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A review of progress in the integration of disaster risk reduction into Australian school curricula programs and materials

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A REVIEW OF PROGRESS IN THE INTEGRATION OF DISASTER RISK REDUCTION INTO AUSTRALIAN SCHOOL CURRICULA PROGRAMS AND MATERIALS

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Introduction

Australia experiences a range of 'natural disasters' including bushfires, floods, severe storms, tropical cyclones, heatwaves, earthquakes and landslides. These events cause great financial hardship for individuals and communities, and can result in loss of life.

The experience of natural disaster has come to be seen as part of the Australian national character, as described in the poem 'My Country' by Dorothea McKellar (1908).

> *I love a sunburnt country, a land of sweeping plains,*
> *Of ragged mountain ranges, of droughts and flooding rains.*
> *I love her far horizons, I love her jewel-sea,*
> *Her beauty and her terror - the wide brown land for me!*

In recent years, there have been several significant disasters in Australia including the 2009 Black Saturday bushfires in Victoria and the 2011 floods in Queensland and Victoria. There is evidence to show that the number and intensity of weather-related disasters will increase in the future due to anthropogenic climate change (Steffen, Hughes & Perkins, 2014; CSIRO & Australian Bureau of Meteorology, 2014).

Youth have been identified as being particularly vulnerable to disasters in Australia (Davie, 2013).

Researchers such as Ronan and Johnston (2005) stress the importance of school disaster education and the youth-school-family network in building community resilience to disasters. They base this view on research which demonstrates 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.' (Ronan and Johnston, 2005, p. 5)*

They add that disaster 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'. (Ronan and Johnston, 2005, p. 95)

The way in which students learn about disasters and hazards – both in and out of school – has been the focus of several Australian psychological studies. 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.' (Towers and Paton, 2007)*

This paper

Disaster Risk Reduction (DRR) aims to reduce the damage caused by natural hazards like earthquakes, floods, droughts and cyclones, through an ethic of prevention (UNISDR, 2014).

The 10-year Hyogo Framework for Action (HFA) came out of the World Conference held in Kobe, Hyogo, Japan in January 2005. The HFA is the first plan to explain, describe and detail the work that is required from all different sectors and actors to reduce disaster losses. It was developed and agreed on with the many partners needed to reduce disaster risk - governments, international agencies, disaster experts and many others - bringing them into a common system of coordination.

The HFA outlines five priorities for action, and offers guiding principles and practical means for achieving disaster resilience. Its goal is to substantially reduce disaster losses by 2015 by building the resilience of nations and communities to disasters.

The United Nations Office for Disaster Risk Reduction (UNISDR) has issued a call for input papers as part of the development of the 2015 Global Assessment Report (GAR15). The GAR15 will be published prior to the World Conference on Disaster Risk Reduction in 2015, in which governments will adopt a successor framework to the HFA.

This input paper addresses Research Area 5, Priority for Action 3 – Core Indicator 2 from the HFA:

> *School curricula, education material and relevant training include disaster risk reduction and recovery concepts and practices.*

In this context, the paper aims to review progress in the integration of DRR into Australian school curricula programs and support materials since 2005.

Methodology

This review was conducted in relation to the study entitled *Disaster risk reduction in school curricula: case studies from thirty countries* (UNESCO/UNICEF, 2012). This study provided guidance to the issues examined in the review and forms the basis for the discussion section.

According to Shaw, Shiwaku and Takeuchi (2011), DRR education can be broadly classified into three modes:

1. Formal education. Disaster education provided in schools, colleges, universities and other formal institutions. Typically, this mode of disaster education has 'structured learning objectives, learning time, and learning support' (Shaw, Shiwaku and Takeuchi, 2011, p. 3).
2. Non-formal education. Structured learning provided outside of the formal education system e.g. extra-curricular activities in schools such as presentations by emergency agencies. This mode complements formal education and is often run in conjunction with it.
3. Informal education. 'Results from daily activities related to work, family life or leisure. It is not structured and usually does not lead to certification. In most cases it is unintentional on the part of the learner' (Shaw, Shiwaku and Takeuchi, 2011, p. 3).

