Acronyms

AIDS	Acquired Immune deficiency Syndrome
DBE	Department of Basic Education
FIFA	Federation for International Football Association
HIV	Human Immunodeficiency Virus
ICSU	International Council on Science previously known as the International Council for Scientific Unions
IKS	Indigenous Knowledge Systems
IOM	International Organsiation for Migration
ISDR	International Strategy for Disaster Reduction
NCS	National Curriculum Statements
NDMC	National Disaster Management Centre
NQF	National Qualifications Framework
OBE	Outcomes-Based Education
SAQA	South African Qualifications Authority
SABC	South African Broadcasting Corporation
SARS	Severe Acute Respiratory Syndrome
TB	Tuberculosis
XDR TB	Extreme-Drug Resistant Tuberculosis
MDR TB	Multi-Drug Resistant Tuberculosis
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNEP	United Nations Environmental Programme
UNESCO	United Nations Education, Scientific and Cultural Organisation
USA	United States of America
UK	Unite Kingdom

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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 percieved 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 loss[2] 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 an 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 l990s, 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.

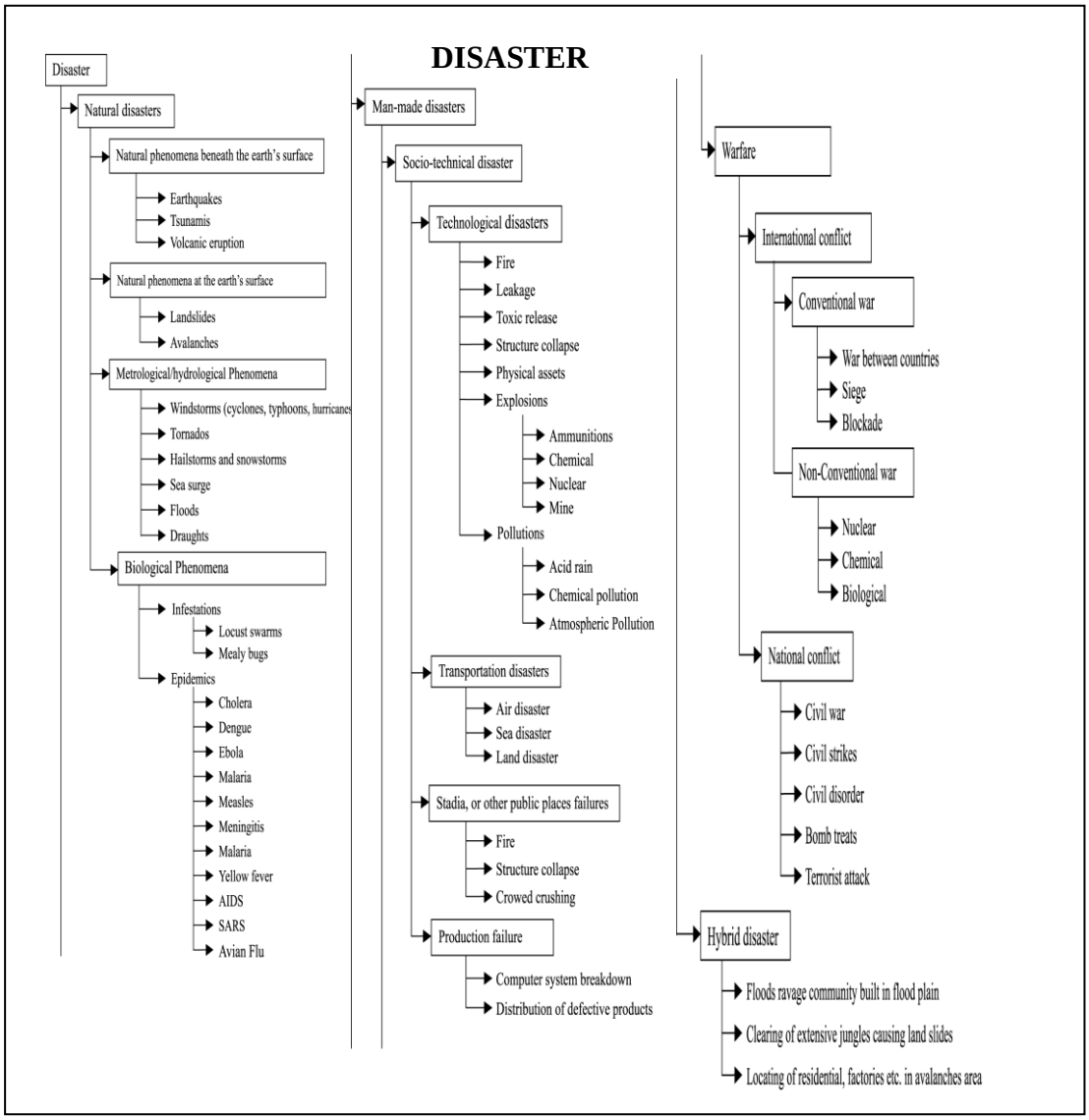

Figure 2.1: Disaster tree depicting the overview of disasters by Shaluf (2007)

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 idenitify 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, Lerise, 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 disaster 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 eThekwini (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).

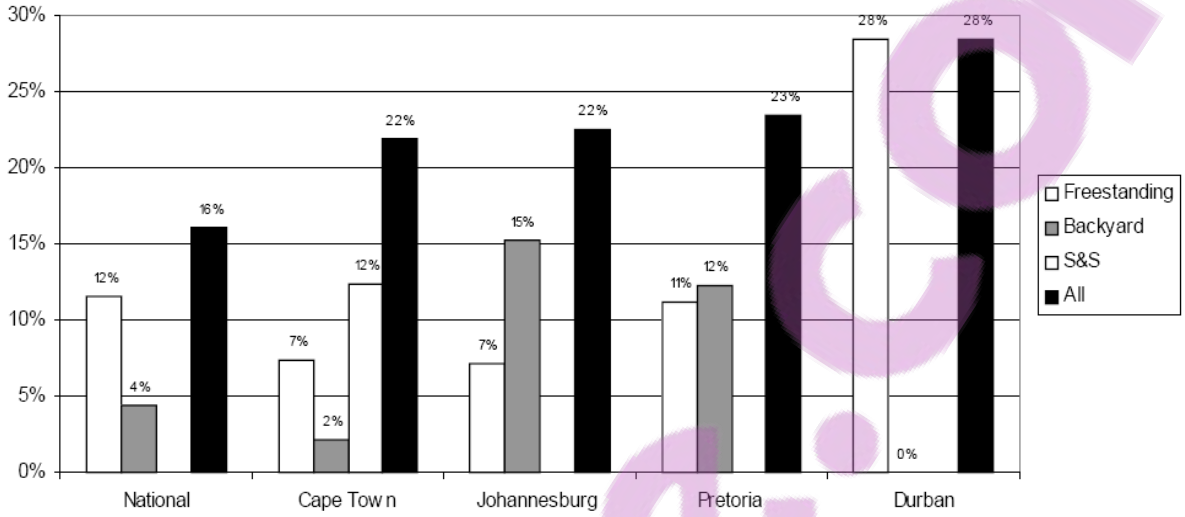

Figure 2.3: Comparisons of informal and formal settlements nationally and four major South African cities by Napier and Rubin (2002:5).

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 an 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 developed 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.

