Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.
Evaluating Disaster Education

Programs for Children

A thesis presented for the degree of

Doctor of Philosophy

in

Emergency Management

at Massey University, Wellington,

New Zealand.

Victoria Anne Johnson

September 2014
Abstract

This research aimed to generate new theories on how to evaluate the outcomes and societal impacts of disaster education programs for children. In the last decade, disaster education programs for children have been promoted as an innovative approach to disaster risk reduction, based on several theories about the benefits of these programs. Due to limited research on these programs, widely held assumptions about the relationships between program outcomes and societal improvements in disaster risk reduction remain unchallenged.

The thesis uses case studies of evaluations to explore ways to improve the evaluation of disaster education programs for children. To build on previous research, this study began with a methodological review of program evaluations in order to characterize the tradition of evaluation methods. Based on the finding that few evaluations examined program theories, program theory models were developed for two case study evaluations of disaster education programs for children.

The first case used quasi-experimental methodology to underpin an impact evaluation of ShakeOut, an earthquake and tsunami drill in two Washington State school districts. The program logic suggested that drills provided children with adequate understanding of protective actions to prevent injuries and deaths during a disaster. The second case used process evaluation to explore the implementation of What’s the Plan, Stan?, a free, voluntary disaster teaching resource distributed to New Zealand primary
schools. The process logic suggested that increased promotion of the resource would increase its uptake and use.

The case studies revealed that some program theories common to many disaster education programs for children are faulty. The findings of the ShakeOut evaluation suggest school drills, as they are currently practiced, do not teach all children adaptive response skills. The *What’s the Plan, Stan?* evaluation identified several intervening and deterrent factors influencing the resource’s uptake and use, suggesting increased national promotion of the resource is unlikely to increase its use. In both case studies, the application of theory-based evaluation methods helped to articulate unknown influencing factors and develop meaningful and feasible outcome indicators for both quantitative and qualitative research methods. Ongoing research is needed to refine outcome indicators of programs’ societal impacts.
Acknowledgements

I would like to acknowledge the financial support of a number of institutions. This research was supported by public research funding from the Government of New Zealand through GNS Science, with additional support and in-kind resources from the Joint Centre for Disaster Research at Massey University. Support was also provided by the Washington Military Department Emergency Management Division, in partnership with public research funding from the Government of New Zealand.

I would like to specifically thank GNS Science for supporting my research both financially and on a personal level. In particular, I would like to thank Prof. David Johnston, Director of the Joint Centre for Disaster Research at Massey University, for encouraging me to undertake a Ph.D. when I came to New Zealand in 2011 on a short-term Ian Axford Fellowship in Public Policy. Despite the challenges of the response and recovery to the 2011 Christchurch earthquake, Prof. Johnston helped expedite my enrollment and identify funding sources for my studies and fieldwork. He was also a primary source of personal support for both my husband and I as we made arrangements to remain longer in New Zealand than originally planned.

I could not have completed this research without the encouragement and sound guidance of my supervisors. My gratitude goes to Prof. David Johnston who served as my lead supervisor, assisting in all matters of the Ph.D. process, including writing and reviews, logistics, speaking opportunities, journal submissions, and providing invaluable professional contacts. Prof. Johnston also provided me access to the case study opportunity in Washington State through JCDR’s long-standing research collaboration
with the Washington Military Department Emergency Management Division. I also thank Prof. Kevin Ronan of CQ University Australia who served as a second rater on several papers and spent many hours providing detailed reviews of my work. He also provided opportunities to contribute to other projects in the field over the course of my Ph.D. I also thank Assoc. Prof. Robin Peace at Massey University who provided an invaluable perspective on evaluation research and practice, as well as detailed reviews and advice.