As the main focus of this review is on DRR integration into the Australian curriculum, it largely examines the 'formal' education mode.

To review changes in DRR integration into the Australian curriculum over time (that is, since 2005), several relevant studies were collected and analysed. A main tool used in assessing prior and current DRR integration was 'curriculum mapping'. Curriculum mapping is a 'technique for exploring the primary elements of curriculum: what is taught; how instruction occurs; and, when instruction is delivered' (Rubicon Atlas, 2013).

All major emergency agencies in Australia were approached to supply data for the review. Data was also accessed from other emergency services organisations such as the Australian Red Cross and Green Cross Australia. Data provided consisted of:

- Reports
- Curriculum maps
- Weblinks
- Teacher professional guides and manuals
- Student learning resources (e.g. games, workbooks)

A few limitations of the review should be noted:

- Only about half of the emergency agencies responded to the request to provide input to the review, and thus it should not be considered as being comprehensive.
- At the time of the review, the Australian curriculum was being developed and therefore some instances of DRR integration may not have been identified.
- There were few studies of DRR integration conducted in and around 2005 compared with today, and thus comparison is relatively tenuous.

Findings

2005-2009

In Australia up until 2009, each state and territory had its own curricula. There were some opportunities for the development of disaster education programs and activities related to these jurisdictional curricula. Kriewaldt et.al. (2003) conducted a study of DRR education across state and territory curricula. They found that disaster 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'.

During 2005-2009, several state and territory emergency agencies carried out curriculum mapping to identify opportunities for integration of DRR into jurisdictional curricula, and then developed teaching units and student resources related to these curriculum links (Dufty, 2008; Dufty, 2009). However, numerous DRR education resources were not linked to curricula and thus risked not being using in teaching programs as they were seen by schools to be 'extra-curricular' or non-formal education (Dufty, 2009).

A trigger for emergency agencies to develop DRR school education materials was the recommendations of major inquiries and reviews. For example, the National Inquiry on Bushfire Mitigation and Management (Ellis, Kanowski & Whelan, 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.' (Ellis, Kanowski & Whelan, 2004)

However, as with broader community DRR education, it appears that in and around 2005 DRR school education languished as a low priority for Australian emergency agencies and other emergency services organisations. In 2004, according to the Australian Government:

> ''Public awareness of natural hazard issues is arguably the least practised and most poorly funded mitigation measure in Australia. With very few exceptions, it is undertaken as a limited auxiliary activity to other disaster management initiatives, rather than as a sustained strategic measure to raise public consciousness and understanding of hazard risks, impacts and minimisation.' (Department of Transport and Regional Services, 2004, pp. 124-125)

In 2009, COAG commissioned a research team from RMIT University to review current community hazard education, awareness and engagement (EAE) programs in order to understand how they might be improved and more effectively tailored to State, Territory and local circumstances.

The RMIT report (Elsworth et. al., 2009) reviewed close to 300 separate programs (including school DRR education programs) and 14 evaluations of these programs. The report found that the programs generally led to 'positive changes in awareness and knowledge of the potential threat of natural hazards along with physical preparedness'. On the other hand, the report advocated that:

> 'the development and implementation of EAE programs and other activities for natural hazards should be more systematically planned and evaluated, and based more directly on available evidence and theory.' (Elsworth et. al., 2009, p. iv)

2009-present

Since 2009, there appears to have been a significant upsurge in the development of school DRR education programs and activities. Evidence for this trend comes from several sources including the curriculum mapping report (dk2 Pty Ltd, 2013) for the *National Emergency Management Project - Educating the Educators.* This curriculum mapping project involved reviewing a sample of 47 existing Australian primary and secondary DRR education school resources gathered from a range of emergency services agencies from across Australia. The sample showed a broad range of Australian DRR education resources available for students from Kindergarten (Foundation) to Year 12.

