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M.A. Coomer, GNS Science, PO Box 30368, Lower Hutt

R.A.C. Tarrant, GNS Science/Joint Centre for Disaster Research, Massey University
PO Box 756, Wellington

M.E. Hughes, Joint Centre for Disaster Research, Massey University/GNS Science,
PO Box 30368, Lower Hutt

V. Johnson, Joint Centre for Disaster Research, Massey University/GNS Science,
PO Box 30368, Lower Hutt

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ABSTRACT

The Wellington region is an extremely hazardous place to live. This is due to the range of potential natural hazard events that could occur in the region e.g. flood, earthquake, landslide, ashfall, tsunami, coastal storm surge. Children and their families have been identified as especially vulnerable to the effects of hazards. An earthquake response and evacuation exercise was observed and evaluated in a fully occupied primary school in Wellington, New Zealand. The observed school has a well-developed protocol for keeping the pupils as safe as possible in the event of an earthquake. The purpose of this evaluation by practitioners and research personnel in emergency management, was twofold: to observe a school emergency evacuation in progress; to suggest modifications to the exercise by identifying issues for best practice in school earthquake preparedness and evacuation. Research aimed at assisting children, youth, and families cope more effectively with the effects of disasters is being undertaken in the Wellington region, and 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, feedback.

1.0 INTRODUCTION

The Wellington region is potentially a hazardous place to live. The region is situated on and around active fault lines, and is susceptible to natural hazard events such as earthquakes, flooding, storms, landslips, tsunamis, and volcanic ash fall, as well as anthropogenic hazard events for example: fire, pandemic, power failure, gas leaks and chemical spills. The Wellington environment combines a complex landscape with a combination of steep topography, a large population, and atmospheric and geological hazards. A major earthquake in the Wellington 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 and preparedness plans are in place before a hazard event occurs, and if children are aware of the plans and of their role in them, this can help to reduce any stress they may experience during a hazard event.

It is the responsibility of schools and families to prepare for an emergency event, but they may have had little or no experience of hazards, and any knowledge they may have may be of minor events (Berry & King, 1998; Finnis et al., 2004; Ronan & Johnston, 2001). Although the Wellington region experiences many earthquakes every year, most residents have had no experience of a damaging earthquake. Educating individuals about what to expect and do before, during, and after an emergency event 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).

Educating children about how to prepare for emergencies is a useful first step in improving community preparedness (Dufty, 2009; Finnis et al., 2004; Ministry of Civil Defence and Emergency Management, 2006; Ronan & Johnston, 2005), which needs to be followed up in a practical way with regular emergency response practices around safety and evacuation. A major disaster could happen during school hours when the children are in the care of school staff. In such a situation children, teachers and caregivers all need to be proactive about disaster education and preparedness. Recent experience from Christchurch shows that there were no deaths or injuries among children at any school for two main reasons: strong building codes, and preparedness and disaster education programs in place in schools. An emergency evacuation exercise including the whole school and wider community (Ministry of Civil Defence and Emergency Management, 2009) is the nearest that schools can get to simulating an actual earthquake event.

The “What’s the Plan Stan” (WTPS) education programme provided by MCDEM (Ministry of Civil Defence and Emergency Management, 2009) provides teachers and schools with comprehensive resources to create and evaluate school preparedness plans and to run evacuation exercises. 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 from simply 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.

New Zealand schools are required to have preparedness plans in place for various types of emergencies, including those resulting from natural hazards. The Ministry of Education requires every New Zealand school to have a documented Health and Safety Policy reflecting 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, and their amendments. 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 obvious step is to observe school emergency exercises while they are being practised, so that the content and procedures of the emergency plans and preparation can be evaluated. The 2009 study of this school was the first known reported evaluation of a school emergency exercise in New Zealand, and this 2011 study looks at 2009 recommendations which the school have included in the current preparedness plans.

1.1 Background to the present study

The primary school in the present study undertakes full emergency evacuation exercises annually, 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. In 2009 the school undertook a similar whole of school evacuation to which an observer team from GNS Science and the JCDR (Joint Centre for Disaster Research) was invited (see GNS Science Report 2010/01).