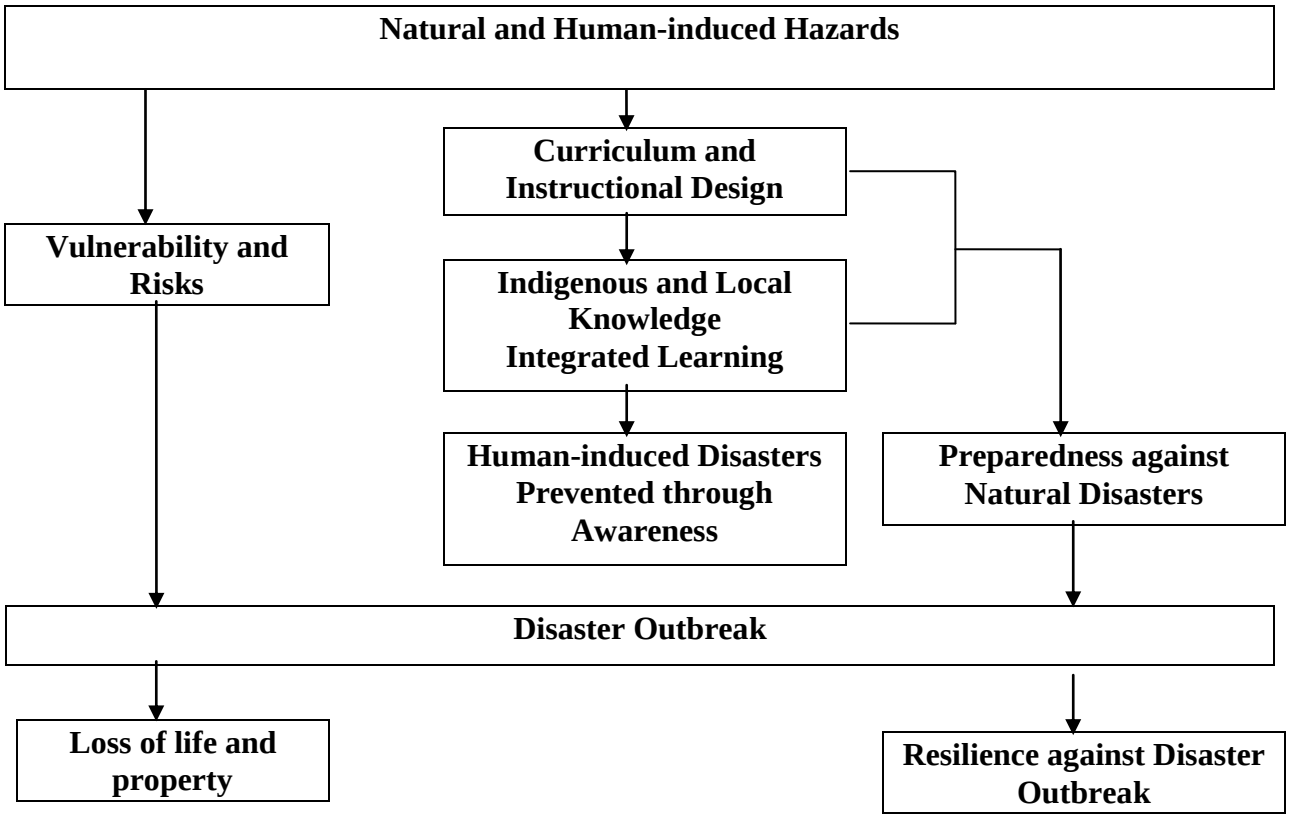

Figure 2.4: The conceptual framework emanating from the literature study

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.

CHAPTER 3

Research approach, strategies and methods applied during the course of the investigation

3.1 Introduction

Chapter three, discusses the multiple method research approach and the motivation why it is the suitable approach to examine how the school curriculum and classroom teaching address the need for learners' awareness of hazards and disasters. The aim of Chapter three is to explain the research strategies used to address issues raised in chapter two and in particular to address the questions that were raised in Chapter one. The chapter focuses on data collection methods, sampling techniques, data collection and analysis methods and thereby provides motivation as to why a triangulation method was used in this particular study.

3.2 Research design: qualitative, quantitative and mixed methods research

Research is a process of systematic and methodical inquiry and investigation to increase knowledge. Cohen et al. (2000:38) identify key characteristics of research as systematic, controlled, empirical and self-correcting. Since discipline is established by developing a body of knowledge, every research should add new knowledge to the body of existing data. Amaratunga et al. (2002:18) identify the following specific conditions for research:

- Orderly investigation of a defined problem.
- Use of appropriate scientific methods.
- Gathering adequate and representative evidence.
- Employing logical reasoning in drawing conclusions on the basis of evidence.
- Demonstrating or proving the validity or reasonableness of conclusions made.
- Ensuring that cumulative results of research in a given area yield general principles or laws that may be applied with confidence under similar conditions in future.

Scott (2000:11) maintains that the field of education teems with disputes about the reliability of different research approaches with little attention paid to epistemology and ontology. Cohen et al. (2000:5), on the other hand maintain that two contending and competing views of social science, namely the traditional view and the interpretive view have been adopted in educational research and have resulted in different schools of thought. The traditional view maintains that educational research is concerned with discovering natural and universal laws regulating and determining individual and social behaviour. The interpretive view maintains that educational research emphasises how people differ from inanimate natural phenomena and from one another. Cohen et al. (2000:13) further argue that researchers adopt the traditional (objectivist) view by treating the world as a natural phenomenon, hard, real and external to an individual. They choose from a comparable range of traditional methods such as experiments, surveys, questionnaires. Others, favouring the more subjective approach and who view the social world as being much softer and personal will select from a comparable range of recent and emerging techniques such as accounts, participative techniques and personal constructs.

For the purpose of this study the interpretive view seems attractive since when dealing with human beings and individuals in particular, one has to consider their unique circumstances. An example that emanated from the literature review in this study is the whole issue of educator involvement in the teaching of hazards and disasters, noting that some individuals are more exposed to hazards on a daily basis, especially those working and staying within informal settlements.

Tashakkori and Teddlie (2003:3) maintain that there are three (main) methodological movements of social and behavioural research; the positivists, constructivist and mixed methodologist. Healy and Perry (2000:118) echo Guba and Lincoln's (1994) four scientific paradigms which are positivism, constructivism, critical theory and realism. Each paradigm has its own methodological, ontological and epistemological viewpoint and uses specific research strategies and data analysis techniques. Cohen et al. (2000:3) support the idea that ontological assumptions give rise to epistemological assumptions that in turn give rise to methodological considerations.

Cohen et al. (2000:11) also argue that the first paradigm characterised by positivism ideals is less successful in its application to the study of human behaviour where the immense complexity and the illusive and intangible quality of social phenomena contrast strikingly with the order and regularity of the natural world. Moreover, in the contexts of classroom and school research Scott (2000:16) argues that objectivity is of crucial importance to the study of education because it can be used to indicate the accuracy of validity and help to ensure that the researcher is free of biases such as human error, dishonest error, interest bound and belief system. Healy and Perry (2000:119) define positivism as a paradigm that dominates science and assumes that science quantitatively measures independent facts about a single reality.

Whereas positivism is concerned with quantitative research according to Healy and Perry (2000:119), the other three paradigms are much more relevant to qualitative research. Cohen et al. (2000:17) maintain that the opponents of positivism are united by their common rejection of the belief that human behaviour is governed by general and universal laws, and characterised by underlying regularities. The second and third paradigms characterised by constructivist and critical theory support the subjective stance of the researcher and maintain that the social world can only be understood from the standpoint of the individuals who are part of the ongoing action being researched. The proponents of the constructivism paradigm view truth as a particular belief system held in a particular context and believe that the world consists of multiple realities that people have in their minds. Critical theory emphasises social realities incorporating historically situated structures.

The proponents of the fourth paradigm, which is realism, believe that there is a real world to discover, even though it is only imperfectly apprehensible. To make a distinction between constructivism and realism, Healy and Perry (2000:120) argue that an intrinsic case study (used in constructivism) focuses on the case itself while in an instrumental case study (used in realism) the case is used to understand something else.

It is important to note that the four paradigms do not study the same phenomena as highlighted in Sale et al. (2002:44) who argue that they cannot be combined. The table below summarises the distinguishable features of these four paradigms.

Table 3.1: Scientific paradigms and their elements, (Healy and Perry: 2000)

Element	Positivism	Critical Theory	Constructivism	Realism
Ontology	Reality is real and apprehensible.	Virtual reality shaped by social economic, ethnic, political, cultural and gender values crystallised over time.	Multiple local and specific constructed realities.	Reality is real but only imperfectly and probabilistically apprehensible.
Epistemology	Objectivist: findings are true.	Value mediated	Subjectivist: created findings	Modified objectivist: findings probably true
Methodologies	Experiments/Surveys: verification of hypotheses; chiefly quantitative methods.	Dialogic/dialectical: researcher is a transformative intellectual change who chiefly changes the social world in which participants live.	Hermeneutical/ dialectical: the researcher is a passionate with participants within the world being investigated.	Case studies, convergent interviewing, triangulation interpretation of research issues in qualitative methods and quantitative methods.

In deciding on the appropriate paradigm, method and strategies to address the problem, the four paradigms of positivism, constructivism, and critical theory and realism theories as discussed above were considered. Based on the discussions above, the realism paradigm as described in Fig 3.1 by Healy and Perry (2000:125) fits well the intentions and goals of the study to determine the contribution of education in raising learners' awareness of, knowledge of and application in responding to hazards and disasters. Firstly, the ontological focus of realism assumes that the research deals with complex social phenomena involving reflective people. In this study the researched phenomena refer to hazards and disaster education of learners and fit the criteria of being complex. The assumption of this study is that whatever data collected need to be verified, corroborated and compared with data from other sources. Hence in this study data will be collected from literature and other document sources, educators and specialists in learning, curricula and disasters.

Qualitative and quantitative research approaches have been used as the most appropriate ways to develop new knowledge and the proponents of these two approaches have been at loggerheads with each other. See the description of Amaratunga et al. (2002:18) who state that philosophers of science and methodologies have been engaged in a long standing epistemological debate about how best to conduct research which centres on the relative value of two fundamentally different and competing schools of thought. Each of the methods is based on a particular paradigm, a patterned set of assumptions concerning reality knowledge (ontology) of that reality (epistemology) and particular ways of knowing about reality (methodology); and that the two methods do not study the same phenomena as highlighted in Sale et al. (2002:44).

According to Johnson and Onwuegbuzie (2004:18) quantitative research focuses on deduction, confirmation, theory/hypothesis testing, explanation, prediction, standardised data collection and statistical analysis. Amaratunga et al. (2002:19) point out that the quantitative approach grows out of a strong academic tradition that places considerable trust in numbers that represent opinions or concepts. Borkan (2004:4) is of the idea that quantitative data collection tools allow the researcher to infer only about that which he or she is examining and that the statistical technique may work best in isolating or identifying the correlates associated with variations at specific moments in time.

