Contents

List of figures v
List of tables vi

Preface 1

1 EMPIRICAL DIDACTICS OF GEOGRAPHY - HISTORY OF A WORKING GROUP 3

1.1 Introduction 3
1.2 1984: A challenge for more awareness of methodology . . . 3
1.2.1 Deficiencies in the application of theory 3
1.2.2 Deficiencies in the design of research work 4
1.2.3 Deficiencies in the nature of variables 5
1.2.4 Deficiencies in the use of statistical methods 5
1.3 1986: Research perspectives for the empirical didactics of geography 7
1.3.1 Macrotheories for a theory of teaching 7
1.3.2 How profound should theory be? 9
1.3.3 The design of experimental research 10
1.4 1988: A memorandum for a working group 12
1.4.1 Major guidelines for future research 12
1.4.2 How to plan an experiment 13
1.5 1990: Results of the working group on empirical research . 14
1.6 Conclusion 16
References 17

2 THE DEVELOPMENT AND EVALUATION OF A GEOGRAPHY COMPUTER SIMULATION 19

2.1 Basic assumptions for the development 19
2.2 "Hunger in the Sahel", a simulation 21
2.3 Strategies in the simulation 23
2.4 Experimental evaluation of different versions 25
2.4.1 The implementation of teaching functions (Leutner 1989) . 25
2.4.2 Checking the function of the adaptive aids (Leutner 1991) . 29
2.4.3 Optimizing the non adaptive aids (Leutner 1991) 29
2.4.4 Controlling the effects in different school types 33
2.4.5 Installing different levels of difficulty 37
References 44

3 SOME PSYCHOLOGICAL GUIDELINES FOR DESIGNING INSTRUCTIONAL COMPUTER SIMULATIONS 47

3.1 Introduction 47
3.1.1 Background information on screen versus on paper . . . 48
3.1.2 Inductive thinking, learning aids, and learning outcome . . 49
3.2 Hypotheses 50
3.3 Methodological design 50
3.4 Results 52
3.5 Summary and discussion 57
3.6 Conclusion 58
References 59

4 COMPUTER-ASSISTED EVALUATION OF CURRICULUM SOFTWARE 61

4.1 Introduction 61
4.2 State of the art 61
4.3 The concept of the overall program package 62
4.3.1 Creation of test with the supereva program 64
4.3.2 The Eva program for use by testee 68
4.3.3 Hardware specific limitations 69
4.3.4 Problems between hardware and software 69
4.4 Initial observations on user interfaces and content design . 70
4.4.1 User interface for the Supereva program 70
4.4.2 The user interface for the Eva test module 70
4.4.3 Design of test module contents 71
4.5 Initial results from evaluations with Supereva 71
4.5.1 Comparison of results between paper test and computer controlled test 71
4.5.2 Initial results of statistical evaluation 72
4.6 Conclusions 73
References 73

5 THE COGNITIVE COMPLEXITIES OF ACCESSING CURRICULUM SPECIFIC DATABASES 75

5.1 Introduction 75
5.2 Factors that influence students' success with computer-assisted learning 75
5.2.1 Student characteristics 76
5.2.2 Learning environment 76
5.2.3 Computer assisted learning 77
5.3 Types of user interface found in curriculum specific databases 78
5.4 The empirical study 80
5.4.1 Method 80
5.4.2 Instruments 80

5.5 Analysis of the data 82
5.6 Results 82
5.7 Discussion and conclusion 84
References 85

6 GEOGRAPHICAL PROCEDURAL KNOWLEDGE AND MAP SKILLS 91

6.1 Introduction 91
6.2 Procedural knowledge 91
6.3 Research questions 94
6.4 The research method 94
6.5 The research population and time planning 96
6.6 Exploratory research 97
6.7 A few final remarks 111
References 112

7 HOW DO STUDENTS IN HIGHER EDUCATION PERCEIVE MAPS? 115

7.1 The problem 115
7.2 Design of the study 115
7.3 Instruments used in the study 116
7.4 The participants in the study 124
7.5 Analyses of the data 124
7.6 Point symbols 124
7.7 Linear symbols 126
7.8 Areal symbols 128
7.9 Combination of symbols 130
7.10 Discussion 131
References 133

8 GROUP LEARNING IN MAP WORK 135

8.1 Introduction 135
8.2 The mastery learning strategy 135
8.3 The cooperative learning model 137
8.4 The learning team model 138
8.5 The group learning strategy 139
8.6 The investigation 140
8.6.1 The sample 140
8.6.2 Method of study 140
8.6.3 Procedure 141
8.6.4 Results and discussion 141
References 143

9 EFFECTIVENESS OF GAMING METHOD IN TEACHING GRID REFERENCES AND CONVENTIONAL SIGNS: AN EXPERIMENTAL STUDY 145

9.1 Introduction 145
9.2 Methodology 146
9.3 Result 148
9.4 Discussion 149
9.5 Conclusion 150
References 151

10 ASSESSMENT IN GEOGRAPHY: AN EVALUATION OF THE SOLO TAXONOMY 157

10.1 Introduction 157
10.2 The need for theory 157
10.3 The SOLO model 159
10.4 SOLO based ordered outcome questions in geography . . 160
10.4.1 An example of an ordered outcome question 161
10.4.2 The stem 161
10.4.3 Unistructural (U) and multistructural (M) level questions . . 163
10.4.4 Relational (R) level questions 164
10.4.5 Extended abstract (E) level questions 164
10.5 The validity of a SOLO format in geography 165
10.5.1 Experimental design 165
10.5.2 Results 167
10.6 Conclusion 174
References 175

List of contributors 179