I would like to acknowledge the support I received from several individuals in Washington State who assisted with the logistics of the 2012 evaluation of ShakeOut, including: Dave Nelson, John Schelling, Barbara Thurman, and Noemi LaChapelle of the Washington Military Department Emergency Management Division; Charles Wallace of Grays Harbor County Emergency Management, who provided significant support by facilitating contacts and meetings with the two school districts; Dr. Paula Akerlund, Superintendent of Ocosta School District; Bill Duncanson, Principal, and David Wayman, Superintendent, of North Beach School District; the 27 teachers who took time out of their busy schedules to voluntarily administer the surveys; and the students of Ocosta and North Beach School Districts who participated in the surveys and even provided some entertaining comments and drawings for their anonymous survey reviewer. I hope the findings of this evaluation will contribute to improvements in school drills and emergency management planning that lead to a safer and more resilience communities in Washington.

I would also like to acknowledge the support I received as a 2011 Ian Axford Fellow in Public Policy, a research fellowship administered by Fulbright New Zealand. I would like to thank the entire Fulbright New Zealand staff, especially Stefanie Joe, Andy
Mitchell and Mele Wendt. I am particularly grateful to my hosts and mentors, Chandrika Kumaran and Dr. Richard Smith of the Ministry of Civil Defence & Emergency Management.

I could not have completed this Ph.D. without the unwavering support of my family and friends, especially my husband Ryan. Ryan not only willingly moved to New Zealand with me, but also provided unconditional support for this undertaking despite the many unknowns that the future held. I am incredibly grateful for Ryan’s unending source of encouragement, love, and laughter throughout the successes and challenges of this thesis.

I dedicate this thesis to my father, Dr. Rev. Gregory R. Johnson, who inspired my love of learning. When I think about the path to this major milestone in my academic career, my first memories are of you reading to Rob, Katie, and me each night, teaching us about history, philosophy, geography, and English, and encouraging us to use our imaginations to picture other worlds and human experiences. You have always been a source of support and encouragement. Thank you Dad for inspiring me to pursue a career in public service. Because of you, I always strive to work hard and aim high.
# Table of Contents

Abstract ................................................................................................................................. i  
Acknowledgements ............................................................................................................ iii  
Operational definitions ........................................................................................................ xiv  

## Chapter 1: Introduction ................................................................................................. 1  
1.1 Overview ..................................................................................................................... 1  
1.2 Disaster impacts ......................................................................................................... 1  
1.3 History of disaster education .................................................................................... 8  
1.4 Rise of disaster education for children .................................................................. 12  
1.5 Models of disaster education programs for children ........................................ 16  
  1.5.1 School drills ........................................................................................................ 17  
  1.5.2 Classroom curriculum infusion ..................................................................... 18  
  1.5.3 National curriculum integration .................................................................. 20  
  1.5.4 Community education ................................................................................... 21  
1.6 Policy goals and progress ....................................................................................... 21  
1.7 Rationale for the research ....................................................................................... 24  
1.8 Thesis structure ....................................................................................................... 25  

## Chapter 2: Literature Review ....................................................................................... 29  
2.1 Introduction ............................................................................................................... 29  
2.2 Key theories of disaster education for children ................................................ 29  
  2.2.1 Disaster education for children can increase children’s hazard awareness, realistic risk perceptions, and knowledge of protective actions .......................................................... 29  
  2.2.2 Children can learn self-protective actions for disasters ................................... 35  
  2.2.3 Children can lead and contribute to disaster preparedness and response .......... 39  
  2.2.4 Children can transfer knowledge to adults and influence them to prepare .......... 43  
  2.2.5 Disaster education that aims to increase realistic risk perceptions can reduce, rather than increase, anxiety and fear in children .................................................................................. 47  
2.3 Limitations of previous research ............................................................................ 53  
2.4 Summary of research gaps and future directions ................................................. 54  

## Chapter 3: Research Methods ....................................................................................... 57  
3.1 Overview ..................................................................................................................... 57  
3.2 Objective .................................................................................................................... 58  
3.3 Research Questions ................................................................................................... 58  
3.4 Research design ......................................................................................................... 59  
  3.4.1 Conceptual framework ................................................................................. 60  
  3.4.2 Case study method ...................................................................................... 63
6.3.3 Knowledge of the causes of injury .......................................... 185
6.3.4 Scenario-based knowledge application .................................. 187
6.3.5 Disaster-related upset .............................................................. 196