Sale et al. (2002:44) explain that the ontological position of the quantitative paradigm is that there is only one truth, an objective reality that exists independently of human perception while epistemologically the investigator and the investigated are independent entities, which implies that the investigator is capable of studying a phenomenon without influencing it or being influenced by it. Sandelowski (2000:248) maintains that in quantitative sampling, probability sampling is usually preferred to permit statistical inferences and that it is oriented toward the development of nomothetic knowledge from generalisations of samples to populations.

It is therefore important to note that quantitative research techniques are important in that they allow for generalisations from samples of populations. Amaratunga et al. (2002:19) maintain that quantitative research grows out of a strong academic tradition that places considerable trust in numbers that represent opinions or concepts. Here, the researcher develops a testable hypothesis and theory which can be generalised across settings. It is important to note that Sale et al (2002:50) view quantitative research as perceiving truth as something that describes objective reality separate from the observer waiting to be discovered. Johnson and Onwuegbuzie (2004:18) maintain that quantitative research focuses on deduction, predictions, standardised data collection and statistical analysis.

The aforementioned discussions on quantitative research, led to the decision that it would be beneficial for this study to implement some components of a quantitative research approach. For the purpose of this study a questionnaire was used as a component of the quantitative research technique which also necessitated the use of other components such as sampling techniques and statistical data analysis involving coding. The reason for using the quantitative research technique is grounded on the fact that the results are easy to summarise and analyse while they also allow for comparisons of groups, location and times. Quantitative research strategies also allow for data collected from a small group to provide an indication of the views of a larger population.

As for a qualitative research approach, Johnson and Onwuegbuzie (2004:18) maintain that it focuses on induction, discovery, exploration, theory/hypothesis generation, the researcher as the primary instrument of data collection and qualitative analysis. The idea is further supported by

Borkan (2004:4) who maintains that qualitative research has great potential for exploring new topics or when familiarising research teams with new topics and that it is categorised by data collection techniques such as interviews, focus groups, participant observation, narrative and lived experiences. Amaratunga et al. (2002:19) support the notion by stating that qualitative research concentrates on words and observation to express reality and attempts to describe people in natural settings.

Sale et al. (2002:45) maintain that the ontological position of a qualitative paradigm is that there are multiple realities or multiple truths based on one's construction of reality which is constantly changing and epistemologically there is no access to reality independent of our minds, no external referent by which to compare claims of truth while the investigator and the object of study are interactively linked, so that findings are mutually created within the context of the situation which shapes the inquiry. Sandelowski (2000:248) argues that qualitative researchers prefer to use purposeful sampling to enhance understanding of the information-rich case and that it is oriented toward the development of idiographic knowledge, generalisations from and about individuals. Qualitative research is an umbrella term for many kinds of research approaches and techniques, including ethnography, case studies, analytic induction, content analysis, hermeneutics and life histories.

According to Amaratunga et al. (2002:25) qualitative research interviews are the most widely used method in social research and it is a highly flexible method that can be used almost anywhere and is capable of producing data of great depth. It is further defined as a technique whose purpose it is to gather descriptions of the life world of the interviewee with respect to the interpretation of meaning of the described phenomena. Amaratunga et al. (2002:25) further argue that when the researcher's concern is the experiences of people, the way that they think, feel and act, the most truthful, reliable, complete and simple way of getting that information is to share their experiences which could be done through one-on-one interviews or a group interview, commonly known as a focus group.

In brief, the discussions above purport that researchers need to choose from either qualitative or quantitative research approaches to develop the knowledge required to solve an identified

problem. Liebermann (2005:435) argues that long-standing methodological tradeoffs in the main modes of comparative analysis have tended to force scholars to choose between one or two imperfect approaches and further argues that such back-and-forth debate has served to illuminate the shortcomings of various methodological approaches; it has also provided momentum for the synthesis of research styles and findings. The idea is supported by Johnson and Onwuegbuzie (2004:16) who argue that scholars have called for an alternative integrative research approach which has resulted in a trilogy of major research paradigms and they regard mixed method research as the third paradigm.

Sale et al. (2002:46) provide several reasons as to why qualitative and quantitative approaches should be combined. The first reason concerning the two approaches is that they can be combined because they share the same goal of understanding the world in which we live in unified logic. The second reason is that the two paradigms are compatible because they share the tenets of theory-laden facts, fallibility of knowledge, in-determination of theory by fact and a value-laden inquiry process, shared commitment to improving human conditions, a common goal of disseminating knowledge for practical use, a shared commitment to rigour and critique in the research process. The third reason is that the complexity of phenomena requires data from a large number of perspectives. Another reason that could be added here as the fourth is that research should not be preoccupied with the quantitative–qualitative debate because it will not be resolved in the near future; that epistemological purity does not get research done.

The prevalent idea in most mixed methods research is that researchers should forge ahead with what works because truth is normative and combining two or more theories or sources of data to study the same phenomenon would assist in gaining a better understanding of it. Johnson and Onwuegbuzie (2004:16), on the other hand, maintain that a mixed research method should instead use a method and philosophy that attempt to fit together the insights provided by the two approaches into a workable solution.

Borkan (2004:4) defines mixed method research as an approach that refers to those studies or lines of inquiry that integrate one or more qualitative and quantitative techniques while Johnson and Onwuegbuzie (2004:17) define it as the class of research where the researcher mixes or

combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study.

Sandelowski (2000:248) argues that a combination of methods is concretely operationalised at the technique level of research, such as the level of sampling, data collecting and data analysis because combination at the paradigm level is not true combination, merger or reconciliation. This argument is further emphasised by Sale et al. (2002:47) who question the studies that found agreement in their qualitative and quantitative research and ask whether the results can be similar if the two paradigms look at different phenomena. There is agreement among researchers that the combination of paradigms is problematic; however, a combination of techniques is possible and the most appropriate. Sandelowski (2000:248) argues that techniques are tied neither to paradigms nor methods and permit innovative uses of a range of techniques for a variety of purposes such as:

- triangulation, to achieve corroboration of data or convergent validation;
- clarification, to explain or to elaborate on the result analysis;
- development, to guide the use of additional sampling, and data collection and analysis techniques.

In light of the discussions above on qualitative, quantitative and mixed research methods, the third approach which advocates the combination of both the qualitative and quantitative has proved to be ideal for this study on hazards and disasters; the former ensured that data were collected from a wider population while the latter focused on a selected few to collect data with great depth. The next section focuses on the description of each method that was used in this study.

3.3 Data collection through documents review, questionnaires and interviews

3.3.1 An overview of data collection methods used in this study

Three methods of data collection were selected for this study: an in-depth study of literature and documents review, questionnaires and interviews. Through literature study and documents

review data were collected from policy documents, such as curriculum guidelines, statements and legislation, disaster legislation, research articles on curriculum and hazards and disasters education and any other sources such as websites and newspapers. In essence any information that helped to provide reliable data to answer the main research question as stated in Chapter one of this study was used. The questionnaires were completed by 150 respondents in five provinces, KwaZulu-Natal, Eastern Cape, Western Cape, Gauteng and North West. Ten individuals were interviewed, including a disaster management specialist, a curriculum specialists, emergency response officers, disaster lecturers and two student teachers.

As indicated in Chapter one, the aim of this study is to determine how the South African education system, in particular curriculum and classroom teaching, contribute to enhancing learners' resilience to disasters. While it was intended that each question should have its own dominant research method, during the application of data collection it became apparent that almost all data collection methods were cross-cutting. Each research method was linked to each sub-question of the study with almost all methods addressing specific elements of other questions not answered well by the specific method linked to the question.

The first sub-question which aimed to determine *what disasters are prevalent in South Africa,* and the second sub-question which looked at *the extent to which South African communities are vulnerable to such disasters*, were linked to a literature study but in the questionnaire the first question probed what educators know about the disasters in their area. During the interviews respondents were asked about the prevalence of disasters in their area.

The third question was linked to research sub-question two aimed at determining *how the South African national curriculum could enhance the teaching of hazards and disasters in schools.* The fourth question looked at *the extent to which indigenous knowledge and integrated teaching could enhance learners' awareness of hazards and disasters*. Even here, although the questionnaire was the main method to address the question, both interviews and document study played an important role in providing useful information.

The fifth sub-question aimed at determining in *what better ways the teaching of disasters can be fully integrated in South African Education* was linked to the third method of interview but as with the first two questions, the other two methods played an important role in providing answers to the third question.

3.3.2 Data collection through literature and document review

Policy documents such as the Disaster Management Act of 2002, website description of Disaster Management Centre activities, National Curriculum Statements guidelines, Curriculum 2005, national and international policy documents related to disasters and curriculum such as UNESCO's South African National Commission on Disaster Management Plan, the Hyogo Framework Action Plan 2005 – 2015 and International Strategy for Disaster Reduction (ISDR) were considered. Research journals and other publications, scientific and non-scientific, were used to gather data to address the sub-research question. The main purpose of using the document study was to gather data that would inform what disasters were prevalent and to what extent communities were vulnerable to such disasters.

