

Chapter 1

The need for enhancing learners' knowledge and skills for responding to hazards and disasters

1.1 Introduction

The global community is experiencing an increasing number of disasters that range from earthquakes, floods, storms, epidemics, fires, landslides, hurricanes, tsunamis to social conflicts that result in loss of life and property. In a South African context the National Disaster Management Framework (NDMC) sums up the disaster related challenges as follows:

South Africa faces increasing levels of disaster risk. It is exposed to a wide range of weather hazards, including drought, cyclones and severe storms that can trigger widespread hardship and devastation. In addition, South Africa's extensive coastline and proximity to shipping routes present numerous marine and coastal threats. Similarly, our shared borders with six southern African neighbours present both natural and human-induced cross-boundary risks, as well as humanitarian assistance obligations in times of emergency. In addition to these natural and human-induced threats and despite ongoing progress to extend essential services to poor urban and rural communities, large numbers of people live in conditions of chronic disaster vulnerability – in underserved, ecologically fragile or marginal areas – where they face recurrent natural and other threats that range from drought to repeated informal settlements fires. (NMDC:2005:1)

While disaster relief has been at the forefront of planning for a long time, communities are increasingly looking at disaster risk reduction as the best solution to safeguard human lives and property. Scholars and policy makers have pointed to disaster preparedness and resilience as strategies to ensure disaster risk reduction. Disaster education has emerged as a possible coping strategy that could enable communities to be prepared and become resilient during and after a disaster. Preparedness focuses on ensuring that communities are educated about the prevalence of hazards and associated vulnerabilities. Also education enables communities to become resilient by knowing what to do during and after a disaster.

Before I embarked on the literature review, it was not clear what role education plays in disaster risk reduction. From the onset of this study the critical question “How does education play a role in disaster risk reduction given the increase of disasters globally and in South Africa” was framed as a point of departure. While reviewing literature it emerged that the debates on curriculum and instructional design were hot in South Africa in the late 1990s and this continued to late 2000. Fuelled by the newly elected democratic government introducing new policies on education including a new national curriculum, these debates contributed to the refinement of the research question to specifically focus on curriculum and instructional design.

The purpose of this study was therefore to determine how education, in particular curriculum and instructional design, contributes to learners’ awareness of hazards and disasters. Chapter one provides introductory information focusing on the problem statement, rationale for the study and a brief explanation of the research methodology used.

1.2 Background to the study

On 11 March 2011, Japan was hit by a monster earthquake of 8.9 on the Richter Scale, which resulted in a tsunami damaging the country and taking lives. The world watched helplessly as television footage on CNN and BBC showed how the tsunami swept everything on its path devastating the community. According to a CNN reporter, residents had a few minutes to escape or face the wrath of this catastrophic event. In essence the reporter mentioned that there was no programme that could have prepared the community for the earthquake. A look at the archives shows a startling resemblance of the Japan 2011 disaster with the 1960 earthquake and tsunami in Chile as illustrated by the *Digital Journal*¹ records presented below.

An hour before the 8.9 magnitude earthquake hit Japan, I was at home, in my Tokyo apartment, on the second floor of a five-floor ferro-concrete apartment built in the late 1980s and which met all the quake construction codes at the time. Many buildings in Japan are of similar construction. At the start of this big quake, I knew it was going to be

¹ The Digital Journal article could be accessed at
<http://www.digitaljournal.com/article/304570#ixzz1CdUlco>

different. It didn't end when it was "supposed to" end. Luckily, Japan prepares for exactly this scenario, and emergency measures are in place. There's an annual Earthquake Preparedness Day here. There's often some type of earthquake readiness drill going in any given community at any given time. So event arenas were opened, emergency kits distributed. Thousands stayed in emergency shelters overnight. Watching the news last night, around 9:30 an earthquake prediction alert pops up on-screen and the special warning beeps are heard— another quake is coming in 10 seconds! This after a day of aftershocks. My wife immediately jumps up and turns off the gas room-heater. It was then I realized that when I dived under the dining table earlier in the day, I'd not performed the basic tasks: turn off the gas at the main in the kitchen (the switch is easy to access in homes and apartments), open a door. While I was under the table, the gas heater kept on heating the living room. After the 1995 Kobe quake, the government emergency response was perceived as inadequate. So the public got even more serious about quakes. Since 1995, we've been prepared to hit the road with our earthquake backpacks, or to "shelter in place".

However if one looks at the report by Atwater, Cisternas, Bourgeois, Dudley, Hendley and Stauffer (2005), an earthquake of higher magnitude followed by tsunami was less devastating than the March 2011 earthquake followed by a tsunami in Japan. The quote below suggests the stark contrast with the Chile scene.

Later that Sunday, the magnitude 9.5 mainshock of the 1960 Chile earthquake rocked the region. After the shaking ended, many people from Queule decided to head to nearby hills. From their stories it is not known why they chose to do this, but their only known warning was the minutes of shaking or, perhaps, changes in the level of the Río Queule or the nearby Pacific Ocean. Heeding natural warnings by going to high ground probably saved hundreds of lives in Queule. There was plenty of time for evacuation in Hilo, Hawaii, as the Chilean tsunami raced across the Pacific Ocean on May 22, 1960. At 6:47 p.m. Hawaiian time, the U.S. Coast and Geodetic Survey issued an official warning that waves were expected to reach Hilo at about midnight. Around 8:30 p.m., coastal sirens in Hilo sounded and continued to sound intermittently for 20 minutes. However, 61 other people in Hilo died and another 282 were badly hurt. These losses occurred, in part, because the warning sirens in Hilo on the evening of May 22, 1960, were interpreted differently by different people. Although nearly everyone heard the sirens, only about a third of them thought it was a signal to evacuate without further notice. Most thought it was only a preliminary warning to be followed later by an evacuation signal. Others in Hilo were unsure of how seriously to take the warnings, because several previous alerts had been followed by tsunamis that did little damage.

The contrast between the two reports is remarkable considering that in 2011, technology should be so advanced to ensure that more people survive the catastrophic events than in 1960. Was the education in 1960 more advanced than the education in 2011? Could it be that people were more used to indigenous knowledge then than they are today?

According to the South African Green Paper on Disaster Management of 1998, South Africa, like other countries, is experiencing the effects of disasters occurring worldwide such as floods, landslides, heat waves, earthquakes, hurricanes, wild fires and epidemics. According to Pelling and Uitto (2001:60) many countries are experiencing pressure from global organisations to have disaster risk reduction plans ready for the outbreak of such disasters. The International Strategy for Disaster Reduction (ISDR) reports that the global community is experiencing a challenge from devastating disasters fuelled by issues such as vulnerability and climate change that were evident with the tsunami on 26 December 2004. The 2010 Haiti and Chile earthquakes as well as constant flooding and storms reported worldwide are an indication that the world is experiencing devastating disasters equal to none.

According to the UNESCO (2007) report on Disaster Mitigation the most cost effective way to ensure that communities are prepared and respond well to disasters is education and awareness. The Hyogo Framework for Action 2005 – 2015 (2005) reported that disaster loss² is on the rise with grave consequences for the survival, dignity and livelihood of individuals, particularly the poor; furthermore, hard-won development gains and associated risks are increasingly a global concern as impacts and actions in one region could easily have devastating results in other regions.

Shiwaku, Shaw, Kandel, Shrestha and Dixit (2007:576) report that a number of catastrophic disasters occurred in many parts of the world. They identify some like the 1995 Kobe earthquake in Japan, the 2004 Tsunami in the Indian Ocean, the 2004 Hurricane Katrina in the USA. The online world news (www.infoplease.com) reported more than five catastrophic disasters that ravaged the international community in 2008 when this study was at its infancy. The 2008 disasters include an earthquake that hit China in May killing 40 000 people and injuring many, the Cyclone Nargis that hit Myanmar killing 78 000 people, a dengue fever outbreak in Brazil killing 80 people and affecting 75 399 in April, tornadoes that in the USA killed more than 60 people and the violence in Kenya that left 300 people killed and thousands of houses and businesses destroyed. While in 2009 the world experienced disasters

² Disaster loss implies damage, injury or loss sustained in an officially designated disaster area.

that resulted in deaths amounting to hundreds, the greatest disasters in the early part of 2010 were experienced in Haiti where an earthquake killed 230 000 and injured 500 000, as well as the Chile earthquake that took the lives of more than 900 citizens and injured many.

In South Africa, the 2008 xenophobic attacks killed more than 60 foreigners; continuous fire outbreaks destroyed shacks in informal settlements and displaced communities, and floods and storms affected society. These disasters entail that there have to be some measures to ensure that where possible some form of preparedness is introduced to communities. Frost-Killian (2008:28) reports that South Africa has a history of geohazards and disasters. It has the deepest mines in the world with some going down nearly 4km; there are high rates of seismic activity from gold mining districts - higher than elsewhere in the world; sinkholes are found in areas underlain by dolomite.

Napier and Rubin (2002:16) maintain that between 1975 and 2001 South Africa experienced nine droughts and famines, 16 floods, landslides, cholera, wind storms, wild fires and a few incidents of earthquake caused by collapsing mines,. It is expected that with the increase in climate change, disasters will increase worldwide. A study reported in the *Sunday Times* of 17 August 2008 hinted that due to climate change a major part of Cape Town might be damaged by floods in twenty years' time.

The background information above indicates that any country in the world can be hit by any type of disaster even though some are more vulnerable than others. Some authors such as Shaw, Shiwaku, Kobayashi and Kobayashi (2004:40), Shiwaku et al. (2007:576), Hosseini and Izadkhah (2006:650), King (2000:227) and Ozmen (2006:393) maintain that education is essential in raising awareness and understanding of hazards and disasters and that it should form part of the school curriculum. The idea is also supported by Slattery (2006:223) who maintains that to avoid ecological disaster, education must point the way toward deep cultural changes to create healing and compassionate environments in the classroom to prevent ecological destruction that follows the demise of learning.

Numerous countries such as USA, Japan and India, after experiencing such catastrophic events, resorted to a full scale integration of disaster education in the curriculum and

provided support to educators to deepen learners' knowledge and understanding of hazards and disasters. To put the matter into perspective O'Brien and Read (2005) maintain that following the devastation of the terrible First and Second World Wars, the United Kingdom like other western European countries, was faced with a huge task of economic reconstruction and emergency management. A new climate of social and economic optimism emerged from the post-war settlement, emphasising the potential of education for social and economic progress and the need for a better educated, graduate teaching workforce that was an indication for a complete overhaul of existing education and curriculum.

The core idea emerging from the literature study, although not crystal clear, is that after a catastrophic event, education is seen as an essential aide in social reconstruction of the country or community hit by disaster. The argument advanced in this study is that education in whatever form or shape, can play a more proactive role by preparing school learners to be aware that disasters can strike any time and they need to adopt certain behavioural traits to survive during and after the disaster. According to the United Nations (2004:236):

Priority emphasis must be given to education as an essential part of disaster reduction strategies. Education is a crucial means within local communities around the world to communicate, to motivate, and to engage, as much as it is to teach. Awareness about risks and dangers needs to start in early education before abilities to address them can become part of growing civic and professional responsibilities as people mature. The various dimensions of disaster risk within a community can be addressed and continuously reinforced, passed between generations, through formal educational programmes and professional training.

According to Stevenson (1996:282) people have acquired rich and extensive base traditional knowledge leading to ecological, emotional, and physical wellbeing, customary social values, cultural practices and spiritual beliefs. Snively and Corsiglia (2000:6) maintain that traditional ecological wisdom is rich in time tested approaches that foster sustainability and environmental integrity. Snively and Corsiglia (2000:11) define traditional ecological knowledge as knowledge of the world that is handed across generations through oral and other cultural practices such as social attitudes, beliefs, principles and conventions of behaviours derived from historical experiences. This in my view is an indication that indigenous knowledge could play a crucial role in ensuring that communities cope with disastrous events experienced nowadays as they did in the past. It is therefore necessary to

include indigenous knowledge as another facet of education during the investigation to determine how education contributes to learners' awareness of hazards and disasters.

The national curriculum reforms introduced in 1997 took into consideration the need for learners to value indigenous knowledge and be included as a principle of Curriculum 2005 changed to National Curriculum Statements (NCS) in 2001. The National Curriculum Statements (NCS) defines indigenous knowledge systems as a body of knowledge embedded in African philosophical thinking and social practices that have evolved over thousands of years. Upon review of the NCS to determine whether it caters for the teaching about hazards and disasters to learners, it became apparent that the NCS learning outcomes do not explicitly make provisions for hazards and disasters but the subject is implied and left to the teacher to decide. However, in the Grade 7 Social Science, hazards and disasters learning outcomes are explicitly included.

1.3 Problem statement

As mentioned in the background to this study, the global community is experiencing devastating disasters. To mention a few, between January and February 2010, the world witnessed two major disasters: the first in Haiti where 250 000 people were killed and more than 500 000 were displaced and injured. The second disaster occurred in Chile where more than 900 people were killed. From October 2009 to February 2010 the South African media reported numerous devastating floods caused by heavy rainfall in Gauteng, while in the Western Cape the reports ranged from devastating fires to floods. Climate change researchers predict that the rate of disasters will increase when one considers the unpredictable climate change as reflected by Vogel, Mosser, Kasperson and Dabelko (2007:349) who maintain that climate-related catastrophes, such as the 2003 floods and heat waves in Europe, the 2005 hurricanes in the USA, Mexico and Cuba, and the persistent droughts and floods in Africa, Australia and Asia, as well as non-climatic high-impact events such as the 2004 Asian tsunami and the 2005 earthquake in Pakistan hold a mirror up to the world showing its continued exposure to destructive natural forces.

Reid and Vogel (2006:196) maintain that resource-poor communities, such as those residing in many parts of South Africa, currently live with a range of stresses and risks including climate risks, HIV/AIDS and insecure land access. Reid and Vogel (2006:195) point out that periods of climate stress, including prolonged drought usually unveil a host of factors that contribute to heightened vulnerabilities to environmental change such as deteriorating social networks linked to HIV/AIDS, poor access to basic amenities and resources and a range of wider, structural and governance factors that accentuate communities' vulnerability. This observation is supported by numerous researchers such as Mgquba and Vogel (2004:30), Napier and Rubin (2002:6), Frost-Killian (2008:28) as well as the National Disaster Management Framework. South Africa has been dominated by localised incidents, such as wild fires, seasonal flooding, droughts and accidents in the mining industry.

Ronan and Johnston (2001:1060) report that a lack of awareness and knowledge combined with unrealistic risk perceptions have been shown to have a negative impact on preparedness and responses to warnings. In their research with 400 children and young adolescents in school settings, they found that a hazard education programme helped children to significantly increase awareness and knowledge, and develop more realistic risk perceptions. They further report that those children who had increased knowledge of a range of hazards also demonstrated increased perceptions of the risk of being injured compared with children who had less knowledge. However, these same children also reported lower levels of fear (12% versus 28% reported they were "often scared" in relation to these hazards). Ronan and Johnston (2001:1062) maintain that it comes as no surprise that children who demonstrate more realistic risk perceptions and have more knowledge and less fear, had been exposed to hazards in school-based hazard education programme, in comparison with their counterparts with decreased knowledge, increased denial of physical risk and increased fear. Furthermore, those children involved in hazard education programme demonstrated more knowledge of hazards and disasters.

Based on the discussions of research by Ronan and Johnston (2001) above, it is suggested that education could play a critical role in assisting communities to become resilient to the outbreak of disasters. My assumption is that both traditional and formal education have a critical role to play in making communities and most importantly learners to become resilient

to disasters. The role that formal education could play in enhancing learners' awareness and resilience to disasters is through curriculum development and instructional design. The two concepts of curriculum and instructional design are discussed in depth in Chapter two.

The idea of the role of education in disaster mitigation is supported by the International Strategy for Disaster Reduction (ISDR) which initiated a World Disaster Reduction Campaign in 2006 referred to as "*Disaster Risk Reduction Begins at School*". This campaign has given a worldwide impulse to efforts aimed at encouraging the integration of disaster risk education in school curricula in countries vulnerable to natural hazards and the safe construction and renovating of school buildings to withstand natural hazards.

The Department of Provincial and Local Governance (1999) passed a White Paper No. 23 of 1999 that made provision for disaster management to be integrated into the school curriculum. The National Disaster Management Framework of 2005 propagates education for disaster risk management professionals and practitioners in associated professions as well as the integration of disaster risk reduction education in primary and secondary school curricula.

Delegates attending the Conference on Disaster Risk Reduction held on 17 and 18 October 2007 at Mentorskraal, Jeffrey's Bay, adopted the following resolutions related to education:

- 1. All places of learning and especially places of higher education should integrate disaster management into course materials across all subject matter and ensure that they have educators with relevant training presenting the disaster management subject.*
- 2. The SA National Minister of Education should strengthen disaster risk reduction in the school curriculum to develop future adults who are able to identify hazardous situations within their own community and ways of reducing disaster risk through proper application of sustainable developmental practices.*

The National Curriculum Statements as reported by the Department of Education (2002:57) stipulates that the Grade 7 learning outcomes of Social Sciences should focus on the general knowledge of natural hazards and epidemics. In this grade, learners are expected to make informed decisions about social and environmental issues through identifying, understanding

and making choices as well as providing alternatives. The knowledge focus of this grade is reflected in learners providing simple explanations of how natural hazards occur, the impact of hazards on people's lives, why some people are more at risk than others, who are at risk and management of risks and risk reduction. There seems to be less focus on how learners should respond when faced with hazards and disasters.

Although there are provisions in the South African curriculum policy that intend to ensure that learners are taught about hazards and disasters, authors such as Jansen (1998:323), Botha (2002: 366) and Mason (1999:138) raised concerns that the curriculum reforms are done hastily and also that it would be difficult for educators to implement the policy provisions. Rogan and Grayson (2003:1171) argue that in many cases curricula are well designed and aim to achieve better results; however the designers and developers focus on the “what” of curriculum change and neglect the “how” as evidenced by the case of Curriculum 2005 that hopelessly underestimated and inadequately supported the implementation of curriculum change. Rogan (2007:98) further argues that Curriculum 2005 reveals a clear awareness of the magnitude of a paradigm shift from the past educational system but lacks the details on how the policy directives might be realised in practice. In a case study done in Mpumalanga, Rogan and Aldous (2005:328) observed that during classroom practice, educators have a tendency to revert to pre-Curriculum 2005 practices and that not many aspects of the new policy have been understood and internalised by educators.

