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# DISASTER RESILIENCE EDUCATION

## A practice framework for Australian emergency management agencies

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GOVERNMENT OF WESTERN AUSTRALIA

DFES Department of Fire & Emergency Services

AUSTRALIAN RED CROSS

Government of South Australia

CFS

CQUniversity AUSTRALIA

SES

NSW RURAL FIRE SERVICE

Australian Institute for Disaster Resilience

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# ABSTRACT

## DISASTER RESILIENCE EDUCATION: A PRACTICE FRAMEWORK FOR AUSTRALIAN EMERGENCY MANAGEMENT AGENCIES

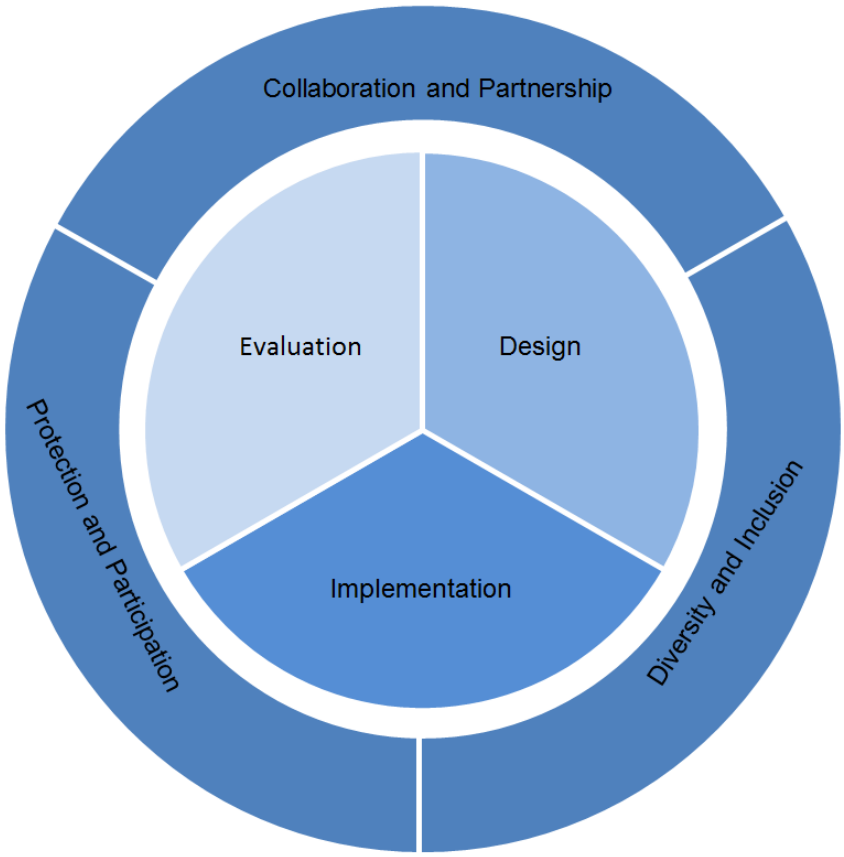
This paper presents a practice framework for the development and delivery of school-based disaster resilience (DRE) education in the Australian national context. The purpose of the framework is to provide Australian emergency management agencies with a strategic, evidence-based approach to the development of DRE programs that reduce risk, increase resilience and can be implemented at scale. The framework is comprised of three guiding principles (Collaboration and Partnership, Protection and Participation, and Diversity and Equity) and three core dimensions (Design, Implementation, Evaluation). The structure and content of the framework has been informed by current international and national policy frameworks, existing DRE practice guidelines, and peer-reviewed research evidence. It has also been informed by consultations with representatives from the emergency management and education sectors. The framework should be viewed as a work-in-progress, which as it evolves, can assist in building capacity for best practice in DRE. To this end, the authors welcome and encourage critical feedback and commentary from both key stakeholders and the wider public.

# INTRODUCTION

At the global and national level, disaster resilience education has been recognised as a core mechanism for reducing risk and building resilience. The Sendai Framework for Disaster Risk Reduction (SFDRR) (UNISDR 2015) and the Australian National Strategy for Disaster Resilience (NSDR) (COAG, 2011) both explicitly identify the development and delivery of quality DRE as a key priority for action. In response to the recommendations of the Victorian Bushfires Royal Commission (Teague et al. 2010), concerted action has been taken to ensure that the delivery of DRE becomes standard practice in Australian schools. The topics of hazards and disasters, disaster risk reduction (DRR) and resilience have been included in the Australian Curriculum (ACARA 2016) and Australian emergency management agencies have developed a range of programs and resources to support the delivery of DRE in classrooms (dk2/Red Cross 2014). This level of commitment to DRE is unprecedented and represents a significant opportunity for increasing the capacities of children and youth to take an active role in DRR and resilience.

To capitalise on this opportunity, in early 2014 the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC) initiated the three-year applied research project 'Building best practice in child-centred disaster risk reduction' (BNHCRC 2015). A key activity in this project has been the development of a practice framework for DRE, the aim of which is to provide Australian emergency management agencies with a strategic, evidence-based approach to the design of quality DRE programs that reduce risk and increase resilience and can be implemented at scale.

The framework has been developed through a method of 'co-production', involving the BNHCRC research team and their end-user colleagues from 13 emergency management agencies and organisations (BNHCRC 2015). As shown in Figure 1, it is comprised of three guiding principles (collaboration and partnership, equity and diversity, protection and participation) and three core dimensions (design, implementation and evaluation).




The structure and content of the framework has been informed by current international and national policy frameworks, existing DRE practice guidelines, and peer-reviewed research evidence from a variety of disciplines including education, psychology, human geography and sociology. It has also been informed by consultations with representatives from the emergency management and education sectors, enabling the incorporation of highly valuable 'tacit knowledge' (Argyris & Schön 1996).

The purpose of this paper is to introduce the framework's three guiding principles and three core dimensions. The core dimensions represent the major components of program design, implementation and evaluation. The guiding principles represent the philosophical and theoretical assumptions that should inform activity across the three dimensions. Due to space limitations, discussion of each principle and dimension is brief.

# THREE GUIDING PRINCIPLES

## COLLABORATION AND PARTNERSHIP

As noted by UNESCO/UNICEF (2014), 'DRR takes the world of education and curriculum into new and unfamiliar territory, which calls for alliance and partnership'. The scaled implementation of quality DRE programs in Australian schools requires collaboration and partnership between a wide range of key stakeholders from the emergency management and education sectors, the private sector, academia, non-governmental and not-for profit organisations, and community-based organisations. For DRE, collaboration and partnership has several major advantages. It maximises benefits from limited financial and human resources, it increases capacity for the development of programs that reflect best practice in program design, it creates a well-informed, integrated and coordinated approach to scaled implementation, and it builds and maintains the relationships that are fundamental to continuous improvement (UNISDR 2012). To quote the NSDR, 'Working together and drawing on the expertise and capacity of various partners produces far greater results than do individual efforts alone' (COAG 2011, p. 9).

The importance of collaboration and partnership between key stakeholders has been emphasised in the Australasian Fire and Emergency Services Authority Council's 'Principles for Educating Children in Natural Hazards and Other Emergencies' (AFAC 2014), which states 'Program development should be collaborative through building relationships and engaging with key stakeholders'. Progressing strategic partnerships is also a core objective of the Australian Institute for Disaster Resilience 'Disaster Resilient Schools Program' (AIDR 2016), which seeks to develop and maintain a coordinated approach to enhancing DRE and facilitate ongoing working partnerships between the emergency management agencies and school education sectors. Moreover, collaboration and partnership is the cornerstone of all current DRR and resilience policy frameworks, including the SFDRR (UNISDR 2015), the Comprehensive School Safety Framework (GADRRRES/UNISDR 2015), and the emergency management and resilience strategies of Australian governments at the national, state and local level (COAG 2011). The concept of 'shared responsibility' that underpins the NSDR presupposes the need for collaboration and partnership across all aspects of DRR and resilience, and DRE is no exception (c.f. McLennan & Handmer 2012).