6.4 Discussion ............................................................................................... 197

6.5 Quality and feasibility of the outcome indicators .................................. 204
6.5.1 Strength of the scientific evidence .......................................... 209
6.5.2 Conformity with accepted practice .......................................... 211
6.5.3 Reliability ................................................................................ 212
6.5.4 Face validity ........................................................................... 213
6.5.5 Utility ...................................................................................... 213
6.5.6 Resources needed ................................................................. 214
6.5.7 User-friendliness ................................................................. 214
6.5.8 Affectivity ............................................................................. 215

6.6 Link to Chapter 7: Paper 4 ..................................................................... 217

Chapter 7: Paper 4 Implementing Disaster Preparedness Education in New Zealand Primary Schools ........................................................... 219

7.1 Introduction ............................................................................................. 220
7.2 Methodology ........................................................................................... 223
7.3 Results ..................................................................................................... 225
7.3.1 Intervening factors: Resource promotion to teacher awareness ................................................................. 225
7.3.2 Facilitating factors of resource use .......................................... 227
7.3.3 Deterrent factors of resource use ............................................. 230

7.4 Discussion ............................................................................................... 233
7.4.1 Increase CDEM interaction with schools through web-based technology ................................................................. 234
7.4.2 Provide more teacher training .................................................. 234
7.4.3 Establish and maintain ongoing evaluation of the resource ............................................................................... 235
7.4.4 Integrate disaster preparedness messaging into other children’s programs ................................................................. 235
7.4.5 Require disaster preparedness education in schools ............................................................................... 235

7.5 Conclusion .............................................................................................. 236

7.6 Quality and feasibility of the outcome indicators .................................. 237
7.6.1 Conformity with accepted practice .......................................... 240
7.6.2 Reliability ................................................................. 241
7.6.3 Face validity ........................................................................... 242
7.6.4 Utility ...................................................................................... 243
7.6.5 Resources needed ................................................................. 243
7.6.6 User-friendliness ................................................................. 244
7.6.7 Overall quality ........................................................................ 244

7.7 Link to Chapter 8 .................................................................................... 246

Chapter 8: Conclusion ............................................................................. 247

8.1 Introduction............................................................................................. 247
8.2 Background and context ................................................................. 247
8.3 Summary of the research undertaken and results ....................... 252
  8.3.1 Chapter 4/Paper 1: Evaluations of Disaster Education Programs for Children: A Methodological Review (Johnson, Ronan, Johnston, & Peace, 2014c) .................................................. 253
  8.3.2 Chapter 5/Paper 2: Improving the Impact and Implementation of Disaster Education Programs For Children Through Theory-Based Evaluation (Johnson, Peace, Ronan, & Johnston, 2014b) .............................................................. 254
  8.3.4 Chapter 7/Paper 4: Implementing Disaster Preparedness Education in New Zealand Primary Schools (Johnson, Ronan, Johnston, & Peace, 2014d) .............................................................. 259
8.4 Implications for evaluating disaster education programs for children ................................................................. 263
  8.4.1 Some common theories about disaster education programs for children are faulty ........................................ 263
  8.4.2 Theory-based evaluation practices can improve the evaluation of disaster education programs for children ............................................... 265
  8.4.3 Observations are inadequate for measuring the outcomes and intended impacts of school drills ..................................... 266
  8.4.4 International policy implications of the research ..................... 267
8.4 Opportunities for future research ..................................................... 269
References ............................................................................................... 273

Appendix 1: Statement of Contribution sheets for published and submitted journal papers .................................................. 321
Appendix 2: Documentation for human ethics requirements .................. 327
Appendix 3: Codes used in the methodological literature review (Chapter 4 / Paper 1) .............................................................. 339
Appendix 4: Documentation from the ShakeOut evaluation (Chapter 6 / Paper 3) .............................................................. 347
Appendix 5: Codes used in the What’s the Plan, Stan? evaluation (Chapter 7 / Paper 4) .............................................................. 375
Appendix 6: Additional relevant papers prepared during the course of the PhD study .............................................................. 377
List of Tables