Several emergency agency agencies have also used curriculum mapping to identify opportunities for developing appropriate DRR education programs and activities. For example, the Western Australia Department of Fire and Emergency Services (DFES) has conducted curriculum mapping to identify opportunities for bushfire programs and activities.

It should be noted that in December 2008, the development of the Australian Curriculum guided by the Melbourne Declaration on Educational Goals for Young Australians was adopted by the Ministerial Council. Since then, the development of the Australian Curriculum has been overseen by the Australian Curriculum, Assessment and Reporting Authority (ACARA). It is hoped that Australian schools will be implementing all learning areas (Foundation to Year 12) in the Australian Curriculum by 2016.

Curriculum mapping of DRR in the Australian Curriculum was conducted for this review and in Dufty (2014). The results are summarised in Table 1. This curriculum mapping identifies opportunities for the development of school DRR education programs and materials in the Australian curriculum (Foundation to Year 12).

At the time of writing (February 2014), the following F-10 curriculums were finalised for implementation in Australian schools: English, Mathematics, Science, History and Geography. In relation to Senior Secondary (Years 11 and 12) implementation, 15 curriculums had been finalised.

Years	Science	Geography	History	Draft Health and PE
F				1.4
1				2.4, 2.5, 2.7
2		ELBH506		2.4, 2.5, 2.7
3				3.4, 3.7
4	ELBS823			3.4, 3.7
5		ACHGK030 ELBH461 ELBH551 ELBH580 ELBH609 ELBH739		4.4, 4.9
6	ACSSU096 ELBS906 ELBS907 ELBS909 ELBS910 ELBS922 ELBS924 ELBS925 ELBS931 ELBS925	ELBH656		4.4, 4.9

7		ACHGK040 ACHGK042 ACHGK046 ELBH348 ELBH416 ELBH421 ELBH437 ELBH454 ELBH458 ELBH547 ELBH574 ELBH586 ELBH690		5.4, 5.5, 5.6, 5.7
8	ELBS1065	ACHGK053 ELBH368 ELBH410 ELBH469 ELBH730	ACDSEH069 ACDSEH070 ACDSEH071 ACDSEH072 DELBH090 DELBH092 DELBH093 DELBH225	5.4, 5.5, 5.6, 5.7
9	ELBS1092 ELBS1108	ACHGK063 ELBH577		6.4, 6.5, 6.7, 6.9
10	ELBS1184 ELBS1202 ELBS 1205 ELBS1210		ACDSEH127 ACDSEH128 DELBH180	6.4, 6.5, 6.7, 6.9
11 and 12	ACSPH125 ACSBL071 ACSBL106 ACSCH123 ACSCH085 ACSES067 ACSES094 ACSES098 ACSES099 ACSES100 ACSES101 ACSES102 ACSES103 ACSES106 ACSES108	ACHGE012 ACHGE013 ACHGE014 ACHGE015 ACHGE016 ACHGE017 ACHGE018 ACHGE019 ACHGE020 ACHGE021 ACHGE022 ACHGE023 ACHGE024 ACHGE025 ACHGE026 ACHGE027		

Table 1: Curriculum map showing the main opportunities for DRR learning in the Australian Curriculum.

The codes in the Table 1 curriculum map refer to content descriptions (codes starting with 'AC') and elaborations to content descriptions (codes including 'ELB'). The content description provides a higher level of opportunity than the elaborations. Thus, for example, there is more opportunity for curriculum development in Year 5 Geography than Year 6 Geography as the former has a content description (ACHGK030 – 'The impact of bushfires or floods on environments and communities, and how people can respond') directly pertaining

to an aspect of disaster resilience learning whilst the latter only is an elaboration to a content description that is not directly related. The codes in the draft Health and Physical Education (PE) curriculum all refer to elaborations.