Vandeyar and Killen (2007:101), after conducting research on educator's classroom practice, concluded that although there has been a radical education system overhaul in South Africa, classroom practices have remained unchanged with educators using the same pedagogical practices they were using a decade ago. Botha (2002:366) argues that new educators trained under the old education system are tasked with the responsibilities of bringing educational change but are still locked into a Eurocentric-specific paradigm. There is therefore a need to determine how educators address learners' awareness of hazards and disasters in their classroom.

Since only the Grade 7 Social Science learning area has provisions for teaching hazards and disasters, this implies that learners could go through their early schooling years from Grade 1

to 6 without being taught anything about hazards and disasters; depending on how well they have been taught in Grade 7 especially if they do not select Social Science stream in the senior phase, they will never know how to respond appropriately to disaster outbreak.

The major concern of this study is whether curriculum and instructional design contribute to learners' awareness of hazards and disasters. The discussions in the background section have pointed out that the South African education systems underwent major changes in 1997 with the introduction of Curriculum 2005, in 2001 changed to NCS and in 2010 a discussion document on Curriculum Assessment Policy Statements (CAPS) was released as a new policy document that would inform the future curriculum implementation in South Africa. The critical concern about curriculum is whether there is translation of curriculum policy to instructional design stipulated as learning programme development in the NCS and whether this learning programme is being used in the classroom by educators. Considering that some researchers such as Jansen (1998:327), Botha (2002:362), Teacher Education (1999:178) and Harber in Griffin (2002:120) are adamant that there is no adequate translation of curriculum policy provisions to classroom practice, this raises questions whether schools teach learners about hazards and disasters so as to prepare them to respond appropriately when faced with the outbreak of catastrophic events.

Also one needs to determine whether indigenous knowledge as another form of education contributes to learners' awareness of hazards and disasters. From reviewed literature such as the UNESCO (2007) report, ISDR report, Fothergill and Peek (2004:92), Paton and Johnston (2001:274), Shaw et al (2004:41) and Hosseini and Izadkhah (2006:649) there is strong evidence that the more prepared and knowledgeable a community is, the more resilient it becomes to disasters. If communities have knowledge of possible disasters that could occur in their vicinity, they develop ways to mitigate the effects of the disaster outbreak as well as survival traits after the unavoidable disaster. Briggs (2005:100), Agrawal (2004:2) and Rautela (2005:235) support the idea that indigenous knowledge is central to later debates on sustainable development because of the way in which such knowledge has apparently allowed people to live in harmony with nature through generations. Arredondo and Rucinsky (1997:296), Fisher and McDonald (2004:240), Morton (1993:2) and Creese (2005:3) argue that integrated teaching helps to bridge different subject perspectives, to make connections

between subjects explicit, and to place emphasis on learners' use of knowledge and skills while increasing direct student interest and active involvement in learning.

1.4 The main research question and secondary research questions

The main research question for this study is phrased as follows:

How does the South African education system, in particular curriculum and instructional design, contribute to enhancing learners' awareness of hazards and resilience to disasters?

In order to understand the depth of the problem, the following secondary research questions are posed as follows:

1. What disasters are prevalent in South Africa?
2. To what extent are South African communities vulnerable to such disasters?
3. How do the South African national curricula cater for the teaching of hazards and disasters?
4. How could indigenous knowledge and integrated teaching enhance learners' awareness of hazards and resilience to disaster?
5. What other teaching strategies could enhance learners' awareness of hazards and disasters?

1.5 Rationale for the study

The aim of the study is to determine how education, in particular curriculum and instructional design, contributes to learners' awareness of hazards and resilience to disasters. According to Ronan and Johnston (2001:1055) virtually no research has examined the hypothesised benefits of hazard education programmes for youth in helping to increase community resilience. Their research examined various aspects of hazards programs in relation to a wide range of child and parent reported hazard adjustments in a sample of 560 school children. Additional factors assessed include children's' risk perceptions, knowledge of response-related protective activities and hazard-related emotional factors. Overall, the results support

the role of hazard education programmes in increasing hazard adjustments. Based on their findings, Ronan and Johnston (2001:1062) conclude that there is a need for specific disaster knowledge; multiple programme involvement over time; and most importantly, promotion of increased interaction between children and parents. Their overall findings support the idea that hazard education programmes for youth provide a gateway through which communities can increase their resilience to the effects of a major hazardous event. Their findings also provide a foundation for further research in this emerging area.

Even though the NCS makes provision for learning outcomes on hazards and disasters, there is a need to determine whether educators indeed teach learners awareness of hazards and disasters, especially when one considers the responses from scholars such as Jansen (1998), Rogan and Grayson (2003), Vandeyar and Killen (2007) and Rogan and Aldous (2005) who are sceptical about the effectiveness and impact of the post-apartheid education reforms in South Africa and these are examined in depth in Chapter two.

1.6 Significance of the study

UNESCO (2007) is committed to playing a pivotal role in the implementation of the Hyogo Framework for Action on Disaster Resilience 2005 – 2015 that promotes the advancement of knowledge to understand natural hazards by strengthening education, public awareness and communication towards disaster preparedness. This UNESCO commitment is an indication that the understanding of hazards and disasters from an educational perspective would enhance the communities' responses and resilience. The UNESCO report acknowledges that increasing vulnerability to disasters poses a major threat to sustainable development and often afflicts poor populations.

There are many disaster management agencies, fire fighters and other institutions that conduct outreach programmes in South Africa to sensitise the community about the dangers of hazards. However, the rate of hazards and disasters affecting the communities in South Africa is increasing at an alarming rate. From my personal observation and watching SABC news, many informal settlements experience floods and fires and are located within multiple hazardous zones. These hazards are coupled with the increase of TB (XDR and MDR) and

HIV/AIDS infections that are growing at an alarming rate irrespective of many existing HIV/AIDS awareness programmes.



Picture 1.1: Depiction of Ivory Park informal settlement situated next to multiple storm water pipes and heavy electric cables

Considering the outbreaks of fires, droughts and floods constantly reported on the news coupled with increasing new infections, it is imperative that there is some form of intervention to battle these potential disasters. Although one size does not always fit all, the findings of this study could be used as a model response to the challenges faced by vulnerable informal settlements in other countries. The research findings are expected to provide advice to school authorities, educators, informal settlement communities and curriculum developers about the status of school disaster education and will contribute to the body of existing data on disaster education in informal settlements. Furthermore, this study is relevant because it afforded the researcher to the opportunity advance his research skills in order to contribute to the scholarly community.

1.7 Aim and objectives of the study

It has been stressed in the introduction that the purpose of this study is to determine how South African education, in particular curriculum and instructional design, can assist learners to become resilient during the outbreak of disasters.

To achieve this aim, the following objectives have been operationalised:

- Review documents and other literature to identify disasters that are prevalent in South Africa and those that are likely to occur.
- Determine the extent of South African communities' vulnerability to disasters.
- Determine how the South African National Curriculum Statements and other regulatory documents make provision for teaching learners about hazards and disasters.
- Solicit the views of educators and disaster education specialists on the importance of enhancing learners' knowledge and skills pertaining to hazards.
- Determine how learning strategies such as indigenous knowledge and integrated teaching could enhance learners' awareness of hazards and resilience to disasters.
- Determine what other instructional design strategies could inform and enhance learners' awareness of hazards and resilience to disasters.

1.8 Conceptual framework guiding the empirical data collection for the study

While discussing the problem statement as well as the introductory arguments underpinning the rationale of this investigation, it was made clear that vulnerability is the key challenge for South African communities and most importantly schools that are located in informal settlements. While the 2004 tsunami, 2010 Haiti and Chile earthquakes have proved that the outbreak of disasters affects communities indiscriminately, evidence has surfaced from literature such as the research of Reid and Vogel (2006:196), Mgquba and Vogel (2004:37), Napier and Rubin (2002:5) that communities residing in informal settlements are more vulnerable and are the ones who suffer greater losses than their counterparts in established settlements. Education and training have been hailed by UNESCO (2007) as a possible antidote for making communities aware of hazards and of ways in which to respond to

disasters. Education, in particular curriculum and teaching, are regarded as important pillars to address the key challenge for learners to be able to live in harmony with hazards prevalent in their areas and even to become resilient during disaster outbreaks.

The review of literature led to the decision for this study to address the questions raised in the problem statement section, the framework should include concepts such as vulnerability, education and training as well as resilience. According to Fothergill and Peek (2004:90), during the early 1990s, social scientists who studied disasters began examining issues of vulnerability and resilience. These researchers concluded that resilience is different from vulnerability in that the former refers to a person's or group's capacity to anticipate, cope with, resist and recover from the impact of a natural hazard while the latter refers to a community residing in an area that is prone to loss of life, property or disruption of the normal life of many people.

Alexander (1997:292) noted that *vulnerability* to disasters is the result of poverty and the fact that the poor and the landless are often constrained to live on the most dangerous sites that makes it difficult to institute measures to increase community resistance to losses and casualties. Pelling and Uitto (2001:51) define human vulnerability as a product of physical exposure to natural hazards and human capacity to prepare, mitigate and recover from any impacts of disasters. In the South African context, informal settlements are mushrooming, which results in increased vulnerability of the population of such settlements. The reality is that in such settlements there are school-going children who are more vulnerable than their adult counterparts. The following question could be raised in this instance: Are these learners aware of hazards prevalent in their community and do they know how to respond in case there is a disaster in their community?

Understanding vulnerability is essential because recognising its effects and the role of disasters will encourage communities to take action, curriculum specialists to include properties of hazards and disasters in curriculum development and, most importantly, educators to develop learning programmes that will enhance learners' knowledge and skills to respond to hazards and disasters in their area.

Resilience is important in this study because it is a given fact that when a disaster occurs, it is usually sudden and in most cases it cannot be prevented. The review of literature has provided adequate evidence that it is possible to assist learners who are victims of disasters to continue living, irrespective of disruptions or losses incurred. Numerous researchers agree that enhancing community resilience needs a multi-pronged approach that entails more than providing information to residents. It is, however, important to note Rose's (2004:307) observation that researchers are confronted with difficulties in conceptualising resilient actions, modelling individual, group and community behaviour in a single framework and that empirically it is difficult to gather data on resilience or specify models.

Different viewpoints have been put forward, amongst them that of Paton (2003:211), who inferred that the adoption process of preparedness comprises three phases. The first relates to factors that motivate people, the second refers to variables that link the initial motivation with the formation of intentions while the third phase describes the relationship between preparatory intentions and actual preparation. The author argues that the assumption that providing the public with information on hazards and how to mitigate their consequences will encourage preparation is unfounded and hence he propagates a framework that moves from focusing on antecedents of behaviour to one that focuses on the cognitive process that underpins behaviour change. To develop a programme that would be able to enhance behaviour change, educators need a deep knowledge of common disasters that may affect the community and the prevalence of hazards in a given area.

The national curriculum is critical as part of the conceptual framework because it serves as a roadmap for educators when they design their learning programmes. McIvor and Paton (2007: 80) as well as Paton and Johnston (2001:273) believe in enhancing disaster resilience through school education and their ideas are supported by other researchers such as Shaw et al., (2004:46), Shiwaku et al., (2007), Hosseini and Izadkhah (2006:650) and Ozmen (2006:392) who maintain that school education is important to ensure that learners respond appropriately when they are faced with a disastrous event. The need for a curriculum that is responsive to the needs of communities is stressed by researchers such as Mathers and Rowland (1997), Van der Akker and Verloop (1994) and Van der Akker (1988). According to Carl (2005:223), Kirk and Macdonald (2001:552) teachers' voice is crucial during

curriculum development and disregarding their voice might result in a distorted view of a curriculum that is un-implementable.

As explained above, the South African education system underwent tremendous reform in the late 1990s, which Jansen (1999: 323) believes was driven by political imperatives. Jansen's idea is supported by Nakabugo and Siebörger (2000:53) who maintains that the pressure to produce the new curriculum and the need to adapt instruction in South African schools were necessitated by the need to remove the worst features of apartheid that were manifest in the existing syllabuses. Botha (2002:361) supports Jansen's idea by stating that during the 1990s, education in South Africa was in turmoil and experienced a major crisis characterised by among other things, challenges in the provision of equal access to schools, unequal educational opportunities, irrelevant curricula, inadequate finances and facilities, shortages of educational materials, inequalities in South African society and more emphasis on rote learning and unimaginative teaching methods which made change necessary. To put this in Mason's (1999:141) words:

Apartheid's legacy is both a desperately under-educated population and a school system lying in tatters. OBE is a significant attempt to seize the opportunities generated by a society in charge to address this dismal situation.

In 1997 Outcomes Based Education (OBE) was confirmed as a curriculum policy of South Africa through Curriculum 2005, in 2001 amended and renamed National Curriculum Statements. An amended policy discussion referred to as the Curriculum Assessment Policy Statement is currently being prepared for implementation early 2011. The most important aspect of these curriculum reforms is the introduction of learning programmes developed at the national level for each of the learning areas to ensure the achievement of national standards set by curriculum policy documents. Learning programmes are defined as structured and systematic arrangements of activities that promote the attainment of learning outcomes and assessment standards. According to the NCS (2003:13), learning outcomes describes what knowledge, skills and values learners should know, demonstrate and be able to do at the end of learning while the assessment standards describe the level at which learners should demonstrate their achievement of the learning outcomes.

South African education scholars such as Jansen (1998 & 1999), Botha (2002), Griffin (2002), Fiske and Ladd (2005), Rogan (2007), Rogan and Aldous (2004), Vandeyar and Killen (2007), Nakabugo and Siebörger (2000) Mason (1999) agree that the educational reforms were necessitated by the change of political regime and in most instances they all agree that there was a need to reform the education system. There is however disagreement on whether the path taken by the new political authority in introducing OBE which culminated in Curriculum 2005, NCS and now moving towards CAPS was the correct one. Borrowing from the advocates of curriculum responsiveness and curriculum integration, my thesis will argue that while these reforms were needed and timely, it is also argued that there is a need for education to respond to current challenges such as increasing devastation by disasters. Also the principle of integration is essential in ensuring that learners experience learning areas as linked and related especially when dealing with hazards and disaster learning outcomes. Moll (2004:3) maintains that the concept “curriculum responsiveness” is unique to South Africa, has immediate appeal and promises some positively formulated benchmarks against which education programmes might be judged as to whether they meet the needs of a transforming society. These two concept “curriculum responsive and curriculum integration would be used as a basis to determine whether hazards and disasters are taught to learners.

As part of the framework, *indigenous knowledge* will also be investigated to determine whether it contributes to learners’ awareness of hazards and resilience to disasters. Briggs (2005:100), Agrawal (2004:2) and Rautela (2005:235) support the idea that indigenous knowledge is central to later debates on sustainable development because of the way in which such knowledge has apparently allowed people to live in harmony with nature through generations. Stevenson (1996:280), Gaillard (2007:524), Gupta and Sharma (2006:70), Snively and Corsiglia (2001:26), Hellier and Newton and Gaona (1999:887) support the idea of indigenous knowledge as an education strategy that education could use to enhance learners’ awareness, knowledge and application of key learning concepts. In the South African context there is a political push to include indigenous knowledge in education, health, agriculture and other sectors of society. In education, indigenous knowledge is recorded as part of NCS principles where learners are expected to value it and use it in their problem solving.

Instructional design is essential for enhancing learners' knowledge, application and problem solving skills. As discussed above, the NCS propagates that a learning programme will be developed nationally to ensure achievement of national standards and it will link well with learning outcomes and assessment standards. The critical challenge for this study is to determine whether this happens in the context of hazards and disasters. A careful review of how other countries teach learners how to respond to hazards and disasters, showed teaching through a collective approach by different educators could produce effective synergy that would have a far reaching impact on preparing learners to respond appropriately to hazards and disasters. According to Arredondo and Rucinsky (1997:287), the collective efforts have been labelled differently by numerous authors who call it multidisciplinary, interdisciplinary, trans-disciplinary, thematic, and integrated or team teaching. For the purpose of this research the term *integrated teaching* was adopted as a simple way of referring to collective efforts by different learning area educators to develop and teach learners on the same topic. For example, a Mathematics educator will concern herself with calculations embedded in issues of hazards and disasters. These could be the depth of the river that people can swim across, how far they should play from high voltage electrical power cables, statistical issues involved in health hazards, etc. The Natural Science educator could focus on health, environmental or biological issues involved in hazards and disasters while educators of Economic and Management Sciences could focus on the economic loss of an event or health hazards.

1.9. Research design and methodology

In this study a multiple methods research approach was used combining complementary qualitative and quantitative strategies to improve the validity and reliability of the study. The study used document study, questionnaires and interviews to collect data from participants. The triangulation of data was done to determine whether there were discrepancies, corroboration or new insights that surfaced.

1.10 Conclusion

The conceptual framework was discussed in this chapter which explains the basis on which the investigation will proceed. More information on these critical issues is discussed in depth in the subsequent chapters. Chapter two provides a conceptual framework for addressing the main research question and to answer the first two secondary research questions. Chapter three focuses on an in depth discussion of strategies used to collect empirical research data. Chapter four outlines data collection and data analysis while Chapter five provides recommendations, implications and conclusions of the study. This study is important not only because it involves an important topic that is currently affecting South Africans, but also because it explores the use of new instructional design that would contribute to enhancing learners knowledge and skills in dealing with disasters.