3.3.3 The use of questionnaires as a data collection tool for this study

The second data collection method comprised questionnaires which were completed by 150 educators employed in schools situated in informal settlements from five provinces which included Gauteng, KwaZulu-Natal, Western Cape, North West and Eastern Cape. Initially permission was requested from education departments in all nine provinces in South Africa, hoping that the total number of the respondents would be 270 if 30 educators from each of the nine provinces completed the questionnaires. Unfortunately four provinces, the Free State, Limpopo, Mpumalanga and Northern Cape did not respond to the request for permission to conduct research even after persistent telephone calls to the offices. Five out of nine was a good response and especially since the three provinces, Gauteng, Western Cape and KwaZulu-Natal responded. An attempt was made that at least 30 respondents participated in each province by distributing many questionnaires in identified schools. In each province more than thirty

questionnaires were distributed in those schools that showed interest through the discussion with the principals.

Considering the busyness of educators and the perception that they might not be willing to complete long questionnaires that probe for much detail outside school operational times, the questionnaire was structured so that the educators could tick only 'Yes' or 'No'. Cohen et al. (2007:322) make it clear that the dichotomous questions are useful for they compel respondents to get off the fence on an issue and make it possible to code responses quickly. A section asking respondents to give comments was included at the end of the questionnaire for those educators willing to provide more explanation. According to Eaden, Mayberry and Mayberry (1999:399) the use of dichotomous questions (a yes/no answer) is associated with significant reproducibility and reliability. This is particularly so when collecting factual information about health. To be really effective it is best to use questionnaires that ask for boxes to be ticked or strength of agreement to statements to be indicated. This has the advantage that it is easier and faster for the recipient to complete and also allows direct comparability of answers. Eaden et al. (1999:400) maintain that a relatively short and non-contentious questionnaire, which includes a description of the purpose and benefits of the study is linked to the response rate that is more than 90 percent and that in practice, many respondents are put off by questionnaires greater than A4 in length. Romero and Han (2004:617) maintain that the proposed negation in yes/no questions contributes to the implications that the speaker believes or at least expects that the positive answer is correct. These authors argue that this type of questioning is useful when the intent of the speaker (researcher) is to ask the addressee (respondents) for conclusive evidence (positive) or any possible doubts (negative). In this study, for example, the literature review revealed that indigenous knowledge is essential to raise learners' awareness of hazards and disasters. The use of Yes/No questions therefore assisted in providing data that tell whether educators are positive about literature findings or have doubts. The interview here was used to give conclusive evidence on whether indigenous knowledge would enhance learners' awareness of hazards and disasters if included in classroom teaching.

In this respect, the limitations of using Yes/No questions in a PhD study are acknowledged; to address these limitations the study employed interviews with specialists with various expertise

on the phenomenon of disasters. Amaratunga et al. (2002:23) argue that triangulation is mostly used for the fact that its effectiveness rests on the premise that the weaknesses in each single method will be compensated by the counter-balancing strengths of another. It is therefore important to note that the use of questionnaires completed by 150 educators contributed to strengthening data collected through the literature review and interviews.

3.3.3.1 The reliability of data collected through the questionnaires in this study

The reliability of the questionnaire was tested through a pilot study in which five respondents were given the questionnaires to complete. Two were former educators, while three were currently teaching. The former educators were included for their knowledge of the research process, as one had just completed her doctoral degree while the other former educator was currently studying towards a PhD degree. The three other educators included two teaching Grade 7 and one teaching Grade 9. The initial questionnaire had 21 questions and 21 spaces for comments. Four of the pilot respondents complained that it was too long for educators, to complete, given their experience. On their advice, the questionnaire was shortened without losing the essence of the required data. After effecting changes the following categories were included:

- *A consent form which informs educators of their right to privacy and informs them that they provide information on a voluntary basis as well as informs them that their participation is confidential.*

Inclusion of this category was informed by the fact that respondents cannot be coerced into completing the questionnaires. Cohen et al. (2000:245) maintain that respondents might be strongly encouraged, but the decision whether to become involved and when to withdraw from the research is entirely theirs.

- *Demographic details such as the name of the school, area, gender and experience in terms of years.*

Demographic details help to provide variable information that could otherwise affect the research and help to caution the researcher to go back and collect more data to avoid biases. For example, if the questionnaires were completed by only males, it would be essential to go back and request females to complete them. In this case the respondents were asked to provide information regarding their age, gender, the name of school and the province. This information was probed because it was essential for the analysis of data.

- *Compulsory questions on knowledge of curriculum and its implementation as well as the modalities for teaching hazards and disasters.*

This category was informed by the literature study in constructing the questions. The questions were then reconstructed after a pilot study completed by five respondents. This section was important because data provided can determine whether the questions raised in the study were answered or not. More details on the questions asked in the questionnaire are explained in depth later in this chapter.

- *Optional section for educators' comments in order to provide additional information or to give more details on their choice of answers.*

In this category respondents had an opportunity to raise anything about the research questions or to add something that they would like to stress.

The researcher collected data from educators following guidelines given in the approval letters from the provincial departments of education. The questionnaires were structured so that the researcher had to explain to the respondents the purpose of the research and then ask for permission to collect data, duly explaining the rights of the respondent to refuse participation if she so wished. No coercion or promises were made to the respondents and they were informed that their confidentiality would be guaranteed.

The process was timed at not more that 20 minutes for each educator to respond. Negotiation was entered into with the relevant principals and educators for the suitable time to complete the

questionnaire without jeopardising the educators' duties and as prescribed in the letters of authorisation. The questions below formed the basis of data collection among sampled educators:

1. In your own view, is your area likely to be affected by natural or man-made disasters?
2. Should hazards and disasters be included in the National Curriculum Statements learning outcomes?
3. Is it necessary for learners to be taught about hazards and disasters in your school?
4. Have you ever included natural and man-made hazards and disasters in your learning area when you teach learners?
5. Have you given your learners an opportunity to observe a real-life or visual representation of hazards or disaster event?
6. Have you ever included any indigenous knowledge information on hazards and disasters in your teaching?
7. Have you ever taught learners how to identify potential hazards in their environment?
8. Have you ever teamed up with other educators to develop a learning programme for hazards and disasters?
9. Have you ever checked whether learners do discuss what they have learned about hazards and disasters with their families?
10. Have you ever taught your learners how to respond when faced with disastrous events?

3.3.3.2 Validity of phrasing the questions as depicted in the questionnaires

Question 1 was included in the questionnaire in response to the emphasis by the Hyogo Framework for Action 2005 – 2015 that stresses the importance of disaster risk reduction being underpinned by a more proactive approach of informing, motivating and involving people in all aspects of disaster risk reduction in their own local community. Other researchers as discussed in Chapter two emphasise disaster risk reduction strategies that are country and in particular area specific. For example, Pelling and Uitto (2001:52) maintain that examination of how best to cope with physical shocks and stress needs to focus on local contexts. The question was meant to address the first sub-question which is concerned with the identification of disasters common in South Africa. Almost all the questions that followed below were intended to provide data for the

second sub-question of the study which was concerned with the integration of hazards and disaster in the curriculum and classroom teaching.

The design of question 2, 3, 4, 5, 7 and 10 was motivated by the Hyogo Framework for Action 2005 – 2015 which points out that countries should promote the inclusion of disaster risk reduction knowledge in relevant sections of the curricula at all levels and the use of other formal and informal channels to reach youth and children with information (ISDR:2005:9). As indicated in Chapter two, Shaw et al. (2004:48) argue that school education is important in enhancing knowledge and perception of earthquake disaster and they are supported by Hosseine and Izadkhan (2006:650), Shiwaku et al. (2007:585) and Ozmen (2006:392). Moreover, the Disaster Risk Reduction Begins at School campaign was spreading the message that disaster reduction projects in the future could be improved by increasing the number of hours allocated to disaster preparedness in the regular school curriculum, and organising sensitisation and education presentations to be given by disaster management officials at schools (ISDR:2007:14)

Question 6 and 9 tested the use of traditional or indigenous knowledge as another way of raising awareness of learners. As discussed in Chapter two under the sub-section *The role of indigenous knowledge on learner awareness of hazards and response to disasters*, indigenous knowledge scholars such as Snively and Cosiglia (2000:17) maintain that many indigenous groups in diverse geographical areas from the Arctic to the Amazon have their own system of managing disasters and recognise the feasibility of using traditional ecological knowledge for contemporary problems. Snively and Corsiglia (2000:26) further argue that teachers need to probe and include indigenous and local knowledge of learners. Pelling and Uitto (2001:56) argue that because of modernisation of island cultures where indigenous knowledge and practices are most extensive, the capacity of a society to absorb disaster shocks is likely to decline. Gaillard (2007:539) proposes a framework that enhances the local consideration of the problems rather than limited industrialised solutions. Gupta and Sharma (2006:70) maintain that some native islanders survived the tsunami because they lived on higher ground or far from the coast due to their local or native knowledge. Agrawal (2004:5) argues that indigenous knowledge is disappearing due to the pressure of modernisation, such as the current perception of a school system based on Western ideologies. Agrawal (2004:6) promotes the multiple domain and types of knowledge

usage as long as it safeguards the interests of those who are disadvantaged. Stevenson (1996:284), in his support for inclusion of indigenous knowledge as another way of raising learner awareness of disasters, maintains that the participation of aboriginal people in environmental assessment is warranted because they have in-depth knowledge of their lands and communities. Other scholars propagating the inclusion of indigenous knowledge to enhance learners' awareness of hazards and disasters include Hellier et al. (1999) and Alexander (1997).