## PROTECTION AND PARTICIPATION

Numerous authors have drawn on the international child rights literature and architecture to argue that current legal frameworks support children's rights to DRE (Mitchell et al. 2009, Benson & Bugge, 2007, Haynes et al. 2010, Nikku et al. 2006). The main legally binding international instrument that deals specifically with children's rights is the Convention of the Rights of the Child (UN-CRC) (UNHCHR 1989). Built on varied legal systems and cultural traditions, the UN-CRC is a near-universally ratified set of standards and obligations that set minimum entitlements and freedoms that should be respected by its signatory governments. As a signatory to the UN-CRC, the Australian Government has

committed itself to 'protecting and ensuring children's rights and is obliged to develop and undertake all actions and policies in the light of the best interests of the child' (UNHCR 1989).

As Mitchell and colleagues (2009) have outlined, the UN-CRC deals with matters of particular relevance to hazards, disasters and DRE:

- Article 3 requires signatory states to 'ensure the child such protection and care as necessary for his or her well-being...and to this end should take all appropriate legislative and administrative measures'.
- Article 13.1 relates to a child's right to freedom of expression that includes 'the right to seek, receive, and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of the child's choice'.
- Article 12.1 requires that signatory states will 'assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child, the views of the child being given due weight in accordance with the age and maturity of the child'.

Thus, children not only have the right to be protected from disasters, they also have the right to access information and participate in decision-making that affects them. DRE programs should not only support children in understanding their rights to protection and participation, but should seek to facilitate the full realisation of those rights (see also Ronan et al. 2016 this issue).

Importantly, children's rights to protection and participation are compatible with the concept of 'shared responsibility', which underpins the NSDR (COAG 2011, McLennan & Handmer 2012). In the strategy, shared responsibility is referred to as a process in which 'political leaders, governments, business and community leaders, and the not-for-profit sector all adopt increased or improved emergency management and advisory roles, and contribute to achieving integrated and coordinated disaster resilience. In turn, communities, individuals and households need to take greater responsibility for their own safety and act on information, advice and other cues provided before, during and after a disaster'(COAG 2011, p. 3) . A rights-based approach is also in accordance with the Attorney-General's NSDR Community Engagement Framework (Australian Government 2013, p. 3), which asserts that 'building disaster resilience recognises active engagement with, and empowerment of, the community as central to achieving resilience over the long term. This approach does not reduce government or agency responsibility in emergency management, but strengthens community participation and influence'.

## DIVERSITY AND INCLUSION

There is great diversity among Australian children. There are currently almost 400 languages spoken and 16 per cent of the population speaks a language other than English at home, approximately 8 per cent of Australian children live with a disability, and approximately 4.3 per cent live with a severe disability (Kennedy & Stonehouse 2012). Children also differ in their socio-economic status, family structure, living conditions and mental, physical and emotional health (Kennedy & Stonehouse 2012). All of these factors affect learning and development (Kennedy & Stonehouse 2012). They also influence people's exposure and vulnerability to hazards and disasters and determine their capacity to respond and recover (Wisner et al. 2006, Peek 2008, Peek & Fothergill 2015). Thus, ensuring that DRE is an empowering and engaging experience requires that programs accommodate diversity and promote the inclusion of all children, regardless of their individual characteristics or geographical location.

UNESCO (2009, p. 8) defines inclusion as 'a process of addressing and responding to the diversity of needs of all learners through increasing participation in learning, cultures and communities, and reducing exclusion within and from education'. As outlined by Cologon (2013), the right to an inclusive education is articulated in both the Convention on the Rights of the Child (UN 1989) and the UN Convention on the Rights of Persons with a Disability (UN 2006). The Australian Government also expresses its commitment to inclusive education in the National Disability Strategy (Department of Families, Housing, Community Services and Indigenous Affairs 2012), the Australian Curriculum (ACARA 2016), the Australian Professional Standards for Teachers (AITSL, 2016), the National Quality Framework (ACECQA 2016), the Early Years Learning Framework for Australia (Australian Government 2009) and the Melbourne Declaration on Educational Goals for Young Australians (Ministerial Council on Education, Employment, Training and Youth Affairs 2008).

Principles of diversity and inclusion are also enshrined in numerous policy frameworks for DRR and resilience. The SFDRR (UNISDR 2015, p.13) states that disaster risk reduction requires 'inclusive, accessible and non-discriminatory participation, paying special attention to people disproportionately affected by disasters, especially the poorest. A gender, age, disability and cultural perspective should be integrated in all policies and practices, and women and youth leadership should be promoted'. The NSDR states that 'Information on disaster risk should be communicated in a manner appropriate to its audiences, and should consider the different needs, interests and technologies used within communities' and that 'Vulnerable individuals [should] have equitable access to appropriate information, training and opportunities'. Specific to school-based DRE, the AFAC's (2014) Principles for Educating Children in Natural Hazards and Other Emergencies states 'programs should be developed that are appropriate for the audience ensuring accessibility for all people (e.g. remote Indigenous communities, CALD, people with disabilities)'.

# THREE CORE DIMENSIONS

## DESIGN

The design of quality DRE involves three key activities: 1) defining program aims and objectives; 2) designing teaching and learning activities; 3). developing tools for assessment.

### Defining program aims and objectives

In quality education, aims and learning objectives are clearly defined (INEE 2010, Stabback 2016). Doing so provides both teachers and students with a clear indication of what is expected from them. It is proposed here that DRE programs should also have clearly defined risk reduction and resilience objectives (see also UNESCO/UNICEF 2014). DRE should not be aimed solely at increasing student knowledge or awareness: it should provide them with opportunities for taking specific and measurable actions in their households, schools and communities.

### Program aims

Program aims are broad statements of purpose or intent. The aims encompass the general philosophy of the program and specify its overall direction and content. They give teachers and students a general indication of what the program is about and what can be achieved by participating in the program.

According to UNESCO (2014, p. 80), education programs should 'build students' understanding of the causes, nature and effects of hazards while also fostering a range of competencies and skills to enable them to contribute proactively to the prevention and mitigation of disaster'. Similarly, the Australian and New Zealand Disaster Resilient Schools Network (DRANZEN 2013, p.1) has determined that DRE programs should focus on 'building disaster resilience in students - the ability to anticipate, prevent or mitigate, prepare for, respond to and recover from the impacts of hazards'.

The action-oriented perspectives embodied in these statements reflect a fundamental shift in the narrative on children and disasters (Tanner 2010, Mitchell et al. 2008, 2009, Peek & Fothergill 2015), first articulated by eminent scholar William Anderson (2005, p. 168), who wrote:

Children and youths are not just passive in the face of disasters. They are not merely victims and dependent observers of the scene, having everything done for them both before and after an event. Even though lacking the authority of adults, children and adolescent youths can still take certain protective actions.

