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Natural hazards education in Australian schools: How can we make it more effective?

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Neil Dufty identifies ways to improve the effectiveness of natural hazard education programs in our schools.

Abstract

Most of Australia's emergency management authorities have developed and implemented some type of education program for youth. Generally, these programs are delivered through schools. Even though these activities have the potential to build community resilience to natural hazards, some may not be as effective as they could be. This article provides guidelines to improve the effectiveness of school natural hazard programs and identifies further research required through program evaluation.

As shown on their websites, most of Australia's emergency management authorities have developed and implemented some type of education program or activity for youth (i.e. people under the age of 18 years). Generally, these programs and activities are delivered through schools.

This article uses learnings from research and practice to identify what appears to be the most effective ways to deliver natural hazard education in Australian schools.

The role of youth and schools in building resilience

Social resilience involves the ability of a community to resist, recover and learn from a natural disaster. Ronan and Johnston (2005, p.5) stress the importance of the youth-school-family network in building community resilience to disasters. They base this view on research that shows that 'youth and families comprise risk groups for increased problems following a hazardous event'. They argue that, 'a focus on educating youth, the adults of tomorrow, has considerable promise. However, in terms of more current concerns, youth also link into the family setting who, in turn, link into multiple community settings and groups'. They add that 'hazards education in schools can play a vital role in increasing a community being ready, willing, and able to do what is necessary to prepare for and respond to a disaster' (page 95).

Other studies demonstrate the need to educate young people about the risks associated with natural hazards and how to be prepared for them. For example, Berry and King (1998, p. 28) in a study of the tropical cyclone awareness and preparedness of far north Queensland school students found that 'they have very limited real understanding of cyclones and the storm surge risk'. They noted that the student's 'direct personal experience is very limited, which is to be expected at this stage, however the families upon whom many depend for information are also relatively inexperienced and very likely to be biased in their own perceptions of cyclone risk'. Furthermore, these researchers found that the students surveyed had little understanding of cyclone preparedness including 'the roles and responsibilities of all members of the community from household residents to emergency service managers and the expectations of them in times of disaster'.

Finnis et. al. (2004, p. 19) investigated natural hazard risk perceptions, levels of preparedness and participation in children from a school in Christchurch, New Zealand. They found that 'the children's awareness of hazards impacting Christchurch was fairly accurate' and 'some vital safety behaviours were well known by the children, with other safety behaviours not as well known'. Moreover, the study found that 'preparedness plans and practices were reported to be poorly adopted by the children's household'.

Both studies recommended improvements in the design and delivery of hazard education to youth through local schools.

Major reviews into natural hazard mitigation and management have also stressed the importance of school education. For instance, the National Inquiry on Bushfire Mitigation and Management (2004, p.37) states that, 'knowledge of "living with bushfire" should be one of the life skills all Australian children acquire during their schooling, wherever they are educated'. The Inquiry recommended that 'state and territory governments and the Australian Government jointly develop and implement nationally and regionally relevant education programs about bushfire, to be delivered to all Australian children as a basic life skill.

These programs should emphasise individual and household preparedness and survival as well as the role of fire in the Australian landscape'.

The context for school natural hazards education

Although the importance of conducting natural hazards education with youth and in schools is promoted above, it should be placed in a broader context.

Dufty (2008, p. 3) defines flood education as 'any learning process or activity that builds community resilience to flooding'. Similarly, 'natural hazards education' is here defined as any learning process or activity that builds community resilience to natural hazards.

The term 'community' includes all spheres of government, business, industry and the general public. In community education it is critical to understand the groups, networks, sectors and organisations that comprise the community and how these entities interact. Maguire and Hagan (2007, p. 18) stress that, 'in order to truly understand the social impacts of disasters, and to manage and prevent adverse consequences, we must understand the impacts of disasters on particular groups. Moreover, it is important to identify the potential "fracture points" or social cleavages within a community. From this, it may be possible to predict future breakdowns in social resilience in disasters, and to design preventative measures.' They also note that 'the resilience of a community can vary with different types of disasters.'

School natural hazards education should be viewed as one possible component of a local community education 'package' that could target a range of vulnerable groups and organisations such as the elderly, people of Non-English Speaking Background, those living in especially high risk areas, businesses and special uses e.g. caravan parks.

The decision as to which group/s to focus on, including youth and schools, and at what level, should be made by representatives of the local community in conjunction with emergency management authorities. Dufty (2008) recommends that this should be coordinated and implemented through a local community natural hazards education plan.

Planning of school natural hazards education should be guided by the functions of natural hazards education. Dufty (2008, p. 4) identified four main functions of flood education that can be applied as below to all natural hazards.

1. **Preparedness conversion.** Helping people, organisations and communities learn how to commence and maintain preparations for natural disasters.
2. **Mitigation behaviours.** Learning what to do before, during and after a natural disaster.
3. **Adaptive capability.** Learning how to change and maintain systems, networks and build community competencies (e.g. skills, leadership) to minimise the impacts of natural disasters.
4. **Post-disaster learnings.** Learning how to improve 1, 2 & 3 above (i.e. preparedness levels, mitigation behaviours and adaptive capabilities) after a natural disaster.

