International Journal of Lifelong Education

Taylor & Francis Group

ISSN: 0260-1370 (Print) 1464-519X (Online) Journal homepage: http://www.tandfonline.com/loi/tled20

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**To cite this article:** John Preston, Charlotte Chadderton, Kaori Kitagawa & Casey Edmonds (2015) Community response in disasters: an ecological learning framework, International Journal of Lifelong Education, 34:6, 727-753, DOI: 10.1080/02601370.2015.1116116

**To link to this article:** https://doi.org/10.1080/02601370.2015.1116116

INT. J. OF LIFELONG EDUCATION, 2015
Vol. 34, No. 6, 727–753, http://dx.doi.org/10.1080/02601370.2015.1116116



# Community response in disasters: an ecological learning framework

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Natural disasters are frequently exacerbated by anthropogenic mechanisms and have social and political consequences for communities. The role of community learning in disasters is seen to be increasingly important. However, the ways in which such learning unfolds in a disaster can differ substantially from case to case. This article uses a comparative case study methodology to examine catastrophes and major disasters from five countries (Japan, New Zealand, the UK, the USA and Germany) to consider how community learning and adaptation occurs. An ecological model of learning is considered, where community learning is of small loop (adaptive, incremental, experimental) type or large loop (paradigm changing) type. Using this model, we consider that there are three types of community learning that occur in disasters (navigation, organization, reframing). The type of community learning that actually develops in a disaster depends upon a range of social factors such as stress and trauma, civic innovation and coercion.

**Keywords:** community learningdisastersinternational

## Introduction

In disasters, the role of education and learning is increasingly seen as important. Organizations such as UNESCO (2012), the European Commission (2013) and other international and national bodies consider education as being key in enabling individuals to prepare for an emergency situation (Preston, 2012). As one of the different ways in which people might prepare, respond and recover from disasters, the community has always been an important element. Community resilience and capability in disasters are significant elements in preparing for a crisis event. Within education, community learning is an important feature of disaster response, particularly in countries that experience natural disasters such as New Zealand and Japan (Preston, Chadderton, & Kitagawa, 2014). This increased interest in community learning is situated in an environment where disasters are increasingly politicized.

In the twenty-first century, the relationship between natural and anthropocentric (human caused) disasters is becoming clearer. The causes of natural disasters such as flooding, changes in sea level, wildfires (and associated

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deforestation) are being associated with climate change. Moreover, the consequences of natural disasters can be exacerbated by human activity. According to Klein (2007), disasters of various kinds have been used as a form of 'disaster capitalism' where catastrophic events are used to reconstruct communities and environments as neoliberal projects for profit. Klein refers to the use of disasters in this way as the shock doctrine:

> This is how the shock doctrine works: the original disaster—the coup, the terrorist attack, the market meltdown, the war, the tsunami, the hurricane—puts the population into a state of collective shock … Like the terrorized prisoner who gives up the names of comrades and renounces his faith, shocked societies often give up things they would otherwise fiercely protect. (Klein, 2007, p. 17)

Klein (2007) provides a range of examples of the shock doctrine such as terrorism in the USA (pp. 283–307), the 2005 Sri Lankan Tsunami (pp. 385–405) and Hurricane Katrina (pp. 406–422) to illustrate disaster capitalism and 'disaster apartheid' (p. 406) where existing inequalities are exacerbated. Moreover, Klein (2014) considers that these natural disasters and other

> … mega-tragedies like Superstorm Sandy and Typhoon Haiyan that kill thousands and cause billions in damages serve dramatically to educate the public about the terrible costs of our current system, driving an argument for radical change that addresses the root, rather than the only the symptoms, of the climate crisis. (Klein, 2014, p. 406)

As Klein's work (2007, 2014) suggests, the politicized nature of disasters means that we also need to see community learning not just as a way of alleviating the disaster, but in terms of consciousness raising and resistance to current social arrangements. However, there have been few studies that consider community learning in disasters in terms of how paradigms of learning may shift, or remain constant, in a disaster.

This study considers how community learning in disasters may be conceptualized using an ecological model of learning. After considering ecological models more generally, the paper examines how a particular model of learning for sustainability may be adapted in terms of community learning for disasters. The methodology is comparative and draws on a number of case studies of major disasters and catastrophes. Using a taxonomic method of analysis, we draw out three forms of community learning in disasters as navigation (when the community learns incrementally), organization (when the community learns to organize resources itself) and reframing (where the community adopts a new paradigm of organization). It is this last form of community learning that is related to the shock doctrine as it indicates that communities may resist the framing of disasters in terms of the current system of 'disaster capitalism'.

In terms of formalized community learning, there are a range of different national responses (Preston et al., 2014). In some countries, which experience a range of highly significant natural disasters, community learning is of particular

importance. In Japan, for example, community learning is embedded in disaster preparedness at all levels of Japanese society. There is a clear message from government that community learning is an important part of the lifelong learning culture of disaster preparedness. In New Zealand, there is also an emphasis on community learning and resilience, but from bottom up, rather than top down, lifelong learning orientation. The approach is that communities are responsible for making their own learning and resilience arrangements, rather than taking a steer from central government. Both of these countries have experienced significant natural disasters, including earthquakes, tsunamis and even volcanic eruptions. In countries that do not often experience major natural disasters, there is less emphasis on community learning. In the UK, for example, there are some calls in government to build community resilience but the role of learning for preparedness mainly concerns the individual, or family, rather than the community. In Germany, there is a volunteering culture but there is no national, or federal, demands for community learning. In the USA, which faces a mixture of natural and human caused disasters, there is more emphasis on the participation of defined civil society groups rather than notions of community.

Despite the idea that the community is very important in disasters which, in some shape or form, is the case in all countries, there has been little attention paid to the major role of community learning, as opposed to community resilience, in a crisis. In particular, there has been little concern with understanding the different types of learning that might occur. So although there is emphasis on adult learning in preparedness or in response to disasters (Preston et al., 2014), there is little understanding of how community learning may adopt a more central role. Understanding the role of community learning can help communities, emergency services and governments plan for future events. Moreover, evidence on community learning has been largely limited to individual case studies of disasters and community response, rather than to use a range of comparative case studies.

The purpose of this article was to systematize the evidence by considering community learning across a range of case studies of varying magnitude in different countries. The approach used forms typologies based on an ecological model of community learning, building on previous work on this approach to learning in different (sustainability) contexts (Bateson, 1973; Tschakert & Dietrich, 2010; Voss & Wagner, 2010). An ecological model considers that community learning in a disaster can be understood as operating on different levels, from small and incremental to large and paradigm changing. These types of learning are not independent, but are interdependent. This is a dynamic model of community learning compared to approaches that consider learning as a mere aggregation of individual responses.

## Community learning and disasters

It is inevitable in a discussion of community learning to begin by considering that both ‘community’ and ‘learning’ are contested concepts.