Using this understanding of the curriculum map, some observations can be made in relation to Table 1:

1. The main curriculum development opportunities for disaster resilience learning are in Science and Geography.
2. Science - the main opportunities are in Year 6 Science (geological changes, extreme weather) and in Year 11-12 Earth and Environmental Science (the cause and impact of Earth hazards).
3. Geography - the main opportunities are in Year 5 (impact of and response to bushfires and floods), Year 7 (causes, impacts and responses to atmospheric or hydrological hazards), Year 8 (causes, impacts and responses to a geomorphological hazard), Year 9 (challenges of climate change) and Year 11-12 (natural and ecological hazards including a depth study).
4. History - the main opportunities are in studies of the Black Death plague (Year 8) and relating to environmental disasters such as Chernobyl (Year 10).
5. Health & PE - the main opportunities are across all years and relate mainly to personal resilience in adversity, safety measures in emergencies, and decision-making for safety.
6. From Year 5 onwards there are generally good opportunities for disaster resilience learning across the curricula.
7. Other than a few elaborations, there are no direct opportunities for disaster resilience learning in Foundation to Year 4.

The curriculum mapping report (dk2 Pty Ltd, 2013) for the *National Emergency Management Project - Educating the Educators* showed that existing DRR programs and supporting resources could be also be 'retrofitted' into appropriate locations in the Australian Curriculum. Thus, there was opportunity to integrate existing materials, as well as develop new ones.

With the development of an Australian Curriculum, there is now the possibility of an Australia-wide approach to DRR education in schools. The Australian Emergency Management Institute (AEMI), through Emergency Management Australia (part of the Attorney-General's Department), is a Centre of Excellence for knowledge and skills development in the national emergency management sector. Since 1956, AEMI has provided education, training, professional development, information, research and community awareness services including the recently-commenced Disaster Resilience for Schools program.

The Disaster Resilience for Schools program includes:

- Disaster Resilience for Schools website comprising a range of teaching and learning activities developed with current teaching pedagogy in mind. www.schools.aemi.edu.au

- Australian curriculum review. Emergency Management Australia has been involved in the development of DRR content and skills in the Australian Curriculum.
- Disaster Resilient Australia School Education Network (DRASEN). In 2012, the Attorney-General's Department supported plans to commence a national network on disaster resilience education. DRASEN was established and structured to be the national broker of engagement and strategic advice between educational professionals, emergency agencies and policy makers, including endeavours to embed the key messages of the National Strategy for Disaster Resilience into the Australian Curriculum. DRASEN has convened twice to date with 32 agencies represented.
- The special January edition of the Australian Journal of Emergency Management focussed on 'Children, Youth and Education' and included articles about DRR school education.
- As cited above, the National Emergency Management Projects (NEMP) *Educating the Educators: Disaster Resilience Resource Mapping Report* (dk2 Pty Ltd, 2013) is a component of a larger NEMP project: Educating the Educators – which aims to develop disaster resilience within primary and secondary students by improving teacher understanding and confidence in using Disaster Resilience Education (DRE) resources from Australian sources which are explicitly linked to the Australian curriculum.

Due to the influence of Disaster Resilience for Schools program and other factors discussed below, many of the emergency services organisations now have DRR education resources for teachers and students that are linked to the Australian Curriculum. For example, the Victorian Country Fire Authority has its 'Fire safe kids' and 'Fire safe youth' programs linked to the Victorian curricula (and will link to the Australian Curriculum) and the DFES Online Natural Hazards program is linked to the Australian Curriculum.

Comparing the Kriewaldt et.al. (2003) article findings with those of the curriculum mapping for this review (Table 1), it appears that there are more opportunities for the integration of DRR teaching/learning resources in the new Australian Curriculum than in previous jurisdictional curricula. This observation relates to integration both across levels and subjects.