Table 3.1 Conceptual framework and operationalization of the case study research ........................................ 62
Table 3.2 Operationalization of the methodological literature review .............................................................. 72
Table 3.3 Operationalization of program theory modeling .................................................................................. 76
Table 3.4 Operationalization of the first case study evaluation: a quasi-experimental evaluation of ShakeOut, an earthquake and tsunami drill in two Washington State school districts ................................................................. 79
Table 3.5 Operationalization of the second case study evaluation: a qualitative, mixed methods evaluation of What’s the Plan, Stan?, a national voluntary teaching resource .......................................................................................................................... 85
Table 4.1 Literature search results ...................................................................................................................... 99
Table 4.2 Summary of evaluations of disaster education programs for children .............................................. 101
Table 4.3 Numbers of study participants ............................................................................................................ 113
Table 4.4 Types of study participants ................................................................................................................ 115
Table 4.5 Evaluation designs .............................................................................................................................. 119
Table 4.6 Data collection methods ..................................................................................................................... 120
Table 4.7 Frequencies of impact outcome indicators .......................................................................................... 123
Table 5.1 Example of an application of a program theory matrix to school earthquake drills .................................................. 160
Table 6.1 Question: During the ShakeOut earthquake drill in your school, did you practice evacuation for a tsunami? (pick one) ........................................................................................................................................ 181
Table 6.2 Question: If you hear the words “Drop, Cover, and Hold On,” what would you do? (pick one) .......................................................... 183
Table 6.3 Question: Why do you “Drop, Cover, and Hold On” during an earthquake? (select all that apply) .......................................................... 184
Table 6.4 Question: If you are near the ocean and an earthquake occurs, what should you do once the shaking stops? (pick one) ........................................................................................................................................ 185
Table 6.5 Question: What do you think has caused the most injuries during earthquakes in the United States? (pick one) ........................................................................................................................................ 186
Table 6.6 Question: What is the most important part of your body to protect from injury during an earthquake? (pick one) ........................................................................................................................................ 186
Table 6.7 Correct indoor action: Drop to my knees and cover my neck and head ................................................ 188
Table 6.8 Correct indoor action: Take cover under a desk or table if possible ...................................................... 188
Table 6.9 Incorrect indoor action: Go outside to an open area ............................................................................ 189
Table 6.10 Incorrect indoor action: Hold on to a desk and try to stay standing .................................................. 190
Table 6.11 Incorrect indoor action: Go to a doorway ............................................................................................. 191
Table 6.12 Incorrect indoor action: Get next to a desk to create a “triangle of life” .................................................. 192
Table 6.13 Correct outdoor action: Cover my head and neck with my arms ......................................................... 193
Table 6.14 Incorrect outdoor action: Go inside to get under a table or desk ......................................................... 194
Table 6.15 Incorrect outdoor action: Hold on to a tree and try to stay standing .................................................. 195
Table 6.16 Question: What would be the best thing to do if you are inside but don’t have a desk or table near you during an earthquake? (pick one) ........................................................................................................................................ 196
Table 6.17 Question: Do you feel upset when you think or talk about earthquakes and tsunamis? (pick one) ........................................................................................................................................ 197
Table 6.18: Program theory matrix for ShakeOut, an earthquake and tsunami drill in two Washington State school districts ........................................................................................................................................ 207
List of Figures

Figure 5.1 Basic logic model of the HFA Priority For Action #3 ................................. 148
Figure 5.2 Basic logic model of school earthquake drills ............................................. 155
Figure 5.3 Hierarchy of intended outcomes for school earthquake drills ................... 158
Figure 5.4 A stage step model of the implementation theory of What's the Plan, Stan?, a voluntary disaster teaching resource distributed to NZ primary schools ...................................................................................................................... 165
Figure 7.1 Program theory model of an implementation theory of What’s the Plan, Stan? ................................................................................................................................. 225
Figure 7.2 Facilitating and deterrent factors to use of What’s the Plan, Stan? ........... 227
Operational definitions

The definitions below describe the key concepts underpinning this research.