Chapter 2

Literature review on the contribution of education to learners' awareness of hazards and disasters

2.1 Introduction

The purpose of Chapter two is to review how literature addresses the question of how education, in particular curriculum and instructional design, contributes to learners' awareness of hazards and resilience to disasters. The chapter starts with an overview of what disasters are experienced globally and how education contributes to communities being aware of such disasters. The chapter further evaluates how scholars have addressed the question of educational contribution to disaster awareness and identifies core concepts emanating from the literature review to guide the collection of empirical data. The chapter also addresses the conceptual framework that was used to develop the questions for interviews and questionnaires.

As a way of introduction to the conceptual framework discussed in 1.8, Frost-Killian's (2008:28) views serve as a point of departure and provide a rationale to investigate the role of education in hazards and disaster awareness raising as reflected below.

As we go about our daily business, the solid Earth seems safe enough, but there's far more going on beneath the surface than meets the eye. Things can change in a devastating flash through floods, earthquakes and other disasters that displace or kill the whole communities of people. The more we understand the natural forces that control the familiar landscapes of water, rocks and soils the better we can calculate – and minimise – the risks to people and property.

2.2 Overview of disasters

Alexander (1997:289) reviewed disaster literature for two decades and concluded that there is no agreement in the literature on the definition of disasters even though there is consensus on

elements that could be used to define disaster, such as number of deaths, value of damage and loss, impact upon the social system and geophysical variables. Shaluf (2007:687) maintains that disasters have been a subject of research and a source of concern for academics, governments and independent agencies, and classifies disasters into three broad categories, the natural, human-induced and hybrid. Alexander (1997:290) defines disaster as a rapid, sustained or profound impact of the geophysical world upon human lives and socio-economic means of support. Although there is no agreement among scholars on the concept *disaster*, based on a review of disaster literature, one could settle on the definition as suggested by Paton (2003:210), Paton and Johnston (2001:270) and Alexander (1997:289) that relates disasters to those events that displace the structural, economic, organisational, cultural and spiritual wellbeing of communities by destroying their means of existence. Disasters could be either human-induced or natural occurrences; disasters are natural if they just happen without being induced by humans like tsunamis, volcanoes, earthquakes, storms and floods.

A related concept, *hazards*, also has been a subject of scholarly debate and is closely related to the concept of disaster as the two go hand in hand and are used as such in this study. Sabates-Wheeler, Devereux, Mitchell, Tanner, Davies and Leavy (2008:11) define hazards as events which, if they materialise, can adversely affect the community's well-being. The argument emanating from this definition of hazards is that the difference between a disaster and a hazard is that communities can learn to live with the latter as long as they are well prepared and are able to prevent it from resulting in loss of lives and properties. The hazard becomes a disaster only if it displaces the well-being of communities and destroys their means of existence.

Shaluf (2007:687) identified a disaster tree with three categories of disasters, natural, human-induced and hybrid which he expanded as indicated in Figure 2.1 below. The disaster tree is important because it gives an overview of disasters that are prevalent across the globe and in this study it will be reviewed against disasters that are prevalent in South Africa.

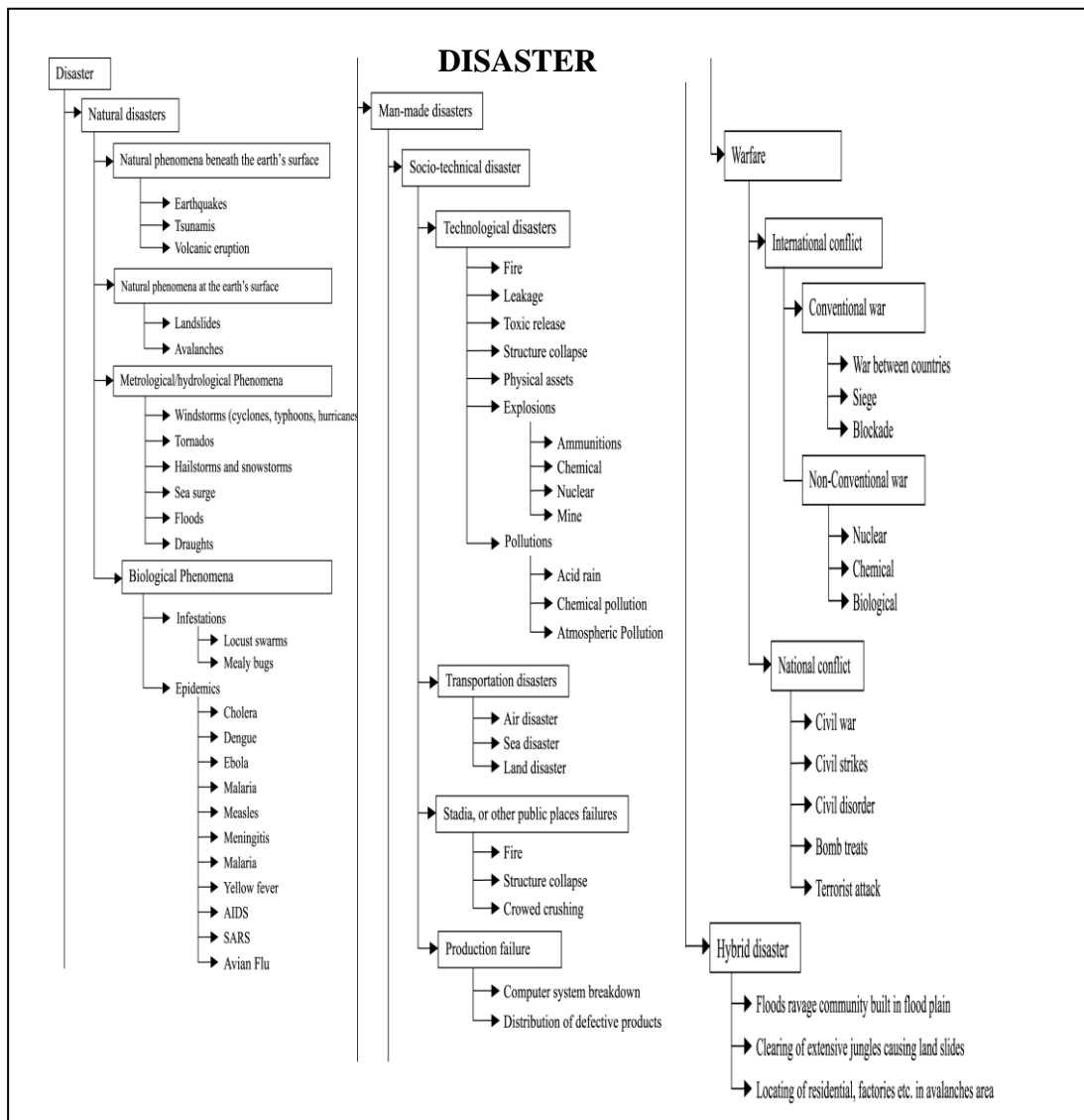


Figure 2.1: Disaster tree depicting the overview of disasters by Shaluf (2007)

Figure 2.1 provides crucial information that gives an overview of disasters that have affected the global community over time and serves as a point of departure; it provided a holistic picture of disasters affecting the global community and disasters that are particular to South Africa. A close scrutiny of Figure 2.1, shows that Shaluf (2007:701) has divided the types of disaster into categories and sub-categories. For example in the first category titled *Natural disasters* there are four sub-categories named natural phenomena beneath the earth's surface, such as earthquakes, tsunamis and volcanic eruption, the natural phenomena on the earth's surface, such as landslides and avalanches. Shaluf (2007:701) provides an overview of disasters that are affecting the global communities.

The last two sub-categories of meteorological and biological disasters are prevalent in South Africa and the most common ones include windstorms, hailstorms, floods and droughts. Biological disasters such as infestations and epidemics are prevalent as well. Epidemics such as malaria cited by Hemingway (2004:475) and Berriman (2004:452), tuberculosis cited by Van Pitius, Warren and Van Helden (2004:465), Kana and Mizrahi (2005:7) and Boshoff, Barry III and Mizrahi (2004:471) and HIV/AIDS cited by Martin and Williamson (2004:479), Hargrove (2008:53), Gregson, Waddel and Chandiwana (2001:467) and Martin (2005) are being regarded as disasters in Africa. While I indicated that learners should be taught about disasters such as earthquakes, landslides, volcanic eruptions and tsunamis because they might encounter them in the future, my emphasis is that biological and socio-technical disasters should be given first priority in the curriculum and instructional design.

The second category of human-induced disasters is divided into socio-technical disasters and warfare. The sub-categories for socio-technical disasters include technological disasters such as fires, gas leakages, toxic releases, and the last sub-categories include transport disasters, public places failures and production failures. Schneider (2000:99) maintains that industrial and workplace disasters are commonplace and include toxic substances, flammable materials, explosive materials, excessive noise, biologically active materials, heat or cold stress. Mulegeta, Ayonghe, Daby, Dube, Gudyanga, Lucio and Durrheim (2007:12) identified human-induced disasters such as air and water pollution, gas flaring and small scale mining, toxic waste disposal, land degradation, conflict related hazards and climate change as the most prevalent disasters within sub-Saharan Africa. These disasters can occur at any-time and anywhere which makes them critical as part of this study.

Shaluf (2007:699) adds conflict-related disasters relating to refugees and asylum seekers that easily stimulate xenophobia attacks. The idea of social conflict as a disaster is supported by Trim (2004:222) who maintains that there is an issue of resentment and ill feeling towards the group of displaced people from citizens of the country in which they seek shelter. South Africa experienced xenophobic attacks in 2008 where people from neighbouring countries were attacked and their property burned or stolen. Now and then there are reports of another

possible outbreak. It is therefore important for the South Africa national curriculum to focus on ways that can reduce the risk of social conflicts.

From watching news on national television, it is obvious that the global community is bombarded with news about the outbreak of disasters of some type almost every month. A search on different internet sites such as Infoplease, National Disaster Management Centre website and Prevention Web reveals that more than one major disaster is reported per month. The Infoplease Online Media have consolidated a list of disasters from January to July 2008 as depicted in Figure 2.2. A glance at the different types of disasters listed in Figure 2.2 makes one wonder what qualifies an event as disaster. This dilemma confirms Alexander's (1997:289) observation that there is no agreement on the definition of disasters. The dilemma comes from the variety of catastrophic events listed in the Figure 2.2 and there has been constant debate in the South African media about when to declare events such as wild fires, floods, crime, HIV/AIDS and the June 2008 xenophobic attack as disasters.

2008 Disasters

January 2008 Disasters

Jan. 1–4, Kenya: more than 300 people are killed and thousands of houses, farms, and businesses are burned nationwide in violent riots between Luo and Kikuyu tribes after incumbent president Mwai Kibaki, a Kikuyu, defeats opposition candidate Raila Odinga, a Luo, in the presidential election.

Jan. 7–8, Ark., Ill., Mo., Wis.: a series of tornadoes caused by record-breaking temperatures kill at least six people, including two children, destroy houses, and flood roads.

Jan. 28, eastern and southern China: severe snowstorms leave at least 24 people dead and affect 78 million people overall, including 827,000 emergency evacuees. About half of the 31 provinces are without power, which strands at least 600,000 train passengers, and at least 19 major airports close. The economic cost of the storm is projected to be \$3.2 billion.

February 2008 Disasters

Feb. 3, Dem. Rep. of the Congo: at least 45 people are killed and about 450 more injured after two strong earthquakes, one at 6.0 magnitude and the other at 5.0, strike the Congo.

Feb. 5–6, Tenn., Ark., Ala., Ky., Mo.: at least 55 people are killed and hundreds more injured after violent tornadoes rip through the southern United States. According to emergency officials, the victims include 31 people in Tennessee, 13 in Arkansas, 7 in Kentucky, and 3 in Alabama.

Feb. 21, Venezuela: a Venezuelan passenger plane crashes into an Andean Mountain within the Sierra La Culata National Park killing all 46 people aboard.

March 2008 Disasters

March 14–15, Georgia: two people are killed and at least 30 people are injured when violent tornadoes strike Atlanta and north-western counties of Georgia including Polk County and Floyd County. The storms cause damage to the CNN Center, the Georgia Dome, and the Convention Center in Atlanta, and leave thousands of homes without power statewide.

March 17–19, Ark., Ill., Ky., Mo., Ohio: 13 people die, hundreds of people are evacuated from their homes, and hundreds of roads are closed during major floods that stretch from Texas to Pennsylvania.

April 2008 Disasters

Ongoing since January, Brazil: More than 80 people have died and at least 75,399 infected in Rio de Janeiro since January during a dengue fever outbreak. In March, the Brazilian military opened three field hospitals to help control the epidemic. In April, after a month of heavy rains, trained members of the army and navy start a

30-day tour in the Rio State to identify mosquito breeding grounds and educate residents on dengue fever prevention.

April 29, Virginia: Three tornadoes strike Norfolk, Suffolk, and Colonial Heights, injuring over 200 people and destroying at least 140 homes.

May 2008 Disasters

May 1–2, Arkansas: seven people are killed and 13 more injured in Arkansas when storms hit 16 counties Thursday night and Friday morning.

May 3, Myanmar: Cyclone Nargis hits the Irrawaddy Delta and the city of Yangon, killing about 78,000 people. Most of the deaths and destruction were caused by a 12-foot high tidal wave that formed during the storm. Cyclone Nargis is the worst natural disaster since the tsunami in 2004.

May 11, Okla., Mo., Ga.: more than 20 people die and hundreds more are injured when tornadoes hit Missouri, Oklahoma, and Georgia. Racine, a town about 170 miles south of Kansas City, Missouri saw the most damage, leaving about 9,000 people without electricity for over three days.

May 12, China: over 67,000 people die and hundreds of thousands more are injured when a 7.9 magnitude earthquake strikes Sichuan, Gansu, and Yunnan Provinces in western China. Nearly 900 students were trapped when Juyuan Middle School in the Sichuan Province collapsed from the quake. On May 19, 158 rescue workers are killed in landslides caused by rain and floods. On May 27, 150,000 people are evacuated from the Sichuan Province in anticipation of major floods.

June 2008 Disasters

June 9–18, Ind., Iowa, Ill., Mo. and Wis.: severe flooding from storms cause already swollen rivers and lakes to flood, killing 10 people, breaking three dams, and causing thousands to evacuate their homes. In addition, at least 90 roads are closed. According to the National Weather Service, the Cedar River is 17 feet above flood stage, the worst flooding Cedar Rapids has ever seen.

June 11, Iowa: a tornado kills four Boy Scouts and injures 48 others, when it tears through the Little Sioux Scout Ranch in western Iowa. The tornado also touched down in Kansas, killing two people.

June 17, southern China: the worst flooding in 50 years kills over 60 people, destroys 5.4 million acres of crops, causes landslides, and leaves 13 people missing in nine southern Chinese provinces.

June 21, the Philippines: a ferry, the *Princess of the Stars*, is struck by Typhoon Fengshen, killing most of the 865 passengers and crew. There are 59 known survivors. Almost 500 other people die during the storm.

July 2008 Disasters

July 24, Japan: at least 90 people are injured and thousands of homes lose power when a 6.8 magnitude earthquake strikes 67 miles below the earth's surface in the region of Iwate.

Figure 2.2: Depiction of disasters that took place in 2008,

www.infoplease.com/world/disasters

According to Pelling and Uitto (2001:60) the global community has experienced devastating effects from disasters ranging from earthquakes, heat waves, floods, hurricanes, droughts and landslides to epidemics. Rose (2004:307) cautions that recent events have shown how vulnerable countries at all levels of development are to disasters while Mgquba and Vogel (2004:30) maintain that future changes in climate as well as changing social conditions, including the role of HIV/AIDS, governance and conflict, pose huge challenges for society at large. Reich (2006:794) argues that the disaster problem is not confined locally but it is an international phenomenon, especially considering the New York World Trade Centre destruction, the Sumatran tsunami tragedy, hurricane Katrina, war, and infectious diseases tragedies that continue to appear on the world stages. Bull-Kamanga, Diagne, Lavell, Leon, Lерise, MaGregor, Maskrey, Meshack, Pelling, Reid, Satterthwait, Songsore, Westgate and

Yitambe (2003:193) maintain that the urban population face a wide range of risks from everyday hazards to health risks posed by poor living conditions to large scale disasters that can result in heavy loss of life and property.

The UNDP (2004) reported that owing to human activities, the frequency, extent and severity of hydro-meteorological hazards is increasing and climatologists predict a further increase due to global change and this will have a significant impact on poorer communities. Concerns about the increase in climate change, technological advancements, manipulation of biological and chemical agents, as well as fears about nuclear accidents, lead to a view that the risk of a large scale disaster is looming globally.

UNDP (2004) distinguishes between hydro-meteorological/geological hazards, which include floods, droughts, wildfires, storms, earthquakes, volcanic eruptions as well as landslides, and biological hazards which arise from epidemics (HIV/AIDS, TB, Ebola, bird flu, foot and mouth disease, etc.) or from other biological sources such as pest swarms. Pelling (2003:21) identified two types of disaster, the catastrophic and chronic disaster. The characteristics of catastrophic are the same as hydro-meteorological while those of the chronic are similar to biological disasters associated with poor sanitation, unfit housing and polluted air.

While it is clear from Figure 2.1 that there are many disasters ranging from natural hazards and human-induced disasters to conflict related disasters, this study focused on finding out whether educators are aware that their area could be affected by disasters and identifying types of disasters that are prevalent in South Africa through reviewing the database of the National Disaster Management Centre (NDMC), scholars' writing about disasters in South Africa and other disaster related documentations.

If the South African situation is considered, some of the classifications as explained in the Shaluf disaster tree are relevant, while some are not. For example, from the natural disaster cluster South Africa has been affected to a lesser extent by natural phenomena beneath the earth's surface such as earthquakes and tsunamis. This notion is supported by Meiklejohn and Sumner (2005:11) who maintain that South Africa has a relatively steep coast and should not experience as much devastation as was recorded in Indonesia. However, the Department of

Provincial Affairs and Constitutional Development (1998) in the Green Paper on Disaster Management of 1998 recorded earthquakes as one of disasters afflicting the country. Not much research on South African vulnerability to earthquakes, tsunamis and volcanic eruptions has been reported in the literature even though these disasters are part of the grade 7 Social Science learning outcomes. Chris Hartnady (2010) however, gives a different perspective on earthquakes by reporting the following in *Science in Africa*'s online magazine:

The probability and likely impact of major earthquakes in southern Africa are difficult to quantify. The continent has limited historical records and there have been just three or four events of a magnitude of seven or higher on the Richter scale since 1900 — compared with hundreds globally in the last 30 years. Yet a major earthquake disaster in the region is inevitable because wide areas of southern Africa are affected by the slow southward spread of the East African rift system. It is not a question of if, but when.

