

A NEW APPROACH TO DISASTER EDUCATION

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Keywords

Public safety, emergency management, disaster education, community engagement, communications

Abstract

Disaster education helps people learn what to do before, during and after a disaster or emergency. Mitigation structures and planning will never protect all people in all disasters; emergency agencies may not be able to help all people. Therefore, disaster education is a critical basis for resistance and recovery in many disasters.

Although it is commonly used around the world by emergency organisations particularly to encourage preparedness, there is surprisingly little academic research into understanding the most appropriate content and methods for effective disaster education. Furthermore, there is scant practical guidance into how to tailor disaster education to local hazard risk scenarios and communities.

Drawing on andragogical program design from other fields (e.g. health, road safety) and evaluations of disaster education, a new approach for the development of effective tailored disaster education programs has been explored and tested. The approach uses a framework consisting of three levels to prepare bespoke disaster education programs. The three levels are:

1. Principles of effective disaster education. Many disaster education programs rely solely on the provision of generic information and preparedness plan templates. However, this ‘traditional’ approach has found to be lacking in impact and principles based on evidence from disaster psychology, sociology and learning theory have been shown to be preferable. These alternative principles include the need for social and experiential learning activities, in addition to cognitive learning. Ongoing evaluation is another hallmark of effective disaster education programs.
2. ‘Palettes’ of potential content and methods to choose from in the development of the disaster education program. The content range is across the disaster management cycle of mitigation, preparedness, response and recovery. The methods that could be used are from the following categories:
 - Public communications, information products and services
 - Training, development and industry-specific programs
 - Community engagement programs
 - Comprehensive personal education programs

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3. 'Filters' to identify appropriate education content and methods from the palettes guided by the principles of effective disaster education. These filters include an understanding of the at-risk community (e.g. vulnerabilities, social networks), hazard risks, risk reduction measures, emergency management arrangements and local disaster knowledge. An appreciation of the specific learners in the at-risk community is also important as the learners can include residents, emergency managers (e.g. volunteers), school students and business owners with each group having a different educational praxis.

Using this deductive approach, the most appropriate content and methods are identified which can then be moulded into a sequence of learning activities that comprises the tailored disaster education program for an at-risk community which can be located anywhere in the world.

Introduction

Community disaster education is an integral component of disaster management around the world. Its main goal is to promote public safety and, to a lesser extent, reduce disaster damages. Some education programs also aim to build community disaster resilience (Dufty, 2012).

Emergency agencies provide a range of educative services to people and communities including public relations, warning communications, formal education programs (e.g. with schools), volunteer training and community engagement. These services can be carried out by different sections or divisions of the agencies. As a result, there is a tendency for emergency agencies to divide disaster educative services into at least community 'education', 'communications' and 'engagement', each of which have slightly different methods (Dufty, 2013). What is common with education, communications and engagement (ECE) is that they all contribute to disaster-related learning for people, organisations (e.g. businesses) and communities.

Although the ECE division is used by many emergency agencies in practice, the holistic term 'disaster education' is appropriate in strategic discussion as it is synonymous with 'disaster learning'. This stance is supported by the Latin roots of the word 'education': *educare*, means 'to train or to mold', and *educere*, means to 'lead out'. Thus, in this paper the term 'disaster education' will be used for all ECE activities that lead to learning before, during and after an emergency or disaster.

There has been considerable action in community disaster education across the world, particularly with the advent of social media. However, there has been relatively little research into the appropriateness and effectiveness of the community disaster education programs and learning activities, including those provided by emergency agencies. This is due largely to the general lack of evaluation of these programs (Elsworth et al, 2009) and the difficulty in isolating education as a causal factor in aspects of disaster management performance (e.g. preparedness levels, evacuation rates, business continuity).

The paucity of this research is also due to disaster education not being embraced strongly by specialist educators that are versed in education theory and practice. As Preston (2012, p.1) states "there is surprisingly little writing in the field of (disaster) education/pedagogy itself". This is largely due to disaster education being a "new area of enquiry in the field of education" (Preston 2012, p.1) and because many of the disaster education programs are designed by non-educators (e.g. engineers, planners) from emergency agencies and other organisations. As a result, there is a large amount of disaster education activity around the world with little technical research into its educational veracity.

As a result of this lack of disaster education research, there is little technical guidance for designing potentially effective community disaster education plans and programs.

This paper provides a new approach to the design of disaster education plans and programs that draws on andragogical (adult learning) program design from other fields (e.g. health, road safety) and evaluations of disaster education.

Theory and Method

Although some of the disaster-related learning in communities is conducted by children and youth including in formal education settings such as schools and universities, much is carried out by adults. Therefore, relevant to design of community disaster education plans and programs is an understanding of adult learning principles.