We cannot take the existence of a unified community for granted, and a communitarian outlook does not necessarily lead to social solidarity. Green, Preston, and Janmaat(2006) consider that community cohesion is qualitatively different from larger scale forms of solidarity such as social cohesion. It is perfectly possible to have very cohesive local, or networked, communities while society as a whole is not socially cohesive (due to inequalities, or community conflict). Similarly, a cohesive nation state may be very low on community cohesion as individuals may trust the government and institutions, but not their neighbours. Rather than considering one scale of community cohesion, there may be several communities in a locale, with different degrees of networking to other communities. Therefore, it makes sense to talk about community *cohesions* rather than cohesion. As disasters usually occur in a geographical area, rather than through a network (although cyber failures and attacks may change that), there is often a desire to identify 'the community', whereas such a thing may not exist in a cohesive form. Speaking about the 'New York community' in Hurricane Sandy, for example, makes little sense, in terms of the diverse economic, ethnic and cultural composition of that city exemplified by the name of districts such as 'Little Italy' and 'Chinatown'. However, there is little doubt that a city-level identity intersects with those other forms of community identity. As community learning is contested, it is also likely that it is misrecognized and that certain community outcomes may be not considered to be indicative of learning as there are moral, and classed, judgements, associated with this concept. For example, group learning to find food in a disaster may be classed as 'looting' and rational seeking of limited resources may be considered to be 'panic buying' (Ladson-Billings, 2006; Marable, 2008).

From this analysis, there are many communities involved in learning, and we should be cautious of moral judgements given the validity of learning or social action in these communities. Any model that we build must therefore not be hierarchical, but recognize the ways in which communities (of different types) may organize within their own value systems. In this paper, we take a pluralist conception of community, recognizing that there are various communities involved in disasters (geographical, networked, social movement).

There are some grounds for considering that community learning in a disaster will follow historical patterns. Wilson (2012) considers that community learning in a disaster can only be understood in terms of community history and culture. He argues for strong path dependency in community learning, in that the ways in which communities have learnt in the past is a strong indicator of future outcomes. He considers that community learning is rooted in the 'social memory' of communities. According to Sapirstein (2006), community learning is an important outcome following a disaster and it can be 'locked into' further efforts at building resilience through integrating the lessons learnt with an existing educational curriculum. Preston (2014) has shown that even after a major industrial disaster in the UK, where a large number of children died (the Aberfan disaster, 1966), the dominant paradigm of community resilience did not change. However, particularly in the age of social media, rapid communications and new forms of civic engagement, there is no guarantee that the past will reflect the future. There is a need to explain whether community learning will follow old, path dependent, patterns or take a completely new course.

Although path dependence is important, we need to consider when new trajectories may emerge.

A dichotomy is also drawn between approaches to disaster which accept the status quo with incremental learning and measured community response, and those in which the paradigm of learning through disasters is radical and disruptive. In Naomi Klein's previously mentioned 'Shock Doctrine' (2007), for example, the need for radical forms of organization and learning to confront 'disaster capitalism' is clear.

These dichotomies (between the path dependent/interruptive and the measured/radical) in community learning are not necessarily helpful in that it is not always the case that one form of learning precludes the other. Small, incremental shifts in learning can lead to a sudden and dramatic paradigm change above a certain threshold. Communal kitchens following a disaster at a local level, for example, may provide the impetus for questioning community and government disaster response as they provide a forum for conversations across distinct groups. Similarly, a sudden and disruptive paradigm shift in community organization may gradually be embedded in the practices of smaller groups at a community level. For example, the intervention of a group with a radical approach to resource allocation and an overt political aim may influence the learning practices of community groups but not the dominant paradigm of how they view the disaster. At a crude level, they may accept the resources, but not the ideology. It is therefore necessary to see these types of learning as potentially connected.

Ecological models of community learning in a disaster where types of learning are inter-related can help us to resolve such dichotomies and to explain the trajectories of current, and future, disasters. Ecological theories of learning consider a systemic view of human action within a range of social contexts (Bronfenbrenner, 1979) which enable us to foreground the dynamics of community learning. According to Brofenbrenner's social ecological model, various interconnected systems from the microsystem (the subject's immediate environment) upwards through the macrosystem (culture and institutions) and the chronosystem (individual and collective history) comprise both an individual and a societal model of learning. Such models consider that there is an unnatural separation between individual and collective learning. For example, Hurrelmann's 'Model of Productive Processing of Reality' (PPR) (1989) considers learning, and the formation of the individual to be intimately connected to the wider social context. In ecological models, we can consider learning to comprise interconnected levels of activity at individual and collective levels. This allows us to consider 'cycles' of learning that allow dynamic and emergent properties to appear that are typical of community learning in disasters. Ecological learning theories have been employed to consider how communities learn about issues around sustainability and environmental disaster. Lange and Chubb (2009) show how environmental activism is shaped not just by the proximal learning environment of schools, but also by non-formal and contextual factors. Hill (2012) concurs that activism and engagement with real-world sustainability issues is a prerequisite for environmental education. Thomas (2005) emphasizes the role of context, considering that education *for* the environment, that considers the role of student's immediate and wider experiences of issues around sustainability is particularly important.

Tschakert and Dietrich's (2010) ecological model of learning for sustainability and action research seems to have more general lessons for disasters beyond environmental crisis. In their model, learning can be of two, possibly connected, types. Firstly, small and fast learning cycles where the learning paradigm remains the same but there is incremental and experimental learning of a rapid nature. Secondly, slower cycles that draw upon collective memory (past paradigms) or alternatives (future paradigms) rather than the current paradigm of community learning. In the 'fast' learning cycles, there is a process of reflecting on immediate experience which leads to generalization of ideas that are then tested leading to further reflection (and the cycle continues). However, these cycles can additionally create longer cycles of learning when reflection enables a paradigm shift leading to 'emergent knowing' and new understandings. Diagram 1 shows the relationship between small and large loop learning in a disaster.

In Figure 1, there are two loops of learning. Small loop community learning is associated with incremental change, reflection and testing of current assumptions. The community is learning in a step-change fashion. Learning is not at the paradigmatic level. That is, communities do not consider previous paradigms of learning (what they did in the past) nor do they consider changing the current paradigm. In small loop learning, communities consider the context that they find themselves in now, rather than turning to past paradigms, or looking to future ones. In certain circumstances, small loop community learning may make the transition to large loop learning where there is a paradigm shift in the ways in which communities learn in a disaster, with associated social reorganization and/or breakdown. For example, in a flood situation which impacts upon local energy infrastructures, community learning may be of the small group type in terms of adopting new ways of cooking or heating. Communities may learn that they need to share resources and to conserve existing ones. In certain circumstances, community learning may shift to a new paradigm where people begin to experiment with shared (perhaps communal) economic arrangements, property rights may break down as people learn that they are not conducive to survival (for example, through 'borrowing' private generators) or previously unconnected civil society organizations may intervene in community resilience and learning. However, large loop learning is not always revolutionary, and it simply means that community learning is taking place at the paradigmatic level. Looking back to past ways of dealing with disasters (past paradigms) can also represent large loop thinking. Small loop learning which consistently fails to find solutions may lead communities to 'look to the past' for solutions and change the paradigm of community learning to a former, reactionary, type. For example, after the 9/11 attacks, it was not only considered that America faced a 'new threat' but also that part of the response was that America had become 'complacent' and needed to return to the kinds of security initiatives which were present in the cold war (but under the guise of 'Homeland Security').

