leerpersepsie na te gaan, en dit stel 'n alternatiewe geodetiese benadering voor, bekend as die breinkaartbenadering (BKB) (Engels: mind-mapping approach (MMA) ). Inherent in die model is die implikasie dat tradisionele metodes nie doeltreffend holistiese denke voorthelp nie, en gevolglik nie doeltreffende lewenslange leerlinge voortbring nie. 'n Praktiese raamwerk word uit die BKB-model en sy aannames ekstrapoleer, nl die BKB wat, wanneer dit binne leeromgewings geïmplementeer word, geodetiese denke sal bevorder wat in natuurlike voldoening is met die funksionering van die brein en derhalwe verkieslik is.

Die studie het die geldigheid van die bogenoemde aanname getoets deur opleiding in 'n alternatiewe geodetiese benadering, die BKB, te verskaf aan 'n groep vna 45 onderwysers en terapeute wat met leergestremde leerlinge werk. Dit het die eerste eksperiment van die studie uitgemaak. Die onderwysers en terapeute het op hul beurt die BKB-metodes met hul leerlinge (639) gebruik, wat die tweede eksperiment van die studie uitgemaak het. Sodoende is beide die BKB as 'n geodetiese raamwerk en die eintlike doeltreffendheid van die BKB-opleidingsprogram in die oordra van geodetiese beginsels geëvalueer.

Die resultate het aangedui dat, alhoewel onderwysers en terapeute beduidend baat gevind het by die BKB-opleiding, dit konserwatief was. Verder het die langstendense van die leerlinge se resultate ook aangedui dat 'n noemenswaardige positiewe verandering deur leerlinge

ervaar is met die invoering van die BKB-metodes, maar nie in die mate wat voorspel is nie. Daar word bereken dat die konserwatiewe, alhoewel aansienlik positiewe verbetering in die onderwysers, terapeute en leerlinge toeskryfbaar is aan die feit dat die BKB-metodes geodeties is, wat verbeterde denke, probleemoplossing en navorsingsvaardighede, sowel as innoverende leer moontlik maak. Tradisionele leer-, opleidings-, toets- en evalueringmetodes fasiliteer egter nie hierdie vaardighede nie, aangesien die klem op die memorisering van feite val. Dit is dus moontlik dat die konserwatief positiewe resultate van hierdie studie die “oordra”-effek van geodetiese opleiding weerspieel. Daar kan gese word dat die gedeeltelike toepassing van die BKB-metodes deur onderwysers en terapeute die prestasie van die leerlinge verbeter het, en dat die studie dus suksesvol was, maar so ‘n manier geevalueer kon word wat die geodetiese opleiding geewenaar het. Die studie verskaf ook waardevolle inligting rakende die effek van geodetiese stelsels op tradisionele stelsels.



# CONTENTS

	<u>PAGE</u>
<b><u>CHAPTER ONE: ORIENTATION AND STATEMENT OF THE PROBLEM</u></b>	
<b>MIND-MAP</b>	<b>1</b>
<b>CONTENTS</b>	<b>2</b>
<b>1.1. INTRODUCTION</b>	<b>3</b>
<b>1.2. THE CONCEPTUALISATION OF LEARNING, THINKING AND THE INTELLECT</b>	<b>8</b>
<b>1.3. THE INTELLIGENCE QUOTIENT (I.Q.) APPROACH</b>	<b>9</b>
1.3.1. THE PHILOSOPHY	9
1.3.2. THE EFFECT ON EDUCATION AND THERAPY	11
<b>1.4. THE PIAGETIAN APPROACH</b>	<b>12</b>
1.4.1. THE PHILOSOPHY	12
1.4.2. THE EFFECT ON EDUCATION AND THERAPY	12
<b>1.5. THE COGNITIVE INFORMATION PROCESSING APPROACH</b>	<b>14</b>
1.5.1. THE PHILOSOPHY	14
1.5.2. THE EFFECT ON EDUCATION AND THERAPY	16
<b>1.6. THE GEODESIC APPROACH</b>	<b>17</b>
1.6.1. THE PHILOSOPHY	17
1.6.2. THE EFFECT ON EDUCATION AND THERAPY	20
<b>1.7. CONCLUSION</b>	<b>22</b>
<b>1.8. ORGANISATION OF THE THESIS</b>	<b>25</b>
<b>1.9. TERMINOLOGY</b>	<b>27</b>
<b>1.10. SUMMARY</b>	<b>29</b>