This shift in the narrative is supported by an increasing number of anecdotal field reports and empirical investigations that demonstrate that when given the opportunity, children exert agency across all phases of the disaster reduction cycle from basic preparedness and response through to mitigation and prevention (Benson & Bugge 2007, Haynes et al. 2010, Haynes & Tanner 2013, Mitchell et al. 2008, 2009, Ronan & Johnston 2003, Save the Children 2006, Towers 2015, Vanaspong et al. 2007, Webb & Ronan 2014). In recognition of this accumulating evidence, the SFDRR states that 'Children and youth are agents of change and should be given the space and modalities to contribute to

disaster risk reduction, in accordance with legislation, national practice and educational curricula' (UNISDR 2015, p.23).

From this discussion, it is clear that the aims of a DRE program should reflect an action-oriented perspective that recognises children and youth as legitimate stakeholders in the concepts and practice of DRR and resilience. It is through the articulation of action-oriented program aims that DRE becomes a primary conduit by which children and youth can assume their presumptive role as 'agents of change'.

## DRR and resilience objectives

Programs that recognise children and youth as legitimate stakeholders and agents of change provides opportunities for their genuine participation in DRR and resilience activities (UNESCO/UNICEF 2014, AFAC 2014). This requires the formulation of DRR and resilience objectives that clearly articulate the actions that students will undertake as a result of the program. For example, if the general aim of a program is to increase student participation in school disaster management, the DRR and resilience objectives might include 'Students will conduct a risk assessment of the school site and present their findings to the school community', 'Students will design and implement structural and non-structural DRR strategies for increasing school safety', 'Students will evaluate the school emergency management plan and implement recommendations for improvement', and 'Students will develop strategies for managing their emotional responses during a school emergency'.

DRR and resilience objectives should be informed by existing international and national DRR and resilience frameworks, established theory and current research, and the strategic action plans and operational procedures of the relevant emergency management agencies (AFAC 2014). They should also be informed by public discussion and debate with a wide range of stakeholders including policy-makers, practitioners, researchers, funding bodies, teachers, parents, and students themselves (Stabback 2016, AFAC 2014, see also Ronan et al. this issue). Adopting a collaborative and consultative approach to the development of DRR and resilience outcomes has the potential to enhance the quality of a program and increase stakeholder commitment to implementing the program in schools and classrooms (Stabback 2016).

DRR and resilience objectives should be tailored to the developmental stage of learners (AFAC 2014, UNESCO/UNICEF 2014). When doing so, consideration should be given to all aspects of child development, including cognitive, social, emotional and psychomotor development (Stabback 2016, Haynes et al. 2010, Towers 2012). At present, there are no clear guidelines regarding what kinds of DRR and resilience objectives are appropriate for each developmental stage. Therefore, they should be selected in consultation with child-development experts, including education specialists and child psychologists (AFAC 2014). The NSW Rural Fire Service 'Guide to Working with School Communities' presents a promising approach, whereby a child's sphere of activity expands outward as they move through primary school. Objectives for lower primary students are focused on personal safety, objectives for middle primary students they are focused on household safety, and objectives for upper primary students are

focused on community safety (Doren-Higgins/NSWRFS 2016, see also Ronan & Towers 2014).

Finally, DRR and resilience objectives should encompass the full spectrum of DRR and resilience practice: from prevention, mitigation and preparedness through to response and recovery (UNESCO/UNICEF 2014). Both in Australia and internationally, DRE programs have tended to focus on preparedness and response (Johnson et al. 2014a). However, there is growing evidence that children's capacities for DRR and resilience extend well beyond preparedness and response into realms of mitigation, prevention and recovery (Mitchell et al. 2008, 2009, Haynes & Tanner 2015, Haynes et al. 2010, Tanner 2010). While incorporating the full spectrum of DRR and resilience practice into a single DRE program represents a significant challenge, contesting the prevailing focus on preparedness and response is a major priority for the development of comprehensive DRE (UNESCO/UNICEF 2014, Johnson et al. 2014a).

## Learning objectives

For the purpose of this framework, learning objectives are descriptive statements of the knowledge, skills and values that students will need to acquire in order to achieve specific DRR and resilience objectives (Diamond 2011). In this context, 'knowledge' refers to propositional or declarative knowledge, which is knowledge of 'facts' (Stabback 2016) (e.g. 'I know that my school is on the bushfire risk register', 'I know that driving through flood waters is dangerous', 'I know that the impacts of a disaster can be felt for a long time'). 'Skills' refers to procedural knowledge, which is knowledge of how to do something (Stabback 2016) (e.g. 'I know how to read a flood risk map', 'I know how to look up the fire danger rating for my district'). 'Values' refers to dispositional knowledge, and includes attitudes, moral dispositions, motivation, will and commitment (Stabback 2016) (e.g. 'I know to check the fire danger rating every day during the fire danger period', 'I know to make sure that my elderly neighbour has an emergency plan').

Historically, DRE programs have tended to focus predominantly on propositional and declarative knowledge (UNESCO/UNICEF 2012, Johnson et al. 2014a). However, when it comes to the adoption of protective actions, skills and values are equally, if not more, important (Solberg et al. 2010). Thus, building children's capacities for achieving specific risk reduction and resilience outcomes requires a holistic and integrated approach which places equal emphasis on knowledge, skills and values.

To be useful, learning objectives should be SMART: specific, measurable, achievable, realistic, and time-bound (Diamond 2011, Tokuhama-Espinosa 2014). They must focus on what a student should or know or be able to do and the ways in which this can demonstrated to others. This requires shifting attention from lesson content (what is taught) towards student attainment (what is learned) (Diamond 2011). It means avoiding statements like 'Students understand the fire danger rating scale', because they do not represent directly observable actions and are highly subject to interpretation. By contrast, statements such as 'Students can explain the purpose of the fire danger rating scale and identify appropriate behavioural responses for each level of fire danger' or 'Students can identify their property on a flood map and interpret the

level of exposure' provide a much clearer basis for determining whether or not a particular learning outcome has been achieved.

Learning objectives should be developed in consultation with technical experts and industry professionals who can provide specialist advice about the specific knowledge, skills and values that are most relevant to a particular DRR and resilience objective. Technical experts and industry professionals can also help to ensure that learning objectives align with existing policy frameworks, reflect peer-reviewed research evidence, and adhere to current models of good- or best-practice (AFAC 2014, UNESCO/UNICEF 2014). Quality DRE programs provide students with knowledge that is accurate and up-to-date, skills that are practical and useful, and values that will motivate them to act. To this end, the contribution of technical experts and industry professionals is essential.

Learning objectives should be structured in a way that scaffolds children's learning (Bruner 1977, Vygotsky 1978, Rogoff 2003, AFAC 2014). Scaffolding involves working within the 'zone of proximal development' defined as 'the area in which the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers' (Vygotsky 1978, p. 86). Scaffolding helps to ensure that children have the requisite knowledge and skills for engaging in increasingly more complex and difficult tasks, which is fundamental to the development of confident, empowered learners (Bruner 1977, Rogoff 2003, see also Ronan & Towers 2014).

## Teaching and learning activities

Building children's knowledge, skills and values for DRR and resilience requires the adoption of participatory, active learning approaches (UNESCO/UNICEF 2012, 2014, AFAC 2014, Towers 2015). Collins and O'Brien (2003, p. 6) define active learning as 'the process of having students engage in some activity that forces them to reflect upon ideas and how they are using those ideas…the process of keeping students mentally, and often physically, active in their learning through activities that involve them in gathering information, thinking, and problem solving'. Active learning is often contrasted to lecture-based or rote learning approaches where students passively receive and memorise information from the teacher (Prince 2004). Freire (1972) referred to lecture-based and rote learning as 'the "banking" concept of education, in which the scope of action allowed to students extends only as far as receiving, filing, and storing the deposits'.