Question 8 was modelled on the use of integrated teaching to enhance learners' awareness of disasters as supported and reflected by scholars such as Carl (2005), Kirk and Macdonald (2001), MacDonald et al. (2002), Creese (2005), Fisher and Mcdonald (2004), Morton (1993) and Arredondo and Rucinsky (1997), Ranby and Potenza (1999), Loepp (1999), Venville, Wallace, Rennie and Malone (2001), Chambers (1995) and Gehrke (1998).

While these questionnaires required that respondents give a Yes/No answer, Cohen et al (2007:322) and Rosnow and Rosenthal (1996) maintain that it is a natural human tendency to agree with a statement rather than to disagree with it which might result in bias from respondents. In this study the bias was taken care of by distributing the question not only to Grade 7 educators, which would have resulted in only affirmative answers; other grade educators were covered as well. The questionnaire was open to be distributed to any educator within the school without necessarily restricting it to a specific grade. School principals and heads of departments were determinants of who participated in completing questionnaires following the guidelines provided by the researcher.

According to Cohen et al. (2000:128) validity could be achieved through careful sampling, appropriate instrumentation and appropriate statistical treatments. In this study, thirty respondents per province were selected and five provinces were selected. The literature study, it indicated that the Western Cape and Gauteng have the largest informal settlements in South Africa and these two provinces were targeted. However, to ensure that data collected are representative, permission was requested from all nine South African provinces. Only five responded positively.

As discussed in Chapter 1 the idea of this type of research was conceived from a social visit to Ivory Park informal settlement; the first research site for this study was Ivory Park informal settlement in Gauteng. In the Western Cape, Khayelitsha is one of the biggest informal settlements in the province located near Cape Town International Airport. The other three areas were chosen not because they were informal settlements but because of the vulnerability embedded in them. Bizana in the Eastern Cape is a rural settlement with schools located in mountainous areas and their greatest challenges are floods and storms. Isipingo in Kwa-Zulu Natal is a formal settlement area but like informal settlements it has a problem of overcrowding and is vulnerable to disasters such as floods, fires and health related risks. Brits was selected because of its being a combination of informal settlement, farm schools and formal settlement schools. In total, five areas were chosen as research sites, the first two depict informal settlement vulnerabilities while the other three depict combinations of different settlements.

Thirty schools were targeted for data collection in each of the five provinces, bearing in mind that in one school data could be collected from a maximum of five educators, which drastically reduced the number of schools to fewer than thirty per province. The total number of schools that participated in the study was 47 broken down to eight in the Western Cape, ten in KwaZulu-Natal, eight in North West, nine in Gauteng and 12 in the Eastern Cape.

Ivory Park in Gauteng was the first area to distribute questionnaires, which proved to be challenging. During the first day only three schools were covered because questionnaires were distributed to those schools and the principals promised that they would give them to teachers during their lunch break. In three schools the questionnaires were not distributed and I was promised that if I came back the next day, the respective educators would have completed the questionnaires. On the next day, two of the three principals had lost the questionnaires. I had to distribute them again but requested the principals to distribute to the heads of departments to which they agreed. The experience in Gauteng taught me that when I got to a school, I asked for permission from the principal and then asked to leave the questionnaires with the heads of department, which proved to be effective.

It took one week to distribute and collect questionnaires in the Western Cape, mainly focusing on Khayelitsha. The process was that a day was reserved for asking permission from principals and leaving five questionnaires per school. The first six schools nearest to one another were targeted and additional schools were added on the next four days, depending on the number of questionnaires completed until the required number of questionnaires was reached.

North West Province was difficult because the research covered not just one place and schools were isolated. Different locations which included farm schools, informal settlements and formal settlement schools were consulted. Lessons learned during data collection proved to be effective and helpful. KwaZulu-Natal and the Eastern Cape were easier because they were the last provinces and data were collected in seven days simultaneously, mainly because of the proximity of the two areas, Bizana and Isipingo. The first day was used to distribute questionnaires to eight schools in Isipingo and these were collected the next day. Where questionnaires had not been completed as requested an appointment was made for the following week Monday. Wednesday was used to distribute questionnaires to twelve schools in Bizana to be collected on Thursday and Friday. On Monday the remaining questionnaires were collected in Isipingo.

While data collected in 47 schools from 150 educators cannot be representative of the views of educators within the country, the data collection for this sample was essential to provide insight into how educators from different provinces think about teaching about disasters. Data provided by this population while informing about issues related to disasters nevertheless provided essential information that was used to inform the interview questions.

3.3.4 Data collection through interviews

During the research proposal phase it was planned that the third research method would be focus group interviews where relevant respondents were invited on the same day. This method was expected to save costs and time for the interview to be completed within the agreed time-frame. However, during the implementation phase it became extremely difficult to have all experts in the same room on the same date and at the same time. As a result individual interviews were then

considered as the possible method that could yield the same results as the focus group, even though it cost time.

The main reason for choosing interviews as a third method was that they have the potential to enable the gathering of data that would mainly address the third question as well as of providing data for both sub-question one and two. In essence the interviews served as the core of the research method and were used to gather data that could not be collected through the literature study and questionnaires. According to Cohen et al. (2000:268) interviews can be used in research to follow up unexpected results and go deeper into some questions raised.

The sampling of disaster management experts was guided by the provision in the South African disaster management regulation that hazards and disaster education should be part of school teaching. For the purpose of this study three disaster management experts were sampled, a senior manager from the National Disaster Management Centre, a lecturer who trained emergency response officers from North West College and was part of the rescue team mission that went to assist in Haiti and a senior emergency officer who worked for Enviroserve, responsible for accidental disasters that could harm the environment, animals and human beings. For an education background five curriculum coordinators were sampled who were involved not only in monitoring and evaluating educators' compliance with the national curriculum but provided advice on the implementation thereof. These curriculum coordinators consisted of a national curriculum coordinator from head office, a curriculum director from Eastern Cape Provincial Education, provincial curriculum coordinators from Gauteng, Northern Cape and Mpumalanga. Two university lecturers were sampled because of their role in preparing educators and disaster education facilitators and for their research expertise through producing scientific publications used as part of the literature. The lecturers come from Wits University and the University of the Free State and had research experience in hazards and disasters.

Interview questions were developed in line with the conceptual framework discussed in Chapter two. The first question was based on vulnerabilities and the prevalence of disasters and the questions were adapted from researchers such as Shaluf (2007), Mgquba and Vogel (2004), Reid and Vogel (2006), Reich (2006), Landau and Saul (2004), Napier and Rubin (2002), Pelling and

Uitto (2001), Forthergill and Peek (2004), Paton and Johnston (2001) and Bull-Kamanga et al. (2003). Researchers supporting education as a way of raising awareness in learners which covers the third and fourth guidelines below include Shaw et al. (2004), Shiwaku et al. (2007), Hosseini and Izadkhah (2006), Ozmen (2006) and King (2000). The fifth guideline on indigenous knowledge was adapted from the viewpoints of researchers such as Snively and Cosiglia (2000), Gaillard (2007) Hellier et al. (1999), Briggs (2005), Stevenson (1996), Gupta and Sharma (2006), Rautela (2005) and Agrawal (2004).

The following guidelines ensured that the interviews were focused and yielded desired results. The participants shared their general perspective regarding:

- what hazards and disasters which might affect school learners are common in South Africa;
- the level at which learners should be taught about hazards and disasters;
- the manner in which the national school curriculum should address the teaching of hazards and disasters;
- the manner in which the teaching of hazards and disasters in the classroom should be done;
- the inclusion of indigenous (traditional) knowledge during teaching of hazards and disasters;
- the integrated learning approach whereby educators from different learning areas team-up to raise learners' awareness, knowledge, understanding and application in dealing with hazards and disasters.

These interview questions adapted from the literature as discussed above are important in this study because they helped to inform whether education contributes to enhancing learner awareness of hazards and disasters. They even added more data in support of the data collected through questionnaires.

Although reliability and validity apply to quantitative research techniques, in this study all interview respondents were requested to sign a consent form to declare that they were participating of their own free will. In some instances the identity of some of the participants

would be hard to conceal. Examples are those that published widely, like a professor form Wits University and a team leader of the rescue mission to Haiti. Another method to improve the trustworthiness of interview data was through the recording of the interview proceedings and transcribing those proceedings afterwards. A document trail was used as another method to improve the trustworthiness of the study where interview records would be safely stored for the verification process in future.