The question emerging from this debate is whether learners should be taught about the phenomena beneath the earth's surface. My view is that it is essential that learners are taught for two reasons the first being that no matter how ninety-nine percent certain we are that these catastrophic events will not happen in South Africa, there is that extra one percent chance that it could happen. Take for example the 2004 tsunami, which took place far away from South Africa, that affected the Indian Ocean coastline area causing havoc in Durban and some parts of Cape Town's coastal area. The second reason is that South Africans travel to other countries for tourism and business and might be affected by such disasters while outside the country.

The greatest challenges for South Africa currently are both the meteorological hazards such as windstorms and floods as well as the biological phenomena such as epidemics especially HIV/AIDS, malaria, cholera and tuberculosis. Under social-technical disasters, fire has been a painful phenomenon for farmers, shack dwellers and industry owners. Of interest are the sewerage leakages, toxic releases, mine dumps, chemical spillages and acid rain, which if combined with floods explain the looming crisis in South Africa related to water being polluted by sewerage and mine acid as reported in numerous newspapers.

The conclusion emanating from the above discussions on the overview of disasters, that natural hazards and human-made disasters are in some instances becoming hybrid, should be a source of concern in South Africa mainly because education can help in ensuring that human-induced hazards do not result in disasters. To think that the information about these disasters could be taught in just one grade is to expect too much. The hazards and disasters are so diverse and have different signals and effects which would need to be taught across different grades and some could be even taught outside the classroom setting.

Mulegeta, Ayonghe, Daby, Dube, Gudyanga, Lucio and Durrheim (2007:4) maintain that Africa is a continent prone to a wide variety of natural and human-induced hazards and disasters such as floods, hurricanes, earthquakes, tsunamis, droughts, wildfires, pest plagues, and air and water pollution which cause extensive losses to livelihood and property, and claim lives. The National Disaster Management Framework (2005:1) reported that South Africa is exposed to a wide range of hazards including drought, cyclones, severe storms, severe floods and wildfires. The Framework further pointed out that large numbers of people live under conditions of vulnerability to chronic disasters in ecologically fragile or marginal areas.

As a way to deal with hazards and disasters, UNDP (2004) identified basic approaches to disaster risk reduction as follows:

- Understand the hazard (where and when and why it is likely to occur).
- Know which areas and communities are most vulnerable to hazards, and what capacities and capabilities are available to cope with disasters.
- Develop knowledge and information resources to enable the risks to be identified and potential impacts to be adequately assessed.
- Ensure political commitment to disaster risk reduction, at various levels, through policy development, legislation, organisational development and promoting community action.
- Increase education and raise awareness of the risks and motivate for changes in collective behaviour to reduce risks.
- Understand and take action to mitigate or relieve the socio-economic conditions that create or increase the vulnerability of a community.

- Implement environmental management and physical and technical measures to reduce risks to communities.
- Increase the coping capacity of communities through better communications, improved resources, etc.
- Have a disaster preparedness plan in place. This plan should cover both emergency management and recovery from the disaster.
- Develop hazard monitoring systems and early warning indicators.

These basic approaches to disaster risk reduction link well with the next section which explores the vulnerability of people living in informal settlements. Although the section stresses poverty as the key driver in the loss of lives and property during disastrous event, it does not in any way imply that poor people are the only vulnerable community.

2.3 The conceptual framework elements guiding the investigation

In the last chapter the conceptual framework for guiding this study was discussed. It consisted of hazards and disasters, vulnerability, resilience, preparedness and awareness as well as curriculum and instructional design, indigenous knowledge and integrated learning. The framework has as its assumption that education plays a critical role in preventing disasters from happening and, where they cannot be prevented, education ensures that affected individuals or communities are resilient. Where vulnerability is manifest, preparedness and awareness through education are needed otherwise the results would be catastrophic where loss of life and property occur. Even there, education would be needed to ensure that survivors continue with their lives. The conceptual framework elements would be discussed in the following sub-sections taking note also that disasters have already been discussed above examining what they entail and what is the situation in South Africa.

2.3.1 The importance of addressing vulnerability in disaster risk reduction

The concept of vulnerability comes first when one thinks of hazards as vulnerability usually leads to a person or community experiencing disasters. As indicated above, hazards and disasters go hand in hand and the glue that sticks them together is vulnerability. Paton and

Johnston (2001:272) maintain that knowledge of vulnerability is essential in understanding disaster preparedness, response and recovery and that it is defined in demographic and environmental characteristics. One of the lessons learnt from the devastating catastrophes discussed above, is that although there are advances in science and technology in particular providing early warning signals for disasters, such warnings rarely reach poor communities in time and they are caught unprepared while some communities are embedded in a disastrous area surrounded by multiple hazards. From his experience of the Wujal Wujal aboriginal community found in the Cape York Peninsula which was hit by Cyclone Rona, King (2000:223) noted that despite advances in communication technology, remote communities occasionally still fail to receive any warning at all, as transmitters fail, or remote area broadcasts are made from very distant locations where there is no knowledge of local conditions. Rao (2007:9) also maintains that warning signals are not taken seriously, as evidenced by what happened in December 2004 when people ignored warnings about possible dangerous waves by reporting that:

everyone on the beach like everywhere else in many countries around the Indian Ocean followed seaward to a point of no return, curiously watching the unusually receding tide, in a false-ebb which normally precedes a tsunami.

While warning signals are important, it must be noted that in most cases disasters both natural and human-induced just happen. Freund (2008:311) maintains that earthquakes cannot be predicted and therefore there are no warning signals: earthquakes strike suddenly, causing death and devastation without warning. Seismologists can only predict where an earthquake will occur but cannot pinpoint when it will occur. Anbalagan, Kohli and Chakraborty (2008:1613) maintain that landslides are usually caused by road and building construction, terracing for agriculture, deforestation and other activities which make them hard to predict also.

The caution by Pelling (2003:23) that daily exposures to low levels of risks can have the reverse effect of reducing people's willingness to prepare for the possibility of catastrophic disasters as risk becomes an accepted and normalised part of life, is worth noting. This statement implies that people who lives in a vulnerable environment get so used to it that they might not realise when disasters are about to strike. In real life this means that some people

would stay in a vulnerable place like an area prone to sinkholes for many years without anything happening to them and when they are warned about a looming disaster, they do not believe the warning. In such instances, the community need not only a warning of a looming disaster but also ways and means to reduce the risk of them being heavily affected.

As disasters get reported worldwide, they make people reflect on their situation and wonder whether they will suffer the same fate. Reich (2006:794) noted that shocking disasters can cause people to worry about society's disaster risk reduction planning and execution as a way to address the vulnerability factor. Taking the Haiti earthquake as an example, the *Hindustan Times* (2010) quoted the team leader of the South African rescue mission to Haiti, Ahmed Bham, saying that:

Haiti was already in a crisis when the earthquake happened. It was so over-populated; the structures were already collapsing. It took a lot of time to get help to all the people.

It seems that the Haiti society never thought that they could be hit by a disaster and hence it was difficult to provide assistance to the victims of the earthquake.

It is important to note an observation made by Gaillard (2007:523) that vulnerability reflects the daily conditions of society and that hazards should be viewed as the extension of everyday hardships wherein the victims are marginalised geographically, socially and politically as they live in hazard prone areas because they are poor and their voice is disregarded. Alexander (1997:291) supports the notion by stating that vulnerability is correlated with the underprivileged, with past losses and with susceptibility to future losses. Fothergill and Peek (2004:91) also observe that poor people around the world suffer the greatest disaster losses and have the most limited access to public and private recovery assets, in developing societies as well as in wealthy industrialized nations.

The reason Alexander (1997:295) stresses the point of poverty is that the people who bear the heaviest burden of disasters are the poor, dispossessed and marginalised and in most instances are least likely to benefit from the information technology revolution. Pelling (2003) supports the point of poverty by stating that it is communities of the poor and marginalised that face living with the greatest threats to health and livelihoods from natural

disasters as well as coping with everyday risks from living and working in a hazardous environment. Pelling (2003) also mentions that the effects of disasters are felt most by people having to live with multiple risk types such as crime, violence, disease, unemployment, pollution and technological as well as environmental hazards.

Fothergill and Peek (2004:90) conducted a synthesis of literature on poverty and disasters to determine how the two relate to each other. These researchers found that disasters do not affect all members of society equally. They further allege that disaster scholars, and to a lesser extent the general public, have acknowledged that disasters do not indiscriminately distribute risk and vulnerability or eliminate pre-existing systems of a stratified nature. However, poor people around the world suffer the greatest disaster losses and have the most limited access to public and private recovery assets, both in developing societies as well as wealthy industrialised nations. Fothergill and Peek (2004:104) concluded that the poor are more likely to perceive hazards as risky; less likely to prepare for hazards or buy insurance; less likely to respond to warnings; more likely to die, suffer injuries and have proportionately higher material losses; have more psychological trauma; and face more obstacles during the phases of response, recovery and reconstruction. Schilderman (2004:414) supports this idea by stating that natural disasters are on the increase not so much because natural hazards are growing in numbers but because poor people are becoming more vulnerable. The issue of linking poor living conditions with disasters is supported by Mgquba and Vogel (2004:32) who conducted a study at Alexandra Township and noted that Alexandra has always been one of the poorest and most impoverished of the black townships in South Africa.

Discussions in the above section, indicate that poverty is a key driver for vulnerability even though it should be noted that there are many poor people who have not experienced disasters that the people living in informal settlements have. If the South African situation is considered, squatter settlements populated by poverty stricken communities reflect many risk factors which make the people residing in such areas vulnerable to disasters. In most cases such settlements are inhabited because of the availability of abandoned land and their close proximity to either the work environment or the city centre. Napier and Rubin (2002:6) concur that the lack of properly constructed houses and the dangerous location of informal settlements mean that when disaster strikes, informal settlement dwellers will not be able to

shoulder the destructive forces of floods, fire and storms. Bull-Kamanga et al. (2003:194) argue that urban specialists are increasingly recognising the considerable health burden that most low-income urban dwellers face from everyday hazards because of inadequate provision of water, sanitation and drainage, poor quality and overcrowded housing and poor management of pollution and road traffic.

These areas are usually abandoned by municipalities because they are located near streams of water, sink holes, high voltage electric lines and dumping grounds for industrial waste. In most squatter settlements people build their shacks close to each other with plastic and wooden materials. All these features of squatter settlements reflect what could be labelled as multiple hazards and if Gupta and Sharma's (2004:72) observation that poor vulnerable communities suffer the most multiple effects and unfathomable hardships during disasters is considered, then without doubt informal settlements are the most disaster prone areas in South Africa.

The picture below of the Khayelitsha informal settlement sums up the conditions in which these communities live.



Picture 2.1: A picture of Khayelitsha shacks built next to the railway tracks

The dangers of informal settlements located next to rail tracks as reported by the *Railway Africa* news (2006), are illustrated in Picture 2.2 as depicted above. The *Railway Africa* news maintain that:

Squatter camps, more politely known as informal settlements, are a big problem on African railways. Not surprisingly, recent increases in the phenomenon in South Africa have been matched by “an associated rise in the incidence of theft, vandalism and sabotage of rail equipment”, Spoornet CEO Siyabonga Gama told members of parliament on 13 November that people obstruct railway lines; stealing cables and stopping trains, then, there is theft from trains; and sometimes people damage signals. Spoornet emergency personnel have difficulty entering informal settlements, for instance following a rail accident, when residents try to hijack their vehicles. Palisade fencing is ineffective – it is stolen as soon as it is put up. Sabotage of signals, Gama said, could lead to accidents – very worrying in view of the hazardous material often conveyed. Within the 20m railway reserve alongside three major rail corridors, including Durban-Gauteng-Polokwane and important lines elsewhere in South Africa, 41 informal settlements – all considered “high-risk hot spots” – have come into existence. A further 165 settlements are deemed medium- and low-risk. The only solution, Gama suggests, is concrete fencing, with high-voltage electric wires on top. In terms of the Prevention of Illegal Eviction and Occupation of Land Act (which Gama wants amended), people may not be evicted unless alternative accommodation is provided. This does not mitigate the fact that squatter proximity to train operations exposes these communities to “severe danger.” Spoornet has budgeted close to R170m over the next three years to deal with the problem.

While the quotation above focused on the crime that happens as a result of informal settlements, the dangers of settlements located next to the railway tracks include children and other members of the community being hit by trains; cars and taxis being crashed into by trains and trains spilling dangerous chemicals into the community. These communities will therefore need to be made aware of the dangers and how to safeguard themselves.

Lack of housing in urban centres drives people to find alternative settlements, and informal settlements become the closest shelter they can find so that they can be near the cities. In the City of Cape Town alone there is a shortage of between 400 000 and 420 000 housing units and on average, every ten households have seven other families living with them or in their backyards because of that shortage. In eThekweni (Durban), the housing shortage last year stood at 190 000 units, while estimates for Tshwane put the shortage in the region of 330 000 units. The proliferation of informal settlements in and around just about every urban or semi-urban area in the country also testifies to the fact that for a substantial part of the South

African population, it is far from paradise on the housing front (www.servicepublication.co.za).

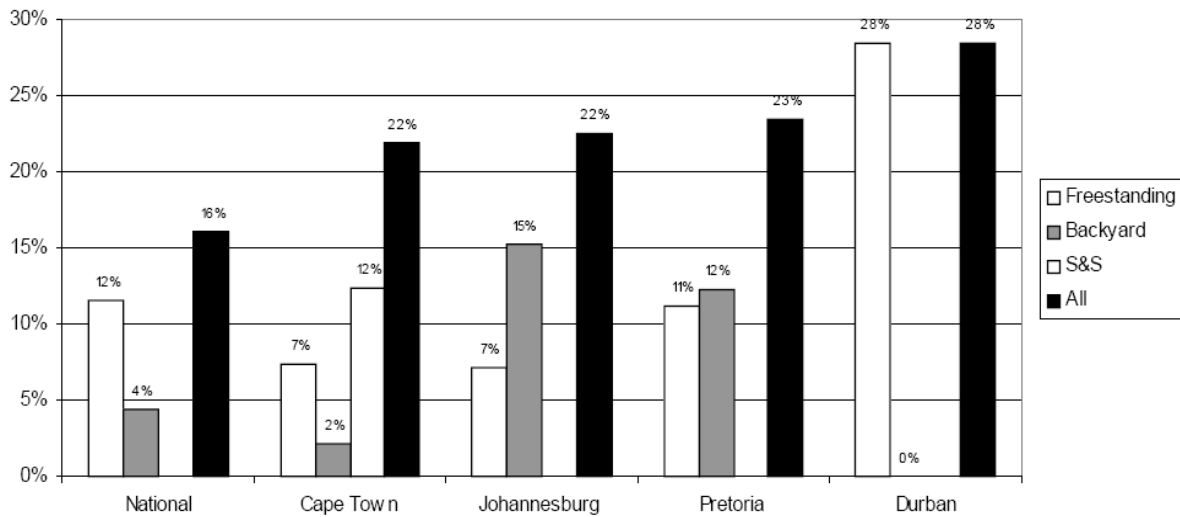


Figure 2.3: Comparisons of informal and formal settlements nationally and four major South African cities by Napier and Rubin (2002:5).

Napier and Rubin made a comparative analysis of informal and formal settlements nationally and in four major towns of South Africa: Figure 2.3 above shows the results of the analysis. The graph depicts percentages of settlement types per province concentrating on free standing, backyard shacks, sites and services. The most important aspect to note on the graph is that the major cities in South Africa have serious problems with informal settlement especially with shacks which house an estimated thirty percent of their population. Napier and Rubin (2002:5) maintain that this is a relatively high proportion of urban residents to be living in locations with a high degree risk. It poses environmental and health risks such as rapidly spreading fires, rising damp, collapsing structures and other epidemics such as waterborne diseases, HIV/AIDS and storms. King (2000:224) observed that the development of housing and facilities on river and beach frontages puts some of the local people at a greater risk. Trends suggest that migration and development are set to continue for many more years. The significance of Figure 2.3 is that it provides insight into the vulnerability of informal settlements to the effects of disasters.

South Africa has many informal settlements and one such settlement which displays the hazards and risk factors as explained above is Ivory Park. This notion is supported by Tempelhoff, Van Niekerk, Van Eeden, Gouws, Botha and Wurige (2009:99) who argue that since the second half of the 1980s South Africa's urban landscape has been noted for the prevalence of informal settlements on the periphery of the country's towns and cities. Most of the informal settlements in South Africa fit the criteria as set by Pelling (2003) that in many cities it is common for the majority of urban residents to be excluded from the formal housing market because of economic poverty and inappropriate financial sources that make it very difficult for low and middle income earners to obtain loans to build or buy dwellings in planned development. Mgquba and Vogel (2004:36) maintain that the vulnerability of these informal settlements was compounded by an interplay of complex aspects such colonialism, capitalism, apartheid and lack of political will by the current regime to prioritise disaster-risk reduction.

In Ivory Park informal settlement, in those shanty houses people use paraffin, gas stoves, coal fires and outdoor fires to cook as well as candles for lighting every night. In most instances one shanty house could be shared by five or more people. This is an indication of the extent to which the settlements are vulnerable to fires, epidemics and other disasters. Witnessing the appalling vulnerable conditions which these communities are subjected to, I kept on wondering whether the inhabitants were aware of the looming disasters in their lives, is the local government aware of their plight, were the surrounding schools aware of the situation which learners from this area face every day and whether the curriculum developers and enforcers were aware of disaster related issues experienced at the local level. The picture below was taken in one area of Ivory Park and shows the high voltage electric cables and a sewerage pipe running on top of some of the shacks, and the closeness of the shacks to each other, which would make it impossible for an ambulance or fire truck to move through.