Malcolm Shepherd Knowles is acknowledged as a leader in andragogical research. Knowles (1984) identified differences between adult learning and child learning including that as a person matures the motivation to learn is internal (rather than provided by external sources such as teachers). He suggested four principles that are applied to adult learning (and very pertinent to disaster education):

1. Adults need to be involved in the planning and evaluation of their instruction.
2. Experience (including mistakes) provides the basis for the learning activities.
3. Adults are most interested in learning subjects that have immediate relevance and impact to their job or personal life.
4. Adult learning is problem-centred rather than content-oriented.

Not only should community education be tailored to the individual learner, it should enable learning from social interactions within communities. Social learning theory promotes the importance of people learning together. It is a theory of learning and social behavior which proposes that new behaviors can be acquired by observing and imitating others (Bandura, 2007).

In simple terms, social learning is learning with and from others. This can either happen online (for instance over popular social media tools like LinkedIn, Twitter) or offline (during group discussions, over coffee or during conferences). Social learning is sometimes cobbled with 'collaborative learning' – where people capitalise on one another's resources and skills (Dillenbourg, 1999).

Andragogical and social learning theory therefore calls for education that is tailored to the individual's and local community's learning needs.

This idea is supported by evaluations of disaster education programs. For example, in an evaluation of Australian natural hazard education, awareness and engagement programs, Elsworth et al (2009) concluded that programs should be more tailored to local communities, rather than be broad-based information campaigns. Webber et al (2017) in an examination of community participative engagement and learning related to emergency management planning found benefits in understanding communities and involving them in all aspects of local emergency management planning.

Using this theoretical and in practice knowledge, the following framework for tailoring disaster education to local communities was explored, and designed (Dufty, 2014a).

Results

The framework for tailoring disaster education to local communities is summarised in Figure 1.

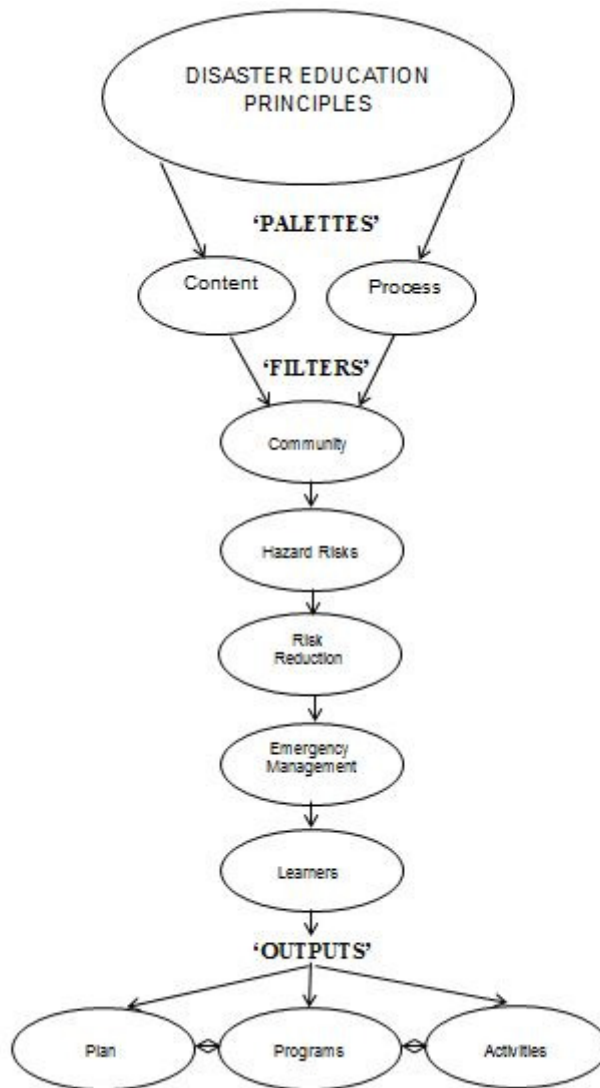


Figure 1: Framework for the design of community disaster education plans and programs

The framework consists of three steps that lead to the ‘outputs’ - the design of tailored local community disaster education plans, programs and learning activities. The three steps are:

1. Broad principles of effective disaster education
2. ‘Palettes’ of potential content and methods to choose from in the design of the disaster education plan, program or activity
3. ‘Filters’ to identify appropriate education content and methods from the palettes guided by the principles of effective disaster education.

1. Principles of effective disaster education

It has been found that many disaster education programs rely primarily on the provision of generic information and preparedness plan templates and this ‘traditional’ approach can be lacking in impact e.g. to motivate preparedness behaviours (Dufty, 2015).