The following process was followed for data collection through interviews.

1. Steps before conducting the interview:
    - Develop the interview guidelines
    - Discuss with research leader/supervisor
    - Pilot the interview guidelines
    - Sample participants
    - Request permission from sampled participants
    - Ask participants to sign consent form

2. Steps during the interview
    - Thank respondents for availing themselves for the interview
    - Introduce myself and the research
    - Request permission to record the proceedings
    - Ask respondents questions according to the interview guidelines
    - Give respondents opportunities to ask questions or make comments
    - Thank the respondents

3. Steps after the interview
    - Listen to the interview records and transcribe them
    - Reread the transcripts to determine if they make sense
    - Analyse the transcript using categories
    - Record the findings using descriptive analysis

- Save the record and write it to a CD for safe keeping

3.4 The research sample that applies to this investigation

3.4.1 Research sample for questionnaires

It has been indicated in Chapter one that this study focuses on the informal settlement context and the reason given was that hazards and disasters mostly affect the poor most of whom in South Africa reside within informal settlements. Informal settlements are a recipe for disaster because of the way the areas are selected. In this study educators who worked at schools located in informal settlement such as Ivory Park, Khayelitsha, Brits informal settlements, Bizana and Isipingo, were invited to complete questionnaires while relevant specialists consisting of five curriculum specialists, three representatives from Disaster Management institutions and two lecturers from institutions of higher learning were also invited to participate. Permission was obtained from the provincial departments of education to allow educators to participate in the research.

A convenience and purposive sampling technique was used for sampling educators because they were working in schools that were located in the surroundings of informal settlements. This form of sampling is relevant because it enables the researcher to ask for permission from the principal and the available educators were asked to respond to the questionnaires. The first priority was given to Grade 7 Social Science educators and the invitation was then extended to any educator available. Letters of request were sent to all nine provincial education departments and permission was secured from five provinces, KwaZulu-Natal, the Western Cape, the Eastern Cape, North West Province and Gauteng. The Google search engine was used to ascertain which areas had in the past experienced disasters and numerous informal settlements were identified. Among them were Khayelitsha and Ivory Park. These two settlements were then selected because of easy access and familiarity with the environment. Bizana and Brits settlements were selected because of being on the boundaries of the selected provinces. Isipingo was selected because of its vulnerability, coupled with an ease of access from the Durban International Airport.

3.4.2. Research sampling for interview participants

In this study ten interview participants were sampled using convenience and purposeful sampling. The rationale for using purposeful sampling was that the participants were the most likely to provide relevant data to address the research problem, and their availability and willingness to participate made the sampling convenient. The lecturers and curriculum and disaster management specialists interviewed were selected because of their response to the request and their availability. Interviews were conducted with a professor of Geography from Wits University, a lecturer in Disaster Management from the University of the Free State, senior manager within the National Disaster Management Centre, five curriculum specialists one from the National Department of Basic Education, the Eastern Cape, Gauteng, Mpumalanga and the Northern Cape provincial departments of educations, a senior emergency officer from Enviroserve and a lecturer at North West Emergency Response Training Institute.

3.5 Data analysis approach applied in this study

Triangulation was used during data analysis to determine whether the data collected through document study, questionnaires and interviews provided the same results, provided different results or resulted in new data as informed by Creswell et al. (2004:11), who argue that triangulation of mixed method data is more difficult to implement than other analysis methods because of the need to reconcile and bring together quantitative and qualitative data to better understand the problem. Caracelli and Greene (1993:196) maintain that triangulation seeks convergence, corroboration and correspondence of results across different method types. The concept of triangulation was first used as a military strategy that uses multiple reference points to locate an object's exact position because multiple viewpoints allow for greater accuracy as recorded in Jick (1979:602). Amaratunga et al. (2002:23) maintain that the use of triangulation should be motivated by the assumption that its effectiveness rests on the premise that the weaknesses in each single method would be compensated by the counter-balancing strengths of another.

3.5.1 Data analysis of the responses retrieved from the questionnaires

Cohen (2000) maintains that once data have been collected, the researcher's task is to reduce the mass of data obtained to a form suitable for analysis; data reduction generally consists of coding either by hand if the survey is small or by computers when numbers are large. The hand option was used where the educators' responses were captured into an Excel spreadsheet. According to Cohen et al. (2000) statistical processing consists of nominal, ordinal, interval or ratios. The nominal and ordinal are often derived from questionnaires and surveys while the interval and ratios are derived from experiments and tests. As indicated above, this study used questionnaires, the nominal and ordinal were the best statistical processing approach to analyse data. Quantitative data analysis in this study concentrated on the mode and frequencies of scores by educators. The task was to determine which questionnaire items had been scored the highest or the lowest and what were the frequencies of the answered questionnaire. In each of the questionnaire items, the respondents were expected to tick Yes/No and then provide an explanation afterwards. The information was captured on an Excel table with pre-developed formulas and the frequency of respondents' scores was analysed and decision made. The study therefore relied heavily on descriptive and frequency analysis.

The Excel table indicated how many respondents answered particular questions and how many said Yes/No per region, gender, province and their experience as educators. A chart was used to provide a visual representation of data for each category. The analysis informed the perceptions of educators on teaching about hazards and disasters in schools and whether there was a need for improvement. Some questions had been repeated just to determine whether respondents did not just tick without reading the questions.

3.5.2 Data analysis of interviews responses and document study

According to Creswell (2009) qualitative data analysis is an ongoing process involving continual reflections about the data, asking analytic questions and writing memoranda throughout the study. This type of analysis involves collecting open-ended data, analysing for themes or perspectives and reporting the themes. Cohen et al. (2005) maintain that qualitative data analysis

involves organising, accounting for and explaining the data to make sense of participants' definition of situations, noticing patterns, themes, categories and regularities. Interviews, document study and literature reviews fall within the ambit of qualitative data analysis. During the literature study, themes were identified which related to questions being addressed in the study. These themes were used as questions posed to the participants during interviews and their responses were analysed to determine whether the themes were covered or not. Logical analysis was employed through comparing data from literature study as recorded in Chapter two.

Creswell et al (2004) argue that triangulation is more difficult to implement than other analysis methods because of the need to reconcile and bring together quantitative and qualitative data to better understand the problem. In this study triangulation is applied to check whether data collected from educators, curriculum and disaster specialist as well as from literature and policy documents yield the same results, have noticeable patterns, produces new insights or agree with each other. A table is used in this study to reflect the insight emerging from literature, questionnaires and interview data collection.

3.5.2.1 Coding of the interview transcripts to enable analysis of interview data

In section 3.3.4 above generic steps for the interview process were discussed and it was pointed out that the interview proceedings would be recorded and transcribed to enable capturing all ideas flowing from participants. To ensure that data collected were reported correctly, the following categorisation strategy was used:

- The Shaluf (2007) disaster tree was used as a guideline for disasters that could be affecting the country. From the transcripts any reference to disasters appearing on the disaster tree and mentioned by the interview participants was colour-coded with a pink marker (represented as 1 in this report). Those disasters not listed on the disaster trees but recorded by other scholars were colour-coded with a powder blue marker (represented as 2) while those not listed in any literature were colour-coded with a light green marker (represented as 3).

- In all instances the respondents were classified as curriculum specialists, disaster specialists or disaster lectures.
- Regarding the vulnerability of communities the guidelines for coding were derived from literature sources and the following categorisation was used:
    - All concepts mentioned in the vulnerability section in Chapter two such as poverty, informal settlements, buildings and structural vulnerability, shacks and residence on river banks were colour-coded with pink, while new items relating to vulnerability were colour-coded in light green.
- All participants who agreed on the inclusion of hazards and disasters in the national curriculum were colour-coded with pink and those that were not sure were colour coded with powder a blue marker and those that indicated that it should not be integrated were coded with a light green marker. A follow-up question was on what level should the integration of hazards and disasters into national curriculum take place and those that wanted it to be as it was now were coded with light green and those that indicated a specific grade were coded with pink, while those who indicated that it should feature in more than one grade were coded powder blue.
- Those that indicated that indigenous knowledge and integrated teaching should be used by teachers were coded in pink; those who were not in favour of the two concepts to be part of teaching were coded in powder blue and finally those who gave additional information on the issue were coded in light green.
- Those who mentioned strategies identified in literature were colour-coded pink, those who suggested new strategies were coded powder blue while those who did not have any strategies were coded in light green.