_Disaster_

Disaster is a natural or human-caused hazard that is “a serious disruption of the functioning of a community or a society involving widespread human, material, economic, or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources” (United Nations International Strategy for Disaster Reduction Terminology, 2007a). Disasters include destructive hazards such as earthquakes, tsunamis, storms, blizzards, tornados, wildfires, floods, pandemics, nuclear emergencies, chemical spills, and terrorism, among others.

_Disaster risk_

Disaster risk is the potential for negative impacts from disasters including loss of life, injuries and damage to assets, functions, and services (UNISDR Terminology, 2009).

_Disaster risk reduction_

Disaster risk reduction is instrumental action “to minimize vulnerabilities and disaster risks throughout a society in order to avoid (prevent) or to limit (mitigate and prepare for) the adverse impacts of natural hazards, and facilitate sustainable development” (United Nations Children’s Fund, 2012, p. 3).
Disaster preparedness

A definition of disaster preparedness is adapted from the UNISDR’s definition of preparedness, namely “the knowledge and capacities developed by governments, professional response and recovery organisations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions” (UNISDR Terminology, 2007b). In the field of emergency management, preparedness is one of four functional phases of the conceptual disaster management cycle that includes preparedness, response, recovery, and mitigation (Mushkatel & Weschler, 1985).

Public education

Public education is the emergency management practice of training and educating members of the public (Peek & Mileti, 2002). The New Zealand Ministry of Civil Defence & Emergency Management (2007, p. 7) describes public education as actions that “build public awareness and understanding by individuals and communities of hazards….that ultimately will lead to action towards preparedness.” Public education is distinct from the emergency management concept of public information, which is defined by the U.S. Federal Emergency Management Agency (2013c, para. 1) as the “processes, procedures and systems to communicate timely, accurate and accessible information on the incident’s cause, size and current situation to the public, responders and additional stakeholders (both directly affected and indirectly affected).”
Disaster education
For the purpose of this research, “disaster education,” also referred to by some scholars as “hazards education,” is used as short hand for a public or curricular education initiative that includes the theory and practice of teaching two incorporated subjects: 1) disaster and hazard risks and 2) disaster risk reduction, preparedness, and/or protective actions. In practice, it is common for programs described as disaster or hazards education to teach only the causes of disasters; however, these programs do not meet the definition of disaster education for the purpose of this research.

Evaluation
Evaluation is “an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, value, merit, worth, significance, or quality of a program, product, person, policy or plan” (Fournier, 2005, p. 139). In program evaluation, the object of evaluation is a program, described as an arrangement for providing a service or conducting professional action (Kushner, 2005, p. 334). Program evaluation has two purposes: 1) assessing the outcomes and impacts of a program and 2) examining the process of the program and its implementation.

Outcome indicators
In the practice of evaluation, outcomes are benefits or changes among individuals or populations during or after participating in program activities and outcome indicators are defined as “specific, observable and measurable characteristics or change that will represent achievement of the outcome” (United Way of America, 1996, p. xv).
**Effectiveness**

Effectiveness is “the degree to which something is successful in producing a desired result” ("Effectiveness,” 2014). Measurement of the outcomes and impacts of a program can contribute to the understanding of the program’s worth or success. However, the indicators and concepts used to evaluate the effectiveness of any one program can vary widely depending on the evaluation design and the intended audience. Also, in practice, evaluations of program effectiveness do not always capture the detrimental outcomes of programs; therefore, a measurement of positive outcomes alone may not be an adequate measure of the overall merit or worth of a program (Davidson, 2005, p. 122).

**Program implementation**

Program implementation is defined as “a specified set of activities designed to put into practice an activity or program of known dimensions” (National Implementation Research Network, n.d.). Program implementation deals with *program integrity*, which includes five main dimensions: adherence, dosage, quality of delivery, participant responsiveness, and program differentiation (Dane & Schneider, 1998). The evaluation of program implementation provides insights into how the program is being conducted and how it can be improved (Rossi, Lipsey, & Freeman, 2004).