Through integrating various types of small and large loop learning, Tschakert and Dietrich (2010) consider that there are ten possible types of learning for sustainability. In the table, we have adapted this framework for major disaster scenarios to consider these types of learning, a description of each and whether they feature small or large loops of learning. We create a new plausible typology of learning, not for sustainability, but for disasters:

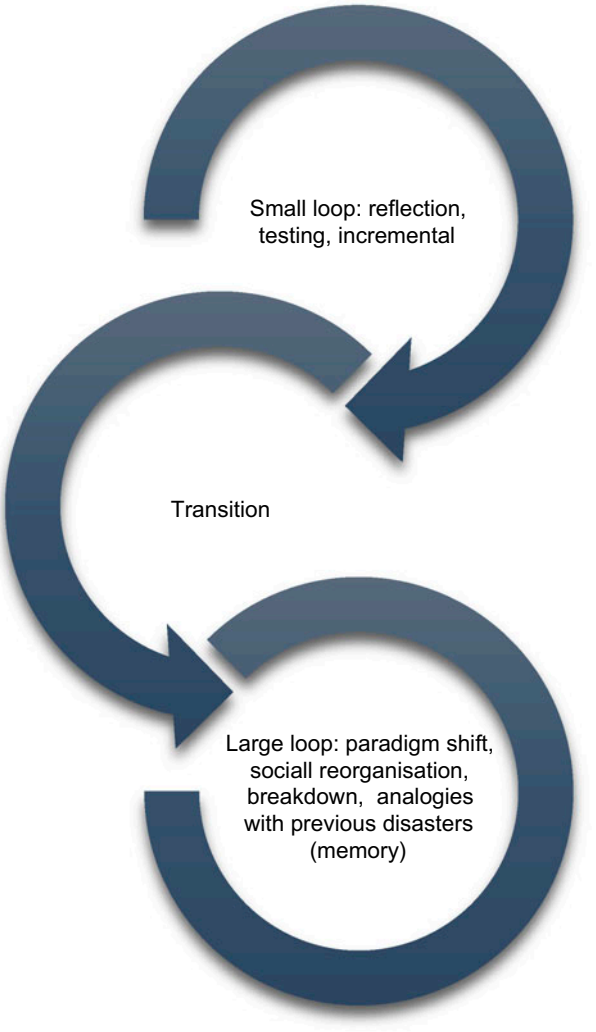


**Figure 1. Small and large loop community learning in a disaster**

The table shows the ten different forms of resilience learning which we have adapted slightly so that they are more relevant to community learning in a disaster. The use of single and double loops of learning builds upon Bateson's (1973) conceptualization of learning of various 'classes' with recursive properties. Bateson's schema of learning is more nuanced than the learning loops presented here and includes a level of learning below single loop (which is simple reaction to stimuli, instinctual learning) and levels above double loop (where belief systems are scrutinized, what is referred to above as 'back loop' learning). It is important that one does not confuse single and double loop learning with the scale of the disaster. Small-scale disasters can lead to double loop learning (Voss & Wagner, 2010).

## Methodology

A comparative case study methodology (Lange, 2013) was used to consider community learning catastrophes and major disasters in five counties. The disasters considered were selected as either a 'major disaster' or 'catastrophe' according to the criteria developed by Perry and Quarantelli (2005). A catastrophe is when the capacity of the locally situated preparedness effort is overwhelmed with the need to rely upon national, or even international, resources, whereas a major disaster is one where regional resources can bound the disaster. Each of the cases involved widespread elements of infrastructure attack and/or failure, requiring some kind of community action in terms of how resources were to be allocated.

A mixed selection approach was used (Lange, 2013, p. 155) where cases that were both typical (major disasters) and atypical (catastrophes) were used to examine a variety of community learning responses under conditions of duress. Catastrophes and disasters from five developed countries (Japan, the USA, the UK, Germany and New Zealand) were selected for three reasons. Firstly, there are similarities between them all in that they are developed countries, with similar levels of GDP/capita. Selecting countries which faced different levels of GDP might lead to very divergent conclusions concerning community learning. Secondly, the countries are also different in terms of those facing sizeable natural disasters (Japan, New Zealand), and through a varieties of capitalism model (the UK, the USA and New Zealand as 'liberal market economies' and Germany and Japan as 'co-ordinated market economies'). Hence, the conclusions given in the paper are for countries which might be considered to be developed, but which are also different in various ways.

The case studies were analysed using a range of documentary data to consider effects and community response/learning at different time intervals. By documentary data, we mean secondary sources such as newspapers, magazine articles and articles from the Internet. The aim was to produce a case study of the major parameters of the disaster, or catastrophe, with particular emphasis on population response. We hence base our case studies on documentary data (Punch, 2009,p. 159) For each case study, we created a table to show the population response at different periods in the disaster from its initial inception, through response and recovery. We used the typology initially developed (Table 1) to attempt to classify each study and then considered areas of similarity and difference between the studies, using an iterative methodology (Srivastava & Hopwood, 2009) whereby we considered the construction of the taxonomy alongside the case studies. Table 2 provides information concerning each of the case studies.