According to Dufty, there has been a tendency for all forms of natural hazards education, including that in schools, to focus on the first two functions above. There is therefore a need to particularly consider the latter two functions when developing school natural hazards education programs and activities.

It should also be noted that schools are only one of many forums for youth to learn about natural hazards. Other forums include:

- Internet
- Radio
- Television e.g. documentaries, advertising
- Magazines and other print media
- Public events e.g. agricultural shows, concerts
- Billboards and other signs
- Personal conversations e.g. with people who have experienced a natural disaster.

Obviously, learning for youth can also occur through personal experience during and after a natural hazard event or disaster. Planning for youth education programs should consider all these non-school forums for learning.

Types of school programs and activities

From the websites of Australian emergency management authorities, three main types of school natural hazards education programs can be found.

1. Interactive programs presented by emergency management authorities
2. Teaching/learning units and lessons
3. 'Extra curricular' activities.

There are several examples of the first type of school program. For example, Butters (1998) describes a range of learning experiences for primary students provided by instructors in the Tasmania Fire Service Education Program. The Country Fire Authority Victoria provides the Brigades in Schools program and uses a Mobile Education Unit in its education of primary students. There are also several examples of units of work (a sequence of lessons) and lessons developed by authorities that can be taught by teachers. For example, Melbourne Water has an animated 'Flood Investigator' program that can be found online and is supported with lesson outlines, teacher's notes and worksheets. In Tasmania, 'The Floods and You' program includes a

sequence of lessons for primary-age students. In NSW, Wollongong City Council has developed a program for secondary Geography students which include an interactive computer flood model, student activity sheets and student broadsheet. Emergency Management Australia has recently re-launched its school education section of its web site to include information and lesson plans about natural disasters and what to do if an emergency or disaster arises. Most of the websites of emergency management authorities have some 'extra curricular' or 'fun' activities that could be used in school teaching programs or accessed by young people, usually of primary age, independently. These activities include cartoon books, puzzles and colouring books.

Effectiveness

What are effective natural hazard school education programs? To answer this question, we need to define 'effectiveness'. The effectiveness of school natural hazard programs can be measured at several levels including:

1. The program compared with learnings from education psychology and leading practice
2. Student's understanding of the natural hazard/s risk
3. Student's understanding of appropriate preparedness behaviours
4. The preparation and maintenance of an emergency management plan by the student's family
5. If a natural disaster occurs, the ability of the student to cope with and learn from the event.

A major weakness in natural hazards education programs, including for schools, is the lack of evaluation to gauge the effectiveness using measures such as those listed above. This issue is further discussed below.
In relation to the first effectiveness measure above, there have been several attempts at relating education psychology to how young people learn about natural hazards. For example, Towers and Paton (2007) researched how children perceive bushfire risk and mitigation as the basis for developing more effective education strategies to increase levels of awareness and preparedness in areas susceptible to bushfires. Their research raised two significant issues. 'Firstly, children's understanding of concepts such as causality and prevention are strongly influenced by age-related changes in cognitive ability. Secondly, the acquisition of knowledge about risk and mitigation takes place in a social context, with some elements of social context exerting more influence than others.'

Also in relation to the first effectiveness measure above, Ronan and Johnston (2005, pp.163-165) list nine 'leading practices' or basics to consider in the planning of school hazard education programs.

1. Use graduated sequence of learning across school years.
2. Combine the raising of concern about local hazards with a 'confident, coping model'.
3. Promote interaction with families such as home-based discussion and developing home emergency plans.
4. Incorporate an emergency management perspective that focuses on readiness, response guidance and planning for recovery.
5. Use natural opportunities to learn (e.g. media coverage of a hazard).
6. Use demonstrations (e.g. by emergency management authorities) and use of computer and other visual aids (e.g. hazard documentaries) to supplement learning.
7. Practice preparedness responses using in and out of class simulations.
8. Promote the school program in the community to increase community-based 'hazards discussions' and 'hazards doing'.
9. Integrate hazard school education programs with other community hazard education programs.

Note that inherent in these guidelines is the need to use a cross-hazard approach to education, where this is possible. For example, some Australian communities have both a high risk of flood and bushfire; a combined hazard education program would be more appropriate and probably more effective for schools in this scenario.

The programs developed by Australian emergency management authorities as categorised above appear to relate well with the nine practices identified by Ronan and Johnston. The second type of program identified (teaching/ learning units and lessons) can be designed to satisfy all nine practices. The first type of program (presentations by emergency management authorities) can also satisfy most of the practices, although these presentations or mobile units can be costly, labour intensive and need to be repeated, at least annually. The third type of program ('extra curricular activities') has questionable effectiveness as they are generally only support the practices at best.

A few Australian emergency management authorities use all three types of programs in an integrated manner, thus maximising opportunities for effective impacts.
It should be noted that many organisations involved in developing programs for schools believe that 'if we teach the students – they'll teach the parents and community'. This linkage should not be assumed. With students learning from a broad range of sources, unless there is a prescribed activity (e.g. homework task to develop a family home emergency plan) students may not take home hazard-related learnings and messages.