Picture 2.2: Ivory Park informal settlement depicting shacks, high voltage electric cables and sewerage pipe running over some shacks

Pelling (2003) emphasises that the most detrimental effects of disasters are felt by people having to live with multiple risks such as those posed by crime, violence, disease, unemployment, pollution and technological as well as environmental hazards. Napier and Rubin (2002:14) maintain that fires in informal settlements are either large fires, which destroy hundreds of homes and affect many informal dwellers at a time, or small continuous fires that affect only a handful of people at a time but lead to serious sustainability and livelihood issues over time, causing misery and loss.

The media have been reporting isolated incidents of fires burning five to twenty shanty houses and in these instances, vulnerable population groups such as children, the disabled and elders were found to be victims of these disasters. The case study recorded by Napier and Rubin (2002:16) about a fire that broke out in the Joe Slovo informal settlement in 2000, indicates the need to understand societal vulnerability if informal settlement communities are to be prepared well in advance for disasters. *The Times* of Jan 30, 2009 reported as follows about the floods facing South Africa:

DESPERATE shack dwellers at flood flashpoints are cutting holes in the walls of their homes to prevent themselves and their few possessions being washed away. After three days of heavy rains, this is the stark reality facing residents of the Stjwetla informal settlement in Alexandra, northern Johannesburg.

Although South Africa has experienced incidents such as wildfires, epidemics, floods and storms that could be termed disasters, it has not experienced devastating disasters such as tsunamis and hurricanes like Katrina. There have been isolated incidents in South Africa where communities have called on the government to declare the incidents as disasters, such as the 2005 floods in KwaZulu-Natal, wildfires in the Western Cape. However, the prevalence of informal (squatter) settlements in South Africa poses a different challenge for disaster preparedness and mitigation as demonstrated by the January 2008 floods in Mamelodi, Soshanguve and Hammanskraal reported by the *Mail and Guardian* newspaper of 23 January 2008 under the title *Disaster centre activated as floods hit Pretoria* as reflected below:

The Tshwane metropolitan council has activated its disaster operations centre as several parts of Pretoria experienced flooding due to heavy rains in the city. "The centre operates 24 hours a day and includes emergency services and other personnel who will monitor the situation and ensure coordinated efforts," council spokesperson Console Tleane said on Wednesday. About 160 households from the Lusaka section in Mamelodi, east of Pretoria, had to be given temporary shelter as their homes were flooded. A local church and community hall in the nearby Stanza Bopape section were used as temporary shelters. "Many community members opted, however, to move back to their houses in spite of the water and rain still pouring down," Tleane said. The Lusaka section is in a flood plain but residents have in the past refused to move, insisting that the city should provide them with houses before they move. Emergency services had to help some residents of the Stinkwater informal settlement -- as well as in Hamanskraal -- to move to friends and families' houses as their own homes were flooded. The areas of Plastic View, close to Rosslyn, north-east of Pretoria, and Soshanguve were also affected by the continuous rainfall. "We had to help a few people move but thus far there were no reports of serious injuries or death due to the flooding," emergency services spokesperson Johan Pieterse said. He warned motorists not to use low water bridges and underpasses that were flooded. "Don't take a chance, rather use alternative routes," Pieterse said.

The city has asked for donations of blankets, food and other materials. People who wish to make donations can contact Sarah Modise at 012 358 4828. The emergency call centre can be contacted at 012 310 6300 or 012 310 6400 or 10177. – Sapa"

(Mail and Guardian, 23 January 2008)

Although disaster always affect the residents of informal settlements, the growth of these settlements never ceases it continues to mushroom. Holloway and Roomaney (2008:10) narrated a story told by one of the residents of an informal settlement from the Western Cape who was surprised by the vicious circle experienced by the residents of informal settlements.

Thabo watched the young man as he carried another sheet of corrugated iron down towards the river. Almost every day now, someone new was building a house in New Situ. He could still remember when there were only a few houses there. Things had been better then: there was more space, and people built their houses away from the river. Now, more and more people seemed to be arriving from the Eastern Cape, hoping to find jobs. There was no more space, but New Situ was close to the factories and other work opportunities in the towns nearby, and people kept coming in. The new ones didn't want to listen when he told them that it was unsafe to build by the river. They told him that such a small river would not cause trouble. They told him that he just wanted to prevent them joining the settlement. But they would see he was right in winter, when the river swelled with rain water. Every year, the houses by the river got flooded – sometimes they even got washed away. The people never stayed long after that, but always there were new people coming in to take their place. He wondered as he watched his little granddaughter chasing a chicken: how many more people would suffer this winter?

A study that is worth considering from the South African perspective and that has a bearing on the problem of vulnerability to disasters is an investigation by Mgquba and Vogel (2004:31) of the flood event of 2000 which indicates that vulnerability in Alexandra township is shown to be the product of political action, lack of access to resources and information, and is compounded by failure to enhance active community resilience. The researchers further noted that the current inability to effectively capture and track these cumulative risks and complex dynamics that underpin risks in poor, urban settings thwarts disaster-risk reduction and mitigation efforts. Mgquba and Vogel's (2004:32) research is essential for this study because they first conducted their research at a poor, urban setting; secondly they observed that vulnerability is a product of a lack of resources and information; thirdly they pointed out that community resilience needs to be enhanced. King (2000:227) strongly believes that everyone in the community has to know how to deal with the hazard, because the reality is that during an event, many thousands of people are going to be actively involved in providing assistance to the victims of disasters.

Reich (2006:794) observed that disasters can cause people to worry about society's planning and execution in responding to such stressful events. Landau and Saul (2004:14) maintain

that in order to assess the practical aspect of vulnerability to disasters, those factors that directly impact the community such as processes, structure, function and organisation should be thoroughly examined through asking questions such as “What resources are available within the community? How are they accessed and utilised? Do community members know stories about past adversities and how they were overcome?”

It is important to note that even though the informal settlement dwellers are mostly affected by disasters, they should not be viewed as the only sector vulnerable because disasters do not discriminate: they affect all communities. The discussions on national curriculum development reflect on learners from both formal and informal settlements. However, it is important to note that these settlements are not expected to respond in the same way to disasters mainly because the effects differ. Irrespective of the differences both communities need to learn how to respond to such disasters and must always be prepared.

My view is that education has a critical role to play in ensuring that people residing in vulnerable areas are aware of the looming disasters and most importantly learners should be taught ways in which they could positively respond when faced with disasters. My impression is that educators are currently teaching learners about hazards and disasters listed in the NCS and not on the hazards they experience in their everyday life. If this is true, then learners from informal settlements are at a higher risk of being affected more than anyone else. I take note that it would be difficult to emphasise the plight of learners in informal settlements in the national curriculum but the instructional design or learning programme development present ample opportunities to focus much attention on addressing the vulnerability of learners from informal settlements.

2.3.2 Enhancing learners’ resilience to disasters through education

The discussions on the concept of vulnerability have indicated that while some disasters could be prevented, there are some catastrophic events that happen any way and which are not preventable. In such instances communities need to continue living irrespective of the loss of loved ones and properties. Resilience is therefore important for victims of disasters and this section will focus on what it is, and how can it be attained.

According to Reid and Vogel (2006:196) a region's capacity to cope with, respond to and adapt to climate-risk will be determined by its overall vulnerability to climate variability. How communities respond and recover from disasters is quite a complicated matter and does not depend on a single strategy. This section explores how researchers, after studying the global communities' resilience in the face of past devastating and catastrophic events, came up with the definition of resilience as a desired state of coping with disasters.

Gaillard (2007:525) maintains that the concept of *resilience* is spread widely in the disaster literature in the 1990s and that it is still an object of conceptual debate among social scientists. Numerous researchers such as Reich (2006:793), Paton and Johnson (2001:272), Rose (2004:308) and Pelling and Uitto (2001:52) define resilience as the ability to bounce back and even to grow in the face of threats to survival or the capacity of a system to absorb or cushion against damage, loss or severe shock. O'Brien and Read (2005:354) define resilience as the ability at every level to detect, prevent, prepare for and if necessary handle and recover from disruptive challenge and argue that resilience brings together all elements of disaster mitigation, which are preparedness, response and recovery.

Gaillard (2007:523) adopts a definition that encompasses three levels, resilience through resistance to change; resilience through incremental change at the margins; and resilience through openness and adaptability. Landau and Saul (2004:1) define resilience as an active process of endurance, self-righting and growth in response to crisis and challenge as well as a community's capacity, hope and faith to withstand major trauma and loss, to overcome an adversity and to prevail, usually with increased resources, competence and connectedness. Paton and Johnston (2007:272) define resilience as the ability of communities to bounce back and recover, using their own resources influenced by personal characteristics and community practices such as coping style, self efficacy and social support. Self-efficacy refers to individuals' appraisals of what they know and what they are capable of performing, and people's receptivity to information and their likelihood of acting to deal with hazard consequences. Pelling (2003) supports the idea that if the social, economic and environmental costs of disasters are to be effectively reduced, there is a need to place more emphasis on a

holistic approach that involves risk assessment, risk reduction, early warning and disaster preparedness.

Developing local knowledge is important in disaster resilience and this is reflected by a number of researchers such as Rautela (2005:235) who indicates that the structural designs of the Kumaoni region have survived many earthquakes; without their earthquake-resistant structural designs they would have been razed to the ground.

Pelling (2003:21) identified five principles by means of which communities could enhance resilience to disasters: namely homeostasis, omnivory, high flux, flatness and butterfly. He maintains the following:

- The homeostasis principle is associated with systems that are maintained by feedback between components parts which signal changes and can enable learning and in this way resilience is enhanced when feedback is transmitted effectively.
- The omnivory principle refers to external shocks that are mitigated by diversifying resource requirements and their means of delivery. Failures to source or distribute resources can then be compensated by alternatives.
- The high flux principle maintains that the faster the movement of resources through the system, the more resources will be available at any given time to help cope with the perturbation.
- The flatness principle maintains that overly hierarchical systems are less flexible and hence less able to cope with surprise, and to adjust behaviour. The top-heavy approach will be less resilient.
- The butterfly principle is a system which has capacity in excess of its needs and can draw on this capacity in times of need, and is more resilient.

These discussions allow one to safely deduce that resilience in its narrow sense refers to the manner in which communities withstand the threats posed by their disasters preparedness, response and recovery from such catastrophes. UNDP (2004) provides a good summary of issues involved by reporting that, to attain resilience, communities must take part in the assessment of disaster risks through a process known as participatory rural appraisal that allows them to:

- take ownership of the disaster risk assessment process;
- educate them about disaster risks;
- facilitate the documentation of local knowledge and interpretation of risk.

According to Paton (2007:370), despite efforts of emergency planners based on the assumption that providing people with information about hazards will motivate the adoption of protective actions, people living in communities at risk of natural hazards continue to demonstrate poor knowledge of risk mitigation and reticence to adopt protective measures. Paton and Johnston (2001:272) stress that although all hazards events are unique and may differ dramatically from one another on several dimensions, the community responses may possess sufficient similarity to be modelled.

The antecedent's behaviour approach would be similar to approaches of just informing residents from informal settlements and other vulnerable areas about disasters and not engaging them cognitively. The cognitive process that underpins behaviour change involves motivating residents to consider preparedness, encouraging them to form intentions and assisting them in how to convert their intentions into actions when disaster strikes. Education is important in this juncture to encourage change of behaviour in its entirety. Paton's (2003:211) model, which looks at motivating factors and forming of intentions, is similar to that propagated by Shaw et al. (2004:46) that stresses that disaster resilience would be attained if communities could have a shared vision of moving from gathering knowledge about hazards in their area to realising that disasters could occur anytime and deepening their understanding of ways to respond when disasters strike, which in fact implies making decisions and taking action before disaster strikes.

According to the NMDC (2010:11) report on the national education, training, research needs and resource analysis,

there are schools in South Africa that are situated in disaster prone areas. The National Education Infrastructure Management System (NEIMS) indicates that nearly 15 per cent of all learners in South Africa are taught in environments that expose them to danger and to potential health hazards. Furthermore, at least 1 166 (4.7 percent) of all schools in the country are at the risk of flooding. Data on risks that pose a threat to school infrastructure and people collected through the NEIMS is an invaluable source of information for risk profiling and disaster risk reduction planning.

The focus on resilience as included in the conceptual framework discussions recorded in section 1.8 is made relevant by definitions explained above especially if one considers the concept such as “bounce back”, “cushion against damage”, “recover from severe shock”. These concepts or phrases are key indicators of what resilience should strive for. For example, having discussed the vulnerability of South African communities and learnt that floods, fires, road and rail accidents as well as epidemics are prevalent hazards, resilience of communities has to happen when there are disasters. If there is a fire outbreak a well prepared system will be in a position to cushion the communities properties and its inhabitants against the damage of fire. The cushion could include aspects such as knowing that if there is a fire outbreak in the building people should crawl instead of run upright. However sometimes the property gets damaged, where all life collection gets destroyed, that victims should have a way to bounce back and continue living. This could include knowing where one can get help, shelter, food, clothing etc.

It is apparent that the resilience of communities would rely heavily on many factors; amongst them are the three factors listed in the paragraph above. The first factor “ownership” was discussed in the previous section on the vulnerability of informal settlements; the second and third factors “local knowledge” and “education” will be discussed in the next two sections titled global education and indigenous knowledge.

2.3.3 Raising awareness of disasters through education

As mentioned above education has a critical role to play in prevention of and resilience to disasters through raising awareness and ensuring that people are well prepared. Using O’Brien and Read’s (2005:354) definition of resilience which encompasses all aspects of disaster risk reductions; preparedness, response and recovery, this section will discuss factors promoting resilience. Paton and Johnston (2001:270) map the way by contending that it is important to examine factors that promote resilience and growth rather than dependence and loss in order to enhance the community’s ability to bounce back and recover using its own resources. Indigenous knowledge and school education are essential because they teach learners to be aware, know how to respond to hazards and to become resilient in the face of disasters. This idea is made clear by Paton and Johnston (2001:275) who maintain that

traditional approaches should be integrated into hazard education programmes to increase resilience, and by Shaw et al. (2004:41) who maintain that it is widely acknowledged that schools play an important role in the awareness among students, teachers and parents because the more a child is aware of hazards and realistic risks, the more potential there is for the adults to be educated through the child sharing knowledge at home.

Shaw et al. (2004:40) raise an important question that not all efforts are found to be effective after the event, but they ask what about pre-disaster preparedness, and how effective is education for actual implementation of pre-disaster preparedness measures. King (2000:226) observes that by raising awareness of expected hazards and increasing knowledge of and active participation in appropriate preparations, there is hope that people will respond more effectively to warnings and behave safely during the passage of the hazard. The need for good education has been demonstrated by both the inability of emergency organisations to respond during a disaster, and the tardiness of many people in preparing early and adequately for the hazard.

The ISDR (2005) report promotes the inclusion of disaster risk reduction knowledge in relevant sections of school curricula at all levels, and the use of other formal and informal channels to reach youth and children with information that promotes the integration of risk reduction. In the South African context, the environmental education curriculum provides information to learners about earthquakes and other natural occurrences but does not provide information about how they should respond if such events happen. According to NCS (2003:23) environmental education is part of the learning outcomes of Natural Sciences and Social Sciences. In Natural Sciences learners are expected to demonstrate an understanding of the interrelationship between science, technology, society and environment while in Social Science they are expected to demonstrate understanding of relationship between people and the environment influenced by political, social, economic and social contexts. The implications here is that since hazards and disasters are an integral part of the environment then they are, or should be included in both the Natural and Social Science learning areas.

It is true that whenever human society experiences a threat or perceived danger, its members take measures to alleviate its effect, especially if it cannot be avoided. This sentiment is

echoed in the statement by the UNESCO Director General, Koichiro Matsuura (2007) who stated that *anticipating, educating and informing* are key issues to reduce the deadly effect of such disasters. Hosseini and Izadkhah (2006:650) also state that schools play a vital role in the development of disaster-aware citizens and they also maintain that disaster education could disseminate vital disaster mitigation information to a large part of the population via knowledge, skills and enthusiasm through schools. The knowledge would then be transferred to home settings as learners are the source of knowledge and skills to convey such messages to their parents.

After the 1983 tsunami hit Japan, a new curriculum for schools which included the evacuation procedures, emergency information and human resource management was introduced into mainstream education which later proved to be effective during the 1995 Kobe earthquake. According to a hazards and disaster report by UNESCO (2007), education for disaster preparedness is an endless process that requires a constant collaboration effort from all parties concerned. The UNESCO report (2007:25) further notes that following the 2004 tsunami that shocked the world, people are eager to learn about the potential for and how to prepare themselves for such occurrences. Moreover, most educators realise the importance of integrating natural disaster preparedness material into school activities.

The ISDR (2005:9) report maintains that the impact of disaster can be substantially reduced if people are well informed and motivated towards a culture of disaster prevention and resilience, which in turn requires the collective compilation and dissemination of relevant knowledge and information on hazards, vulnerabilities and capacities. The report adopted as its key activity to promote the inclusion of disaster risk reduction knowledge in relevant sections of school curricula and to use other formal and informal channels to reach the youth and children.

According to Ozmen (2006:385) the fear of a terrorist attack in the United State of America geared the educational officials to make a disaster preparedness education programme compulsory for all school learners. According to O'Brien and Read (2005:354), after the September 11 attack, it was reported that many countries increased disaster preparations through drills and school curriculum provisions. Shaw et al. (2004:48) reported that after the

Kobe earthquake in 1995 in Japan, school education was viewed as useful for the very important first step which is providing knowledge and activating learners' interest. Shiwaku et al. (2007:576) maintain that people at large are required to take measures at an individual level, but they underestimate the importance of taking measures because they do not take action to prevent or reduce hazards, which implies that there is a gap between intentions to reduce risks and lack of action. In this instance the authors argue that disaster education is one of the effective ways to resolve the problem. King (2000:223) argues that the important role of disaster mitigation is the provision of targeted education and information so that people will behave safely and appropriately during disasters and thereby minimise loss of life and property.