As a way of summary the table below depicts themes and categories identified from literature study and discussed in depth in Chapter two. The themes include concepts such as vulnerability, curriculum, instructional design, indigenous knowledge and integrated teaching. During data collection especially, the emphasis was on how participants viewed the contribution of these themes to learners' awareness of hazards and disasters. The findings should reflect a close scrutiny of these themes and recommendations ought to show a link to the themes

Table 3.2: The table depicting the link between the research questions, research methods and data collection sources

Main Research Question	Sub Research Questions	Research Method	Research Technique	Research Sample	Data Analysis
How does the South African education system, in particular curriculum and instructional design, contribute to enhancing learners' awareness of hazards and resilience to disasters?	1. What disasters are prevalent in South Africa?	Qualitative	Literature, document study and interviews	Literature on hazards and disaster, 3 disaster specialists, 5 curriculum coordinators and 2 disaster lecturers.	Logical Analysis
	2. To what extent are South African communities vulnerable to such disasters?	Qualitative	Literature, document study and interviews	Literature on hazards and disaster and 3 disaster experts, 5 curriculum experts and 2 disaster literatures	Logical Analysis
	3. How does the South African national curriculum cater for the teaching of hazards and disasters?	Qualitative-Quantitative	Literature, document study, interviews and questionnaires	literature on hazards and disaster and 3 disaster experts, 5 curriculum experts and 2 disaster lectures and 150 educators	Logical analysis and descriptive/frequency Analysis
	4. To what extent would indigenous knowledge and integrated teaching enhance learners' awareness of hazards and resilience to disaster?	Quantitative – Qualitative	questionnaires and interviews	Literature on hazards and disaster and 3 disaster experts, 5 curriculum experts and 2 disaster lectures and 150 educators	Logical analysis and descriptive/frequency analysis
	5. What other learning strategies could enhance learners' awareness of hazards and resilience to disasters?	Qualitative	interviews	3 disaster experts, 5 curriculum experts and 2 disaster lecturers	Logical analysis

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3.6 Measures to address validity and reliability of the study

Healy and Perry (2000) have developed criteria that can be used to determine the validity and reliability of research within the four paradigms of research. Such criteria include ontology of realism, contingent validity, triangulation, methodological trustworthiness, analytic generalisation and construct validity.

According to Golafshani (2003:599), reliability is the consistency of measurement, or the degree to which an instrument measures the same way each time it is used under the same conditions with the same subjects. To ensure that the research is reliable, triangulation was used to determine points of similarities and differences from data collected through a literature study, questionnaires and interviews. Validity is defined as the strength of the research conclusion, inferences and propositions and it could either be a construct, content, internal, external or instrument validity.

Leedy (1997) maintains that strategies commonly employed to achieve trustworthiness in qualitative research include triangulation, member checking, chain of evidence, outlier analysis, pattern matching and representative checking. In this study, triangulation and member checking were used to improve the trustworthiness of the data collection. To ensure that the data collected were valid and reliable various measures were employed such as the following:

- Submitting an ethical statement for approval by the University of Pretoria ethics committee.
- Asking for permission from the provincial department of education and school authorities.
- Asking respondents consent for their participation.
- Recording the participants' responses through a recording device and transcribing them.

To ensure that data collected from respondents were reliable, the questionnaire was piloted to five educators and their comments were solicited which resulted in drafting the final questionnaires. Triangulation was used to check consistency in the findings. The interview participants were requested to check whether their views had been represented appropriately.

3.7. Research limitations for the study

The purpose of this study was to determine how education, in particular, curriculum and instructional design contributes to learners' awareness of hazards and resilience to disasters. The topic is essential as disasters are currently affecting many South Africans. However it is important to consider that its wide scope had necessitated that it be narrowed down, which resulted in sacrificing some key elements such as data collection from learners and also focusing on the contribution that community training could make to disaster risk reduction. For the problem to be addressed in its entirety, more data should be gathered from educators, curriculum experts, disaster education experts, learners, recent disaster sites, disaster victims and the community in general. This study however, focused only on gathering data from educators and a few disaster and curriculum specialists given the limited time and resources linked to PhD studies.

There is a methodological limitation as well: this study would have been enhanced by sampling a large population of educators from all learning areas to complete questionnaires but given limited capacity of human resources, time and finance for this study, the data collection was limited to 150 educators completing questionnaires. Also if educators were interviewed, the findings in this study could have been enhanced. Rather than focusing on all schools in South Africa, the study sampled educators from schools located in selected informal settlements, which makes it difficult to generalise.

According to Ary et al. (2002) data analysis is a process whereby researchers systematically search and arrange the data in order to increase their understanding of the data and to enable them to present what they have learned from others. Ary et al. (2002) further suggest that to simplify the complexity of data analysis, it is best to break the data down into manageable steps: organising data, summarising data and interpreting data.

The data were analysed using a two-stage analysis approach whereby data collected through three methods (document study, questionnaires and interviews) were analysed first individually; the second stage was to analyse the combined results through triangulation to determine

corroboration, similarities or differences. The first analysis focused on data collected through document and literature study. The second analysis considered the demographic details of educators in the first section of the questionnaires and the main questions and comments at the end of the questionnaire.

The collected data provided information on the perspective of educators on hazards, disasters and National Curriculum Statements. The third analysis considered data collected from interview participants consisting of curriculum specialists, disaster management specialists and hazards and disaster lecturers.

Making sure that educators provide an honest opinion when completing the questionnaires is another area of limitation of this study. Moreover, it was not possible for the researcher to sit with all educators while they completed questionnaires and a follow-up was not possible because of the confidentiality clause which encouraged educators not to provide their names. However, the researcher made sure that questions were asked to those educators who agreed to complete the questionnaire in the researcher's presence.

3.8 Conclusion

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The research design made it easier for the researcher to collect required data without compromising their reliability and validity. The choice of multiple methods of research was the best decision because the questionnaire responses provided the basis for posing questions during the interviews. The richness of such data collected at schools located in informal settlements from the five sampled provinces, the Western Cape, KwaZulu-Natal, North West Province, the Eastern Cape and Gauteng as well as from disaster and curriculum experts contributed to understanding the depth of the problem under investigation. The next chapter will demonstrate the richness of such data collected. The researcher managed to collect relevant data from sampled individuals without compromising the validity, reliability or the trustworthiness of data collection.

Chapter 4

Analysis and discussion of the results of the investigation

4.1 Introduction

In Chapter four data collected through questionnaires and interviews are displayed, analysed and discussed in depth to determine whether they addressed the main research question posed in Chapter one:

> *How does education, in particular curriculum and instructional design, contribute to learners' awareness of hazards and resilience to disasters?*

The chapter determines whether the provisions as stipulated by the National Management Disaster Framework are being implemented as stated by the NDMC (2005:79). Disaster risk reduction education must be integrated in primary and secondary school curricula. Schools should be regarded as focal points for raising awareness about disaster risk management and disaster risk reduction. The risk reduction component of disaster risk management education should be linked to broader education programmes relating to development and the environment.

The chapter also reports on the understanding and implementability of principles discussed in the NCS (2003:3 by the Department of Education). The principle of integration of learning within and across subjects and fields of learning is crucial for achieving applied competence and to promote learning of theory, practice and reflection. The NCS (2003:4) further discusses the principle of valuing indigenous knowledge as essential to enhance learners' understanding of the world demands and that it should be infused into subject fields as such.

To ensure that there is logic and systematic flow of addressing this question, data presentation in this chapter was done using the order of the sub-questions as listed in Chapter one. For example the first sub-question intended to determine what disasters are prevalent in South Africa. Data collected through questionnaires were displayed, analysed and discussed to determine whether

evidence was provided to address the question and a conclusion was given. Data collected through interviews followed the same format and the data set collected through questionnaires and interviews was triangulated with findings from literature to determine if sub-question one had been addressed. This format was followed right through to sub-question five and the final section looks at whether the collected data provided evidence to address the main research question. Data findings from the literature review, questionnaires and interviews were analysed using descriptive analysis techniques and triangulation to determine whether education contributes to learners' awareness of hazards and disasters.

4.2 An analysis of data collected to address sub-question 1: *What disasters are prevalent in South Africa?*

The first sub-question intended to determine what disasters are prevalent in South Africa. This question was important because knowing the types of disaster that afflict the country would enable curriculum developers, educators to develop interventions that suit the target. Questionnaire respondents and interview participants responses are displayed in this section and compared to what scholars and policy documents say about the prevalence of disasters in South Africa.

4.2.1 An analysis of data collected through literature and policy documents

In Chapter two Shaluf's (2007) disaster tree framework was discussed as a starting point for disasters affecting the global community. Shaluf (2007) divides his framework into three broad categories of disasters: natural, human-induced and hybrid. According to Shaluf (2007), the first broad category consists of the phenomena beneath the earth's surface such as earthquakes, tsunamis and volcanic eruptions; the second sub-category refers to phenomena at the earth's surface such as landslides and avalanches. The third sub-category consists of meteorological/hydrological phenomena such as windstorms, tornadoes, hailstorms, sea surges, floods and droughts. The last sub-category consists of biological phenomena such as infestation characterised by locust swarms, mealy bugs and epidemics characterised by cholera, dengue fever, Ebola, measles, malaria, meningitis, yellow fever, AIDS, SARS, Avian Flu, etc.

The second category of human-induced disasters is divided into two sub-categories; socio-technical disasters and warfare. The socio-economic as the first sub-category is divided into disasters such as fire, leakage, toxic release, structure collapse, physical assets, explosions induced by ammunition, transportation disasters from land, sea and air, stadia and public places failure as well as production failure. Warfare as the second category of human-made disasters is divided into international and national conflict. International conflict refers to conventional war (war between countries, siege and blockade) and non-conventional war (nuclear, civil war, civil strikes, civil disorder, bomb threats and terrorist attacks). The third category refers to hybrid disasters such as floods ravaging communities built in flood plains, clearing of extensive jungle resulting in landslides and locating of residential areas and factories in vulnerable sites like avalanche areas.

