

THE RETEACHING OF MATHEMATICS SKILLS TO FIFTH GRADE STUDENTS

by

Matthew C. Kutscher

A DISSERTATION

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Doctorate of Philosophy

Major: Educational Studies

(Instructional Technology)

Under the Supervision of Professor David W. Brooks

Lincoln, Nebraska

August, 2008

THE RETEACHING OF MATHEMATICS SKILLS TO FIFTH GRADE STUDENTS

Matthew C. Kutscher, Ph.D.

University of Nebraska, 2008

Adviser: David W. Brooks

The scores of United States students on the Trends in International Mathematics and Science Study from 1995 to 2003 have shown little improvement at the fourth and eighth grade levels in overall results and a further decline in international comparative rankings. However, a more alarming statistic shows a decrease in U.S. scores between the fourth and eighth grade levels – indicating that a closer examination is needed, primarily on the instructional interventions utilized during these critical learning periods of upper elementary and middle school.

Reteaching and retesting is a phrase a local school district has adopted in its vernacular to ensure that no children are left behind in both instruction and opportunities to relearn instructional materials. However, there are wide ranges of strategies teachers throughout the district utilize that allow students to demonstrate a proficient level of mastery in the area of mathematics.

The purpose of this study is to examine fifth grade classrooms and develop an understanding of what reteaching is, what materials are utilized to improve student performance, and some of the barriers that could lead a student to need reteaching. Additionally, this study will examine the use of an online assessment tool, called EDU,

modified to deliver similar reteaching materials as the traditional fifth grade mathematics curriculum in order to observe strengths and weaknesses of online tools to improve learning.

Findings within this qualitative case study suggest that reteaching is not clearly defined and often a reactionary process after a student fails a particular objective. One location addressed reteaching from a preventative approach, seeming to provide a more positive learning environment for both teacher and students. Additionally, the use of EDU provided positive instructional interventions.

DEDICATION

To my loving wife, Wendy, to whom I treasure.

ACKNOWLEDGEMENTS

My deepest appreciation goes to Dr. David Brooks, my mentor, who taught me to pursue my passion, even when faced with the greatest adversity. To him, I have the deepest gratitude – for his vision and commitment in seeking the truth in learning. Without his guidance and encouragement, this would not have been possible.

To Dr. Fowler I owe a great deal of respect and gratitude. Your willingness to share with me and my first group of students the explorations of brain waves – highlighting how technology could engage students in meaningful activities, allowing me to expand my repertoire of teaching and begin to tap into the importance one’s creativity can add to the learning of mathematics.

To Dr. Steckelberg I am so thankful in your help pursuing my initial graduate degree in instructional technology and your encouragement to take the next steps towards a career in academia. You encouraged me to take bold steps in the world of educational technology, as an interactive designer, an online course developer, and to have a voice in helping develop one of the best instructional technology programs in the Midwest.

To Dr. Grady I owe you so much thanks. You initially came to me when I began working with the Department of Educational Administration, asking me to assist you in promoting educational research through both the promotion of the Women in Educational Leadership conference and assisting her in efforts to promote educational research throughout the broader educational community. You gave me confidence in my skills and lit a fire to do research.

Finally, to all of those who shaped my academic pursuits – I thank you too.

Table of Contents

LIST OF TABLES	ix
LIST OF FIGURES.....	x
I. INTRODUCTION	1
Context of the Study.....	1
“Reteaching”	3
EDU.....	4
K-12 and EDU	5
Introducing EDU into the Individualized Elementary Mathematics Curriculum	6
Purpose of the Study	6
Research Questions	7
Questions about Reteaching	7
Questions about EDU.....	8
Significance of the Study	8
II. LITERATURE REVIEW	9
Introduction	9
Working Memory and Cognitive Load Theory.....	9
The Learning of Mathematics.....	14
A Connection between CLT and the Learning of Mathematics.....	14
Reteaching Strategies.....	21
The Use of Computer/Web-Based Instructional Tools.....	23

III. METHODS	27
General Overview	27
Participants	28
Design.....	30
Instruments and Materials	31
Procedures	32
Data Analysis.....	33
Validation Procedures	33
IV. TEACHERS, STUDENTS, AND SCHOOLS: FIVE DIFFERENT CLASSROOMS, FIVE DIFFERENT APPROACHES.....	35
Megan’s Classroom at School #1	35
Hasan’s Experiences at School #1	59
David’s Classroom at School #2.....	62
Cindy’s Experiences at School #2	72
Jennifer’s Classroom at School #3.....	76
Brian’s Experiences at School #3	89
Nancy’s Classroom at School #4	91
Cameron’s Experiences at School #4.....	105
Carrie’s Classroom at School #5	110
Brooklyn’s and Angelica’s Experiences at School #5.....	134
V. THE PROGRAMMING OF RANDOMIZED PRACTICE PROBLEMS.....	139

VI. PRESENTATION OF FINDINGS	147
Demographics	147
State, District, and Individual School Assessment Data	153
Instructional Materials	158
Reteaching – Retesting	160
VII. INTERPRETATIONS OF DATA AND IDENTIFICATION OF THEMES.....	163
Theme One: Professional Practice	165
Theme Two: Instructional Materials	171
Theme Three: Learning Strategies	172
VIII. RESPONSE TO RESEARCH QUESTIONS	174
Questions about Reteaching	174
Questions about EDU	178
IX. SUMMARY AND RECOMMENDATIONS	180
The Validation of Data	180
Conclusions about Reteaching	181
Conclusions about EDU	182
Future Directions and Recommendations	184
A Call for Further Research	185
REFERENCES	187
APPENDIX A: E-MAIL REQUEST FOR TEACHER PARTICIPATION	200
APPENDIX B: UNL IRB APPROVAL LETTER	202
APPENDIX C: LPS APPROVAL LETTER	204
APPENDIX D: E-MAIL TO PRINCIPAL	206

APPENDIX E: PARENT CONSENT FORM.....	208
APPENDIX F: CHILD ASSENT FORM.....	211
APPENDIX G: EDU QU CODE.....	213
APPENDIX H: 5 TH GRADE MATHEMATICS OBJECTIVE CARD.....	300

LIST OF TABLES

Table 2.1	Effect Sizes for Instructional Strategies Tested with Special Education and Low-Achieving Students.....	22
Table 6.1	2006-07 Student Enrollment.....	148
Table 6.2	Ethnicity Data, 2006-07	149
Table 6.3	Free and Reduced Data 2006-07.....	150
Table 6.4	English Language Learning/Gifted.....	151
Table 6.5	Mobility Rate (2005-06).....	152
Table 6.6	2005-06 School Attendance Rate.....	153
Table 6.7	2005-06 Academic Year Performance Data.....	155
Table 6.8	Retesting Data.....	161

LIST OF FIGURES

Figure 2.1	Emphasis of Mathematics Content Standards Across the Grades.....	15
Figure 5.1	Creating Topics Using EDU’s Web Interface.....	142
Figure 5.2	Random Problem and Comments in EDU	143
Figure 5.3	Programming in QU Code.....	144
Figure 5.4	Using the Algorithm/Randomization Process in EDU.....	145
Figure 6.1	State Proficiency Scores on Overall Mathematics Objectives	154
Figure 6.2	District Assessment Scores by Standard and Overall Averages.....	156
Figure 6.3	Participating School’s Standard and Overall Score.....	157
Figure 6.4	Frequency District’s Standards are Covered by Grade Level.....	159
Figure 6.5	Frequency of Computation and Numeration and Number Sense.....	159
Figure 6.6	Emphasis of Mathematics Content Standards Across the Grades.....	160