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). Prior planning and preparation are the keys to conducting effective emergency response practices and evacuation exercises, and all participants must have 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 frequently to ensure familiarisation with the school’s current preparedness plans and expectations. Classroom teachers reviewed appropriate earthquake safety behaviours, and discussed evacuation routes with the children in the weeks prior to the exercise. The school sent information about their preparedness plans home to caregivers and, prior to conducting the drills, included reminders about specific exercises in the school newsletter.

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 primary school, to evaluate it in terms of best emergency practice, and to suggest modifications for improvement where appropriate. The hazard of interest was an earthquake.

2.2 Aim

This observation exercise followed the parameters of the previous observed exercise (see GNS Science Report 2010/01). The broad aims of the observation were to:

- Assist the school by providing feedback from the exercise as it attempts to prepare for, and minimise, the potential impact of a significant earthquake on their students and staff;
- 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 (observation of subjects in their natural environment with no intervention on the part of the researcher), this approach being appropriate for an evaluation of a school emergency exercise. At the conclusion of the exercise, the observation team met with the school staff to discuss both the exercise and possible modifications for improving emergency preparedness.

2.4 Observation criteria

- Observe the emergency response and evacuation exercise;
- Observe the behaviours of staff and children as they undertook the exercise;
- Observe the discussion/feedback exercise in classrooms immediately after returning to class from the evacuation 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 would help maximise community recovery.

2.5 Participants

Participants were all 200 pupils and the 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, New Zealand (NZ). Pupils ranged from 5-13 years of age. A caregiver was to collect each child in the evacuation exercise. Pupils remaining at school at the completion of the exercise were supervised in the school library until they were collected, or allowed to make their usual way home at the end of the school day.

2.6 Observation team

The observation team comprised four members: A GNS Science researcher and three research staff from the Joint Centre for Disaster Research (JCDR), situated at Massey University, Wellington, NZ. Two observers were with 2 junior classes and two were with 2 senior classes at the school. All observers were signed in at the school office and wore Identification.

3.0 FINDINGS

For clarity of reporting, the emergency exercise was divided into three phases: Emergency response practice; Classroom discussion and student feedback; 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 was one child in the playground – that child was returning to class after taking a message to the school office - and no children were elsewhere in the school grounds.

The school warning siren was activated at 12.55pm on 1st December 2011. 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. The child in the playground was observed to drop and assume the 'turtle' position immediately the earthquake warning sounded. 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 to their evacuation roll call place in an orderly manner. The child in the playground joined her class at this point. Teacher-wardens checked toilets and any non-classroom places where children would possibly be, to confirm that the school was empty of staff and pupils. Class rolls were checked and teachers walked 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. Whilst the building check was happening, the names of siblings within the school were called out and the older siblings moved to join their younger brothers and sisters at their class assembly point. The principal then spoke to the children about the emergency response practice by: giving feedback on the exercise, congratulating them on their sensible behaviour and their good listening, for following instructions quickly, and for helping others. The Principal asked the children about what they should look out for when an evacuation is in process e.g. hazards like fallen power lines, holes in the road or footpath. She then talked to the children about how to identify adults and other officials in charge in the school by their safety helmets and high-viz jackets and clarified with the students that they could only return to their classrooms when wardens had given the all-clear. The wardens reported back to the principal at the assembly area, confirming that school buildings appeared safe for children and staff to return to. When the principal dismissed the children, teachers escorted them back to their classrooms.

A reliever teacher commented that he had been fully warned about the evacuation exercise being conducted and he was able to prepare by reading the teacher notes and being aware of the location of the blue go-kit (evacuation grab-bag) in his classroom – although he did not know to put on the high-viz vest in the go-kit. He also commented that if an actual earthquake event had occurred, as a reliever teacher he might not have known the appropriate response for this school.

3.2 Phase 2: Classroom discussion and student feedback

3.2.2 Junior classes

Children were given the opportunity to discuss the evacuation drill with their teacher when they returned to their classroom. New entrant children had a classroom discussion with their teacher and their teacher emptied the class go-kit (evacuation grab-bag) explaining what each item was for and discussing the contents with the class.