Hosseine and Izadkhah (2006:650) argue that educating the children in any community at risk can be considered an effective strategy to communicate safety messages to the entire community via the knowledge, skills and enthusiastic motivation of children. They conclude that schools play a major role in the development of a disaster-aware community, and are an appropriate environment for conducting awareness activities as well as the learning and transfer process.

Ozmen (2006:391) conducted a study to determine how well schools were prepared for a prospective earthquake disaster in Turkey and found that after the 1999 earthquake, the citizens had begun to gain awareness and to enhance their knowledge about preparedness toward mitigation and deal effectively with maintaining risk reduction. Ozmen (2006:392) concludes that schools are most convenient to develop a disaster resistant culture in society; and therefore recommended that schools should be the place where learners gain the awareness, knowledge and ways of protecting themselves and others from disasters.

According to Hosseini and Izadkhah (2006:651), disaster education and awareness rely on schools for disseminating this vital information to learners, parents and the community. In a school setting the knowledge transfer is based on a western science approach as Snively and Corsiglia (2001:9) suggest while in most cases the traditional and ecological information is transferred through the home environment and is referred to as indigenous knowledge. This view is supported by Hartnady's (2010) article in *Science in Africa* online magazine, who

reported that sustainable development agencies must engage with education authorities to promote disaster awareness and community preparedness by influencing the development of new curricula, textbooks and teacher training in both primary and secondary schools.

To support the idea of the adoption process, Shaw et al. (2004:42) emphasise that in order for communities to become resilient to disasters, they should go through the five stages which are: knowing, realising, deepening, decision and action. This framework has far-reaching implications on school education's role of deepening learners' knowledge and understanding of hazards and disaster preparedness. Rather than just providing information to learners, the teaching and assessment of learners should ensure that learners realise the need for making decisions and taking actions when confronted with hazards. Educators are expected to utilise effective teaching styles to create awareness of hazards and disasters.

Shiwaku et al. (2007), using the Rohrman awareness model that has three levels risk appraisal, decision for prevention action, and risk-reducing behaviour, propose an educational framework that enhances awareness and promotes action for disaster reduction, community education, family education and school education. This framework emphasises that whatever school education teaches learners, it should not be for the sake of providing just information. The learning should enable them to identify risks and hazards in their environment, make conscious decisions and take action to prevent the risks and display risk-reducing behaviour. This could be achieved through educators' generating curiosity on hazards and disasters in class teaching, learners conducting self-study by reading books and watching television. Then learners discuss their insights with their friends and family and participate in community projects to mitigate hazards and risks.

Hosseini and Izadkhah (2006:657) support an educational framework that would introduce learners to ways of identifying real hazards that can result in disasters, do drills for reacting when there is a disaster, focusing on immediate response, communication and post-disaster habits. Ozmen (2006:392) strongly supports the notion that schools are the most convenient places to gain the awareness and knowledge to protect nature and the environment and learn ways of protecting themselves and others from disasters.

It is even more important to note that hazards and disasters are often natural occurrences that are given meaning through interaction with human society. By developing knowledge and understanding of disaster events, human beings learn to become resilient to such catastrophes as Scott (2000:14) indicates; human beings persist through time and place enabled by their relational exchange with the world characterised by different knowledge structures. Rautela (2005:234) maintains that, in ensuring that they are resilient to disasters such as earthquakes and storms affecting their communities, people living in the Himalayas built an evolving strong structural design as evidence of indigenous technical knowledge to ensure resilience. Scott (2000:19) further argues that it depends on humans how they see the world. Pelling (2003) supports the idea that if social, economic and environmental costs of disasters are to be effectively reduced, more emphasis should be placed on a holistic approach that involves risk assessment, risk reduction, early warning and disaster preparedness.

The discussions it is clear that resilience encompasses various aspects such as creating awareness through hazards and disaster education and indigenous knowledge which would enable learners to respond and be able to learn from the effects of disasters. There is also a need to further explore the concept of resilience in the two frameworks presented by Gaillard (2007:524) where he argues that traditional environment dependant societies are fragile and unable to cope with the fast onset of natural disasters and that traditional societies are capable of recovering on their own from the impact of natural hazards. These frameworks are driven by the fact that in some instances the occurrence of natural hazards act as a catalyst for ongoing cultural change and in some instances the diversity of pre-disaster livelihoods affects the capacity of traditional societies' resilience.

2.3.4 Raising disaster awareness through indigenous and local knowledge

In the past indigenous knowledge was the source of educating communities about ways to interact with the environment and it is still relevant and being used in rural areas as Gupta and Sharma (2006:78) point out in their observation while assessing the post tsunami recovery of Indian Ocean island communities. These authors came to the conclusion that time-tested traditional wisdom has repeatedly proved to be the lowest cost, most acceptable, environmentally appropriate and locally sustainable means of mitigating disasters. It is,

however, unfortunate that western science is perceived as the only knowledge that needs to be taught to learners. Snively and Corsiglia (2001:6) suggest that western or modern science is just one of many sciences that need to be addressed in the Science classroom. Agrawal (2004:1) adds to the debate by stating that the focus of indigenous knowledge clearly heralds a long overdue move and represents a shift away from the preoccupation with the centralised, technically oriented solutions of the past decades which failed to improve the prospects of most of the world's poor people. Hellier, Newton and Gaona (1999:887) argue that indigenous knowledge may be a valuable source of information on the status and trends of local ecology and such information would be of particular value where no alternative sources offer such scientific data.

Snively and Corsiglia (2001:24) argue that there is a tendency for Western society to accept the evolving discoveries of Western science as the best and only avenue for understanding how the world functions while, on the contrary students from indigenous cultures and other mainstream students face a dilemma whenever they study Western science. Snively and Corsiglia (2001:26) recommend that teachers should incorporate prior beliefs and indigenous knowledge while teaching Western science to enrich multi-perspective and traditions of science in the classroom.

The ISDR (2005) report maintains that disaster can be substantially reduced if people are well informed and motivated towards a culture of disaster prevention and resilience, which in turn requires the collective compilation and dissemination of relevant knowledge and information on hazards, vulnerabilities and capacities. Briggs (2005:106) maintains that indigenous knowledge is central to later debates on sustainable development because of the way in which such knowledge has apparently allowed people to live in harmony with nature through generations. Hellier et al. (1999:870) argue that many rural societies are often very knowledgeable about their plants, animal species and the ecology as well as classifications of the physical and compositional structure of local vegetation.

Stevenson (1996:280) defines indigenous knowledge as an intellectual product of countless generations of direct observation and intuitive experience handed down through oral tradition. Agrawal (2004:1) makes a distinction between an indigenous and Western

knowledge system by stating that indigenous knowledge is scattered, local in character and gains its vitality from being implicated in people's lives. Gupta and Sharma (2006:70) observe that although the tsunami was devastating to the Andaman and Nicobar islanders, many of the native islanders survived the tsunami because they lived on higher ground far from the coast while others managed to read the warning signals and escaped to safety areas.

ISDR (2008) defines indigenous knowledge as the methods and practices developed by a group of people from an advanced understanding of the local environment, which has formed over numerous generations of habitation. This knowledge contains several other important characteristics which distinguish it from other types of knowledge. These include originating within the community, maintaining a non-formal means of dissemination, collectively owned knowledge, developed over several generations and subject to adaptation, and imbedded in a community's way of life as a means of survival.

Gaillard (2007:524) provides a good link between indigenous societies, poverty and disasters by stating that traditional societies characterised by pre-industrial self-sufficient ways of living have an intimate relationship with the immediate natural environment. However, destruction of the environment due to extreme natural phenomena deprives these societies of their main resources and makes it difficult for the recovery of poor indigenous societies.

In the current generation indigenous knowledge is being eroded and is less used by societies that are urbanised as indicated by Rautela (2005:239) who noted that the previous couple of decades have witnessed the weakening of the social fabric of the hill communities in Himalaya. Rautela (2005:235) acknowledges that with many age-old traditional practices of resource management, and despite innovation and technical advancement, the populace at risk from disasters is unwilling to recognise that their traditional practices have elements of disaster resilience. Agrawal (2004:5) views indigenous knowledge as the voice of the marginalised poor and reckons that this knowledge is disappearing as a result of modernisation and cultural homogenisation.

Gupta and Sharma (2006:68) maintain that there a number of reasons for the island communities populated by tourist and business communities being more seriously affected

than their mainland counterparts populated mostly by natives. Such reasons include poor developmental processes, remote and sluggish governance, immobilised communities, ill equipped NGOs and the absence of plans, which compounded the tsunami loss. Hence Gupta and Sharma (2006:70) ascribe the survival of the native islanders to their indigenous culture and knowledge as they choose to live far away from the coast, selecting the higher ground.

Although Briggs (2005:105) is critical of indigenous knowledge and favours Western science as the most appropriate knowledge to address the plight of the poor, he nevertheless acknowledges that indigenous knowledge has an advantage over western science in the context of poor communities in that information has been tested and contributes to the survival of many indigenous communities. However Briggs' (2005) elevation of western science above indigenous knowledge is challenged by Sillitoe (2000:4) who maintain that scientific knowledge may not be relevant for some problems experienced by indigenous communities and in some instances it has worsened their conditions while indigenous knowledge is flexible, adaptive and innovative and able to contribute to community development.

In arguing for the inclusion of indigenous knowledge in the school curricular, Beckford, Jacobs, Williams and Nahdee (2010:241) maintain that indigenous ways of living and interacting with the environment provide lessons that can help mainstream society reconnect with nature and establish mutually beneficial relationships. Ogunniyi's (2007:1190) view is that the national curriculum policy statements have not indicated in a clear and unequivocal manner how valuing and recognition of Indigenous Knowledge Systems (IKS) should be integrated into classroom teaching. However, using practical argumentation course to equip a group of science teachers with knowledge and instructional skills to integrate Science-IKS in their classroom, Ogunniyi (2007:1205) concluded that IKS representing the "soul" or religious and cultural believes is important in the classroom while science represent the body. Botha (2010:35) supports the idea of schools and local communities as arenas for negotiating new ways of understanding and institutionalising indigenous knowledge through a process of culturally-centred system based on ideas of Afrocentricity and cultural psychology.

According to ISDR (2008) development research tells us that the success and the sustainability of interventions at the community level depend, among a number of factors, on the availability of relevant local culture, knowledge and indigenous practices that can combine with new ideas to generate innovation. Indigenous knowledge contributes not only to the success of intervention, but more importantly to its sustainability in the longer term. Green (2007:150) argues that basing IKS research in one faculty is problematic because of its holistic nature encompassing more than one field.

According to Dekens (2008:40) indigenous and local knowledge, if combined with external, scientific knowledge, can enable implementing organisations to create innovative and sustainable solutions to reduce disaster risks and is important in building community confidence as communities themselves need to be convinced that some of their local knowledge and practices are of relevance to disaster preparedness. In his study of Northern Australia and the Pacific which are regularly impacted by predictable natural disasters such as floods and tropical cyclones, King (2000:225) observes that in moving to cities, individuals lose knowledge of their local hazards and must learn new strategies for the new environment. What is appearing here is the distinction between indigenous and local knowledge. The latter is concerned with events of a specific location and has nothing to do with culture.

The current systems of education should be reconsidered in order to link local communities clearly with schools so that school curricula are adapted to local needs and realities and incorporate and foster local knowledge and practices. Although this section focuses much on the idea of indigenous knowledge being the probable voice of knowledge transfer to the marginalised poor, it is of the utmost important to heed Briggs' (2005:109) and Agrawal's (2004:3) advice that people are very open to new ideas and change and that the pressures of modernization under the auspices of the modern nation-state and global trends threaten the life-style, practices and cultures of indigenous people. From this research point of view, indigenous knowledge is important and forms part of the empirical data to determine whether educators sensitise learners' awareness of using their grandparents as a source of information regarding disasters.

In a home setting, parents, grandparents or any other aged community member could be responsible to convey the message about disasters and how to respond in times of such occurrences. For the purpose of this study the knowledge gained from home settings is referred to as local or indigenous knowledge, especially if it does not originate from formal education.

To summarise the discussions here it is important to acknowledge the ideas put forward by researchers such as Briggs (2005), Agrawal (2004) and Rautela (2005), Stevenson (1996), Gaillard (2007), Gupta and Sharma (2006), Snively and Corsiglia (2001) and Hellier et al. (1999) who support the idea of the inclusion of indigenous knowledge as a teaching strategy that could enhance learners' awareness, knowledge and application of key learning concepts relating to hazards and disasters education.

The next section therefore explores the South Africa education system to determine whether it allows for educating learners about hazards, response to disasters as well as determining whether indigenous knowledge on responding to disasters is being integrated in the classroom practice.

2.3.5 The role of national education in raising awareness of hazards and disasters

It was emphasised in Chapter one that South Africa, like other countries, is experiencing the effects of disasters such as floods, landslides, heat waves, earthquakes, hurricanes, wild fires and epidemics occurring worldwide. With the technological achievement experienced one would think that countries would be ready to mitigate the effects of such disasters. It was further emphasised in Chapter one that most countries, especially from the developing world, are experiencing pressure from global organisations such as UNESCO and ISDR to have disaster management plans in place to ensure that communities are prepared for disaster. Although there are many ways to enhance community resilience to disasters, preparedness has been proven to be the common denominator as the main source of community resilience. The literature reviewed suggests that the most cost effective way of enhancing community preparedness to disasters is education and awareness initiatives.

Disaster education is broad and can mean anything; however, school education is essential. Moreover, integrating hazards and disasters in the curriculum would enable hitting two birds with one stone: Hosseini and Izadkhah (2006:650) contend that educating children should be considered as an effective strategy to communicate safety messages to the entire community. Firstly, you have all learners who might share their knowledge with their parents sensitised to hazards and disasters; secondly, you have a future adult population that has knowledge and understanding of disasters. This idea is presented by Shaw et al. (2004:48) who state that ideal school disaster education means that when learners master disaster management actively, disaster management becomes a part of their lives, thereby promoting the culture of disaster preparedness which in the long term helps adults to make effective decisions and take necessary actions.

If one needs to understand what role the South African education system plays in enhancing learner's awareness of hazards and disasters, one should start where the educational reforms were initiated. While the call for educational reforms was part of the freedom struggle in the early 1960s to late 1980s in South Africa, it was only in the early 1990s that it was considered. In March 1995, the South African government led by the African National Congress produced its first white paper on education and training to establish a new philosophy of education for South Africa based on equity, social justice and democracy. This signalled a major break with the past wherein under apartheid, the government controlled formal education with the purpose of producing a racial, authoritarian and dramatically unequal society. According to Harber in Griffin (2002:111) the apartheid system was characterised by creation of 19 education departments catering for the separate racial and ethnic groups with white children receiving a disproportionate share of educational funding which in 1988/89 was four times that allocated to African black children while Fiske and Ladd (2005:3) estimate that at the height of apartheid, per pupil spending for white schools was ten times that for black schools.

Fiske and Ladd (2005:34) elaborate on the misdemeanours of the apartheid systems by stating that white people enjoyed good education, ready employment, and a sense of control of their individual and collective destinies while black people lived in an essentially totalitarian and dehumanising environment in which their every move was restricted and

education and vocational opportunities were severely circumscribed. Fiske and Ladd (2005:47) highlight the fact that the apartheid government relied heavily on a state education system to promote and sustain the values of racialism and to keep the black population powerless for more than four decades. All aspects of education, such as governance, funding, professional development and curriculum were defined and operated along racial lines in an unequal manner.

Fiske and Ladd (2005:61) argue that just as a racially delineated education system had been central to the maintenance of apartheid, a completely new education system that eliminated all vestiges of racial inequity would be essential for the creation and functioning of a democratic South Africa. The Constitution of the Republic of South Africa (Act 108 of 1996) provides the basis for educational reforms in South Africa which in turn have become the key driver for curriculum transformation and development. The constitution spells out its intention to:

- heal the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights;
- improve the quality of life of all citizens and free the potential of each person;
- lay the foundations for a democratic and open society in which government is based on the will of the people and every citizen is equally protected by law;
- build a united and democratic South Africa able to take its rightful place as a sovereign state in the family of nations.

Fiske and Ladd (2005:64) maintain that instruction in the apartheid era was universally teacher-centred and emphasised rote learning rather than critical thinking and open-ended problem solving. The new curriculum was envisaged to focus on the child, promote active learning, and give each learner some responsibility for the shaping of his or her own education.

Harber, in Griffin (2002:117) notes that the major curriculum reform to affect schools since the end of apartheid has been the introduction of Curriculum 2005 in 1997 which is a policy of changing teaching, learning and assessment to outcomes-based education (OBE). The initiative began in the first year of primary and secondary school in 1998 and was to be

completed in 2005. The new curriculum initiative emphasised outcomes or competencies in what a learner should be able to do at the end of a learning process. These reforms have restructured traditional education levels into eight broad National Qualifications Framework (NQF) levels as reflected below.

Table 2.1: The NQF Education and Training Band adapted from SAQA position paper (2001)

NQF Level	Band	Type of qualifications and certificates	
8	Higher Education and Training Band	Doctorates, further research degrees	
7		Higher degrees, professional qualifications	
6		First degrees, higher diplomas	
5		Diplomas, occupational certificates	
Further Education and Training Certificates			
4	Further Education and Training Band	School/College/Training Certificates	
3		School/College/Training Certificates	
2		School/College/Training Certificates	
General Education and Training Certificates			
1	General Education and Training Band	Senior phase (Grades 7-9)	Adult Basic Education and Training (ABET) Level 4
		Intermediate phase (Grades 4-6)	ABET Level 3
		Foundation phase (Grades R-3)	ABET Level 2
		Pre-school	ABET Level 1

The table above shows how the South African Qualification Authority (SAQA) restructured the education system into eight levels, three bands and different phases. Throughout this report, the discussions will use these categorisations of foundation, intermediate and senior phase.