## Findings

As expected, we did not find a single model of community learning that fitted all types of disasters, or catastrophes, which we examined. Rather, we found that there were examples of different types of community learning, ranging from very small adaptations to paradigm shifts. In order to classify these, we used examples from the framework developed in Table 1. However, we considered

**Table 1. A taxonomy of community learning in a disaster**

| Type of learning | Description | Example | Loops |
|---|---|---|---|
| Loop learning and spirals of steps | Small and large loops of learning, exchanges of information and paradigm shifts. The disaster leads to learning and experimentation as well as paradigm shifts in community learning and organization | Disaster leads to information exchanges and eventually to new ways of community learning and organization. Victims set up local meetings and discussion leads to new ways of organizing resources | Small/large loop |
| Windows of opportunities | Unexpected connections and areas for collaboration occur | A novel organization or information sharing method leads to idiosyncratic methods of community learning that change the way in which the disaster is dealt with | Small/large loop |
| Memory | Current knowledge becomes a way to conceptualize the post-disaster scenario. Communities draw on current understandings and shared history to manage the disaster | The community draw on the knowledge of a previous disaster to learn how to deal with this one | Large loop learning in terms of drawing on previous experience |
| Reorganization | Current assumptions and objectives are challenged, and institutional structures questioned. The disaster leads to a fundamental change in the way in which resource management is employed | The disaster leads to questioning of existing institutions and processes. A new way of allocating resources and learning about the disaster arises and displaces the previous method | Small/large loop |
| Experimentation | Small loop learning—questioning theories and putting ideas into practice. Communities learn through experimentation, which could potentially shift the paradigm concerning community organization | The community learning involves experimentation which could change the way in which the community deal with the disaster in future | Small loop/large loop |

(*Continued*)

Table 1. (*Continued*).

| Type of learning | Description | Example | Loops |
|---|---|---|---|
| Back-loop learning | Co-production and reclamation of voice. The community manages the disaster itself | The community reclaim the meaning of the disaster and take control of the terms of the crisis | Back-loop learning can be a form of learning above what has been called here 'double loop' learning (Bateson, 1973) as it involves a redefinition of the initial problem (in this case the disaster itself) |
| Self-organization | Mutual aid and spontaneous cooperation. The community learns to allocate resources and mutual aid | The community determine the allocation and distribution of resources in a cooperative manner | Small loop/large loop |
| Revolting | Rapid breaking down of power relations. A revolutionary change in power relations occurs | The community take direct, non-violent (and possibly violent) action against existing social conditions and agents of authority | Small loop/large loop |
| Small disturbance and surprise | Current order maintained, incremental learning with elements of novelty. There is no paradigm shift | The community react to a small, unexpected, event but this does not change learning behaviour from its usual trajectory | Small loop |
| Navigating transitions | Communities learn to deal with each stage in the disaster as it occurs. There is no paradigm shift | The community learns to deal with problems as they arise | Small loop |



that this initial framework was too subtle, and there were three broad community learning types that emerge: navigation (small loops of learning and navigating transitions), organization (self-organization and reorganization) and reframing (memory, revolting and back-loop learning).

### *Navigation: small loops of learning and navigating transitions*

In some of the disasters, we found that communities were learning incrementally, experimentally and were navigating events as they occurred. They were not drawing significantly on experiences from past disasters, or changing the disaster paradigm. The learning involved small adaptations, experiments and navigating transitions as they occurred. We call these responses to these transitions navigation—shorthand for 'disaster navigation'.

**Table 2. Case studies**

| Country and disaster | Disaster or catastrophe? | Background |
|---|---|---|
| Japan: Great East Japan Earthquake and Tsunami 11 March, 2011 | • Catastrophe<br>• Most or all of the community was heavily impacted<br>• The facilities and operational bases of most emergency organizations were hit<br>• Local officials were unable to undertake their usual work role, and this extended into the recovery period<br>• Many leadership roles had to be provided by outsiders to the community<br>• Help from nearby communities could not be provided<br>• All of the everyday community functions were sharply and concurrently interrupted | • The catastrophe was the combination of the largest recorded earthquake in Japan (Magnitude 9) and the largest recorded tsunami —39.7 m was recorded at the highest point. 90% of 18,800 casualties were killed by drowning. The tsunami triggered the accident at the Fukushima nuclear power plant, which resulted in unmeasurable damage. There were more than 1,000 aftershocks of which 80 were over Magnitude 6<br>• Large part of the physical infrastructure in Miyagi, Iwate and Fukushima Prefectures was swept away by the tsunami—ports, airports, railways, major roads, hospitals, schools, government offices, cultural properties and also evacuation sites<br>• Telecommunications, gas, electricity, water and transport were severely disrupted<br>• The tsunami resulted in over 340,000 displaced people in the Tohoku region, and shortages of food, water, shelter, medicine and fuel for survivors<br>• The earthquake and tsunami created approximately 25 million tons of rubble and debris |
| Japan: Volcano Sakurajima eruptions March 2012-present | • A minor disaster<br>• The facilities and operational bases of most emergency organizations were not hit<br>• Life in many contiguous areas went on almost normally | • The Showa Crater on the southern slope of Volcano Sakurajima erupted in June 2006 for the first time in 58 years. Since then, eruptions have continued. The Level 3 warning (no entry within 2 km of the crater) has remained |

(*Continued*)

Table 2. (*Continued*).

| Country and disaster | Disaster or catastrophe? | Background |
|---|---|---|
| | • The event attracted attention from outside the community media only for a few days | unchanged since it was issued in March 2012. There are 5,000 inhabitants on the Sakurajima Island<br>• Volcanic elements, such as gas, ash, lapilli, have caused problems to infrastructure, particularly roads and farms. In 2012, for example, the main road on the Sakurajima Island was closed for half a day for the purpose of removing the ash fall and cleaning the road. Farm goods were ruined when they were covered by ash which reduces the quality of the products<br>• One of the largest eruptions occurred at 16:31 on 18 August, 2013, which yielded a 5,000-metre volcanic column. The eruption lasted for a couple of minutes, and was followed by ash clouds which moved to the town centre of Kagoshima City<br>• The ash fall was 5mm in Kagoshima City, and it also caused 'makiagari', the curling of the ash in the air. Road sweepers operated for two days to remove the ash |
| New Zealand: Canterbury Earthquake Feb 22nd 2011 | • Catastrophe<br>• Massive impact on built structure<br>• Local officials unable to take on normal work role due to damage to the built environment<br>• Hardest hit communities in East of city could not be reached<br>• Massive failure of critical and lifeline infrastructure | • Devastating earthquake (6.3 magnitude) followed by a series of severe aftershocks over several months<br>• Telecommunications networks, electricity, water, transport, road networks were all severely damaged |

(*Continued*)

Table 2. (*Continued*).

| Country and disaster | Disaster or catastrophe? | Background |
|---|---|---|
| | • National state of emergency declared involving Head of Ministry of Civil Defence taking on role as 'National Controller' | |
| New Zealand: Mt Tongariro eruptions 7 August and 21 November, 2012 | • Disaster<br>• The facilities and operational bases of most emergency organizations were not hit<br>• Life in many contiguous areas went on almost normal<br>• The event attracted attention from outside the community media only for a few days | • The Te Maari crater on the northern slope of Mt Tongariro erupted without any warning signs, followed by an earthquake which lasted for 5 min<br>• Ash and rock were ejected within a 1km radius of the crater<br>• Flying rocks in the eruption caused some damage to the Ketetahi Hut and the Tongariro Alpine Crossing track<br>• Ash accumulated by 5mm near Lake Rotoaira, which required removing<br>• The air smelled of sulphur even in the town Waiouru 30km away<br>• Some roads in the Tongariro National Park Road around Mt Tongariro were closed, and the huts on the mountain were closed<br>• On 21 November, a small amount of ash and gas erupted from the same crater |
| United States: Hurricane Sandy, 2012 | • Catastrophe<br>• This is a catastrophe as a huge percentage of multiple communities were affected, with damage affecting a significant amount of homes, businesses, schools and other community functions. It affected multiple infrastructures and additionally affected multiple emergency services | • Hurricane Sandy destroyed or damaged at least 650,000 houses<br>• Caused an estimated $65 Billion worth of damage<br>• Left 8.5 million customers in 21 states without power<br>• Resulted in 222 deaths (although figures vary slightly in the media) which were 147 direct deaths and 75 indirect |