In the last several years, rigorous large-scale research studies in education and psychology have clearly demonstrated the advantages of active learning over lecture-based and rote-learning approaches (Freeman et al. 2013). The principals and processes of active learning also align with an extensive literature on community-based DRR, which clearly demonstrates that understanding the existing knowledge and experience of local people is fundamental to the development and implementation of effective and sustainable DRR and resilience strategies (Hewitt 1997, Mercer et al. 2008, Wisner et al. 2004, 2012, Maskrey 1989, Bahadur & Tanner 2014, Tanner 2010). Active learning also fits with various models of behaviour change, both general and DRR-related. These

include Bandura's (1986) social-cognitive theory, Lindell and Perry's (2012) Protective Action Decision Model, and Paton's (2003) socio-cognitive model of disaster preparedness (see Becker et al. 2013 for a more comprehensive review).

While rigorous empirical research on active learning for school-based DRE is limited, there is some preliminary evidence that it has major benefits, in terms of both learning outcomes and DRR and resilience outcomes (Gaillard & Pangilinan 2010, Towers 2015, Haynes & Tanner 2013, Ronan & Towers 2014, Johnson et al. 2014b, 2016, Webb & Ronan 2014, Ronan et al. 2010, Ronan & Johnston 2003, Mitchell et al. 2008, Tanner 2015). In the most in-depth study to date, Towers (2015) demonstrated how rote learning of key messages for bushfire emergency response does little to enhance children's knowledge and understanding. Rather, the development of more sophisticated conceptual models requires two-way dialogue with more knowledgeable adults or peers and genuine participation in DRR and resilience activities. Corroborating these findings, Johnson and colleagues (2014b, 2016) have shown how rote-based learning is inadequate for teaching children the fundamental concepts of earthquake response. Drawing on this evidence, AFAC asserts that 'programs must provide recurrent opportunities for children to articulate their existing knowledge and perspectives' (AFAC 2014, p. 4).

Table 1 shows the UNESCO and UNICEF (2014) suite of active learning approaches that can be adopted for the development of engaging, student-centred DRE teaching, and learning activities.

| Learning type | Associated learning activities |
|---|---|
| Interactive learning | Brainstorming, pair and group discussion exercises, interactive multimedia presentations by students, teachers, community members, DRR experts. |
| Inquiry learning | Individual and team case study research and analysis, project work, undertaking surveys and interviews, internet searching. |
| Affective learning | Sharing feelings, hopes and fears around hazards and disasters through multiple media. |
| Surrogate experiential learning | Board games, digital games, role plays and drama, simulation gaming. |
| Field experiential learning | Field visits to emergency management agencies, hazard mapping, hazard vulnerability and capacity assessments, transect walks, emergency drills and simulations. |
| Action learning | Student and community initiatives to raise hazard awareness, participating in DRR and resilience building initiatives. |
| Imaginal learning | Visualising what to do in crisis situations, writing fictional stories. |

ACTIVE LEARNING APPROACHES AND ACTIVITIES (ADAPTED FROM UNESCO/UNICEF 2014)

It should be noted that providing children with multiple opportunities to develop their knowledge and skills through a range of learning approaches accommodates diversity in learning styles and creates an inclusive educational environment. This is particularly important in the case of students with disability or other special needs.

Many of these active approaches are yet to be applied and tested in Australian DRE. However, they offer emergency management agencies a vast array of creative options for increasing children's opportunities for constructing sophisticated understandings of hazards and disasters. They encourage the active participation in DRR and resilience activities that are practical, achievable and sustainable in the context of children's everyday lives.

## Assessment

While assessment of student learning is a fundamental component of quality education (Stabback 2016), a recent international study found that 'student assessment is the least considered and least developed aspect of DRR curriculum innovation' (UNESCO/UNICEF 2012, 2014). This is certainly the case in Australia, where DRE programs and resources rarely include any comprehensive form of student assessment. Reflecting this, a key recommendation of the 'Educating the Educators' DRE curriculum mapping project was to incorporate assessment as part of the learning process in future DRE resources (dk2/Australian Red Cross 2014).

The foundation for any assessment program is the development of objectives that clearly describe what students are expected to know and be able to do at the end of a lesson or program. When we are clear about what students should learn, we know what should be assessed (Huber & Freed 2000). In this way, objectives and assessment are inextricably linked (Diamond 2011). Decisions about what to assess express a program's objectives both explicitly and implicitly. If something is worth assessing, it is worth learning and vice versa (UNESCO/UNICEF 2014).

There are two main types of assessment: formative and summative. Formative assessment is undertaken throughout the learning process and seeks to determine how students are progressing towards the achievement of a specific learning objective (Fautley & Savage 2008). For DRE, formative assessment is essential. Children do not approach DRE as 'blank slates'; rather, they have pre-existing knowledge about hazards, disasters and DRR. Some of it is accurate and some of it misconceived. This strongly influences how they interpret new information (Towers 2015). Formative assessment provides teachers with a basis for addressing misconceptions and accommodating existing knowledge and understandings (UNESCO/UNICEF 2014, AFAC 2014, Towers 2015). Summative assessment, by contrast, is undertaken at the end of the lesson or program and evaluates whether a particular learning objective has been achieved (Fautley & Savage 2008). Put simply, formative assessment is assessment for learning, while summative assessment is assessment of learning (UNESCO/UNICEF 2014).

Assessment of DRE learning calls for a diverse set of assessment tools (UNESCO/UNICEF 2014). Methods for formative assessment can include teacher-student dialogue, class-based discussion, short tests or quizzes, think-pair-share activities, and general observations of student learning (INEE 2010, UNESCO/UNICEF 2014). Methods of summative assessment can include presentations, role plays, simulations, closed- or open-ended questions, analysis of case studies or fictional scenarios, and diaries or journals (INEE 2010, UNESCO/UNICEF 2014). While teacher assessment is important for determining whether learning objectives and DRR /resilience objectives have been achieved, self and peer assessments that encourage critical reflection are also highly beneficial for student learning (Fautley & Savage 2010). Household assessments undertaken as interactive child-parent homework activities have also been shown to have substantial benefits for both student learning and the completion of specific mitigation and preparedness activities (Ronan et al. 2009, Towers 2015).

Regardless of the assessment methods chosen, they should be 'authentic' (Wiggins 1993). F for example, closed-ended questions might be appropriate for assessing children's basic hazard knowledge, whereas the application of that knowledge to real-life situations would be more effectively assessed through analysis of a case study or fictional scenario. Meanwhile, household or school-based DRR activities could be assessed through reflective journals, video diaries or learning 'artefacts'.

## IMPLEMENTATION

Implementation refers to the mechanisms and processes that support program delivery in schools. It has been widely established that implementation is the least studied aspect of DRE. In Australia and internationally there is very little empirical research on the implementation of DRE programs (Johnson et al. 2014a). However, the available literature does point to several key mechanisms and processes that may support scalable, sustainable implementation, including curriculum alignment, professional development, and leveraging existing emergency management policy and practice.

### Curriculum alignment

It is well established that the Australian Curriculum is overcrowded (APPA 2014, Hudson 2012) and this is widely cited as a key barrier to the implementation of DRE in schools (Amri et al. 2016, Johnson et al. 2014a, UNESCO/UNICEF 2014, Renwick 2012). Therefore, it is essential that DRE programs are designed to align with the Australian Curriculum or relevant state-based syllabus (AFAC 2014, Dufty 2014, dk2/Australian Red Cross 2014). This requires identifying where the aims and objectives of a program link to specific learning areas and content descriptions, cross-curricula priorities, and general capabilities (c.f. ACARA 2016). These links should be explicitly communicated in program materials and teacher's guides. It needs to be immediately apparent to teachers that delivering the program will not take time away from their existing curricular and extra-curricular responsibilities.