**CHAPTER TWO : THE GEODESIC INFORMATION PROCESSING MODEL AND  
THE MIND-MAPPING APPROACH**

<b>MIND-MAP</b>	<b>30</b>
<b>CONTENTS</b>	<b>31</b>
<b>2.1. INTRODUCTION</b>	<b>33</b>
<b>2.2. EXPLANATION OF THE MODEL</b>	<b>33</b>
2.2.1. ORIENTATION	33
2.2.2 AN OVERVIEW OF THE OPERATION OF THE GEODESIC INFORMATION PROCESSING MODEL	34
2.2.3 THE METACOGNITIVE COMPONENT	36
2.2.3.1 Introduction	36
2.2.3.2 The seven metacognitive modules	36
2.2.3.3 The processing systems and their functions	37
2.2.3.4 The metacognitive domain - the computational capacity	38
2.2.3.5 An example of the interplay in the metacognitive domain	38
2.2.3.6 The activation of the metacognition module - metacognitive action	40
2.2.3.7 The neurobiological level of metacognitive action	41
2.2.3.8 The neuropsychological level of metacognitive action - pattern recognition	41
2.2.3.9 The interaction of active and dynamic self-regulation	41
2.2.4 THE COGNITIVE COMPONENT	43
2.2.4.1 Introduction	43
2.2.4.2 The cognitive process	43
2.2.4.3 An example of cognition in action	45
2.2.5. THE SYMBOLIC COMPONENT	46
2.2.6. THE NEUROPSYCHOLOGICAL COMPONENT	46
<b>2.3. THE MIND-MAP: THE TOOL OF THE MIND-MAPPING APPROACH</b>	<b>48</b>



2.3.1. INTRODUCTION	48
2.3.2. THE MIND-MAP: A DEFINITION	49
2.3.3 THE MIND-MAP: A DESCRIPTION	49
2.3.4 THE ADVANTAGES OF MIND-MAPPING	49
2.3.5 MIND-MAPPING REDEFINED	51
<b>2.4 THE CONCEPTUAL NATURE OF THE MIND-MAPPING APPROACH AND THE MIND-MAP</b>	<b>51</b>
<b>2.5. THE MULTIMODAL NATURE OF THE MIND-MAPPING APPROACH AND THE MIND-MAP</b>	<b>54</b>
2.5.1 INTRODUCTION	54
2.5.2 THE MULTIMODAL TECHNIQUES OF THE MIND-MAP	55
2.5.2.1 Organisation	55
2.5.2.2 Association	56
2.5.2.3 Categorising	56
2.5.2.4 Visualisation	57
2.5.2.5 Conspicuousness	59
2.5.3 THE MULTIMODAL TECHNIQUES OF THE MMA	59
2.5.3.1 Music	59
2.5.3.2 Relaxation techniques	60
2.5.3.3 Mnemonics	61
2.5.3.4 Multiple sensory input	62
<b>2.6. CONCLUSION</b>	<b>63</b>
<b>2.7. SUMMARY</b>	<b>64</b>
 <b><u>CHAPTER THREE</u> : THE ASSUMPTIONS AND THEORETICAL UNDERPINNINGS OF THE GEODESIC INFORMATION PROCESSING MODEL</b>	
<b>MIND-MAP</b>	<b>65</b>
<b>CONTENTS</b>	<b>66</b>

<b>3.1.</b>	<b>INTRODUCTION</b>	<b>68</b>
<b>3.2</b>	<b>THE EIGHT ASSUMPTIONS OF THE GEODESIC MODEL: AN OVERVIEW</b>	<b>68</b>
<b>3.3</b>	<b>THE ASSUMPTIONS RELATING TO THE METACOGNITIVE COMPONENT OF THE MODEL</b>	<b>72</b>
3.3.1	METACOGNITION IS THE NON-CONSCIOUS LEVEL THAT ACCOUNTS FOR THE BULK OF LEARNING	72
3.3.2	THE METACOGNITIVE STRUCTURE OF THE NON-CONSCIOUS LEVEL	75
3.3.2.1	Introduction	75
3.3.2.2	The metacognitive modules	75
3.3.2.3	The processing systems of the metacognitive modules	78
3.3.2.4	The metacognitive domain	80
3.3.3.	THE INTERACTION OF ACTIVE AND DYNAMIC SELF-REGULATION IS THE OPERATING SYSTEM OF EFFECTIVE THOUGHT PROCESSING	82
<b>3.4</b>	<b>THE ASSUMPTIONS RELATING TO THE COGNITIVE COMPONENT OF THE MODEL</b>	<b>85</b>
3.4.1	THE COGNITIVE COMPONENT IS THE LEVEL ON WHICH CONSCIOUS SEQUENTIAL THOUGHT OCCURS	85
3.4.2	MEMORY ENHANCEMENT IS PART OF THE COGNITIVE PROCESS AND DEPENDS ON CONTEXT AND CONTENT	87
<b>3.5.</b>	<b>THE ASSUMPTION RELATING TO THE NEUROPSYCHOLOGICAL COMPONENT OF THE MODEL</b>	<b>89</b>
3.5.1	ASPECT ONE: <i>Synergy between the hemispheres releases potential</i>	90
3.5.2	ASPECT TWO: <i>The metacognitive action results in the activation of descriptive systems through the process of pattern recognition and feedback, creating open systems</i>	94
3.5.3	ASPECT THREE: <i>The brain is a modular system of interlinked functional systems</i>	98
3.5.4	ASPECT FOUR: <i>The limbic system needs to be activated in order for useful knowledge to be reconceptualised</i>	100