(*Continued*)

Table 2. (*Continued*).

| Country and disaster | Disaster or catastrophe? | Background |
|---|---|---|
| | | • Power lines were damaged by the winds and flooding affected the electric substations<br>• Critical terminals for petroleum and petroleum products were badly damaged<br>• Three reactors were impacted either by shutting down completely or by tripping during the storm<br>• There were gas shortage issues due to gas stations not having electrical power—this led to gas rationing<br>• The accompanying storm surge flooded New York City's subway tunnels, impacted on runways at La Guardia and Kennedy airports and damaged the New Jersey transit system<br>• Telephone and internet services were impacted by the flooding leaving customers without means of communication and AT&T, Sprint and Verizon (cell phone companies) all stated they could not send people to assess the damage due to the continued flooding and poor weather conditions<br>• Hospitals were impacted with a major hospital in New York City having to evacuate newborn babies from intensive care units due to the backup generator failing<br>• 911 services were overloaded<br>• Schools closed |
| United States: Mississippi River Floods, 2011 | • Disaster<br>• This is a disaster not a catastrophe as even though some people lost their lives it was not a | • The largest and most damaging floods recorded in the US waterway<br>• Caused $2.8 Billion in damage |

(*Continued*)

Table 2. (*Continued*).

| Country and disaster | Disaster or catastrophe? | Background |
|---|---|---|
| | significant proportion of the population. The emergency services, Army, government and Federal agencies could still function and plans were able to be implemented in order to cope. Even though infrastructures were impacted, they were restricted to the flooded vicinity and were able to be restored | • Caused by late winter and early spring snow melting and heavy rain including a series of Tornados across two days in April 2011<br>• The river in central Memphis had swelled to 3 miles wide (it is usually ½ mile wide)<br>• Water surged over the banks of the Mississippi River<br>• Water was purposely diverted from large settlements by the blasting of levees (the embankments built after the floods in 1927 along the river to prevent flooding) and opening of spillways<br>• Thousands of square miles of land (both agricultural and residential) were submerged under water<br>• Many areas along the Mississippi River experienced flooding including Illinois, Missouri, Kentucky, Tennessee, Arkansas, Mississippi and Louisiana with reports stating that 119 counties were hit<br>• President Barack Obama declared three western counties as federal disaster areas<br>• More than 21,000 homes and businesses were affected<br>• Several people drowned in flash floods and many deaths were reported approximately 400<br>• Shipping, industrial and agricultural industries were significantly impacted<br>• Petrol refineries were shut down which accounted for a substantial amount of domestic gas production |

(*Continued*)

Table 2. (*Continued*).

| Country and disaster | Disaster or catastrophe? | Background |
|---|---|---|
| | | • A main grain-shipping port was closed<br>• Major shipments of coal were delayed<br>• A nuclear generating station had a refuelling shut down<br>• Some highways were closed with some access cut-off for two weeks |
| United Kingdom: 7/7 London Bombings, 2005 | • Disaster<br>• Even though there was a tragic loss of lives, it was not a significant number of the community. Additionally, although infrastructures were impacted, these were confined to the immediate vicinity and were relatively quickly restored. Emergency services were able to function and it did not have a major impact on other communities in the same way | • A series of coordinated suicide attacks in London on public transport systems which targeted civilians during the morning peak rush hour<br>• Four separate bombs detonated by four British Islamist men—three in very quick succession detonated on London underground trains and the fourth a while later on a double decker bus in Tavistock Square<br>• 52 civilians were killed, as were the four suicide bombers, and a further 700 civilians were injured<br>• The countries first ever suicide attack<br>• The bombings impacted the power lines along the train lines which caused a series of power failures<br>• Security was increased to the highest level and suspicious packages in seven other cities in the UK were destroyed<br>• There was disruption to the telecoms networks with Vodafone reporting their mobile phone capacity had reached its capacity, other networks reported similar impacts and failures as well as excessive usage impacting landlines |

(*Continued*)

Table 2. (*Continued*).

| Country and disaster | Disaster or catastrophe? | Background |
|---|---|---|
| | | • Disruption to the transport network continued for weeks after the bombings<br>• Media coverage was continuous and uninterrupted throughout the day of the bombings<br>• Radio channels were blocked so crews from London ambulance service that had been dispatched could not get messages back to controllers |
| United Kingdom: Storm and Flood, October 2013—February 2014. | • Disaster<br>• Even though a huge amount of people were affected by the floods, it was not in clusters and did not affect most or all of England, nor did it affect most or all of the community built structures. Emergency services were able to operate and local officials were able to undertake their usual roles even though they were criticized by some victims. There was not a significant loss of life despite the many people affected by the floods | • A series of catastrophic storms and floods occurring from 27 October 2013 through to February 2014<br>• Thousands of people had to evacuate their homes<br>• More than 5000 homes and businesses flooded<br>• 625,000 homes lost power during the early storms<br>• 750,000 homes lost power over Christmas<br>• Road closures, travel disruption and power outages<br>• A stretch of railway was destroyed when a section of the sea wall in Devon collapsed and the railway to Cornwall was suspended in mid air<br>• Flooding triggered landslips<br>• All routes into south-west England were blocked by the floods and landslips |

(*Continued*)

Table 2. (*Continued*).

| Country and disaster | Disaster or catastrophe? | Background |
|---|---|---|
| Germany: Blackout Muensterland November 2005 | • Disaster<br>• Failure of several aspects of critical infrastructure<br>• Effects localized, only local officials involved<br>• Some help provided from outside affected area | • Total power failure in the region of Muensterland<br>• Extremely heavy snowfall caused 82 electricity pylons to collapse<br>• This was the largest power failure in the history of Germany<br>• 250,000 people without electricity, light, heating, telecommunications, ATMs/card payment for up to 5 days |
| Germany: Floods 2013 in south–East Germany and neighbouring countries (May 26–3/4th June) | • Disaster<br>• Local and national officials involved<br>• Several aspects of critical infrastructure affected<br>• German military deployed | • Rivers Danube, Elbe, Inn, Ilz<br>• Intensely heavy rainfall and flooding exceeding 'once in a century' levels of 2002. Highest water levels in 500 years. However, less damage was caused in the main because investment post-2002 had meant much improved defences<br>• Eight fatalities in Germany, 25 overall<br>• Transport infrastructure affected, including main roads, motorways and train lines. High-speed track from Berlin to other major cities badly damaged<br>• Drinking water supply in some areas affected<br>• Localized telecommunications and internet affected<br>• Some interruption to local businesses including destruction of goods and premises<br>• Agriculture devastated in some areas |

