



The impact of a museum-based hazard education program on students, teachers and parents



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A B S T R A C T

Museum-based disaster education programs have the potential to offer hands-on and interactive activities unavailable in schools. In our study, we provide promising new insight into the effectiveness of increasing knowledge and disaster preparedness behaviours in students, teachers, and parents after attending a museum education program. Students from nine primary schools ($n=432$) attended a disaster education program at the Museum of New Zealand Te Papa Tongarewa and were assigned to one of four treatments or a control group. Three of the treatments groups received “bridging” objects for household disaster preparedness – a fill-in disaster plan, plastic putty or steel brackets - to take home and implement with their families. Pre and post-program questionnaires were administered to students, teachers, and parents. The study found that the museum education program significantly increased student knowledge of disaster preparedness compared to the control group ($F_{4382}=7.657$, $p < 0.001$), and had a positive impact on teacher and parent knowledge and behaviour. The results of this study suggest that providing the students a bridging object and instructions they can use themselves at home, even in a limited manner, may help build children's self-efficacy beliefs and skills for preparedness. Implementing a museum-based earthquake education program for schools may increase school and household discussion about disaster preparedness and instigate actions towards preparedness that will ultimately protect lives and property.

1. Introduction

Museums serve as a source of public information on the physical and social impacts of natural and technological hazards. With a wide array of hands-on resources, interactive activities and eye-catching informational displays typically unavailable in schools, educational museum programs have the potential to provide a learning experience that motivates disaster preparedness in children's homes and schools [8]. Several scholars stress that to increase students' motivation and engagement with a particular curriculum, both formal and informal instructional methods are needed, geared to different learning intelligences [14,43]. Some research has indicated that museums can be an effective, informal method of teaching science to children [23,28,6,9,32]. However, there is a gap in the literature on the effective conveyance of disaster preparedness education through museums to students, teachers, and families.

The need for and dissemination of public disaster education internationally arose from the consensus that teaching people about disaster risks and disaster preparedness measures, such as home

hazard adjustments and family communication plans, can prevent some of the injuries, damage and negative social and economic consequences of disasters [24]. Public disaster education programs are increasingly common and have been found to improve knowledge and raise awareness [19,24,5]. There is also limited but promising evidence that disaster education for children could improve children's knowledge and awareness of disaster risks [11,13,27,33–36,10], enhance their self-protective skills [18,31], influence children's adult household members to prepare [21,26,33], and reduce of children's fear of disasters [15,33,36,37], which may improve their ability to discuss and cope with negative feelings arising from a disaster experience.

Despite these findings, policy makers and emergency management practitioners have struggled to execute effective educational methods that instigate instrumental action towards preparedness [22,25,29,30]. For example, over the past decade, the national government in New Zealand ran many educational preparedness campaigns highlighting New Zealand's high risk of seismic activity, but in 2011, less than half of residents had taken measures to prepare for earthquakes [4]. Also, a

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recent review of evaluations of disaster education programs for children found that there is limited evidence that children's disaster education programs instigate preparedness activities or influence them to prepare for disasters as adults [19].

New Zealand is located on the boundary of the Pacific Plate and the Australian Plate and tens of thousands of earthquakes occur each year in the country. Based on historical records, New Zealand has several 6.0 magnitude earthquakes each year with notable and deadly quakes occurring in 1931 (Hawke's Bay), 2011 (Christchurch), and 2016 (Kaikoura). Despite the country's earthquakes risks, disaster education is not commonly taught in New Zealand schools as part of the school curriculum [20]. In New Zealand, earthquake and natural hazards sits within the science curriculum (Planet Earth and Beyond) for Years 3–8 but disaster education is not a explicitly part of the Ministry of Education's curriculum achievement objectives. Instead, disaster education is the responsibility of the Earthquake Commission (EQC), a national agency that provides a research, education, and insurance management role, and the Ministry of Civil Defense and Emergency Management (MCDEM). As part of EQC's mandate, it sponsors an exhibit, *Awesome Forces* (<https://www.tepapa.govt.nz/visit/whats-on/exhibitions/awesome-forces>), at the Museum of New Zealand Te Papa Tongarewa (Te Papa). The exhibit highlights disaster risk and preparedness information, including a walk-through shake house simulator, and information on the services of New Zealand's Earthquake Commission. The purpose of the exhibit is to educate visitors about New Zealand's natural landscape and hazard risks and provide a memorable educational experience that would inspire children and adults to take measures to prepare for disasters. EQC also subsidizes (bus and entry costs) approximately 2000 low-income school children a year to visit Te Papa and attend a hazard education program. To investigate the effectiveness of museum-based disaster education for children, our study evaluated the outcomes of school group visits to the *Awesome Forces* exhibit at Te Papa in Wellington, New Zealand, and the program's impact on children's preparedness actions at home. Visiting *Awesome Forces* is a popular activity for local schools and extracurricular groups in Wellington. While a handful of studies mention the incorporation of museum visits as part of school-based disaster education programs for children [1,39,40], none of the studies investigated the exclusive impact of the museum program on children's knowledge of disaster risks and their preparedness actions. Therefore, this study attempts to provide new knowledge to a virtually unexplored area of inquiry.