3.5.5	<i>ASPECT FIVE: Processing of information occurs in a parallel simultaneous fashion on the non-conscious level, and sequentially on the conscious level</i>	104
<b>3.6.</b>	<b>THE ASSUMPTION RELATING TO THE SYMBOLIC COMPONENT OF THE MODEL</b>	<b>106</b>
3.6.1.	THE MIND-MAP IS THE SYMBOLIC EXPRESSION OF THE THOUGHT PROCESS	106
<b>3.7.</b>	<b>THE ASSUMPTION PERTAINING TO ALL FOUR COMPONENTS OF THE MODEL</b>	<b>107</b>
3.7.1.	INTELLIGENT LEARNING IS THE RECONCEPTUALISATION OF DESCRIPTIVE SYSTEMS LEADING TO NEW KNOWLEDGE	107
<b>3.8</b>	<b>CONCLUSION</b>	<b>110</b>
<b>3.9.</b>	<b>SUMMARY</b>	<b>112</b>
<b><u>CHAPTER FOUR: METHODOLOGY</u></b>		
	<b>MIND-MAP</b>	<b>113</b>
	<b>CONTENTS</b>	<b>114</b>
<b>4.1.</b>	<b>INTRODUCTION</b>	<b>116</b>
<b>4.2.</b>	<b>AIMS</b>	<b>118</b>
	4.2.1. FIRST MAIN AIM	118
	4.2.2. SECOND MAIN AIM	118
<b>4.3.</b>	<b>VARIABLES</b>	<b>119</b>
<b>4.4.</b>	<b>HYPOTHESES</b>	<b>119</b>
<b>4.5.</b>	<b>RESEARCH DESIGN</b>	<b>120</b>
<b>4.6</b>	<b>SUBJECTS</b>	<b>123</b>
	4.6.1. CRITERIA FOR SELECTION	123
	4.6.2 SELECTION PROCEDURES FOR THE SUBJECTS	124

4.6.3	<b>DESCRIPTION OF THE SUBJECTS</b>	125
4.6.3.1	Teachers and therapists	125
4.6.3.2	Pupils	126
<b>4.7.</b>	<b>MATERIAL AND APPARATUS</b>	<b>126</b>
4.7.1	<b>THE QUESTIONNAIRE</b>	126
4.7.1.1	The aim of the questionnaire	126
4.7.1.2	The design of the questionnaire	127
4.7.2	<b>THE APPARATUS USED FOR THE MMA TRAINING PROGRAMME</b>	129
4.7.2.1	The MMA training manual	129
4.7.2.2	The MMA training transparencies	129
4.7.2.3	Videos	130
4.7.2.4	Music	130
4.7.2.5	Reference material	130
4.7.3.	<b>THE DATA COLLECTION FORMS</b>	130
<b>4.8.</b>	<b>PROCEDURES</b>	<b>130</b>
4.8.1	<b>THE GENERAL PROCEDURE</b>	130
4.8.1.1	Phase one: The pilot study	132
4.8.1.2	Phase two: (A1 of experiment 1): Pre-training questionnaire	132
4.8.1.3	Phase three (B of experiment 1): MMA training course	132
4.8.1.4	Phase four (B of experiment 2): Application of the MMA principles in education and therapy	135
4.8.1.5	Phase five (A2 of experiment 1): Post-training questionnaire	135
4.8.1.6	Phase six (A1 and A2 of experiment 2): The pupils' academic results	135
4.8.2.	<b>DATA COLLECTION</b>	135
4.8.3	<b>DATA ANALYSIS AND INTERPRETATION</b>	135
4.8.3.1	Recording procedures	135
4.8.3.2	Analysis procedures	136
<b>4.9</b>	<b>SUMMARY</b>	<b>137</b>