2.3.5.1 The role of curriculum in enhancing learners' awareness of hazards and disasters

According to Schiro (2008:34), curriculum theories can be categorised into four schools of thought or ideologies the scholarly academic, the socially efficiency, the learner-centred and social construction. The differences between these ideologies is that the first focuses on the achievements of academic disciplines, the second focuses on what the learner could do to meet the needs of society, the third focuses on the needs and concerns of individuals while the fourth and last focuses on construction of knowledge that would teach people to understand their society in such a way that they can develop a vision of a better society. The first two, scholarly academic and socially efficiency theories could be linked to what Doll (2003:283) refer to as copy-model pedagogy defined as fixed truth and procedures to be passed on from generation to generation, person to person, and summarised as transmitted curriculum. The scholarly academic approach is also supported by Carl (2009:40) who argues that curriculum development is a systematic process directed by academic rationality, and stresses that knowledge explosion and the proliferation of school subjects necessitated other patterns such as broad fields, correlated curricula, interdisciplinary studies and combined studies. The second two, learner-centred and social construction, could be likened to discovery pedagogy which provides openness and flexibility with the object not being to furnish the mind but to train it to use its own powers.

The social re-construction theory as advanced by Schiro (2008:36) assumes that curriculum, if it is revitalised along the lines of social change, has the power to educate people to analyse and understand social problems and envision a world in which those problems do not exist. The South African education system seems to be aligned with the same social re-constructivist approach as the discussions that follow below suggest. This view is supported by scholars such as Popkewitz (2010:308) who maintains that the process of change is complicated by the need to integrate what is called academic machinery (laboratories, libraries and archives) and cultural practice into school curriculum.

In support for the idea of the process of change, Smith and Lovat (2003:193) maintain that change is an integral feature of natural and human systems which is essential to human beings evolution contributing to transformation of people, objects, institutions and places.

The authors argue that curriculum work is about change that tries to achieve ideals more closely. Glatthorn, Boschee and Whitehead (2006:96) maintain that curriculum whether is hidden or apparent seems to be changing even more to meet today's needs and realities necessitating current instructional design determined by individuals environment. Expanding on the notion of hidden or apparent curriculum, Smith and Lovat (2003:34) defines hidden curriculum as outcomes from teaching/learning activities that are not part of the explicit intentions of those responsible for the planning activities.

The discussions about curriculum change becomes relevant in a South African context especially when one considers the challenges that the South African education system is experiencing such as inadequate learning resources in some schools as well as the stipulation to value IKS and implement integrated learning approach. Green (2010:455) argues that transformation of education is essential and requires that representation serves as the core of the national curriculum. In the context of this study what Green (2010) means here is that responding to hazards and disaster is viewed as a representation of reality and must be factored in the curriculum through narratives or texts.

Wraga and Hlebowitsh (2003:427) maintain that since the USA's curriculum was reconceptualised in early 1990s it has not improved the crisis in education and to the present it is still in disarray. Here Wraga and Hlebowitsh (2003) consider the changing nature of the curriculum and the fact that introducing a new curriculum approach would necessarily address challenges at hand but also gives rise to another challenge. The situation is similar to that of South African re-conceptualisation of curriculum in the late 1990's which has not pulled the South African education system out from the crisis of apartheid as suggested by Fiske and Ladd (2005) and supported by Jansen (2001:244) who identified the flaws of Outcomes-Based Education as:

The image of the teacher as liberator was fundamentally challenged and undermined in the curriculum positions associated with Outcomes-Based Education and Curriculum 2005. Suddenly, and without warning, the teacher disappeared. Teachers, instead of becoming the dominant force in the classroom that liberates young minds from the evils of apartheid, now became re-imaged to become soft facilitators of a new pedagogy. In the memorable words of a key author of those early curriculum documents: "teachers now become the guide on the side rather than sage on the stage." Teachers would, in this image, slowly but deliberately move back from centre stage into an invisible position on

the margins of the classroom: facilitating a learning process in which young minds took charge of their own learning, designed their own materials, invented their own learning opportunities, and occupied the centre of what was to become "a learner-centred classroom." Not only were teachers to withdraw from teaching, they were also to withdraw from the comforts offered by subject matter competence (however poorly understood). Content was played down, learner initiated tasks in which knowledge was to be generated from the environment, was played up. Teaching and content were displaced by learning and competences. In short, the teacher would disappear in a classroom plan where learners and learning became the central focus of policy change under the new curriculum. First, the new "facilitator" had to give up the symbolic as well as physical space which she occupied at the centre of the classroom as "presenter." Second, the soft-hearted facilitator had to simultaneously give up that other instrument of control: corporal punishment. And third, since the teacher had to deny content, and learners generate knowledge out of environmental experience, that one source of authority for poorly prepared (and even qualified) teachers — the textbook — took a back-seat.

An analysis by Jansen (2001) here shows the limitation of the discovery model as proposed by Doll (1993) in a South African context but this does not necessarily mean that it is not ideal for the country. There is currently a hullabaloo about the majority of South African youth of working-age not having entrepreneurial skills, without taking into consideration the kind of education they received. Also there is noise about the majority of students who entered universities in 2009, not having the required written and communication skills as well lacking substantial course background for university entrance. Most of these students are the outputs of Outcomes-Based Education and the concerns are not only raised when they complete their schooling, but there has been an outcry also when they moved from foundation phase to senior phase. Although this outcry is justified, one should also consider the developing nature of the South African curriculum as some of the concerns are addressed as time goes. Another issue to consider in South Africa is the diverse views of those raising concerns; labour organisations, business forces, social forces, people from underprivileged areas and those from a privileged environment. The government has to satisfy all and try to strike a balance its reforms while in addition the ruling party of the country is concerned with maintaining its power.

Teodoro and Estrela (2010:626) report that curriculum development from 1970 to the present in Portugal was characterised by a need to democratise education and ensure that it responded to the economic and social demands of the day which resulted in crisis in state education. This in itself implies that there will never be a time when education is not in crisis because

the world is ever-changing and education has to respond to the change, as Popkewitz (2010:313) and Doll (2003:82) suggest. These scholars maintain that teachers, schools and education ministry officials are conscious that reforms in schooling are to enable students to become successful in the global world and also that educational reforms are stimulated by perturbation, disturbances, disequilibrium, or dissipation built in for self-organisation to be initiated.

Carl (2005:223) and Kirk and Macdonald (2001:552) believe that teachers play a critical role in curriculum development and should therefore not be seen as only implementers of curriculum statements in their classrooms. Carl (2005:224) administered a questionnaire to 400 schools to determine educators' involvement in all processes of curriculum development. The responses from educators show that they desire to be involved in the prophase of curriculum development rather than to be seen as only implementers of a developed curriculum.

The SAQA position paper on the NQF, Curriculum 2005 and Outcomes Based Education (OBE) supports the social constructivist approach by proclaiming that when a society finds itself lagging behind other countries in the global market, politicians start to use education reform as a platform for canvassing votes, questioning the validity of what is taught and how it is taught in an effort to improve the country's economic or social situation. For example, in 1994, Dr Sibusiso Bengu, the former South African Minister of Education integrated the fragmented education departments and introduced Outcomes Based Education and in 1997 he introduced Curriculum 2005. Professor Kadar Asmal who took over as the Minister of Education in 1999 reviewed Curriculum 2005 and introduced Curriculum Statements thereafter. When Ms Naledi Pandor took over as the Minister of Education in 2004, she reviewed the Curriculum Statements and introduced revised national curriculum statements now called the National Curriculum Statements. There are currently reports in the media that Ms Angie Motshekga who took over as the Minister of Basic Education in 2008 will be phasing out OBE and will introduce a new education system called Curriculum Assessment Policy Statements (CAPS).

Jansen (1998:324) provides a gloomy critical assessment of the South African outcomes-based education by spelling out ten reasons why OBE fails and his assessment is supported by Mason (1999). The basis of Jansen's argument is that the reforms were based on political imperatives rather than realities of classroom life and the following ten reasons justify his position:

- Language and terminology of OBE is too much and complex for teachers to comprehend, let alone for learners.
- Curriculum policy is implicated in problematical claims and assumptions about the relationship between curriculum and society.
- OBE is based on flawed assumptions about what happens inside the schools, how classrooms are organised and what happens inside the school system.
- OBE has a fundamental contradiction by insisting that learners use knowledge creatively while informing them that the desired outcomes have been specified.
- Although curriculum reforms claim to be participatory, teachers were not consulted in developing the pillars of Curriculum 2005 apart from the elite referred to as experts who were mostly Whites.
- OBE side-steps the question of values in the curriculum and does not define content or what is called actual learning programmes.
- The management of OBE multiplies the administrative burdens placed on teachers without adequate implementation support such as release time to deal with loads of paperwork expected for assessment and planning.
- OBE focuses on outcomes rather than content and negates the opportunity to capitalise on a multicultural curriculum and cross-curricular and interdisciplinary demands.
- Teachers have not been adequately trained in the previous education system; as a result they are expected to embrace a new system while under-qualified to undertake such new tasks.
- The issue of continuous assessment as opposed to the traditional examinations was not addressed properly.

Although some of these reasons were raised at the onset of Curriculum 2005 and during consultative sessions, Jansen (1998:323) maintains that the Department of Education went ahead and implemented Curriculum 2005 hurriedly because the political authorities wanted to be seen to be doing something. In fact Jansen (1999:63) argues that the changed syllabuses simply reflected the whites political establishment and the apartheid system thereby reinforcing and legitimizing the white educational model.

Fiske and Ladd (2005) note that Curriculum 2005 got off to a shaky start owing to numerous problems such as the following:

- a) The considerable latitude of teachers to determine the shape and substance of instruction. Although curriculum 2005 provided teaching and learning outcomes, it did not provide explicit content knowledge and teachers were expected to generate the content.
- b) The accounting system which requires teachers to keep logs that track the progress of each learner on each learning objective is time-consuming and reduces the amount of time teachers need for classroom instruction and curriculum planning.
- c) The unequal distribution of the past education system has created a legacy which is not easy to shake off, with previously privileged schools implementing the new reforms with ease while the disadvantaged schools struggled to put into practice the principles of Curriculum 2005.

Noting the arguments above about the South African education system which has been undergoing tremendous changes since 1994, championed by the newly elected government of national unity, one needs to reflect on this system, the curriculum and instructional design to determine if it does make provision for enhancing learners' awareness of hazards and disasters. This is important considering Vandeyar and Killen's (2007:103) argument that educators' conceptions are unlikely to be immune from the influences of the system within which they work. South Africa like any other country is susceptible to disasters and it has a prevalence of hazards which reflect its vulnerability which makes the preceding statement by Vandeyar and Killen (2007) more relevant.

Important to note is that after 1994 several reforms were introduced to redress the past inequalities of the apartheid education system. In 1997 Curriculum 2005 was launched, which introduced a new system of learning that restructured school subjects into learning areas and introduced new assessment approaches. Curriculum 2005 was revised in 2000 and subsequently National Curriculum Statements were introduced to streamline and strengthen Curriculum 2005 in 2001.

According to the SAQA (2001) position paper on the National Qualifications Framework, Curriculum 2005 and Outcomes Based Education, when a new government is elected to power, inevitably they engage in so-called education reform. They institute change in the content of the curriculum, a change in the assessment system, the advocacy of new ways of ‘doing things’ in the classroom, i.e. they try to find the perfect curriculum and the perfect way of delivering that curriculum. In other words, they institute curriculum reform. These reforms then become the focus of criticism from opposition politicians and the cycle begins again.

In addressing the concerns raised by researchers like Jansen and others, the SAQA position paper argues that if the practical arrangements for implementation have not addressed all aspects, e.g. teacher training and support material adequately, it is illogical to claim that the role of Outcomes-Based Education in systemic transformation is at fault; or that the educational principles expounded by proponents of outcomes-based education are invalid. The SAQA position paper further argues that Jansen in Jansen & Christie (1999) has convincingly argued that implementation issues are at the heart of the success of delivery in an education and training system. However, problems of implementation do not necessarily imply the need to reject the philosophical principles.

The introduction of National Curriculum Statements in South Africa in 2001 was underpinned by three principles, namely social justice, healthy environment and human rights. These principles imply that the National Curriculum Statements are embedded in the attainment of social justice, creation of a healthy environment and respect for human rights. According to a report by the Department of Education (2002), the National Curriculum Statements further proclaim that the freedom of educators to develop learning programmes

and the principle of integration of learning areas provide the opportunity to ensure that learners attain a high level of skills, acquire knowledge and develop attitudes and values relevant for the creation of a healthy environment. Having observed the conditions of learners living in informal settlements which reflect a place with hazards and risks, one wonders how the attainment of social justice, the creation of a healthy environment and respect for human rights are practised in the real classroom.

The aims of the National Curriculum Statements are to develop the full potential of each learner as a citizen of a democratic South Africa, create a lifelong learner who is confident and independent, literate, numerate and multi-skilled, compassionate, with respect for the environment and the ability to participate in society as a critical and active citizen. The Department of Education (2003) reported that OBE strives to enable all learners to reach their maximum learning potential by setting the learning outcomes to be achieved by the end of the education process and encourages a learner-centred and activity-based approach to education.

The National Curriculum Statements envision educators who are qualified, competent, dedicated and caring and who will be able to fulfil various roles such as being mediators of learning, interpreters and designers of learning programmes and materials, scholars, researchers, assessors and learning area specialists. Educators are expected to lead their learners to promoting human rights, environmental and social justice and, most importantly, to help learners value the indigenous knowledge systems which are a body of knowledge embedded in African philosophical thinking and social practices that have evolved over thousand years.

The learning areas in the National Curriculum Statements consist of languages, Mathematics, Natural Sciences, Technology, Social Sciences, Arts and Culture, Life Orientation and Economic and Management Sciences. To ensure the achievement of national standards, the National Curriculum Statements make provision for policy guidelines for relevant learning programmes, which emphasise the principles of integrated learning and achievement of optimal integration across learning areas. Integration is achieved within and across subjects and fields of learning through integrating knowledge and skills to achieve applied competence. Applied competence aims to integrate three distinct areas, namely practical,

foundational and reflective competence in order to promote the integrated learning of theory, practice and reflection.

The Grade R to Grade 9 Social Science outcomes make provision for the learner to demonstrate geographical and environmental knowledge and understanding and to make informed decisions about social and environmental issues and problems. The Grade 7 learning outcomes in particular focus very much on general knowledge of natural hazards and epidemics. Grade 7 learners are expected to make informed decisions about social and environmental issues through identifying, understanding and making choices or providing alternatives. The knowledge focus of this grade is reflected in learners' providing simple explanations of how natural hazards occur, the impact of hazards on people's lives, why some people are more at risk than others, who are at risk and management of risks and risk reduction.

According to the Grade 7 Social Science assessment standards, learners should have prior knowledge about the environment which could only be acquired from other learning areas creating a need for integrated learning. For example, learners will be assessed on how well they identify a variety of geographical and environmental sources, organise and interpret information through graphs, maps and statistical sources, provide reports on the enquiry and use computers in the presentation of the socio-economic impact of hazards. Hazards and disasters learning could be represented in almost all learning areas and this according to the Department of Education (2003:13) supports the National Curriculum Statement principle of integrated learning, which ensures that learners experience learning areas as linked and related phenomena.

The Grade 10 – Grade 12 Geography National Curriculum Statement explicitly stipulates that learners should demonstrate an understanding of the human response to hazards and disasters as learning outcomes. However, this implies that in Grades 10 to 12, learning about hazards is only compulsory for those learners who choose to specialise in Geography. This leaves Grade 7 as the only grade which explicitly focuses on developing a high level of knowledge and skills in all learners on responding to hazards and disasters. The implication arising from these discussions is that an empirical study will need to be conducted to ascertain whether

learners are being taught about hazards and disasters in different learning areas as per the NCS.

Looking at the recent educational development in South Africa, from the introduction of Curriculum 2005 in 1997 and then the National Curriculum Statements in 2001, it is amazing to see how the New Curriculum Statements have explicitly dedicated the teaching of hazards and disasters in one grade only to cover all learners. The fact that other learning areas and grades implicitly makes provision for the teaching of hazards and disasters leaves the teacher as the sole decider of what to teach to learners. The indication here is that teachers that are effective and efficient will go the extra mile to research and compile lessons plans for hazards and disasters but those that rely on textbooks only would be stuck on teaching what is recorded in the textbook and lose an ample opportunity to teach about localised hazards and disasters.

Curriculum reforms in South Africa, although limited seem to be making it easier for educators to integrate hazards and disasters because of the permission given to educators as developers of localised learning programmes and as researchers of content. Nevertheless the challenge is to determine whether educators do develop learning programmes that are consistent with the existing learning outcomes on hazards and disasters and how they facilitate learning.

Taking note that throughout the General Education and Training (GET) band the beginning and intermediate phase, Grade 7 is the only grade that explicitly makes provisions for learning outcomes on hazards and disasters, the Grade 7 Social Science educator is entrusted with the huge challenge of ensuring that during that space of less than ten months of schooling time is dedicated to deepening learners' knowledge and understanding of hazards and disasters. The important point to note is that the Grade 7 Social Science educator(s) have other content to teach such as History and other Geography learning content. Also one needs to consider that the learners will have other learning areas in which they need to prove competency to progress to the next grade. There is much interplay here that an educator is also expected to facilitate: learning, assessing learners and to ensuring that learners attain the learning outcomes in areas such as statistics, measurement, reading maps, operating a

computer, socio-economic impacts, verbal and non-verbal reporting and investigative skills which are cross field in nature. The new dispensation educators are further expected to employ new teaching techniques that differ vastly from the methods dominated by rote learning used before 1990.

