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ABSTRACT

An earthquake response and evacuation exercise was observed and evaluated in a fully occupied primary school in Wellington, New Zealand. The observed school conducts twice-yearly emergency practices, and has a well developed protocol for keeping the pupils as safe as possible in the event of a severe earthquake. The purpose of this evaluation, conducted by practitioners and research personnel in emergency management, was to suggest modifications to the exercise, and to identify issues for best practice in school earthquake preparedness and evacuation. Key lessons emerging from the present case study will contribute to informing best practice for earthquake safety in New Zealand schools.

KEYWORDS

New Zealand, earthquake, school, children, preparedness, evacuation, response, exercise.

1.0 INTRODUCTION

Wellington, New Zealand, is potentially a hazardous environment with a complex landscape, combining atmospheric and geological hazards with a relatively steep topography and a large population. A major earthquake in the region has the potential to cause extensive damage to buildings and infrastructure, to result in injuries and loss of life, and to separate family members for extended periods. If emergency plans are not in place before an emergency, or if children are unaware of plans, this can add to the stress they may already be experiencing.

It is the responsibility of schools and families to prepare for an emergency, but they often have little or no experience of hazards, and any knowledge they do have is often of minor events (Berry & King, 1998; Finnis et al., 2004; Ronan & Johnston, 2001). This is especially common with earthquakes. Educating individuals about what to expect and do before, during and after a disaster helps reduce fears and can increase their ability to respond and recover from what can be a potentially stressful situation (Ronan et al., 2008; Ronan & Johnston, 2005).

While educating children about how to prepare for emergencies is seen as a useful first step in improving community preparedness (Duffy, 2009; Finnis et al, 2004; Ministry of Civil Defence and Emergency Management, 2006; Ronan & Johnston, 2005), this knowledge needs to be followed up in a practical way with regular emergency response practices (safety behaviours and building evacuation) and emergency evacuation exercises (emptying the school by having caregivers collect their children) (Ministry of Civil Defence and Emergency Management, 2009).

The Ministry of Civil Defence and Emergency Management (MCDEM) provides schools with a comprehensive resource for teaching civil defence and emergency management. The “What’s the Plan Stan” (WTPS) education programme (Ministry of Civil Defence and Emergency Management, 2009) provides teachers and schools with resources to plan, conduct and evaluate school preparedness plans. The WTPS resource identifies three types of emergency practices and simulations that schools can use to test their emergency plans and procedures: (1) emergency response practices; (2) evacuation exercises; and (3) disaster simulations. These activities range in complexity from practising emergency safety behaviours, through to a full disaster simulation that would include students, teachers, and civil defence and emergency management agencies in the community. Schools are encouraged to conduct emergency response practices including using safety behaviours at least once a term, school evacuation exercises that require caregivers to collect their children from the school at least once a year, and disaster simulations every two years.

The Ministry of Education requires every New Zealand school to have a documented Health and Safety Policy which reflects compliance with relevant legislation such as the Health and Safety in Employment Act 1992, Fire Service Act 1975 no.42 and the Building Act 2004 no.72, and their amendments. New Zealand schools are also required to have preparedness plans in place for various types of emergencies, including those resulting from natural hazards. Annual fire drills and emergency evacuations are a legal requirement of all New Zealand schools, the Ministry of Education stating that they be carried out “in accordance with the school’s evacuation scheme” (Ministry of Education, 2008). However, with little

observational data, it is difficult to assess their effectiveness. Much of the previous research on emergency exercises in schools has focused on the *frequency* of children's participation in drills rather than on the *specific content* and *evaluation* of exercises (Coomer et al, 2008; Finnis et al, 2004; Ronan & Johnston, 2001). The next necessary step is to observe school emergency exercises while they are being practised, so the content and processes of the emergency preparation can be evaluated. The present study is the first known reported evaluation of a school emergency exercise in New Zealand.

1.1 Background to the present study

The primary school in the present study undertakes full emergency evacuation exercises annually (normally in the first term), and fire drills three times a year. Drills are conducted for fires occurring both inside and outside the classroom to ensure children are familiar with contingency plans for both scenarios. The school sends information about their preparedness plans home to caregivers at the start of each school year, and includes reminders about specific exercises in the school newsletter prior to conducting the drills. The school previously undertook one full emergency simulation exercise in 2007 with civil defence and emergency management response personnel present, and has another planned for the beginning of the 2010 school-year.

The emergency exercise in this study was a combination of an emergency response practice for an earthquake (which included use of safety behaviours and a building evacuation), followed by an evacuation exercise (which required children to be collected from school by caregivers). Conducting effective emergency response practices and evacuation exercises requires prior planning and preparation, with all participants having a clear understanding of their roles and responsibilities in the exercise and, by extension, in an actual emergency event. Thus, prior to the exercise, staff met several times to ensure familiarisation with the school's current preparedness plans and expectations. Classroom teachers reviewed appropriate earthquake safety behaviours and building evacuation routes with the children in the weeks prior to the exercise.