Principles based on evidence from disaster psychology, sociology and learning theory have been shown to be preferable (Dufty, 2010). These alternative principles include:

- Strong participation of the learners in the design, implementation and evaluation of community disaster education programs

- Focus on community resilience including learning for preparedness, building capabilities and systems, forming social capital
- Linkages of education activities with the ‘disaster cycle’ and the Prevention, Preparedness, Response, Recovery (PPRR) model
- Evaluation of disaster education programs including related to learning outcomes
- Linkages with other disaster mitigation and resilience-building plans and methods such as emergency management plans
- Using a disaster education plan to ensure longevity of education implementation in communities.

Furthermore, many current disaster education plans tend to use only cognitive learning (Dufty, 2013). However, there are four learning domains available for disaster education:

1. Cognitive - learning as purely a mental/ neurological process
2. Behaviourism - focus on observable behaviour
3. Affective - emotions and affect play a role in learning
4. Social - humans learn best in group activities.

2. ‘Palettes’ of potential content and methods

As shown in Figure 1, a range of learning content and method options (‘palettes’) should be used to choose from in the tailoring of the disaster education plan or program.

The content range is across the disaster management cycle of PPRR. However, if disaster education provided by emergency agencies is to help build disaster resilience through learning then it needs to not only be geared to public safety and reducing risks to property, but also to attaining an efficient recovery to ‘bounce back’ through the post-disaster relationships.

Furthermore, to help with building disaster resilience, learning should also be obtained by post-disaster evaluation conducted not only by agencies (e.g. after action reviews) but also with impacted communities (e.g. community de-brief meetings, resilience forums, webinars).

For weather-related hazards (e.g. flood, heatwave, drought, wildfire/bushfire), learning related to climate change adaptation should be added, as it will impact on the other content. An example of a program that couples climate change adaptation learning with public safety and local risk mitigation learning is described by Stevens et al (2012).

Also, it has been shown that the formation of social capital has a significant impact on the recovery and resilience of communities (Aldrich, 2012). Social capital has been defined as the ‘networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit’ (Putnam, 1995). It consists of those bonds created by belonging to a group that instils trust, solidarity, and cooperation among members. Therefore, the formation of social capital through community learning should arguably be a part of disaster education content.

The range of education methods has been identified by several authors. For example, Molino Stewart (2012) has categorised current disaster learning methods into four main groups:

1. Public communications, information products and services e.g. publications, internet sites, displays, promotional products, media liaison, advertising/marketing, social media.
2. Training, development and industry-specific programs e.g. skills development courses, leadership training, mentoring, emergency drilling and exercising.
3. Community engagement programs e.g. public participation programs, forums, discussion groups, events, developing networks, social media.
4. Comprehensive personal education programs e.g. school curriculum, university curriculum, personal development courses, action research programs, community education courses, Massive Open Online Courses (MOOCs).

There are many education methods in these four categories from which to choose. Apart from the results of evaluations of disaster education programs and learning activities, exploratory research has shown the potential of some of the disaster education methods related to learning theories as summarised in Table 1 (Dufty, 2013).

Table 1: Summary of potential disaster education methods linked to learning theories (source: Dufty, 2013)

Learning domains	Theory/Pedagogy	Relevance	Examples of Methods
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, social and emotional learning programs in schools, resilient therapy, social media, counselling
	Transformational	People may need to change to prepare appropriately for future disasters	Role playing, disaster case studies, mind exploration, 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

3. 'Filters' to identify appropriate education content and methods

As shown in Figure 1, there are five 'filters' that help tailor the disaster education content and methods to local communities. The filters are:

1. Community profile
2. Hazard risks
3. Risk reduction
4. Emergency Management
5. Learners

A study of the at-risk community should be undertaken as an initial stage of the filtering process. This will help place the disaster education plan or program in the context of the community. It should be noted that the ‘community’ may not be a geographical entity such as a town, suburb or city; it may have a shared sense of belonging (e.g. religious group, school community) or be a social network (e.g. sporting, online).

Techniques to better understand communities include:

1. Community profile using census and other demographic data. Aspects such as gender distribution, age cohorts, education background, transience of the population, people requiring assistance will help determine the appropriate disaster education content (e.g. type and level of language) and methods (e.g. social media generally for the younger population, newspapers and radio for older).
2. Social research. For example, some governments and other organisations conduct community surveys and these could provide a useful insight for the design of local disaster education plans and programs. In addition, it may be prudent to design and conduct social research to ascertain the disaster education needs of the local community.
3. Social network analysis. It is important to understand the interrelationships of people in the community so that these can be effectively tapped for disaster education. A high level approach to social network analysis is to hold a workshop with community representatives and map the local social groups and their linkages.
4. Vulnerability assessment. Vulnerability is the propensity to suffer some degree of loss from a hazardous event (Etkin et al, 2004). A vulnerability assessment can provide details of specific inherent risks in the community that may trigger specific disaster education for vulnerable groups (e.g. older people, children, poorer people, new migrants, people with disabilities).