Discussion

Changes since 2005

As shown from the findings, there has been a considerable upsurge in the integration of DRR into Australian programs and materials since 2005, and particularly since 2009. It appears that this has largely been due to four factors:

1. Australian curricula (and particularly the Australian Curriculum) that have a range of content pertaining to DRR and disaster resilience across subjects and levels.
2. The Disaster Resilience for Schools program including DRASEN which coordinates and encourages the development of curriculum-integrated DRR programs and materials by emergency services organisations and their use by teachers.

3. The National Strategy for Disaster Resilience. The Strategy, adopted by COAG in 2011, uses a whole-of-nation, resilience-based approach to disaster management, which recognises that a national, coordinated and cooperative effort is needed to enhance Australia's capacity to prepare for, withstand and recover from disasters. One of its key groups of actions is 'communicating with and educating people about risks'. This appears to have encouraged emergency services organisations to develop DRR education resources linked to the Australian Curriculum.
4. Recommendations from inquiries into major natural disasters into Australian disasters. For example, a recommendation from the 2009 Victorian Bushfires Royal Commission was that 'the State revise the approach to community bushfire safety education'. These recommendations appear to have prompted more activity in DRR education, including that for schools.

Although there has been considerable progress made in the integration of DRR into Australian curricula and supporting resources for teachers and students, DRR education is only a small part of the overall mitigation activities across the country. From this and other research, it appears that DRR education (including DRR school education) is on average less than two percent of the budget of Australian emergency agencies.

Another gauge of the importance of DRR education in Australian disaster mitigation is through a review of disaster risk management policies and plans. DRR education is generally included as one option out of many. For example, in the New South Wales Floodplain Development Manual (Department of Infrastructure, Planning and Natural Resources, 2005), DRR education (all sectors including schools) is one option in response modification (see Table 2).

Property Modification Measures	Response Modification Measures	Flood Modification Measures
Zoning	Education – Awareness	Flood Control Dams
Voluntary Purchase	Education – Readiness	Retarding Basins
Voluntary House Raising	Flood Prediction and Warning	Levees
Building & Development Controls	Local Flood Plans	Bypass Floodways
Flood Proofing Buildings	Evacuation Arrangements	Channel Improvements
Flood Access	Recovery Plans	Flood Gates

Table 2: Typical Floodplain Risk Management Measures (Source: NSW Floodplain Development Manual)

Thus, although now part of the DRR milieu in Australia, DRR education (and DRR school education) receives relatively small budget and resourcing for development and implementation.

Comparison with the UN report

The findings of this research closely compare with those from the United Nations report: Disaster risk reduction in school curricula: case studies from thirty countries

(UNESCO/UNICEF, 2012). The United Nations report found that 'the most frequently found approach to DRR integration is that of infusion, i.e., disaster-related themes and topics that are woven into specific school subjects'. Infusion is primarily used in Australia where DRR is included in school teaching programs and supporting materials for different subjects that address the relevant curricula.

As noted in the United Nations report, 'DRR is, for the most part, integrated into a narrow band of subjects, typically the physical and natural sciences'. As shown in Table 1, the main evidence of integration into the Australian Curriculum is in the subjects of Science and Geography. As found in the United Nations report, in Australia 'there is little evidence of cross-curricular linkages being forged nor of an interdisciplinary approach being adopted. If horizontal integration is not prominent, neither is vertical integration of DRR learning at the primary and secondary grade levels.'

In Australia, there is little evidence of the evaluation of DRR school education programs and materials by emergency agencies and the school users. This issue is also identified in the United Nations report. Without evaluation, there is no opportunity to assess the appropriateness and effectiveness of the programs and materials, and make changes. This issue has also been identified in Australia for all natural hazards EAE (Elsworth et. al., 2009), as mentioned previously.

There was some evidence of teacher professional development in DRR school education in Australia. For example, the NSW State Emergency Service and the Victorian Country Fire Authority provide guide books and online professional development for teachers. However, most likely as stated in the United Nations report 'teacher professional development in DRR also needs advancing.'

Dufty (2013, p.13) explored the range of pedagogical approaches that could be used in DRR and disaster resilience education. This range of pedagogies is shown in Table 3.