2.0 RESEARCH DESIGN AND METHODS

2.1 Purpose

The purpose of the present study was to observe an emergency response and evacuation exercise in a New Zealand (NZ) primary school, and to suggest modifications for improvement where appropriate. The hazard of interest was an earthquake. The specific school was chosen for this study as it holds regular emergency response and evacuation exercises.

2.2 Aim

Using the case as an exemplar, the broad aims of the observation were to:

- Assist the school as it attempts to prepare for, and minimise, the potential impact of a significant earthquake;
- Inform future hazards preparedness in NZ schools; and
- Promote community recovery following a hazardous event.

2.3 Research approach

The study was conducted using a naturalistic observation, this approach being appropriate for such an evaluation of a school emergency exercise. At the conclusion of the exercise, the observation team met with the school staff to discuss the exercise and possible modifications for improving emergency preparedness.

2.4 Observation criteria

- Observe the processes of the emergency response and evacuation exercise;
- Observe the behaviours of staff and children as they undertook the exercise; and
- Evaluate the exercise with teachers after caregivers had collected their children.

To conduct the evaluation, the observation team would:

- Listen to teachers' perceptions of the exercise and to their suggestions for improvement to procedures;
- Provide feedback to the teachers on observations made during the exercise;
- Clarify with teachers an understanding of what is required of staff, children, and caregivers in an emergency event; and
- Suggest modifications to the exercise that would increase the likelihood of minimising potential impact from a significant earthquake, and help maximise community recovery.

2.5 Participants

Participants were all 200 pupils and the 15 teachers and general staff in a decile 9, co-educational, primary school (Years 1-8) in a hill suburb within five kilometres of Wellington City CBD, NZ. Pupils ranged from 5-13 years of age. A caregiver was to collect each child in the evacuation exercise. (Pupils still at school at the completion of the exercise were supervised in the school library until they were collected.)

2.6 Observation team

The observation team comprised five members: two research staff and a post-graduate student from the Joint Centre for Disaster Research (JCDR), situated at Massey University, Wellington, NZ; one researcher from GNS Science; and one researcher from a private emergency management consultancy firm. Additional input was provided by a researcher in health and safety from Christchurch Polytechnic. The observers were divided among three classes at the school.

3.0 FINDINGS

For clarity of reporting, the emergency exercise was divided into two phases: Emergency response practice; Evacuation exercise, as follows:

3.1 Phase 1: Emergency Response Practice

All children and teachers were in their classrooms at the agreed start-time for the exercise, having already been familiarised with how the exercise would be conducted, and knowing that the purpose of the exercise was to prepare them for keeping safe in the event of an earthquake. There were no children in the playground, and none were placed elsewhere in the school grounds.

The children and their teachers sheltered under classroom desks or tables during the five-minute 'earthquake,' holding onto desk-legs and ensuring their whole body was covered by the desk. Once the *all clear* bell had been rung (after the 5-minute-period under desks), children quickly left the classrooms by the designated emergency exit doors, and moved away from the buildings in an orderly manner. Class rolls were checked and then teachers moved their classes to the school's designated assembly area situated away from all school-buildings. At the assembly point, the principal accounted for all classes, and she stayed with the children and teachers while the building safety-check was conducted by nominated teacher-wardens. The wardens then reported back to the principal at the assembly area, confirming there was no-one left in the particular part of the school for which they were responsible, and that school buildings appeared safe for children and staff to return to. The principal then concluded the emergency response practice by giving the children feedback on the exercise, congratulating them on their sensible behaviour, their good listening, for following instructions quickly, and for helping others. When the principal dismissed the children, teachers escorted them back to their classrooms.

3.2 Phase 2: Emergency Evacuation Exercise

By the time children were back in their classrooms, it was the end of the school day. Children's behaviour appeared to be normal, with no child demonstrating any signs of disturbance following the exercise. There was no class-discussion of the exercise at this point, and no observers heard any children discussing the exercise with others. Caregivers collected their child from the classroom, signing out their child with the teacher before they left the school grounds.

Caregivers had been advised beforehand of the date and time for the evacuation exercise, and were asked to provide emergency contact details to the school in advance of the exercise. These details included who would be collecting their child after the exercise, or any alternative arrangements made for their child to be collected from school.

After the exercise, observers met with the teachers to discuss the exercise. This discussion included: the roles and responsibilities of school personnel before, during and after an emergency event; feedback from teachers; and the effectiveness of the current plans and procedures (including whether caregivers collected and signed for their children). Modifications to the exercise were suggested where appropriate. Conclusions emerging

from the discussion and evaluation are reported below, followed by suggested modifications to the exercise.