At present, the Australian Curriculum includes DRR and resilience related content in several learning areas (see Dufty, 2014). However, recent curriculum mapping projects have revealed enormous potential for the integration of DRE across the whole curriculum (Dufty 2014, d2k/Australian Red Cross 2014). This potential exists not only in the learning areas that have been traditionally associated with the study of hazards and disasters, such as Geography and Science, but across a wide range of learning areas including English, Mathematics, Humanities and Social Sciences, Health and Physical Education, Civics and Citizenship, the Arts, and Technologies. Given the multidisciplinary nature of DRR and resilience, this is not surprising. However, by making the curriculum connections and linkages explicit, these mapping projects provide a valuable tool that can be used for designing DRE programs that address the natural and social dimensions of hazards and disasters and provide multiple entry points through which teachers can incorporate DRE into their professional practice.

## Professional development

Across the literature, there is consistent agreement that professional development for educators is essential to the effective implementation of DRE programs (Amri et al. 2016, UNESCO/UNICEF 2012, 2014, Johnson et al. 2014a). Several empirical studies have identified teacher training as a facilitating factor for the uptake of DRE programs in schools (Johnson et al. 2014, Renwick et al. 2012). In two separate studies on the implementation of New Zealand's national DRE resource, 'What's the Plan, Stan?' (Renwick 2012, Johnson et al. 2014a, Renwick 2012), it was found that teachers wanted, and in some cases expected, training on how to use the resource. Johnson and colleagues (2014a) also found that when teachers were provided with assistance from outside experts, they were more likely to use the resource in their classrooms. Taken together, these findings suggest that some teachers may lack confidence in their ability to deliver DRE. Achieving optimal program uptake may require the provision of training and support beyond that which is provided in teacher's guides or lesson plans.

AFAC (2014) explicitly identified the need to support the implementation of programs through the provision of professional development that 'educates the educator'. While emergency management agencies provide routine training and support for agency staff and volunteers who are involved in the delivery of school-based DRE programs, professional development for teachers is lacking. As the dominant mode of DRE implementation shifts from agency-delivered programs towards teacher-delivered programs, this represents a potential barrier to optimal program uptake and effectiveness. Recognising this, the Victorian CFA and SES School Curriculum 'Natural Hazard Resilience Package' has made teacher training and capacity building a major priority and professional development sessions are being trialed in 20 Victorian government schools. Importantly, the impact of these sessions on program uptake and effectiveness is being evaluated, which will provide valuable baseline data for ongoing continuous improvement in this area. The evaluation of training and capacity building for agency staff and volunteers has also been recognised as a key priority in other agencies, including the NSW RFS and Fire

and Rescue NSW. This work is currently underway (Ronan et al. 2015).

## Leveraging existing policy and practice

Under the provisions of legislation, Australian schools are required to develop and maintain emergency management plans that describe the actions to be taken before, during and following an emergency to ensure the ongoing safety of staff, students and others. In addition, schools are required to practice those plans in school-wide drills and exercises on a regular basis, under a variety of emergency scenarios. It is proposed here, that by embedding DRE in these legally-mandated activities, emergency management agencies can potentially increase the uptake and sustained implementation of school-based programs.

While the effectiveness of this approach has yet to be empirically tested, it has recently been articulated in the Comprehensive School Safety (CSS) Framework (GADRRRES/UNISDR 2014). The framework is underpinned by the recognition of children's rights to survival and protection as well as to education and participation. As outlined in the framework, school safety rests on three pillars:

1. Safe learning facilities

2. School disaster management

3. Risk reduction and resilience education (GADRRRES/UNISDR 2014).

Importantly, the three pillars are interlinked (see Ronan et al. this issue), and DRE is designed to provide students with the requisite knowledge, skills and values for participating in action and decision-making related to both safe school facilities and school disaster management.

Embedding DRE in school emergency management plans would have potential benefits for both school safety and student learning. Including students in action and decision-making for school emergency management could potentially lead to enhanced plans and procedures, as well as increase a school's capacity to respond during an actual emergency. At the same time, the school would act as a 'learning laboratory' wherein teachers and students can explore, present, discuss, and enact DRR and resilience strategies through the active learning approaches discussed earlier. Having built their capacities in the safe, supportive and structured environment of the school, students could extend their knowledge and skills to DRR and resilience activities in their households and communities. Most importantly, if it could be demonstrated that student participation in action and decision-making actually enhances school safety, schools would be provided with a major incentive for delivering DRE programs.

## EVALUATION

Evaluation can be defined as a "systematic study using research methods to collect and analyse data to assess how well a program is working and why" (GAO, 2012, p.4). Evaluation results may be used to assess a program's effectiveness, identify how to improve performance, or guide resource allocation (ACF, 2011; GAO, 2012). AFAC (2012) also identifies evaluation as a key mechanism for increasing uptake of DRE programs: "Programs should use monitoring and evaluation, with outcomes utilised for marketing and promotion".

### Types of evaluation

In the context of DRE, various types of evaluation are both useful and relevant, including formative, summative, outcome, process, and impact evaluation.

Formative evaluation is undertaken during the development of a new program or when an existing program is implemented in a new context (IFRC 2011). The results are used to provide feedback on components of program design and implementation and what changes or modifications are needed to improve program quality before the program is implemented at scale (ACF 2012). Formative evaluation is particularly valuable for the development of DRE programs because the available evidence-base for informing the various aspects of program design and implementation is so limited (Johnson et al. 2014a). Historically, Australian emergency management agencies have not incorporated formative evaluation as a routine part of DRE program development. Currently, it is being used to inform the development of several new programs, including the CFA/SES School Curriculum 'Natural Hazard Resilience Package', the Australian Red Cross 'Pillowcase Project', and the NSW RFS 'Guide to Working with School Communities'.

Summative evaluation is undertaken at the end of the program cycle to examine the effectiveness of the program design and implementation (IFRC 2011, ACF 2012). The results are used to measure program success against specific indicators and provide the foundation for an ongoing process of continuous improvement (ACF 2012). Internationally, numerous summative evaluations of DRE programs have been conducted, mainly in New Zealand and the United States (c.f. Johnson et al. 2014). While emergency management agencies explicitly acknowledge the fundamental importance for promoting quality in DRE (AFAC 2014), published evaluations are scarce. Consultations with emergency management agencies suggest that the lack of evaluation is largely due to constraints on human and financial resources. Thus, summative evaluation has become a major focus of the 'Building best practice in CCDRR' project that will conduct evaluations of several existing programs including L'il Larrikins Bushfire Safety (AFAC 2016), Bushfire Patrol (DFES 2016), and the full suite of Fire and Rescue NSW Fire Ed programs (FRNSW 2016).

Outcome evaluation examines the extent to which a program affects participants according to specific indicators or data elements (ACF 2011). The focus is on program effectiveness and the degree to which program aims and objectives have been met (GAO 2012, ACF 2011). In the context of a DRE program, an outcome evaluation can answer the following types of questions: Have students acquired the knowledge, skills and values specified in the learning objectives?, Have students undertaken the actions specified DRR and resilience objectives?, Can student learning and action be directly attributed to the program?, Has student learning and action been sustained over time?