Despite its size, The Great East Japan Earthquake and Tsunami 11 March 2011 provides an example of *small disturbance and surprise*. The Earthquake and subsequent Tsunami caused widespread, indiscriminate loss of life and the failure of physical infrastructure, in particular a nuclear power station which released radiation into the atmosphere. Given the magnitude of the disaster, there was no major paradigm shift in the way in which resources were organized or learning constituted. At first, learning was instinctive with victims struggling to believe what has happened. Many people caught in the tsunami thought they were located on high enough ground to be safe. Spontaneous and planned evacuations started very quickly as did community learning and response. Volunteer activities by individual citizens, not-for-profit organizations, universities and corporate companies started almost straight away, drawing on their existing education and training. Evacuation continued across Japan and survivors had difficulty accepting the reality of the situation. Survivors whose family members' bodies were found tended to accept the loss, but when family members were still 'missing', survivors found it hard to move on. The recovery process therefore started in a stepwise fashion with volunteering and community learning of an incremental nature. Over a longer time scale, temporary housing was built, and survivors began a new life. Healthy survivors then started participating in the recovery process. What we see is that there is a repetition of small group learning over the period of the disaster. Three years after the catastrophe, there are still a number of victims who cannot move on from a state of trauma. In this instance, communities were navigating changes as they occurred despite the enormous magnitude of the disaster.

In the case of a much smaller natural disaster, the New Zealand Mt Tongariro eruptions, we also see a similar pattern of stepwise learning. This volcanic eruption had impacts on transportation and local communications but for the most part, the ability of the emergency services to deal with the disaster was not compromised. After the eruption, following an existing Maori custom, a protective restriction was placed on entering the 3-km high-risk area and 24 local residents self-evacuated. Local residents were advised to check for water supplies affected by ash and for those on tank water to disconnect. Police, Department of Conservation and rescue volunteers went into the area to check the local tracks and huts. Taupo Council's Civil Defence warned the local population to stay at home, close windows and cover their mouths if caught in the ash. Hawke's Bay Airport closed and flights cancelled on the following day. Most who self-evacuated returned to home the following morning. Here, we can again see small loop adaptive learning, *small disturbance and surprise*. Communities were drawing on their existing training and education rather than developing new forms of learning to navigate the transitions.

In a country which had little experience of substantive natural disasters, the storm and floods in 2013 and 2014 in the UK, did not involve much local authority help and were characterized by an inflexible response by government, which meant that people began protecting their own properties. By UK standards, these were very severe storms and floods over a protracted period of time which had a severe impact on coastal areas of the country. Many people had to take time off work or could not get to work. The Salvation Army began helping people affected by floods, offering a listening ear, setting up rest centres for a safe and calm place to go. They also provided a mobile canteen and supported

the emergency services. Local residents began donating clothes and food to the Salvation Army's rest centres for the people affected by the floods. As the storms and floods continued, people began to get angry with the Environment Agency accusing them of neglecting the rivers. Some residents remained in their homes and did not evacuate while others did evacuate and went to stay with relatives and friends. Other residents began helping others using their own transport systems to ferry people about. However, there was not significant self-help or organization. Rather, the community learnt to *navigate transitions*, dealing with each change as it happened. As the UK does not have a lifelong learning culture for dealing with disasters (as in New Zealand and Japan), each change in the situation was dealt with in terms of incremental learning. There are similarities between this disaster and the Mississippi river floods of 2011 in the USA where there was also incremental, small loop learning. This again is an example of navigation rather than more radical organization/reorganization.

### *Organization: self-organization and reorganization*

Organization means that the community is learning in an incremental fashion but eventually the community learns to adapt new practices and to reorganize the ways in which resources are employed. There is self-organization and adaptation by the community.

In the case of the recent, devastating, Christchurch earthquake, the emergency caused widespread evacuations, including of the city centre and Christchurch Airport was closed. The earthquake was extremely severe and caused catastrophic damage to buildings, transportation and infrastructure in the area. A level 3 emergency was declared, the highest level for a regional disaster which then became a National state of emergency. The population were immediately concerned with the emergency response and organization, quickly learning to adapt to the new situation. There are stories of people working for hours to save others before going to find out whether their own loved ones were safe. There was some panic calling to loved ones, but after the immediate aftermath panic, calling levels returned to manageable levels, as people heeded calls to limit non-essential mobile use. As time went on, communities began to fragment. Around 15% (55,000) of the Christchurch population were likely to have left the city over the first week. The majority of the population loss was women and families with young children. However, even given this fragmentation, citizens did not appear to wait for the authorities. They organized themselves, even putting themselves at risk to do so. Volunteers organized very efficiently, using new methods to educate volunteer groups, despite the initial reluctance of authorities to allow this and work with them. New groups learnt to step in with the recovery effort and they included the Student Volunteer Army and the Farmy Army. In the longer term, recovery has been slow. Although a government agency has been formed to organize response (Canterbury Earthquake Recovery Authority), this is targeted at specific groups, including businesses and better-off. Those without their own homes are not recovering very well. The population is suffering from very high levels of mental health issues. There is a significant amount of community support and organizing bringing people together through groups such as churches. Here, we can see that there is evidence of *self-organization*, some of which was novel, but the paradigm by which disasters

are dealt with was not changed in the longer term. Hence, although there was some very responsive learning, the more transformative types of learning did not occur, or at least were not institutionally accepted. However, there was evidence of a shift in the allocation of resources typical of such organization.

The above case was similar to the case of the German Floods in 2013 in south-east Germany and neighbouring countries. Large—even unexpected—amount of help was provided by volunteers (organizing on social media) and farmers. Volunteers filled sandbags and cooperated mostly with the civil defence authorities, fire service and military, which managed the volunteer deployment. In fact, they had too many volunteers and had to send people away. There was also considerable volunteer learning in the community. The Passau—urban gardeners—helped in terms of recovering urban spaces. This is also an example of *self-organization*. The community quickly learnt to adapt to the new situation, and novel civic associations were involved in the response. These civic associations are evidence of the degree to which communities were able to organize to meet the new challenge.