This author contends, based on several years of research, that a critical success factor for the uptake of natural hazard activities in schools is the ability to embed these activities in existing school programs that are already linked to learning outcomes in curriculums and syllabuses. This helps to ensure that the school will accept the natural hazards program as a valid activity as part of its existing

teaching program and not as a 'one off'. Moreover, as a natural hazard can occur at any time, this approach will also mean that 'natural hazards' will be taught each year. Curriculum-based programs are developed by initially identifying opportunities for the inclusion of natural hazards education in appropriate State and Territory curriculums through a process known as 'curriculum mapping'. After this has been achieved, programs can be designed with activities that link with learning outcomes and subject matter in the appropriate parts of the curriculums and thus school programs. For expert advice, it is crucial to involve the curriculum support section from the respective State or Territory department of education and a sample of teachers in this process.

There are numerous opportunities for the development of natural hazard programs and activities related to Australian curriculums. Kriewaldt et. al. (2003) conducted a study of hazard or disaster education across State and Territory curriculums. They found that hazard education 'is evident in years 5-6 and more comprehensively addressed in years 7-10. Most education systems in Australia include study of hazards in their post-compulsory geography course.' A few Australian emergency management authorities have mapped and linked their school natural hazards programs to appropriate curriculums. For example, the Country Fire Authority Victoria has mapped its Brigades in Schools, Mobile Education Unit and Pakenham Learning Centre programs to Victorian curriculums.

Evaluation

Although school natural hazard programs can be easily evaluated in relation to education psychological research and leading practices, it is much more difficult to gauge effectiveness based on other measures such as those listed above. There are a few studies that help in an understanding of the immediate effectiveness of school and community hazard education programs in raising student's awareness and preparedness levels. For example, Johnston et. al. (2001) evaluated school-based activities in four communities in Washington State, USA that are at risk from lahars (volcanic mudflows) at the base of Mount Rainier. They found that all students surveyed from the schools had a good awareness of hazards that might affect them in the community and had practiced emergency preparation at school. One school, Orting, had linked hazard awareness programs with additional community initiatives. At this school students perceived lahars as an additional likely hazard. It is also interesting to note that although students were encouraged to discuss hazards and practice emergency preparation at home, few had done so (further supporting the assertion above that transfer of learning from students to their parents cannot be assumed). Ways to evaluate the effectiveness of immediate outcomes (e.g. awareness, personal preparedness, transfer of learning to families) should be built into all school natural hazards programs to further build up research knowledge to guide planning. There are a dearth of studies that gauge the effectiveness of school programs in student and family response to and recovery from a natural hazard event. Although it is difficult to isolate the program as the cause of response and recovery impacts, on-going (longitudinal) studies will assist in providing some indication of the long term effectiveness of school programs.

References

Berry, L., and King, D., 1998, Tropical cyclone awareness and education issues for far north Queensland school students. *The Australian Journal of Emergency Management*, Spring 1998, pp. 25-30.

Butters, G., 1998, The Tasmanian Fire Service School Fire Education Program. *The Australian Journal of Emergency Management*, Spring 1998, pp. 55-56.

Dufty, N., 2008, A new approach to community flood education. *The Australian Journal of Emergency Management*, Vol. 23, No. 2, pp. 3-7.

Ellis, S., Kanowski, P., and Whelan, R., 2004, *National Inquiry on Bushfire Mitigation and Management*. Commonwealth of Australia, Canberra.

Finnis, K., Standring, S., Johnston, D., and Ronan, K., 2004, Children's understanding of natural hazards in Christchurch, New Zealand. *The Australian Journal of Emergency Management*, Vol. 19, No. 2, pp. 11-20.

Johnston, D., Paton, D., Driedger, C., Houghton, B., and Ronan, K., 2001, Student perceptions of hazards at four schools near Mount Rainier, Washington, USA. *Journal of the American Society of Professional Emergency Planners*, Vol 8, pp.41-51.

Kriewaldt, J., Butler, D., Doyle, D., Freeman, J., Hutchinson, N., Parkinson, S., Terry, E., and Boscato, M., 2003, Curriculum overview of hazard education in Australia. *The Geography Bulletin*, Autumn 2003.

Maguire, B., and Hagan, P., 2007, Disasters and communities; understanding social resilience. *The Australian Journal of Emergency Management*, Vol. 22, No. 2, pp. 16-20.

Ronan, K.R., and Johnston, D.M., 2005, *Promoting community resilience in disaster: the role for schools, youth and families*. Springer, USA.

Towers, B., and Paton, D., 2007, *What do children understand about bushfire risk?*, Research Poster for the Bushfire CRC/AFAC Conference, Hobart, September, 2007.

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Neil Dufty is a Principal of Molino Stewart Pty Ltd. He has extensive experience in curriculum development across Australia, especially in the fields of environmental education and sustainability education. He has designed several natural hazards teaching programs including for the Victoria State Emergency Service.