Process evaluation examines the effectiveness of a program's implementation strategy (ACF 2011). The focus is on program 'reach' and the extent to which a program has been delivered as intended (ACF 2011, GAO 2012). A process evaluation can answer the following types of questions: How many schools and teachers delivered the program and what factors influenced program uptake?, What kind of teacher training or support was provided and was this adequate?, Were individual lessons delivered as detailed in the teacher's guide and how were lessons adapted to meet student needs?, What problems or challenges did teachers and students confront during program delivery and how were these addressed? A process evaluation can also address questions relating to program design and development. For example: What formal or informal partnerships support program development?; How were DRR and resilience objectives and learning objectives determined?; Who was involved in the development of the teachers and learning activities and how well do these reflect best practice in education?; What kind of quality control was applied to the development of program materials and resources?

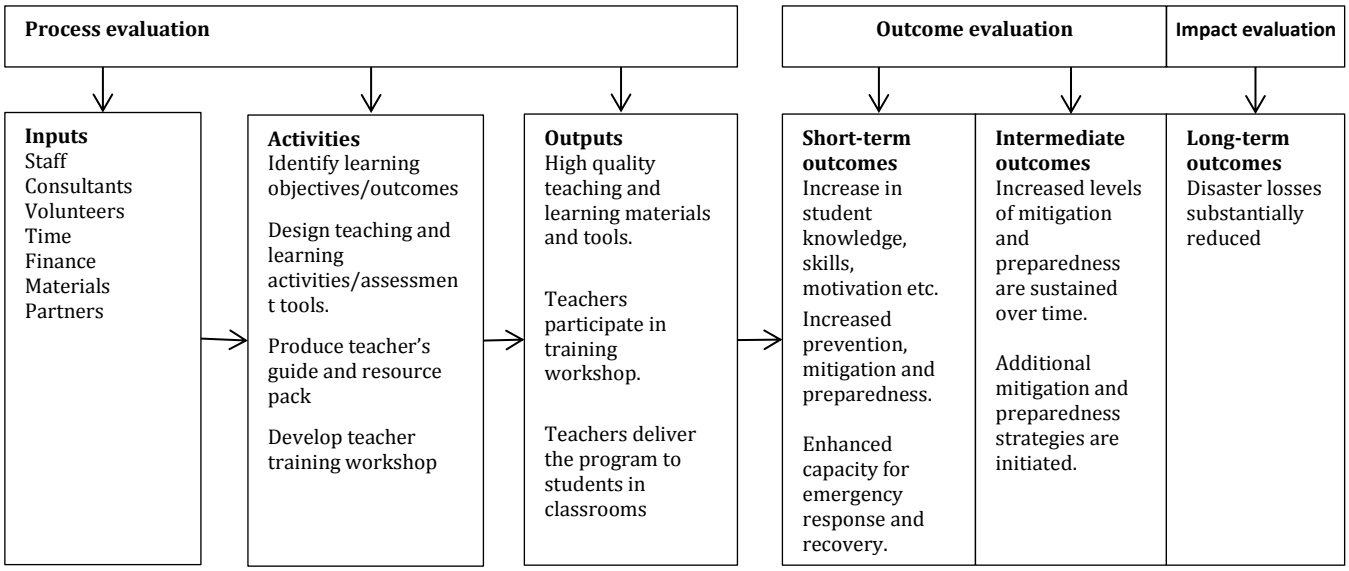
Comprehensive program evaluations examine outcomes and process (ACF 2011). A process evaluation may find that a program is being implemented in the way it was intended but if outcomes are not evaluated, it is impossible to determine whether the program is worthwhile. Likewise an outcomes evaluation may find that a program is worthwhile but if program implementation is not evaluated, it is impossible to determine the specific processes that are contributing to program effectiveness (ACF 2011). However, evaluations that examine both the outcomes and process of DRE programs are scarce. In an analysis of 33 published DRE evaluations, Johnson and colleagues (2014a) found that only ten (29 per cent) examined both outcomes and process. Moreover, among those ten, the focus tended to be on outcomes and process was rarely studied in-depth. Thus, while there may be growing evidence that DRE is effective, the processes that contribute to effectiveness are not clearly understood. This state of affairs is constraining progress towards best-practice.

An impact evaluation is an outcome evaluation that focuses on the broad, longer-term outcomes or results of a program (ACF 2011, GAO 2012). For example, an impact evaluation could show that a DRE program translated into reduced losses during an actual hazard event. As far as we are aware, no DRE program has been subjected to an impact evaluation, either in Australia or internationally. To address this gap, Johnson and colleagues (2016) advocate for the adoption of longitudinal and time series research designs that are

extended to reflect the full disaster cycle (i.e. before, during and after). While outcome and process evaluations can demonstrate the effectiveness of program design and implementation, it is only through impact evaluation that the true value of DRE can be reliably established.

## Program logic models

A program logic model (also referred to as 'program theory') is a systematic and visual way to present the relationships among the inputs and resources that can be directed towards a program (funding staff, consultants, volunteers, technology), the activities undertaken to develop a program (identify learning objectives and outcomes, design teaching and learning activities, write the teacher's guide, develop a teacher training workshop), the tangible outputs that result from those activities (teachers participate in training workshops, teachers implement the program in their classrooms), as well as the short-term, intermediate and long-term outcomes of the program (increased knowledge, skills, motivation, increased levels of prevention, mitigation, preparedness, reduced disaster losses) (GAO 2012). As shown in Figure 2, the three major types of evaluation map directly onto specific elements of the logic model. Process evaluation is focussed on inputs, activities and outputs. Outcome evaluation is focussed on short-term and intermediate outcomes. Impact evaluation is focussed on long-term outcomes.



While program logic has not traditionally been applied to the development of Australian DRE programs, evaluation experts agree that it has significant benefits for program design, implementation and evaluation (Funnell & Rogers 2011). When the relationships between inputs, activities, outputs, and outcomes are made explicit, program developers can clearly communicate the assumptions and expectations that underpin program design and implementation (ACF 2011, Funnell & Rogers 2011). This provides program evaluators with a clearer basis for formulating relevant research questions and collecting data that can test those assumptions and expectations (GAO 2012). Although program logic can be retrofitted onto an existing program, it is much more efficient to apply it to program development from the very outset.

## Research design and methods

While a detailed discussion of research design and methods is beyond the scope of this paper, it is necessary to make several key points. Internationally, DRE program evaluations have tended to rely on quantitative methods (Johnson et al. 2014a, Towers 2012). In their analysis of existing DRE program evaluations, Johnson and colleagues (2014a) found that quantitative questionnaires using multiple choice questions or Likert scales were used in 22 studies (63 per cent), and 21 studies (60 per cent) relied on quantitative questionnaires as the sole method of data collection. Meanwhile, qualitative methods were much less common. Individual interviews were used in five studies (14 per cent), focus group interviews were used in two studies (6 per cent), and only one study used a qualitative diary method (3 per cent).

As Johnson and colleagues (2014a) point out, quantitative questionnaires have several advantages. They can be administered to large groups and the data is relatively simple to analyse compared to qualitative data. However, as Johnson and colleagues (2014a) and Towers (2015) both note, quantitative studies often fail to explain why an outcome has or has not occurred, which can limit the evaluators' ability to make meaningful recommendations for program improvement. This view is supported by numerous scholars of childhood who have argued that checklists, rating scales and questionnaires restrict the researcher's ability to capture a detailed understanding of children's knowledge and experience (Corsaro & Streeck 1986, James & Prout 2004, Woodgate 2000). This narrows the lens for identifying the program strengths and weaknesses and constrains opportunities for program improvement.