In the 7/7 London transport attacks, there was also widespread organization and community learning/adaptation. These terrorist attacks, launched by British citizens using homemade explosives to damage the tube network and a London bus, caused serious loss of life and life-changing injuries. Following the attacks on the underground network, people immediately became altruistic, trying to help injured fellow passengers at the sites of the attacks with many leaving their 'safe' unaffected carriages to assist. Others helped by remaining on the train to help others when they were being evacuated. One passenger turned the power off the tracks by holding two copper wires together and others formed a human chain to help rescue others. One young man who was situated not far from one of the bombers asked a lady for help after the bomb exploded and told her he was autistic, she reassured him and helped him. Outside of the attack sites information was confused with many believing different accounts of what had occurred such as a power surge causing the explosions; this, however, was rectified relatively quickly with it being announced that this was a terrorist attack. Within hours of the explosions, there were several websites set up which aimed to allow people to express their resolution that they would not be afraid. Many people searched for information on the BBC news websites and many people began to blog, offering practical advice and analysing how well the news outlets had covered the events. Within weeks, many peace vigils were held in memory of those who were killed. Emotions including frustration and grief remained for the weeks and years after the bombings, compounded possibly by the inquest. During and after the event, there was evidence of significant altruism and adaptation. Again, there was much evidence of *self-organization*.

We can also see community learning in terms of the reorganization of resources. In the German Blackout in Muensterland November 2005 where there was a substantive electricity failure in the area, citizens first waited for the electricity to come back on. Those with open fires heated stones, wrapping them in towels and putting them in the beds to warm them. Those with camping stoves used them for cooking if they had gas canisters/white spirit. People started running out of money, becoming very reliant on food supplies brought in by Red Cross, the civil defence authorities and the fire brigade, who were also struggling to get through the snow. Communication/information was via car

radio or the fire stations. Hospitals and town halls had generators and were kept warm. People gathered at the town hall, where it was warm and hot food was provided, but also at the fire stations, where they could get information. There was a serious impact on agriculture and cows could not be milked. Young animals were dying in the cold. Farmers tried to share generators, but many animals died, leading to enormous financial loss. Batteries, candles and bread sold out at the local shops. Rotting food from the freezers was an increasing problem at the supermarkets, which had to be thrown. However, emergency accommodation was provided for some old people and those with open fires invited friends and neighbours to warm themselves. Closer relationships formed in the community, the effects of which are lasting, to some extent. Here, we see community learning at a greater level than self-organization. It was more a *reorganization of resources* where there was extensive mutuality, altruism and learning.

*Reframing: memory, revolt and back-loop*

In some disasters, there will be a reframing of the current situation. People might draw extensively on previous historical or collective memories to frame their current experience. Alternatively, there may be a complete change in the disaster paradigm. Often, community learning is shaped by concerns for democratic accountability (Ellis & Scott, 2003). By revolt, we are referring to circumstances in which communities share collective values and undertake direct actions which act in opposition to injustices and absurdities arising from the State and its agencies (Foley, 2014). In contrast, back-loop learning rejects the very terms of the disaster. Rather than considering the disaster to be a problem to be navigated, organized or resisted, the learning reframes the disaster as having its origins in social and power relations. For example, during Hurricane Sandy, the Occupy movement considered the roots of the disaster in terms of anthropocentric climate change, 'disaster capitalism' and social cleansing (the poor having unequal access to flood protection).

In the case of the Volcano Sakurajima volcanic eruptions where eruptions have occurred from March 2012 to the present day, the community have continually used their *memory* of previous disasters (large loop learning) to respond. The experience of the community with volcanic eruptions has provided them with a collective, historical memory to draw on. When the local population were informed by the local Meteorological Agency and the municipal government about the scale of the eruption and the wind direction, they took immediate action, drawing on past knowledge. Windows were closed, and the laundry was taken in. Farmers protected their products from ash by covering them. The local population started collecting ashes using the bags provided. As the disaster unfolded, the local population continued to check the warning level issued by the local Meteorological Agency. Because people were prepared through a long period of living with an active volcano, there has been limited emotional response. The population live with eruptions and the threat constantly and so they are drawing on historical memory rather than undertaking short-term reorganization. Increasingly, social arrangements are being emphasized to tackle with disaster vulnerabilities. Therefore, large loop learning is used and the response to the crisis is measured with little interruptive learning taking place.

The population is drawing on *memory* in their response. They are reframing the disaster, using their historical memories.

In a natural disaster in the USA, Hurricane Sandy, social inequalities came to be important. Hurricane Sandy was a large-scale hurricane that damaged over half a million homes and caused electrical and telecommunications infrastructure to fail. People wanted to know where they could get help and what kind of services they could apply for but there was a lack of centralized information. There was a lot of confusion in the immediate aftermath of Hurricane Sandy but many volunteers began to help immediately. Many people volunteered to help others. Occupy Sandy was a grass-roots disaster relief network that emerged in the immediate aftermath in order to provide information and aid to communities hit by Hurricane Sandy. A website was designed which listed among many other useful resources, lists of gas stations, people's needs and requests for volunteers. Volunteer groups began efforts to rebuild homes and people's lives in the first month and continue to do so. However, there is building frustration among many people who are still waiting after two years for the funds to rebuild their homes and lives, many of whom are caught up in a new web of bureaucracy dedicated to the Hurricane Sandy recovery. Again, there was questioning of social conditions but the intervention of Occupy Sandy led to *back-loop learning*, questioning the way in which disaster relief was organized and the way in which the recovery benefited business interests. The terms of the disaster were reframed.

Hurricane Sandy can be contrasted with Hurricane Katina (2005) in the United States which was another disaster where there was community memory. It was also a significant social and economic disaster. Like Sandy, Katrina was a severe Hurricane which caused property damage and large-scale population displacement. The collapse of the system of levees and spillways displaced thousands of residents. However, some people ignored the mandatory evacuation orders. Police went door to door to warn people and police presence was increased in evacuated areas to prevent looting. There was widespread community conflict between FEMA (Federal Emergency Management Agency), the

**Table 3. Conditions leading to small and large group learning in a disaster**

| SMALL LOOP LEARNING PREDOMINATES WHEN … | LARGE LOOP LEARNING PREDOMINATES WHEN … |
|---|---|
| 1. Populations are in a state of shock, anxiety or distress | 1. A new civic, or voluntary organization appears to fill a power vacuum |
| 2. There are institutional or power structures which prevent more radical forms of organization | 2. Communities are drawing on a pre-existing paradigm (e.g. memory of the response to a previous disaster—an existing 'large loop' of how things should be organized) |
| 3. There is a long historical time period between disasters | 3. The social conditions are so disrupted that a new paradigm of community learning emerges (note that this is not inevitable even if the conditions are extremely difficult) |
| 4. The disaster causes little disturbance to existing social relations | |
| 5. Coercive power structures are successful in an attempt to impose existing paradigms of disaster response | |

police and the community. Parts of a levee in Missouri were demolished to prevent a small town being destroyed; however, this resulted in 200 square miles of farmland becoming flooded. Other spillways were opened to reduce the risk to the city, but at a social cost to other residents. People reported it as surreal and dramatic while reporting feeling shocked, overwhelmed and astounded as they had never seen anything of similar magnitude. Hurricane Katrina has caused an ongoing economic and social change in the area. The conditions of oppression caused *revolting* against the social conditions resulting from the mismanagement of the disaster. This has caused subsequent community learning and resistance. There was a reframing of the disaster as being indicative of wider structural inequalities of US society.