The NDMC (2010:11) through its commissioned study on national education, training, research needs and resources reported that:

An analysis of the National Curriculum Statement directives shows a convincing alignment – in especially Learning Outcome 3 in Social Sciences (Geography) at Grade 7 – with the disaster risk management concepts and principles contained in South Africa's National Disaster Management Framework of 2005. Children will have a basic understanding and knowledge of disaster risk management concepts and principles if these curriculum directives are implemented in a skilful and creative manner in the classroom, the basis laid at primary school level is continued in secondary school curricula. However, the inclusion of disaster risk management concepts and principles are limited to a few learning areas (specifically Geography) and Grades (Grade 12: Life Orientation). Disaster risk management education is therefore not reaching all senior secondary school children, because of learning area choices and high secondary school dropout rates. The lack of focus on cultivating disaster risk reduction behaviour is to be found in a lack of proper guidance and support to schools.

According to the curriculum policy review of 2000, the quality and availability of suitable learning support materials (LSM) is an important prerequisite for the successful introduction of the new curriculum framework, pedagogy and assessment. However, since the 1997/98 provincial budget crisis, funds available to provinces for ordering LSM have drastically declined. Problems have been experienced at many points in the book supply chain. It has become apparent that the control of inventories, durability of materials and retention of books in schools are important issues to be managed by provincial departments and school leadership teams.

The Department of Education (2003:3) maintains that the National Curriculum Statements emphasise the principle of integrated learning to deepen learners' knowledge and understanding, which implies integrating learning across eight learning areas. The need for this technique of integrating learning is vividly expressed in Macdonald, Hunter, Carlson and Penney (2002:270) when they state that a review of university and school knowledge structures, reinforced by school-based data, suggests that official knowledge remains

fragmented through discipline and subject allegiances and structures in schools and universities. These authors argue for the possibilities of teacher education to better educate graduates to work across the breadth of Key Learning Areas and the broader question of what society needs from school and university knowledge structures.

It is therefore necessary to explore the importance of integration of learning as a possible technique for advancing the knowledge and skills of learners regarding hazards and disasters. The discussion above shows that inclusion of hazards and disasters in the national curriculum signals how the South African education system considers the matter of learners' awareness of hazards and disasters. The next section explores the principle of integration of learning and whether it is necessary for hazards and disasters educators to use this technique in their day to day teaching activities.

One could conclude by stating that the national curriculum should be responsive to the challenges being experienced in the country. This sentiment is echoed by Olser (2011:2) who reports that the UK introduced citizenship education in 2000 to respond to national challenges of racism within the public service and required schools to promote race equality. In South Africa the major challenges include disasters that are ravaging communities including epidemics such as HIV/AIDS, TB and other infectious diseases or natural hazards such as floods, droughts or the human-induced events such as fires and accidents to which, the national curriculum must respond. Once the national curriculum stipulates the inclusion of learning outcomes on hazards and disasters, it is up to schools to make sure that teaching should happen and this is where the instructional design comes.

2.3.5.2 The role of instructional design in enhancing learners' awareness of hazards and disasters

A good starting point to discuss the role of instructional design in enhancing learners' awareness of hazards and disasters is to look at the South African national curriculum statements to determine what it stipulates about instructional design. The dilemma embedded in the NCS is explained well by Chisholm (2005:194) who states that:

On the other side, there is the debate on curriculum as knowledge and as a process. Underlying this debate is a view of how knowledge is constructed and what the role of the school is in teaching and learning. For South African proponents and elaborators of constructivism and outcomes-based education, the heart of outcomes-based education lies in its learner-centred character as well as in its emphasis on bringing to the surface the local, hidden, silenced knowledge, and everyday realities of learners. Through surfacing this knowledge, hidden and suppressed reservoirs of cultural knowledge come into being that challenge the Eurocentric and rationalist assumptions of school-based knowledge.

Underpinning the NCS is the construction of knowledge, and schools have to develop learning programmes that are learner centred considering also that there are other sources of knowledge such as local and cultural. Carl (2009:33) maintains that learning programmes are vehicles by which the curriculum is implemented in the various fields and consists of sets of teaching and learning activities in which the learner becomes involved in the realisation of one or more specific outcomes. These learning programmes have replaced syllabuses and stipulates scope of learning per phase.

Carl also (2009:34) reports that learning programmes are based on relationships between the learning outcomes across the various learning areas, without compromising the integrity of each learning area. This information is significant for the study as it stresses an instructional design that is integrated in nature. Ornstein and Hunkins (2009:126) using Gardner's multiple intelligences theory maintain that those in charge of planning and implementing curricula must expand their vision beyond intellectual and academic pursuits by nurturing all types of intelligence and all types of excellence. This expansion and nurturing of learners' abilities support a system where educators with different abilities, styles of learning, ways of thinking need to collaborate in order to attain this task of diversifying their education.

IKS has been discussed above as part of the role of education in enhancing learners' awareness of hazards and disasters. The discussion below will focus on learning programme design and integrated learning as two principles of the NCS on instructional design. Slattery (2006:222) support this notion by stating that the solution to the ecological devastation involves recovering older notions of virtue found in antiquity as

well as developing a sense that oneself is inseparable from a larger community that is part of cosmological vision.

The National Curriculum Statements for Social Sciences (2003:44) report that integrating learning areas should enhance the knowledge, skills, attitudes and values embedded in the learning outcomes of each learning area. According to Arredondo and Rucinski (1997:286) integrated curriculum units tend to present content from multiple subject perspectives, to make connections between subjects explicit, and to place emphasis on learner use of knowledge and skills within a highly learner-centred environment.

Ranby and Potenza (1999), Loepp (1999), Robinson and Schaible (1995), Venville, Wallace, Rennie and Malone (2001), Chambers (1995) and Gehrke (1998:253) support the idea that curriculum integration would help educators to deepen the knowledge and understanding of learners at a higher level. Slattery (2006:214) contend that curriculum theorists have joined in the revolution of proposed vision of sacred interconnectedness, responsive teaching, holistic curriculum and ecological literacy. Jansen (1998), however, is critical of whether the principle of cross-curricular integration will be attained by the Outcomes-Based Education approach as propagated by Curriculum 2005. Cross, Mungadi and Rouhani (2002:172) argue that from the outset, socio-political purposes for curriculum integration were clear but its pedagogical and procedural purpose was unclear; the practicalities and uncertainty about curriculum integration have led some educators to settle on a more comfortable and modest notion.

According to Arredondo and Rucinsky (1997:287) the term *interdisciplinary* is applied to a variety of curricular designs and is frequently used interchangeably with such terms as integrated, multidisciplinary, trans-disciplinary, and thematic teaching or could be described as “a knowledge view and curriculum approach that consciously applies methodology and language from more than one discipline to examine a central theme, issue, problem, topic, or experience”. It is also important to note Arredondo and Rucinsky’s (1997:286) argument mentioned as an opening statement of this section that integrated curriculum units tend to present content from multiple subject perspectives, to make connections between subjects explicit, and to place emphasis on student use of knowledge and skills within a highly

learner-centred environment. Fisher and McDonald (2004:256) support the argument by stating that purposeful curriculum integration can serve to increase the power of creative teaching, increase job satisfaction and interaction with teaching peers, and increase direct learner interest and active involvement in learning linked within the school environment.

According to Morton (1993:6) serious collaboration of teachers engaging in the rigorous mutual examination of teaching and learning is rare, and where it exists, it is fragile. Yet it can and does occur, and the enthusiasm of teachers about their collaborations is persuasive. When schools are organised to support it, the advantages of collegial action are varied and substantial. When teachers work as colleagues, they produce greater coherence and integration in the daily work of teaching. Furthermore, collegial action equips individual teachers, groups of teachers and their schools for steady improvement. In short, it helps to organise the school as an environment for learning to teach. This idea is supported by Robinson and Schaible (1995:58) who maintain that research on collaborative learning indicates that its benefits for learners include higher achievement, greater retention, improved interpersonal skill, and an increase in regard of positive interdependence.

Murawski and Hughes (2009:269) maintain that although collaboration is an umbrella term that includes a wide array of interactions between individuals, co-teaching is a specific instructional service-delivery model by which “two more professionals jointly deliver substantive instruction that is diverse or blended, to a group of students in the same physical space. They also maintain that co-teaching involves the co-planning, co-instruction, and co-assessing of group students with and without disabilities in the same classroom. Simply putting two educators in the same room is neither sufficient nor necessarily collaborative, teachers need to actively collaborate with their colleagues to make sure that lessons are research based, address the wide variety of needs in the general education classroom, ensure access to the general education curriculum for diverse learners, ongoing data collection and progress monitoring is occurring and students are able to receive specialised and more individualised instruction in small groups. co-teaching becomes a powerful means of meeting the goals of education.

Creese (2005:4) maintains that, historically, teaching as a profession has emphasised the importance of teachers' autonomy and personality. Teachers are encouraged to be self-reliant and autonomous in making their decisions about curriculum and teaching methods. Their relationship with their learners within closed walls in the classroom keeps interference out and allows teachers to bring their own ways of perceiving the world into their classroom. The training that teachers receive and the organisational structures of schools seem to discourage cultures that develop interaction and shared knowledge with fellow teachers. Norms of interaction do not simply just happen; they do not spring spontaneously out of teachers' mutual respect and concern for each other. Rather school principals seem to take a lead in structuring them in the work context.

Scwhartz, Shanely, Gerver and O'Commings (2000) believe that team teaching arrangements were used in the 1960s in an attempt to reach a wider range of children with diverse learning needs, particularly those at risk. Although these collaborations have changed in name and purpose over time as policy and legislation evolved, these teaming relationships do have benefits for both the professionals and learners involved.

Goetz (2000) argues that team teaching can open a learner's eyes to accepting more than one opinion and to acting more cooperatively with others. Team teaching may even provide educational benefits such as increasing the learner's level of understanding and retention in addition to enabling them to obtain higher achievement. Exposure to the views of more than one teacher permits learners to gain a mature level of understanding. Rather than considering only one view on each issue or new topic brought up in the classroom, two or more varying views help learners blur the black-and-white way of thinking common in our society to many shades of gray. In addition, diverse perspectives encourage learners to consider the validity of numerous views. The variety of teaching approaches used by the team can also imply a greater variety of learning styles. The cooperation that learners observe between team teachers serves as a model for teaching positive teamwork skills and attitudes. In a collaborative team teaching experience, the learners witness and partake in a dynamic display of two or more minds and personalities. The benefits of collaborative learning include higher achievement, greater retention, improved interpersonal skills and an increase in regard for group work for both learners and teachers.

Considering the discussions above, integrated teaching which refers to teachers from different learning areas collaborating to develop learning programmes should be used to teach learners. The concept encompasses integrated learning, team teaching, collaborative teaching and multidisciplinary teaching. It is therefore essential to undertake an empirical study to determine whether the cooperation of educators in facilitating learning, interpreting and designing of learning programmes would, as their challenge, address the notion of deepening learners' knowledge and understanding of hazards and disasters and facilitating attainment of relevant skills to respond appropriately when disasters strike.

2.4 The need for empirical data to address the questions arising from the literature study

The literature on disasters presents evidence that communities residing within hazardous areas should be able to develop knowledge about possible disasters, read the warning signals for disasters that are possible in their vicinity and know how to respond when there is disaster. If communities are not prepared for disasters, they will not be in a position to respond and recover well when catastrophe strikes and therefore it is worth exploring elements that could enhance resilience. The literature clarifies that there is a need to determine whether education contributes to learner awareness of hazards and disasters. It is important to embark on a study to determine whether South African educators teach learners about disaster awareness, focusing on the following questions:

- What hazards and disasters are prevalent in South Africa?
- How do the National Curriculum Statements address the need to enhance learners' awareness of hazards and disaster?
- Do educators include indigenous knowledge in their day-to-day teaching?
- Do educators team-up with other educators to teach hazards and disasters?

2.5 Summary of key issues emanating from the literature study

It is clear from the discussions above that a framework for addressing the problems raised would have to include the concepts of vulnerability, resilience, curriculum and instructional designs. These concepts are interlinked, with resilience playing a central role while the

curriculum and instructional design serves as a driver that would enable communities of learners to attain the desired goal. Assessing community vulnerability serves as the point of departure for educators as they will know what to teach their learners if they themselves are aware of their environment. Indigenous knowledge and integrated teaching should enhance learners understanding of hazards and disasters. The concepts provide a powerful impetus to understand the dynamics of the role that the South African education system could play in deepening learners' knowledge and understanding of hazards and disasters.

The discussions above clearly outlined that issues of poverty drive communities to reside within a hazardous environment, which makes them vulnerable to disasters. It has been emphasised that the idea is not to prevent natural disasters but to enhance learners' resilience when faced by catastrophes. To develop learners' resilience to disasters, the education system should ensure that the curriculum spells out what needs to be done and by whom. This entails that the curriculum for all levels of learning should have some outcomes on hazards and disasters education.

The framework below suggests that the prevalence of hazards could result in an outbreak fuelled by community vulnerability. If learners have adequate knowledge and skills of responding to disasters they will be able to become resilient but if they do not have relevant skills and knowledge of responding to disasters, they will perish. This therefore places both classroom and IKS education at the forefront of research ensuring resilience of learners to disasters.

2.5.1 The conceptual framework for the study

The conceptual framework below serves as an attempt to summarise the discussions in the literature review. The left part of the framework takes note that human beings have existed alongside hazards. The vulnerability and risks in which communities find themselves could lead to human-induced disasters and could also result in communities not being able to survive natural hazards. All this would lead to loss of life and/or property. The central part implies that education can play a critical role in ensuring that communities prevent human-induced disasters and also to ensure that they are well prepared for natural hazards on the

right side of the framework. The simplified message emanating from the framework is that if vulnerability and risks issues are not addressed, the result is death and destruction of the livelihood whereas if education, in particular curriculum and instructional design is considered, the loss of property and lives will be averted as communities will heed the warning signals communicated through indigenous knowledge and integrated teaching. The resilience of communities during the outbreak of disasters implies that they cope with hardships emanating from the disaster and continue living irrespective of losses incurred such as those of property, loved ones and also injuries.

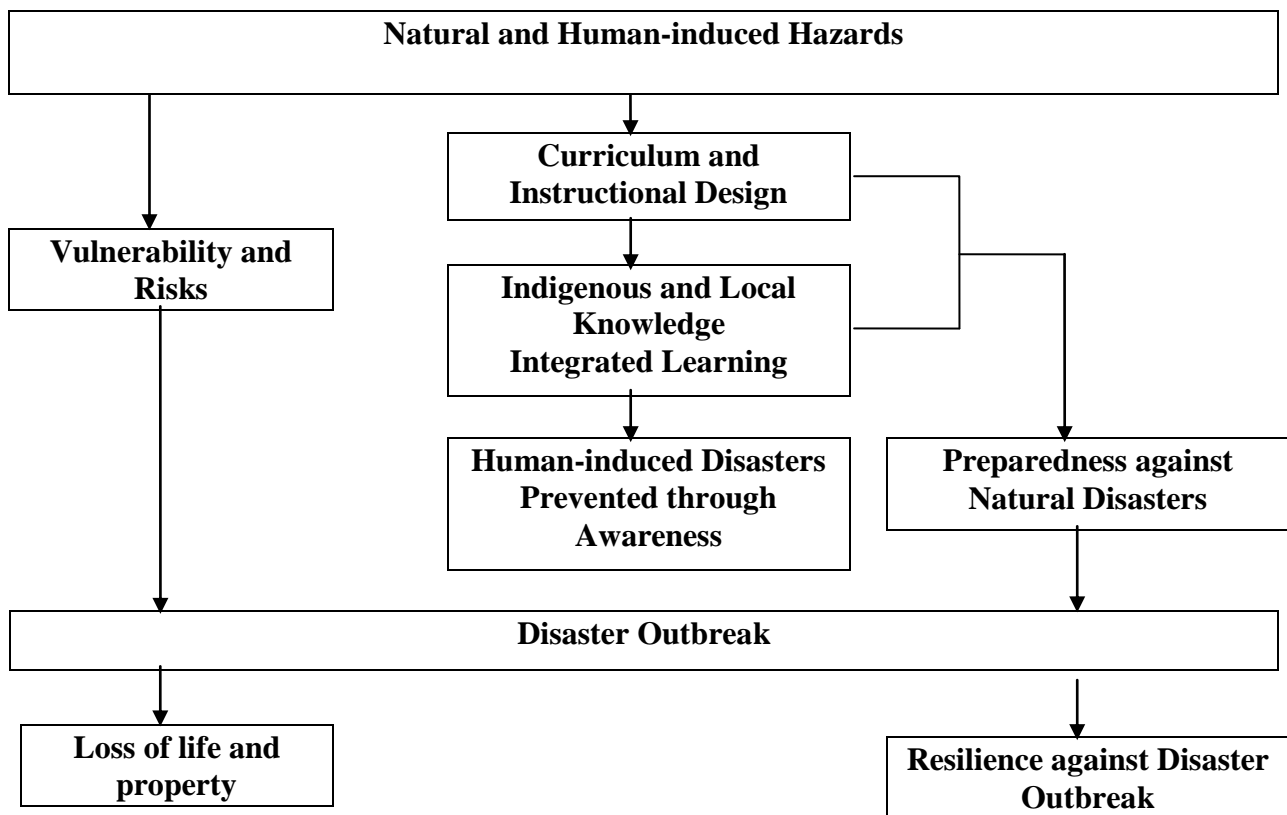


Figure 2.4: The conceptual framework emanating from the literature study

2.6 Conclusion

South Africa is currently experiencing meteorological and biological disasters such as floods, fires, droughts, storms and epidemics as depicted in Figure 2.1. Other disasters, such as

earthquakes, tsunamis, warfare, transport accidents, public places accidents and xenophobic attacks could happen any time. These call for the education system to contribute to learner awareness of hazards and disasters. The contribution would need to be done through the integration of disaster education into the national curriculum and through ensuring that the educators' instructional design caters for the teaching of hazards to learners. Indigenous knowledge and integrated teaching have proved to be possible didactic considerations that could address the learners' need for disaster awareness. Poverty is strong condition of vulnerability and informal settlements in South Africa are the most vulnerable. For learners to be well prepared for disasters, they need the commitment from their educators and the school system. There is a need for determining whether this commitment is evident in practice. The next chapter will address the strategies of collecting data from educators and other role players.