## **CHAPTER FIVE: RESULTS**

<b>MIND-MAP</b>	<b>138</b>
<b>CONTENTS</b>	<b>139</b>
<b>5.1. INTRODUCTION</b>	<b>141</b>
<b>5.2. RESPONSE OF THE TEACHERS AND THERAPISTS TO THE MMA TRAINING PROGRAMME: THE FIRST MAIN AIM</b>	<b>142</b>
5.2.1 THE GENERAL TRENDS	142
5.2.2 CHANGE IN KNOWLEDGE, ATTITUDES AND SKILLS REGARDING GEODESIC LEARNING PRINCIPLES	144
5.2.2.1 Levels of knowledge, attitudes and skills before training	144
5.2.2.2 Levels of knowledge, attitudes and skills after training	144
5.2.2.3 The change in neuropsychological knowledge (KN)	155
5.2.2.4 The change in metacognitive knowledge (KM)	158
5.2.2.5 The change in attitude towards neuropsychological concepts (AN)	160
5.2.2.6 The change in attitude towards metacognitive concepts (AM)	161
5.2.2.7 The change in skills in the application of neuropsychological and metacognitive principles (SN and SM)	162
5.2.3 THE INFLUENCE OF BIOGRAPHICAL VARIABLES ON BEHAVIOUR CHANGE	163
5.2.3.1 The influence of age	167
5.2.3.2 The influence of language	170
5.2.3.3 The influence of qualifications	171
5.2.4. ANALYSIS OF SECTION F OF THE POST QUESTIONNAIRE	177
5.2.5. GENERAL CONCLUSIONS REGARDING THE RESPONSE OF THE TEACHERS AND THERAPISTS	179
<b>5.3. RESPONSES OF THE PUPILS TO THE MMA GEODESIC PRINCIPLES: THE SECOND MAIN AIM</b>	<b>180</b>
5.3.1 GENERAL TRENDS	181
5.3.2 THE LONGITUDINAL TRENDS OF ACADEMIC RESULTS	181

5.3.2.1	The overall longitudinal trend in general	181
5.3.2.2	The overall longitudinal trend per phase	181
5.3.2.3	The overall longitudinal trend per standard	185
5.3.2.4	The overall longitudinal trend per subject	185
5.3.3	THE INDIVIDUAL TRENDS PER SUBJECT	189
5.3.3.1	The trend of each subject per phase	189
5.3.3.2	The trend of each subject per standard	192
5.3.4.	GENERAL CONCLUSIONS REGARDING THE RESPONSE OF THE PUPILS	196
5.4.	CONCLUSION	197
5.5.	SUMMARY	198

**CHAPTER SIX : DISCUSSION AND INTERPRETATION OF THE EMPIRICAL  
RESEARCH**

	MIND-MAP	199
	CONTENTS PAGE	200
6.1.	INTRODUCTION	202
6.2	THE RESULTS OF THE STUDY RELATING TO THE HYPOTHESES	203
6.3	THE RESPONSE OF THE TEACHERS AND THERAPISTS TO THE MMA TRAINING PROGRAMME: THE FIRST MAIN AIM	204
6.3.1	THE CHANGE IN KNOWLEDGE, ATTITUDE AND SKILLS REGARDING THE GEODESIC PRINCIPLES OF THE MMA	204
6.3.1.1	The change in knowledge	204
6.3.1.2	The change in attitude	208
6.3.1.3	The change in skills	212
6.3.1.4	General conclusion regarding the change in teachers' and therapists' knowledge, attitude and skills	215