The United Nations report found that DRR learning was primarily in the cognitive domain and there was less evidence of affective and experiential learning. This also appears to be the case in Australia, although there were examples of gaming and role plays provided by emergency agencies. The use of social media in the classroom providing cognitive, affective and social DRR learning (Dufty, 2013) was also found in some states and territories. Schools in Australia use emergency evacuation drilling as part of the implementation of their emergency management plans.

Learning	Theory/Pedagogy	Relevance	Some DRR activities
Behavioural	Programmed instruction	Rehearsing behaviours required prior to a disaster	Drilling, exercising, training
Cognitive	Information processing	Disaster information needs to be processed to trigger appropriate behaviours	Warning messages, social media, media releases, signage, crowdsourcing
	Gestalt	Risk perception, decision-making, attention, memory and problem-solving are all important requirements for appropriate disaster behaviours	Awareness-raising documents and web sites (e.g. risk, preparedness actions), role plays related to disaster scenarios, maps
	Constructivist	People construct learning from disaster information and experience	Oral histories, social media, diaries, personal research
Affective	Experiential	Prior or learned experience is an important factor in people's disaster preparedness and resilience	Gaming, simulations, virtual reality training, exercising
	Social and emotional	Emotional factors play an important part in people's preparedness and resilience	Workshops, SEL programs in schools, resilient therapy, social media, counselling
	Transformational	People may need to change to prepare for future disasters	Role playing, disaster case studies, critical reflection
Social	Situated learning/communities of practice	Social capital has been shown to be a major factor in community resilience	Social media, post-disaster community meetings, resilience forums, community engagement

Table 3 : Range of DRR pedagogies (source: Dufty, 2013)

From the above findings and discussion, as for some other countries in the world, the HFA indicator (Research Area 5, Priority for Action 3 – Core Indicator 2) appears to still require

substantial attention in Australia and should be included in the successor framework to the HFA. Better wording for the indicator in the HFA successor framework may be:

> *Disaster risk reduction concepts and practices are integrated into school curricula with supporting education material and teacher training provided.*

This wording supports the contention that formal DRR education related to school curricula is most likely more effective than non-formal disaster education in DRR education for youth. As Dufty (2009, p. 15) contends:

> *'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'.*

Conclusion

The general principle underpinning the HFA Thematic Research is that it is a retrospective review looking forward. In this spirit, this review examined changes in the integration of DRR into Australian curricula programs and materials since 2005, the year in which the HFA commenced.

The review found that over that period there was a significant increase in the development of teaching programs and materials that were linked to Australian curricula. This trend will most likely continue as the new Australian Curriculum is developed and used in all Australian schools.

There was evidence of the integration of DRR in state and territory curricula prior to the advent of the Australian Curriculum. However, the Australian Curriculum allows for a more concerted, nation-wide approach to DRR school education and this is being enhanced by initiatives such as the Disaster Resilience for Schools program including DRASEN. Due to the lobbying of the emergency agencies and the embedding of key messages in the National Strategy for Disaster Resilience, it appears that the Australian Curriculum has more links to DRR than the previous jurisdictional curricula.

It should be noted that school DRR education is only one of numerous risk mitigation options used in Australia and generally has a relatively low priority and level of resourcing in the emergency and disaster risk management agencies across the nation. This severely constrains the development of school DRR education in Australia.

Furthermore, as was found for some other countries in the United Nations report (UNESCO/UNICEF, 2012), there are several issues regarding the integration of DRR into the Australian curricula:

1. Tendency to use infusion as the only approach to DRR integration.
2. DRR learning was mainly in the cognitive domain, with little done in the affective and social domains.

3. There was little evidence of evaluation and assessment of DRR education programs and materials including those linked to Australian curricula.
4. There was some evidence of teacher professional development in DRR education but more activity could be provided in this training.

From this research, further work is required in Australia in relation to the DRR school education HFA indicator, with revised wording suggested for the indicator in the HFA successor framework.

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