In one junior class the teacher talked about how the children 'felt' giving children space to talk about how they felt and then discussing ways to deal with their fear/confusion/worries.

3.2.3 Senior classes

One observer noted that whilst outside during the exercise children were discussing issues such as: people dying and/or being injured from buildings falling on them, and talking about tsunamis. However, only one child made a comment when back in the classroom but that may have been because their teacher was a reliever and not their usual teacher.

In one senior class the teacher initiated conversation about the evacuation, and children asked questions that they had thought of during the exercise. Both the teacher and children offered suggestions/solutions to the questions asked.

Q – What do I do if an earthquake happens at playtime?

A – Stop, drop, cover and hold

- If playing around your classroom then join the rest of your class at the classroom once the initial shake is over – no-one there? Then go to roll call area – no-one there? Then go to the field.

Q – What if I am in the toilet?

A – Stay in the toilet as the cubicle is relatively stable

- Put your head between your legs if sitting, make a turtle if not
- Go to join your class when the earthquake is over

Q – If the duty teacher is on the field when an earthquake happens that's OK but if no teacher then what do you do?

A – Stay on the field make like a turtle and wait for the classes to evacuate from the school.

Q – But if you are not in the classroom the teacher won't be able to mark you off the roll?

A – If your name is not marked off the roll as being present, and you are not on the field, someone will come to look for you – anyone not on the field will be searched for.

Q – What will the teacher do if he/she is on the field when the earthquake happens?

A – Teacher will return to their classroom

Q – Is there a backup plan if there are fallen wires or trees?

A – It is important for junior pupils to know only one plan – but the plan can be changed if needed at the time

Q – What if siblings are not at school on the day?

A – That will be sorted out on the field

There was some discussion of the positives and negatives of the exercise.

Positives:

- I knew what to do – I was prepared
- Everyone knew and was well informed about the earthquake
- Went to Te Papa exhibition (i.e., local museum educational display) so was well informed
- Good learning experience for us – do turtle if no desk and use nearest desk not necessarily your own desk

Negatives:

- When evacuating I heard people yelling/screaming – shouldn't be – didn't obey the rule to keep calm
- People were running when evacuating – they may fall or electric wires might be in the way and they won't notice them – should just walk quickly
- The exercise made our lunchtime shorter!

After this discussion and while waiting for caregivers to pick them up, the class played a game of charades using items on an evacuation list that the class had devised earlier in the day (first aid kit, blanket, torch, water etc.).

3.3 Phase 3: Emergency Evacuation Exercise

Caregivers arrived to sign out and pick up their children. Children with parental permission were allowed to walk home. Children going to after-school care were signed out and taken by caregivers. All Ridgway students who were left in classrooms were taken to 2 classrooms only and they waited there with teachers until they were picked up by caregivers or walked home at the normal time at the end of the school day.

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 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 except for a couple of new entrant children who may have been confused by their first emergency exercise. 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 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.

4.2.1 Exercise positives

1. Reliever teacher felt that the evacuation instructions for teachers were very clear.
2. Teachers Aid for health issues was excellent – the aid had a medical kit and tested diabetic students while evacuated to the field.
3. Some observers noted that teachers checked that children were under cover in classrooms and reassured them by asking them what they should be doing and having a class discussion whilst under the desks.
4. The exercise was run earlier in the day than previous exercises, so as to give time for the children to discuss the exercise with their teachers and to give feedback, rather than going straight home at the end of the exercise.
5. In the case of a teacher being killed/injured during an emergency event, children are aware that the go-kit holds a card they must take to another teacher to identify their need for help.
6. All observers considered this exercise to be very well run.

4.2.2 Exercise negatives

1. Some younger children were seen to have not all of their body underneath the desks during the exercise – that will improve with practice.
2. At the point of entry to the field where Class A1 entered the field the drain hole grill had been lifted and the drain appeared large enough for a small child to fall into. It was pushed back into place by observers but this may be a point to raise with the Wellington City Council.
3. Some classrooms have furniture/fittings that are not fixed down e.g. computer screens, bookshelf.
4. When collecting their children, some parents were openly sceptical about the need for the exercise, and some did not follow the clear instructions given for how to collect and sign out their child/children.