In addition, action for DRR and resilience is heavily influenced by various social, cultural, political and economic factors (Wisner et al. 2004, Haynes & Tanner 2015) that can be very difficult to capture through quantitative measures. Incorporating both qualitative and quantitative measures into the design of evaluations can provide important information on how these factors are interacting with various program components. This facilitates the development of DRE programs that accommodate the realities of children's everyday lives.

# CONCLUSION

While the BNHCRC project team aimed to produce a framework that is both comprehensive and evidence-based, it is by no means intended to be the final word on quality DRE. Rather, it represents a starting point to be revised, reformulated and improved over time. Its purpose is to stimulate discussion and debate among key stakeholders, including policy-makers, practitioners, agencies, researchers, teachers, parents, children and youth. It should be viewed as a working document, which, as it evolves, will be a useful tool that can assist in a best-practice model for DRE.

# REFERENCES

ACARA. (2016). *Australian Curriculum.* Available at http://www.australiancurriculum.edu.au/

ACECQA 2016, *National Quality Framework.* Available at http://www.acecqa.gov.au/national-quality-framework

ACF 2010, *The Program Manager's Guide to Evaluation, Second Edition. Administration for Children and Families, Office of Planning, Research and Evaluation. Washington, DC.* Available at http://www.acf.hhs.gov/programs/opre/resource/the-program-managers-guide-to-evaluation-second-edition

AFAC 2014, *Principles for Educating Children in Natural Hazards and other Emergencies.* AFAC: East Melbourne.

AIDR 2016, *Disaster Resilience Education for Schools Program.* Available at https://www.aidr.org.au/education/school-education/

AFAC 2016, *L'il larrikins bushfire safety.* Available at http://www.afac.com.au/initiative/lillarikkins

AITSL 2016, *Australian Professional Standards for Teachers.* Available at http://www.aitsl.edu.au/australian-professional-standards-for-teachers/standards/list

Amri A, Bird DK., Ronan KR, Haynes, K, & Towers, B 2016, *Disaster Risk Reduction Education in Indonesia: Challenges and recommendations for scaling up. Natural Hazards and Earth System Sciences,* Manuscript under review, 10.5194/nhess-2015-344, 2016.

Anderson W 2005, *Bringing children into focus on the social science disaster research agenda. International Journal of Mass Emergencies and Disasters, 23, pp. 159-175.*

APPA 2014, *The overcrowded primary curriculum: a way forward.* Available at http://www.appa.asn.au/wp-content/uploads/2015/08/Overcrowded-primary-curriculum.pdf

Argyris C & Schön D 1996, *Organizational learning II: Theory, method and practice. Reading, Mass. Addison Wesley.*

Australian Government 2009, *Belonging, being & becoming: The early years learning framework for Australia. Canberra. Australian Government.*

Australian Government 2013, *National Strategy for Disaster Resilience: Community engagement framework. Australian Government Attorney General's Department. Canberra.*

Bahadur A & Tanner T 2014, *Transformational resilience thinking: putting people, power and politics at the heart of urban climate resilience. Environment and Urbanization, 26, pp. 200-214.*

Bandura B 1986, *Social foundations of thought and action: A social cognitive theory. New Jersey. Prentice-Hall.*

Becker J, Paton, D, Johnston DM & Ronan K 2013, *Salient beliefs about earthquake hazards and household preparedness. Risk Analysis, 33, pp. 1710-27*

Benson L & Bugge J 2007, *Child-led disaster risk reduction: a practical guide. Stockholm. Save the Children.*

BNHCRC, 2015, *Child-centered disaster risk reduction,* Available at http://www.bnhcrc.com.au/research/resilient-people-infrastructure-and-institutions/236

Bruner J 1977, *The process of education. Boston. Harvard University Press.*

DFES 2016, *Bushfire Patrol.* Available at http://www.dfes.wa.gov.au/schooleducation/teachersandschools/Pages/bushfirepatrol.aspx

COAG 2011, *National strategy for disaster resilience. COAG, Canberra.*

Collins JW & O'Brien NP (Eds.) 2003, *Greenwood Dictionary of Education. Westport, CT. Greenwood.*

Cologon K 2013, *Inclusion in education: Towards equality for students with disability. Children and Families Research Centre Institute of Early Childhood Macquarie University. Sydney.* Available at http://www.cda.org.au/inclusion-in-education

Corsaro WA & Streeck J 1986, *Studying children's worlds: methodological issues. In G. J. Cook, W. A. Corsaro & J. Streeck (Eds.), Children's worlds and children's language (pp.13- 25). Berlin: Mouton de Gruyter.*

Department of Families, Housing, Community Services and Indigenous Affairs 2012, *2010–2020 National Disability Strategy Report to the Council of Australian Governments 2012. Australian Government. Canberra.*

Diamond R 2011, *Designing and Assessing Courses and Curricula: A Practical Guide. San Francsico. Jossey-Bass.*

dk2/Australian Red Cross 2014, *Educating the Educators - Mapping of disaster resilience education resources against the Australian Curriculum. Canberra. Australian Government.*

Doren-Higgins B & NSW RFS 2016 *Guide to Working with School Communities*. Sydney. NSW RFS.

DRANSZEN 2013, *Disaster resilience education in the Australian National Curriculum. Canberra. Australian Government Attorney General's Department.*

DRANZSEN 2014, *Disaster Resilient Australia and New Zealand School Education Network - Terms of Reference. Australian Government: Canberra.*

Dufty N 2014, Opportunities for disaster resilience learning in the Australian curriculum. *Australian Journal of Emergency Management, 29, pp. 12-16.*

Fautley M & Savage J 2008, *Assessment for Learning and Teaching in Secondary Schools. Learning Matters: Exeter.*

FRNSW 2016, *School programs.* Available at http://www.fire.nsw.gov.au/page.php?id=218

Freeman S, Eddya S, McDonough M, Smith M, Okoroafora N, Jordt H & Wenderotha MP 2013, *Active learning increases student performance in science, engineering, and mathematics. PNAS, 111,* pp. 8410–8415.

Freire P 1972, *Pedagogy of the oppressed. London, Penguin.*

Funnell S & Rogers P 2011, *Purposeful program theory: effective use of theories of change and logic models. San Francisco. Jossey-Bass*

GADRRRES/UNISDR 2015, *Comprehensive School Safety: A global framework in support of The Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector and The Worldwide Initiative for Safe Schools. Geneva. GADRRRES/UNISDR.* Available at http://www.preventionweb.net/files/31059_31059comprehensiveschoolsafetyframe.pdf

GAO 2012, *Designing evaluations. Washington DC. United States Government Accountability Office.*

Haynes K, Lassa J & Towers B, 2010, *Child-centered disaster risk reduction and climate change adaptation: roles of gender and culture in Indonesia. Working Paper prepared for the Children in a Changing Climate Coalition, United Kingdom.*

Haynes K & Tanner T 2013, *Empowering young people and strengthening resilience: youth-centred participatory video as a tool for climate change adaptation and disaster risk reduction. Children's Geographies, 13, pp. 357-371*

Hewitt K 1997, *Regions of risk. Essex. Longman.*

Huba ME & Freed, JE 2000, *Learner-centered assessment on college campuses: Shifting the focus from teaching to learning. Needham Heights, MA. Allyn & Bacon.*

Hudson PB 2012, *A model for curricula integration using the Australian curriculum. Teaching Science, 58, pp. 40-45.*

IFRC 2011, *Project/programme monitoring and evaluation guide. Geneva. IFRC*

INEE 2010, *Guidance Notes on Teaching and Learning. New York: INEE Coordinator of Network Projects and Communications.* Available at http://toolkit.ineesite.org/toolkit/INEEcms/uploads/1004/Guidance_Notes_on_Teaching_and_Learning_EN.pdf

James A & Prout A 2004, *Constructing and reconstructing childhood. New York. Pallgrave Macmillan.*

Johnson VA, Ronan KR, Johnston DM, & Peace R 2014a, *Evaluations of disaster education programs for children: A methodological review. International Journal of Disaster Risk Reduction, 9, pp.107–123.*

Johnson VA, Johnston DM, Ronan K R, & Peace R 2014b, *Evaluating children's learning of adaptive response capacities from ShakeOut, an earthquake and tsunami drill in two Washington State school districts. Journal of Homeland Security and Emergency Management, 11, pp. 347–373.*

Johnson VA, Ronan KR, Johnston DM & Peace R 2016, *Improving the Impact and Implementation of Disaster Education: Programs for Children Through Theory-Based Evaluation. Risk Analysis*, doi: 10.1111/risa.12545.