As part of the filtering process, it is important to understand the hazard risks facing the community so that these can be addressed in local disaster education. This can be done through risk modelling; however, it is vital to include the at-risk community in local hazard risk assessment to garner local knowledge and as an educative process by itself. There are several examples of techniques to enable community participation in hazard risk assessment including the Community Emergency Risk Assessment process used by the Victorian Government, Australia – see <https://www.ses.vic.gov.au/em-sector/community-emergency-risk-assessment-cera>

The community should also be involved in dialogue and decision-making about future risk including the impacts of climate change. Again an education activity itself, an example is community engagement relating to the impacts of sea level change on coastal communities (Stevens et al, 2012).

As noted in Figure 1, local disaster risk reduction measures should be examined, particularly for potential disaster education content that encourages learning about mitigation (prevention) measures. It should be acknowledged that disaster education could be one of a suite of non-structural local mitigation options. Again, community participation in local disaster risk reduction is encouraged including because of its potential educational value.

Disaster risk reduction cannot protect all communities in all hazard events, and ‘residual risk’ is transferred to communities. Emergency services and communities share the responsibility for managing this residual risk through emergency management involving preparedness, response and recovery. An assessment of existing local disaster education plans and programs should be conducted to avoid duplication in future education planning. Further insight should be gained through community participation in aspects such as emergency management planning (e.g. Webber et al, 2017) and the design of early warning systems (e.g. Dufty, 2018).

From the examination of the at-risk community, its hazard risks and measures to reduce those risks and keep people safe, identification of groups of learners should be conducted. These groups of learners could include:

- Residents (including landowners and renters)
- Schools (and other formal education institutions)
- Youth
- Businesses
- Emergency organisations (including volunteers)
- Occupiers of special landuses (e.g. caravan parks, retirement homes)
- Religious groups
- Tourists
- Vulnerable people
- People living in 'hot spots' i.e. high risk areas

Both the education content and methods will be different for each of these learning groups. For example, in schools there is a preference to embed disaster education content and methods within teaching/learning opportunities in existing curricula (Dufty, 2014b). For business, a preferred way is to link disaster education with business continuity planning (Gissing, 2003).

As shown in Figure 1, when the above discussed filters have been applied, appropriate education content and methods for a range of learners in the community can be identified. These then can be moulded into local education plans, programs and learning activities.

The basic difference between an education plan, program and learning activity is that a plan details a course of action and can consist of several programs; a program is a long-term managed portfolio of multiple, sequenced learning activities designed to produce learning outcomes; and learning activities are achieved through completion of a series of tasks in order to achieve intended learning outcomes.

In most cases, it would be appropriate to develop a local disaster education plan, consisting of several programs (e.g. for different groups of hazards, different hazards) with each program consisting of several learning activities. These are normally constructed across the 'disaster cycle' of PPRR.

It is of the utmost importance to include formative and summative evaluation processes in at least the local disaster education plan and programs to assess if the learning outcomes are being met in the short term and also to gauge their longer term impact in public safety in an emergency or disaster (and other outcomes such as minimising property damage in an event and building community disaster resilience). Local disaster education plans should be linked to or be a sub-set of local disaster management plans.

Conclusion

Many disaster education programs across the world rely solely on the provision of generic information and preparedness plan templates. They tend to use only cognitive learning.

Research has shown the need to localise disaster risk reduction techniques including disaster education. The framework outlined in this paper provides an approach to the tailoring of appropriate disaster education content and methods to local communities and risk scenarios that uses adult learning theory across all learning domains.

The tailoring filters include an understanding of the at-risk community (e.g. vulnerabilities, social networks), hazard risks, risk reduction measures, emergency management arrangements and local disaster knowledge. An appreciation of the specific learners in the at-risk community is also important as the learners can include residents, emergency managers (e.g. volunteers), school students and business owners with each group having a different educational praxis.

The output of the framework is a local disaster education plan, and supporting programs and learning activities involving appropriate content and methods for a range of local learners and hazard settings. Instead of relying solely on information provision, the framework enables choice from a range of cognitive, behavioural, affective and social learning methods across the 'disaster cycle'.

The disaster education framework has been tested in several communities in Australia with positive results (e.g. Molino Stewart, 2012). Further research is required to provide more detailed guidance.

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Neil Dufty is a Principal at Molino Stewart, an environment and natural hazards consultancy based in Parramatta, NSW, Australia. Neil is a qualified earth scientist and educator, and has over 40 years of experience in education research, practice and evaluation. Over the past 15 years, Neil has researched, designed and evaluated disaster education plans and programs for numerous clients across Australia including the Victoria State Emergency Service, the New South Wales State Emergency Service and the Australian Bureau of Meteorology. Neil has also been regularly engaged to research other aspects of disaster management and resilience-building including community warning systems and climate change adaptation.