6.3.2	THE INFLUENCE OF BIOGRAPHICAL VARIABLES ON BEHAVIOUR CHANGE	215
6.3.2.1	Age	216
6.3.2.2	Language	217
6.3.2.3	Qualifications	218
6.4.	THE RESPONSE OF THE PUPILS TO THE EXPOSURE TO THE MMA METHODS: THE SECOND MAIN AIM	219
6.4.1.	THE CHANGE IN LONGITUDINAL TRENDS OF ACADEMIC RESULTS IN GENERAL, PER PHASE, PER SUBJECT AND PER STANDARD	219
6.4.2.	THE LONGITUDINAL TREND IN EACH SUBJECT PER PHASE AND PER STANDARD	222
6.5.	A CRITICAL REVIEW OF THE EXPERIMENTAL PROCEDURE	223
6.5.1.	RESEARCH DESIGN	224
6.5.2.	RESEARCH PROCEDURES	226
6.6.	THEORETICAL IMPLICATIONS FOR GEODESIC LEARNING	227
6.6.1	CHANGES IN THE TEACHERS AND THERAPISTS	227
6.6.2.	CHANGES IN THE PUPILS	230
6.6.3.	THE SPEECH LANGUAGE THERAPIST	232
6.7.	CONCLUSION	235
6.8.	SUMMARY	236
<b><u>CHAPTER SEVEN :</u> CONCLUSIONS AND IMPLICATIONS</b>		
	MIND-MAP	237
	CONTENTS	238
7.1.	INTRODUCTION	240

<b>7.2.</b>	<b>CATEGORY ONE: IMPLICATIONS FOR THE CHANGED PERCEPTION OF LEARNING</b>	<b>242</b>
7.2.1.	LEARNING IS THE RECONCEPTUALISATION OF KNOWLEDGE AS OPPOSED TO THE INTERNAL INCREMENTALISATION OF FACTS	242
7.2.2.	LEARNING ENVIRONMENTS NEED TO BE ECOLOGICALLY CONGRUENT AND AUTHENTIC WITH AN EMIC PERSPECTIVE, IN ORDER TO FACILITATE EFFECTIVE LANGUAGE, LEARNING AND COMMUNICATION	244
7.2.3.	LEARNING IS A PROCESS OF ACTIVE RESEARCH INITIATED AND CONTROLLED BY THE LEARNER	246
7.2.4.	INTELLIGENCE IS PLURALISTIC AND IN EVERY INDIVIDUAL THERE IS A UNIQUE BLEND THAT DETERMINES THEIR INDIVIDUALITY	248
<b>7.3.</b>	<b>CATEGORY TWO: IMPLICATIONS FOR TEACHERS AND THERAPISTS</b>	<b>249</b>
7.3.1.	THE LEARNING APPROACH NEEDS TO BE TRANSDISCIPLINARY REQUIRING FACILITATORS, DIRECTORS AND THERAPISTS TO ASSUME INTERCHANGEABLE ROLES AND RESPONSIBILITIES FOLLOWING THE NEEDS OF THE CHILD, THE FAMILY AND THE COMMUNITY	249
7.3.2.	TEACHERS AND THERAPISTS PLAY DIFFERENT ROLES IN A GEODESIC AS OPPOSED TO TRADITIONAL LEARNING ENVIRONMENTS	250
7.3.3.	THE SO-CALLED “LANGUAGE-LEARNING DISABLED POPULATION” CAN BECOME INNOVATIVE THINKERS IF THEIR LEARNING IS FACILITATED WITHIN A GEODESIC ENVIRONMENT USING GEODESIC METHODOLOGY	252
<b>7.4.</b>	<b>CATEGORY THREE: IMPLICATIONS FOR EDUCATION AND THERAPY</b>	<b>253</b>
7.4.1.	LEARNING IN A WORLD OF CONTINUING ACCELERATING CHANGE IS A PROCESS OF ONGOING ENQUIRY	253



<b>7.4.2. THE PURPOSE OF “EDUCATING” AND “REMEDIATING” IS TO FACILITATE INNOVATIVE LIFE SKILL LEARNING COMPETENCIES</b>	<b>256</b>
<b>7.4.3. GEODESIC LEARNING FRAMEWORKS NEED TO BE NEUROPSYCHOLOGICALLY AND METACOGNITIVELY ORIENTED</b>	<b>257</b>
<b>7.5. CONCLUSION</b>	<b>258</b>
<b>7.6. SUMMARY</b>	<b>260</b>