4.0 CONCLUSIONS

4.1 The process

The present emergency response practice and evacuation exercise was completed as planned, and as routinely practised in the school. The pupils and teachers were well prepared, aware of their particular roles, and there were no instances of anyone being confused or unaware of what to do. Staff reported that they were satisfied that school emergency procedures for safety during an earthquake, and for evacuation, were appropriate and well understood by children and staff alike. Involving caregivers in the evacuation exercise had also served to update the school's caregiver contact lists.

Wardens were aware that in an actual earthquake, they would be looking for physical damage to any buildings, blocked entry, fires, wires down, unsafe access, broken glass, etc. In an actual emergency, wardens would be expected to relay that information to the principal back in the assembly area. In emergency response exercises at the school, one room is nominated as a "damaged" room, and children are not allowed to enter that room after the exercise. An alternative safe place would be allocated for any pupils normally located in that room to which caregivers would be directed from which to collect their children.

4.2 Behaviours

The pupils and teachers were fully engaged in the exercise, appearing confident in their ability to demonstrate appropriate safety behaviours and procedures. Children appeared to enjoy role-playing the earthquake shaking scenario, shaking the desks and squeezing in together to make sure they were completely covered by the desks and tables. At the end of the emergency response phase of the exercise (i.e., after exiting classrooms and assembling as a school), the principal reinforced the appropriate behaviour of the children through her positive feedback to the assembly before dismissal. Children waited patiently for caregivers to collect them, and caregivers engaged in the exercise by signing out their children before leaving the school grounds.

4.3 Recommendations for modifications to the exercise

1. During the emergency response phase of the exercise, teachers could talk to the children, providing reassurance and ongoing communication while the 'earthquake' was continuing.
2. Once the school had assembled in the common area outside, pupils could be united with their siblings from other classrooms, to provide support and comfort. In these cases, teachers should keep track of their pupils by keeping a record of who had moved out of their class group.
3. Several children could be placed out of their rooms for an emergency exercise, necessitating a protocol for their safety in an actual emergency.
4. Children could be given an opportunity to play a role in planning, organising or conducting the exercise (which may encourage them to conduct their own drills at home).

5. By conducting the exercise an hour or so before the end of the school-day in future, feedback on the exercise could be gathered from the children while it was still 'fresh' in their minds.
6. Following the exercise, caregivers could be given an opportunity to comment on the exercise from their perspective.
7. Greater involvement, enthusiasm and understanding of earthquakes, preparedness, and responses may be achieved by integrating the exercise with other areas of the curriculum. (The exercise did not appear to be linked into any other part of the curriculum. For example: In Maths, time-frames could be recorded and compared for the various stages of the exercise; results may increase efficiency of later exercises; Writing exercises concerning the pupils' reflections of the practice could help consolidate learning, and provide class feedback to others.)
8. To encourage emergency discussions at home, and to encourage home-based disaster preparedness, homework exercises could be designed to require interaction with caregivers, other adults and other children.
9. In a situation where a class teacher is injured in the earthquake, children can be trained to lead and support other children in their class (e.g., go to another teacher for help after the shake is over, collect the teacher's grab-bag, or administer basic first aid in an emergency situation).
10. The school could consider and plan for the particular hazards associated with the location of the school. For instance, landslide may be a possibility in the hill area around the school.
11. Staff may benefit by receiving some psycho-educational material that discusses issues affecting how people might react when exposed to high anxiety, to emergencies, or to trauma and hazardous events.
12. Full emergency exercises involving community resources (e.g., local emergency and Civil Defence personnel) are encouraged on, for example, a biennial basis to enable trial and evaluation emergency processes on a larger scale.

5.0 SUMMARY OF KEY LESSONS LEARNT

- Before any school emergency exercise is conducted, thorough briefing regarding the specifics of the exercise, including exactly what will be required of participants, is likely to increase the probability that children and staff involved in a real emergency at school will respond in an informed, predictable manner, and engage in behaviours that are recognised as best practice.
- Role-playing aspects of an earthquake exercise encourages children to engage in the exercise, and is likely to increase their understanding of possible outcomes in a significant event. Such role play could include children taking a leadership and care role in the case of an "injured teacher."
- Feedback to the children from the school principal can serve to reinforce the importance of the exercise, and to let the children know how well they performed, thus giving ownership to the children, and motivating children to prepare for emergencies.
- It is important that the class teacher maintains communication with the children during the emergency response phase of an exercise, reassuring and comforting them that they are safest remaining where they are (i.e., sheltering under a desk) at that time.
- Engaging caregivers in emergency exercises sends a message to caregivers and children that the school is prepared to protect the safety of their children in an emergency. Such an exercise is likely to encourage families to develop emergency plans

at home. Caregiver involvement also enables the school to keep updated contact details for caregivers. Caregivers could be invited to provide feedback on the exercise from their perspective.

- Conducting regular emergency response practices and evacuation exercises is necessary to ensure effective preparedness plans are in place and provides an opportunity to gather feedback from participants. These exercises assist with improving procedures to enable schools, caregivers and pupils to feel confident that they are in capable and safe hands in the event of an actual emergency event.

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