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. It was noted that some children did not have their whole body under the classroom desks and probably needed reminding about the importance of doing this. The Observer noted that teachers could remind the children, especially the younger children (Year 1 and 2), to stay under cover during the earthquake as young children can move about and be out of cover before the all-clear is called.
3. All teachers should participate in 'drop, cover and hold' with the children.
4. One suggestion is that teachers should lead the children outside rather than asking them to go to the safe space themselves and following. This may be intuitive in an earthquake when there is real damage. However, where the teacher is also a warden, children will need to go independently to their safe place to be watched over by another teacher (this would be prearranged).
5. Several children could be placed out of their rooms for an emergency exercise, necessitating a protocol for their safety in an actual emergency.
6. 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).
7. An evacuation point could be identified as an alternative to the playing field: 1. The field may not be suitable to be used in an earthquake event; 2. Alternative evacuation points may be required for different hazard events e.g. earthquake, flood, fire.
8. Children with special needs and others affected by stressful situations could be identified as vulnerable and 'buddied up' with another child (children) if this is not already happening in the school.
9. Some teachers may also be experiencing current or recent difficulties in their lives and also may need extra support in an emergency situation.
10. Relieving teachers should be made aware of the teacher notes for emergency events, and need to know the location of the go-kit. Furniture and fixtures not already fastened down should be fixed to walls, floor, tables etc. to ensure that falling objects do not impact on teachers or children.
11. Plans are needed in the scenario of parents or caregivers being injured or killed during an emergency event and children needing extended care.

12. A number of caregivers gave the school a permission note for their children to walk home after the exercise. In a real-life emergency situation such as a major earthquake, children must remain at school until collected by a nominated caregiver. This may be a public education/reinforcement opportunity for the school.
13. Contents of the go-kits should be shown to and discussed with the children if this does not already happen.
14. 'Yellow Bags' – each classroom has a yellow bag containing valuables that the children may have brought to class that day e.g. cell phones, jewellery, handheld devices. The contents of the bags need to be returned to children on return to their classrooms – their caregivers may be trying to contact them.
15. A greater understanding of earthquakes, preparedness, and responses may be achieved by integrating the exercise with other areas of the curriculum.
16. For school interaction with the wider community - homework exercises could be designed to require interaction with caregivers, other adults and other children, and to encourage home-based disaster preparedness.
17. The school could encourage parents to sign up for an automatic text alert system to reassure them of their children's safety after a hazard event.
18. 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

- Thorough briefing of exercise participants will increase the probability of children and staff responding in an appropriate manner when involved in an actual emergency event at school.
- Role-playing aspects of an earthquake exercise encourage children to engage in the exercise, and 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.
- Communication between the class teacher and children during the emergency response phase of an exercise is vitally important. Reassuring and comforting them, and telling them that they are doing the correct thing are integral to having confident and capable response actions from the children.
- 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. A school emergency 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.
- Regular emergency response practices and evacuation exercises ensure effective preparedness plans are in place and provide an opportunity to gather feedback from participants. These exercises can help improve procedures enabling schools, caregivers and students to feel confident that they are in well prepared and capable hands in the event of an actual emergency event.

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www.gns.cri.nz

Principal Location

1 Fairway Drive
Avalon
PO Box 30368
Lower Hutt
New Zealand
T +64-4-570 1444
F +64-4-570 4600

Other Locations

Dunedin Research Centre
764 Cumberland Street
Private Bag 1930
Dunedin
New Zealand
T +64-3-477 4050
F +64-3-477 5232

Wairakei Research Centre
114 Karetoto Road
Wairakei
Private Bag 2000, Taupo
New Zealand
T +64-7-374 8211
F +64-7-374 8199

National Isotope Centre
30 Gracefield Road
PO Box 31312
Lower Hutt
New Zealand
T +64-4-570 1444
F +64-4-570 4657