## LIST OF TABLES

<u><b>TABLES</b></u>	<u><b>PAGE</b></u>
Table 3.1: The Assumptions and Theoretical Underpinnings of the MMA Model	71
Table 4.1: The Tectonic Structure of the Research Design	121
Table 4.2: Teacher / Therapist Description	125
Table 4.3: The Phase / Standard Grouping	126
Table 4.4: Questionnaire Category Description	129
Table 4.5: The Procedure of the MMA Training Programme Total Duration - 12 hours	133
Table 5.1: The Change in knowledge, attitude and skills regarding the geodesic principles of the MMA	143
Table 5.2a : The Change in Neuropsychological Knowledge (KN)	145
Table 5.2b: The Change in Metacognitive Knowledge (KM)	147
Table 5.2c: The Change in Attitude towards Neuropsychological Concepts (AN)	149
Table 5.2d : The Change in Attitude Towards Metacognitive Concepts (AM)	151
Table 5.2e : The Change in Neuropsychological Skills (SN) and Metacognitive Skills (SM)	153
Table 5.3a: The Influence of age on the pre and post scores	164
Table 5.3b: The Influence of language on the pre and post scores	165
Table 5.3c: The Influence of qualifications on the pre and post scores	166
Table 5.4a: The influence of age on the pre and post scores by learning categories	168
Table 5.4b: The influence of language on the pre and post scores by learning categories	172
Table 5.4c: The influence of qualifications on the pre and post scores by learning categories	175
Table 5.5: Results of Section F of the post questionnaire	178
Table 5.6 : The overall longitudinal trend of the academic results: Results of Mixture Test of Wilcoxon Sum Ranks & Signed Ranks	182
Table 5.7 : A comparison of the overall longitudinal trend of the academic results of each phase: Results of Mixture Test of Wilcoxon Sum Ranks & Signed Ranks	183
Table 5.8 : A comparison of the overall longitudinal trend of the academic results per standard: Results of Mixture Test of Wilcoxon Sum Ranks & Signed Ranks	186
Table 5.9: The overall trend of academic results per school subject : Results of Mixture Test of Wilcoxon Sum Ranks & Signed Ranks	188
Table 5.10: A comparison of the trend of academic results per subject per phase: Results of Mixture of Wilcoxon Sum Ranks & Signed Ranks Test	190
Table 5.11: A comparison of the trend of academic results of each subject per standard: Results of Mixture Test of Wilcoxon Sum Ranks & Signed Ranks	193



## LIST OF FIGURES

<b><u>FIGURES</u></b>	<b><u>PAGE</u></b>
Figure 1.1: The Paradigm Shift in Thinking / Learning / Intelligence	10
Figure 1.2: A Comparison of Wholistic & Traditional Approaches to Learning	23
Figure 2.1: Geodesic Information Processing Model as Invoked by the Mind-Mapping Approach	35
Figure 2.2: The Metacognitive Domain	39
Figure 2.3: The Interaction between Active and Dynamic Self-Regulation	44
Figure 2.4: A Schematic Representation of the Neurobiological Arrangements of the Metacognitive Modules	47
Figure 3.1: The Metacognitive Structure of the Non-Conscious	76
Figure 4.1: Schematic Layout of the Order of the General Procedure of the experiment	131
Figure 5.1a : The Change in Neuropsychological Knowledge (KN)	146
Figure 5.1b : The Change in Metacognitive Knowledge (KM)	148
Figure 5.1c: The Change in attitude towards Neuropsychological Concepts (AN)	150
Figure 5.1d: The Change in attitude towards Metacognitive Concepts (AM)	152
Figure 5.1e: The Change in Neuropsychological Skills (SN) and Metacognitive Skills (SM)	154
Figure 5.2a: The influence of age on the pre and post scores	164
Figure 5.2b: The influence of language on the pre and post scores	165
Figure 5.2c: The influence of qualifications on the pre and post scores	166
Figure 5.3a: The influence of age on the pre and post scores by learning category	169
Figure 5.3b: The influence of language on the pre and post scores by learning category	173
Figure 5.3c: The influence of qualifications on the pre and post scores by learning category	176
Figure 5.4: The overall longitudinal trend of academic results	182
Figure 5.5: The overall longitudinal trend of each phase of academic results	184
Figure 5.6: The overall trend of academic results per standard	187
Figure 5.7: The overall trend of academic results per school subject	188
Figure 5.8: The trend of academic results per subject per phase	191
Figure 5.9: A comparison of the trend of academic results per subject per standard: Results of Mixture of Wilcoxon Sum Ranks & Signed Ranks Test	194



## APPENDICES

	<u>PAGE</u>
MIND-MAP : CONTENTS	261
APPENDIX I : QUESTIONNAIRE	262
APPENDIX II : SECTION E DEFINITION CRITERIA	263
APPENDIX III : SECTION F DEFINITION CRITERIA	264
APPENDIX IV : IVA: MMA MANUAL IVB: ADDITIONAL TRANSPARENCIES IVC: SUMMARY OF VIDEOS IVD: LIST OF TAPES IVE: READING LIST	265
APPENDIX V : DATA CORRELATION FORM	266