2. Methods

The research was conducted during Term 4 (October and December) of the 2011 academic school year. Participants (n=432) were Year 5 and 6 students (age 10–11) from 18 classrooms in nine primary schools in Wellington, New Zealand (Table 1). Study participants also included 18 teachers and the students' parents/primary caregivers.

The quasi-experimental study included a pre-test for students and teachers delivered at each school, the intervention (an educational program delivered at the museum with different treatments) and a post-test for students, teachers and parents. The study included four treatments and a control group.

2.1. Pre-test assessment

A pre-test was conducted by two museum educators at each school before the class visit to the museum. The pre-test included two forms of assessment for students and one for teachers. The first student assessment was a one-page checklist questionnaire. The checklist included pictures and labels of different actions and items (n=12). Students were asked to check the box if the item or action would be helpful or not helpful during or immediately after an earthquake. Ten

Table 1

Details of schools that participated in study.

School	Number of classes	Number of students	Decile ^a	Treatment
St. Anne's	2	42	3	Control
Brooklyn	2	49	10	Program only
Newtown	2	50	5	Program only
Clyde Quay	2	42	10	Blue Tack
Berhampore	2	46	7	Blue Tack
Kilbirnie	2	54	10	Emergency plan
Lyall Bay	2	62	7	Emergency plan
St. Pats	1	18	5	Brackets
Ridgway	1	24	9	Brackets
Lyall Bay	2	45	7	Brackets

^a Deciles are ratings used by the New Zealand Ministry of Education to determine some of the funding a school receives. A school's decile measures the extent to which the school's students live in low socio-economic or poorer communities. Decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities. Decile 10 schools are the 10% of schools with the lowest proportion of students from these communities (<http://parents.education.govt.nz/primary-school/schooling-in-nz/ministry-funding-deciles/>).

items would be helpful during or after an earthquake. In the second assessment, students were asked to draw their residence (house or apartment) and label and/or draw how their home is prepared for an earthquake. This measure was modelled on cognitive mapping methods which has been used in numerous disciplines to study student's relationship to spaces (e.g., [12]) and allows for pre and post-program comparison [17].

The checklist and house drawing results were used to establish a baseline of students' existing knowledge of disaster preparedness and mitigation measures. Each assessment was labelled with the student's name, age, class, and school so that the pre- and post-tests could be compared at the individual and classroom level.

Teachers completed a multiple choice pre-test questionnaire that assessed their knowledge of natural hazards and disasters in the school and at home, any preventative actions taken by the class, and who they would qualify as helpful sources of disaster preparedness information (e.g., school principal, emergency manager, etc). They were also asked about their use of *What's the Plan, Stan?*,¹ a primary school resource with prepared lesson plans and activities to teach disaster risks and preparedness, which is promoted nationally by the New Zealand Ministry of Civil Defence and Emergency Management (MCDEM). The teacher pre-test results were used to establish a baseline of teacher knowledge and classroom-based disaster education activities and disaster preparedness measures.

2.2. Program and treatments

Two weeks after the pre-test assessment, students visited Te Papa for an hour-long education program delivered by a museum educator. The museum education program was developed using the Ministry of Education's Education Outside the Classroom Guidelines which emphasises real-world experiences. A visit to the museum offers students and teachers access to experiences and resources not available at the school. Through hands-on experiences, student long-term learning can be enhanced [2].

There were four treatments and a control group. The control group did not visit the museum between the pre-test and post-test assessments. However, classrooms in this group visited the museum after the study so they could benefit from the educational program.

We tested the impact of four different treatments on students, teacher, and parent disaster preparedness knowledge and behaviour. Each treatment corresponded to an item given to each student at the end of their

¹ *What's the Plan, Stan?*, <http://www.whatstheplanstan.govt.nz/>.

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