Kennedy A & Stonehouse A 2012, *Victorian early years learning and development framework practice principle guide: Equity and diversity. Melbourne, Victorian Government.*

Lindell M & Perry R 2012, *The Protective Action Decision Model: Theoretical Modifications and Additional Evidence. Risk Analysis, 32, pp. 616–632.*

Maskrey A 1989, *Disaster mitigation: a community-based approach. Oxford. Oxfam.*

Mercer J, Kelman I, Taranis L & Suchet-Pearson S. (2008). *Framework for integrating Indigenous and scientific knowledge for disaster risk reduction. Disasters, 34, pp. 214–239.*

McLennan B & Handmer J 2012, *Reframing responsibility-sharing for bushfire risk management in Australia after Black Saturday. Environmental Hazards: Human and Policy Dimensions, 11, pp.1-15.*

Mitchell T, Haynes K, Hall N, Choong W & Oven K 2008, *The role of children and youth in communicating disaster risk. Children, Youth and Environments, 20, pp. 1-30.*

Mitchell T, Tanner T & Haynes K 2009, *Children as agents of change disaster risk reduction: lessons from El Salvador and the Philippines. Working paper prepared for the Children in a Changing Climate Coalition, United Kingdom.*

Ministerial Council on Education, Employment, Training and Youth Affairs 2008, *Melbourne Declaration on Educational Goals for Young Australians*. Available at http://www.curriculum.edu.au/verve/_resources/National_Declaration_on_the_Educational_Goals_for_Young_Australians.pdf

Nikku B, Sah N, Karkara R & Ahmed S 2006, *Child rights perspective in response to natural disasters in south Asia: a retrospective study. United Kingdom. Save the Children,*

Paton D, 2003, *Disaster preparedness: a social-cognitive perspective. Disaster Prevention and Management, 12, pp. 210 – 216.*

Peek L 2008, *Children and disasters: understanding vulnerability, developing capacities, and promoting resilience - an introduction. Children, Youth and Environments, 18, pp. 1-29.*

Peek L & Fothergill A 2015, *Children of Katrina. Austin, University of Texas Press.*

Prince M 2004, *Does Active Learning Work? A Review of the Research. Journal of Engineering Education, 93, pp. 223-231.*

Renwick J 2012, *Report of the 2012 "What's The Plan Stan?" survey of New Zealand primary schools. Research and Evaluation Services, Strategy and Governance Branch, New Zealand Ministry of Civil Defence.* Available at www.civildefence.govt.nz/assets/Uploads/publications/wtps-survey-results-2012.doc

Rogoff B (2003). *The cultural nature of human development. Oxford University Press. Oxford.*

Ronan K & Johnston D 2003, *Hazards education for youth: a quasi- experimental investigation. Risk Analysis, 23, pp. 1009-1020.*

Ronan K, Crellin K & Johnston D 2009, Correlates of hazards education for youth: a replication study, *Natural hazards, 53, pp. 503-526.*

Ronan K & Towers B 2014, *Systems Education for a Sustainable Planet: Preparing Children for Natural Disasters. Systems, 2, pp. 1-23.*

Ronan K, Towers B, Haynes K, Alisic E, Davie S, Petal M, Ireland N, Handmer, J, & Johnston D. 2015, *Building best practice in child-centred disaster risk reduction: Annual project report 2014-2015. East Melbourne. Bushfire and Natural Hazards CRC.* Available at: http://www.bnhcrc.com.au/publications/biblio/bnh-2350

Save the Children 2006, *Living with disasters and changing climate: children in Southeast Asia telling their stories about disaster and climate change*. *Sweden. Save the Children.*

Solberg C, Rossetto T & Joffe H 2010, *The social psychology of seismic hazard adjustment: re-evaluating the international literature. Natural Hazards and Earth Science Systems,* 10*, pp. 1663-1677.*

Stabback P 2016, *What Makes a Quality Curriculum? Geneva. UNESCO International Bureau of Education*. Available at http://www.ibe.unesco.org/sites/default/files/resources/ipr2-stabback-qualitycurriculum_eng.pdf

Tanner T 2010, Shifting the narrative: child-led responses to climate change and disasters in El Salvador and the Philippines. *Children & Society, 24, pp. 339-351.*

Teague, B., McLeod, R. & Pascoe, S. (2010). *2009 Victorian Bushfires Royal Commission final report. Melbourne. Parliament of Victoria.*

Tokuhama-Espinosa, T 2014, *Making classrooms better. New York. W.W Norton & Company.*

Towers B 2012, *Children's knowledge of vulnerability and resilience to bushfire. Unpublished doctoral dissertation, Schoo, oil of Psychology, University of Tasmania, Hobart.*

Towers B, 2015, Children's knowledge of bushfire emergency response. *International Journal of Wildland Fire*, *24, pp. 179–189.*

UNESCO 2009, *Policy guidelines on inclusion in education.* Geneva. *UNESCO.*

UNESCO/UNICEF. (2014). *Towards a learning culture of safety and resilience technical guidance for integrating disaster risk reduction in the school curriculum.* Geneva: UNESCO/UNICEF.

UNHCR, 1989. *Convention on the rights of the child. Geneva. UNHCR.* Available at http://www.ohchr.org/en/professionalinterest/pages/crc.aspx

UNISDR, 2012, *Assessing School Safety from Disasters-A Baseline Report.* Available at http://www.preventionweb.net/educational/view/34995

UNISDR 2015, *Sendai framework for disaster risk reduction 2015-2030. Geneva. UNISD.*

Vanaspong C, Ratanachena S & Rattanaphan J 2007, *Lessons learned from child led disaster risk reduction project: Thailand. Save the Children. Stockholm.*

Webb M & Ronan K 2014, *Interactive Hazards Education Program for Youth in a Low SES Community: A Quasi-Experimental Pilot Study. Risk Analysis, 34, 1882-1893.*

Wiggins GP 1993, *Assessing student performance. Jossey-Bass Publishers. San Francisco*

Wisner B, Blaikie P, Cannon T & Davis I 2004, *At risk: natural hazards, people's vulnerability and disasters. London. Routledge.*

Wisner B, Gaillard JC & Kelman I (Eds.), 2012, *Handbook of hazards and disaster risk reduction. Oxon, United Kingdom. Routledge.*

Woodgate R, 2000, *A critical review of qualitative research of qualitative research related to children's experiences with cancer. Journal of Pediatric Oncology Nursing, 17, pp. 207-228.*

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