## Conclusion: a model for community learning in disasters

From the case studies and using our earlier, tentative, typology, we have identified three broad types of community learning in a disaster:

(1) NAVIGATION: Incremental, small loops of learning, experimentation and learning from events as they arise. The current paradigm of community learning for a disaster predominates.
(2) ORGANIZATION: Experimentation leads to new methods of resource allocation and mutuality in an incremental fashion. This leads to new ways of self-organization.
(3) REFRAMING: The disaster is reframed, either through drawing parallels with historical events or adopting new paradigms of disaster management, even questioning the ways in which disasters are managed.

In the above typology, navigation means that there is almost exclusively small loop learning, whereas reframing means that there is predominantly large loop learning. Organization is a case in which small loop learning that eventually transitions into large loop learning. In terms of which will predominate in a given situation, Table 3 provides some factors derived from the case studies.

Table 3 gives some indications of the circumstances in which either small or large loop learning would predominate, drawing on the case studies which have been discussed.

Small loop learning has been seen in several of the case studies. In the case of the Japanese earthquake and tsunami (2011), the sheer scale of the disaster, and the resulting societal shock, meant that small group learning was dominant. The UK storms and floods (2013 and 2014) were a case where it was not the scale of the disaster, but rather the rigidity of existing institutional structures that meant that there was only incremental learning by communities. In most cases, coercion and oppression leads to small loop learning but in some circumstances (such as Hurricane Katrina), it can lead to social action against the existing form of disaster response. In terms of the New Zealand Mt Tongariro eruptions (2012), the atypical event did not cause sufficient disruption to create more extensive learning.

Large loop learning, on the other hand, occurs where a new social organization arises to fill a vacuum in the existing response. The case of Occupy Sandy,

during Hurricane Sandy in the USA (2012), represents perhaps the most salient example of where a previously unexpected source of community learning in a disaster (the Occupy movement) became a key provider of mutual aid, support and advice. The disruption to resources in the Rockaway area of New York was so catastrophic that there was the room for a new learning paradigm to develop. On the other hand, collective memory of disaster in the Volcano Sakurajima eruptions in Japan from 2012 produced a very different type of large loop learning, drawing on collective memory.

We should note that the model presented here is not a deterministic model, but can allow policy makers, responders and voluntary organizations to consider how they should respond in a crisis. This model is not necessarily adaptable to all types of disaster, particularly very minor disasters (which may be no more than simple navigations) but it is not necessarily specific to a country context. Although based on an earlier, more nuanced, framework, we have devised a simple typology of three, rather than ten categories, which comprise mainly small loop learning (navigation), small and large loop learning (organization) and mainly large loop learning (reframing).

There are a number of implications of this research in terms of developing educational programs for emergency situations.

Firstly, previous research (Preston et al., 2014) has noted that it is very difficult to change national learning cultures for disasters. Path dependence of national systems means that curricular are slow to change and systems that have a didactic approach to learning for disasters (such as the UK) would find it difficult to implement at a curricular level, the lifelong learning approach adopted in other countries (such as Japan). This research indicates that even given these national approaches, there is considerable variety in terms of how communities learn in disasters which appear to be more dependent on the factors as shown in Table 3 rather than the national context. Hence, there may be scope for sharing information between communities facing disaster rather than transferring community learning models at a national level. For example, free and open-source web platforms such as Ushahidi allow communities to share practical community knowledge on disasters, democratizing the sharing of disaster knowledge using crowdsourcing techniques.

Secondly, population behaviour in disasters has frequently been modelled starting with assumptions derived from methodological individualism (Albala-Bertrand, 2013, p.45). This means that there is a problem of aggregation as systems beyond the microsocial are not simply composites of individual behaviour and there is a reflexive relationship between individual and collective behaviour. Adopting models of community learning which are non-deterministic, but develop ecologically, may help policy makers to consider how behaviour might plausibly develop in future disaster scenarios. This may allow policy to consider responses to large loop learning in disaster, where social media and new social movements allow collective responses that are not predictable from models of isolated, atomized individuals.

Although an ecological approach has been adopted here, here are a number of ways in which these models could be extended to incorporate other models of learning. Terpstra (2011) considers that the affective, as well as the cognitive, dimensions, of community learning, are particularly important in a disaster. Each provides a pathway by which learning can be achieved and bringing in the

emotional dimension may help us to understand how trauma can influence learning. Dufty (2012) considers that communities which are frequently struck by disaster can be considered to be 'communities of practice' and, again, this notion may help us to understand the learning by civic organizations in a crisis. Similarly, the transformative community learning literature may enable us to consider the 'reframing' form of community learning in disasters. Mezirow (2007) considers that transformative learning is not a form of communicative learning (allowing concepts and ideas to be shared), but also allows learning that allows questioning of '… ideology, culture and power' (p. 28).

This points towards a further iteration of 'reframing' in disasters to critically reflect on existing social structures beyond the timeframe of the disaster. Indeed, conscious raising is one strand of transformative learning (Dirkx, 1998). The possibility for transformative learning, not only following a disaster, but also in the future, implies a role for community adult educators beyond the building of psychological resilience (Höfler, 2014) or dealing with trauma (Kerka, 2002). Adult educators have a central role, not only in working with communities to navigate transitions or help organize resources, but also in consciousness raising and reframing disasters in their political context. Moreover, this model sensitizes adult educators to different types of community learning in disasters. It is not always the case that disasters will lead to a change in consciousness, or a reframing of the disaster. For some adult educators, from a transformative learning or critical pedagogy perspective, disasters may present a clear opportunity to engage in pedagogical activities that engage with political themes. However, in other disasters, simply navigating the disruption caused by the incident, or organizing community resources, may be more pressing. This is not to deny the wider consciousness raising role of adult educators in a disaster, but the model enables them to consider the contextual factors which would make such an activity salient.

One important conclusion from this study is that community learning does not follow a clearly defined path from the start. In managing disasters, there have been recent attempts to operationalize community learning through concepts such as community resilience. The problem with community resilience (if it is a collection of human assets and networks) is that it attempts to reify what, as our case studies show, is frequently a more organic and spontaneous development of community capabilities. More organic, and grass roots, concepts such as mutual aid or volunteering seem to be more indicative of the processes that take place in a crisis. No disaster is the same, and community learning is not simply a function of existing community resources.



## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

This work was supported by the Economic and Social Research Council [grant number ES/K00233/1].

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