The International Council for Science (ICSU) panel on natural and human-induced hazards and disasters in sub-Saharan Africa developed a science plan (2007:4) in which they recorded that Africa is an area prone to a wide variety of natural and human-induced disasters such as floods, hurricanes, earthquakes, tsunamis, droughts, wildfires, pest plagues, and air and water pollution.

The National Disaster Management Framework (2005:2) recognises a diversity of risks and disasters that occur in southern Africa, and gives priority to national developmental measures that reduce the vulnerability of disaster-prone areas, communities and households. Also, in keeping with international best practice, the NDMF places explicit emphasis on the disaster risk reduction concepts of prevention and mitigation as the core principles to guide disaster risk management in South Africa. According to the White Paper on Disaster Management published by the Department of Provincial Affairs and Constitutional Development (1999:21), South Africa like many countries in the world, is at risk from a wide range of natural, technological and environmental hazards that can lead to disasters such as droughts, floods, major fires, mining disasters, tornadoes, major oil spills and even earthquakes.

Reid and Vogel (2006:199/200) identify HIV/AIDS, floods, fires, drought and other waterborne disease while Mgquba and Vogel (2002:31) identify HIV/AIDS and floods as disaster challenge

for South Africa. Frost-Killan (2008:28) identify hazards such as human-induced earthquakes in mining areas resulting in sinkholes, landslides, flooding and coastal erosions. Linked to these is pollution of water with mining acids that is currently being reported in the South African media. Meiklejohn (2005:33) reported that hurricanes in the form of tropical cyclones affect the northern parts of the South African coastline. Meiklejohn and Sumner (2005:10) maintain that although South Africa would not experience as much devastation from tsunamis owing to its steep coast, low-lying areas of northern KwaZulu-Natal and the southern part of the Western Cape are vulnerable to tsunamis. Bradshaw (2003), Mayosi et al (2009), Wojcicki and Malala (2001), Bachmann and Booysen (2003), Macdonald and Schatz (2006), Susser and Stein (2000), Martin (2005) and Martin and Williamson (2004) identify epidemics such as HIV/AIDS, tuberculosis, cardiovascular disease as challenges for South Africa, which could result in disasters.

The next section will determine whether respondents and participants were aware of disasters and to determine whether they have identified any hazards or disaster that are different from those listed from literature and policy documents. The focus will be to check whether respondents and participants were aware of what was happening in their environment.

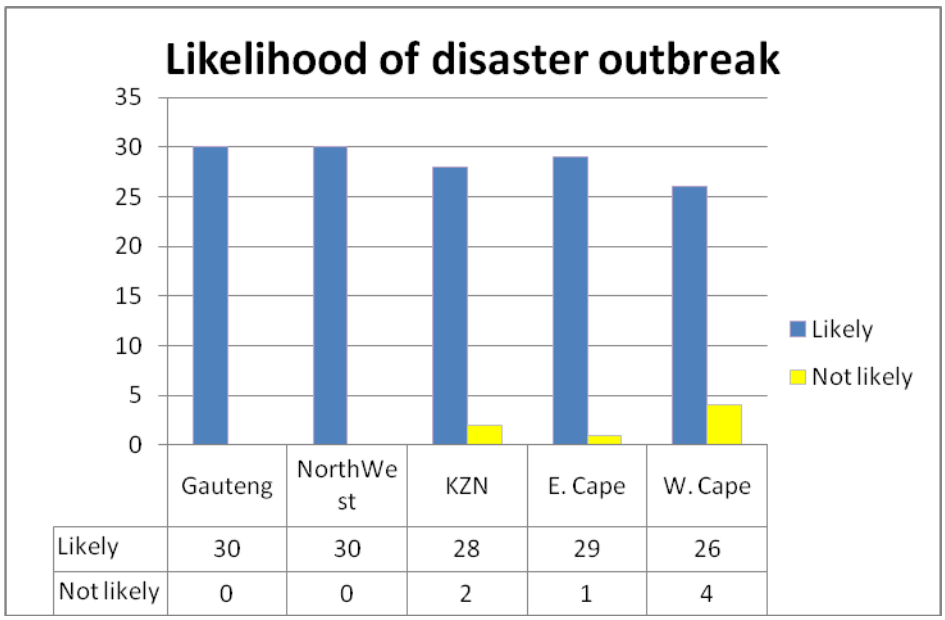
4.2.2 Questionnaire response in relation to the prevalence of disasters in South Africa

Data for this sub-question were collected through a questionnaire distributed to 150 educators located in informal settlement schools. The educators were asked whether their area was likely to be affected by hazards. The intention of this question was to determine whether educators were aware of hazards and disasters in their area and whether South Africa has a prevalence of hazards and disasters. The chart below indicates the responses per provinces and displays the information in percentages. Asking this question was informed by the assumption that if educators were aware of disasters that have affected the community in the past and were aware of hazards that were prevalent in the community, then they were likely to teach learners how to respond to disasters and hazards. This assumption was informed by Paton's model of preparedness recorded in Paton (2003 & 2007), Paton and Johnson (2001) and McIvor and Paton (2007) which places critical awareness as the centre of preparedness. Paton (2003) defines critical awareness as an

extent to which people think and talk about specific sources of adversity or hazards within their environment. Also the assumption relates well to the Shiwaku et al. (2007) education framework reported in p. 46/47 which used Rohrman's awareness model which states that awareness promotes action for disaster reduction in the community.

4.2.2.1 Chart display of educator responses on the likelihood of their area being affected by disasters

The responses of educators from Gauteng and North West Province reveal that respondents are completely aware that their area could be affected by disasters while in the Eastern Cape only one person thought that the area was not likely to be affected by disasters. In KwaZulu-Natal, two respondents thought that their area was not likely to be hit by disasters while in the Western Cape four educators thought that their area is not likely to be affected. The response to question 1 reveals that 143 out of 150 were in agreement that their province was likely to be affected by disasters while only seven did not think so. In terms of percentages, 95.3 percent of educators were aware that disaster could strike. However, the researcher is aware of the caution that needs to be taken when converting small raw scores into percentage. Since the data were collected from only five provinces out of nine, it is important to note that it is not representative of the entire country as four provinces did not participate in the study. However, since the response was from 55.5 percent of the provinces, the result has some value and should be considered as such. Furthermore, given that only 150 educators participated in the study out of a large population of educators in South Africa, it cannot be concluded that 95.3 percent of educators in South Africa believe that the country could be hit by disasters. Nevertheless, the data indicate that out of a population of 150 respondents, the majority agree that South Africa is likely to be affected by disasters. Since the aim of the sub-question was to determine what disasters are prevalent, the questionnaire provides educators' perspectives.



	Gauteng	NorthWest	KZN	E. Cape	W. Cape
Likely	30	30	28	29	26
Not likely	0	0	2	1	4

Figure 4.1: Chart display of educator responses on the likelihood of their area being affected by disasters

In terms of the research problem the educators' responses indicate a high level of awareness that their areas could be affected by disasters. These results were expected as data was collected from schools located in informal settlement. What is important to note though is how much the results tie in with Figure 2.3 by Napier and Rubin (2002:5) as depicted in p30. Figure 4.1 depicts that there were educators in Western Cape and KwaZulu-Natal who thought that they would not be affected by hazards and disasters. In Figure 2.3, Napier and Rubin (2002) depicted that Cape Town has less informal settlement or what he calls backyard housing while in Durban there were no backyard settlements when their study was conducted. Gauteng educators' response shows that they believed that they were likely to be affected by disasters, and links well with Napier and Rubin's Figure 2.3 which showed a high number of informal settlements (backyard) in Pretoria and Johannesburg. The significance of educators' responses depicted in Figure 4.1 is the level of awareness within the schools thereby supporting that there is awareness within education of the need to teach learners. The results here are also consistent with the findings recorded by Ozmen (2006:391) where he found that after the 1999 earthquake in Turkey, learners gained much awareness of disasters and became prepared. This supports the idea that because these educators work within an informal settlement vulnerable to disasters they are more aware.

4.2.2.2 Educators' general comments related to the prevalence of hazards and disasters in South Africa

Although the questionnaire requested respondents to answer by selecting either Yes/No, they were further asked to make additional comments at the end of the closed-ended questions that relate to the research sub-question 1. Fifteen respondents gave additional comments related to sub-question 1 with six respondents from the Western Cape, five from the Eastern Cape, two from Gauteng, one from KZN and one from North West Province.

A respondent (R1) from North West commented that:

> *Our school is situated in an underdeveloped area consisting of narrow roads, houses get burned by fires and floods are problematic in the area.*

A respondent (R2) from the Eastern Cape commented that:

> *Soil has eroded at the river banks affecting the classrooms which were built in mud during the rainy season and cyclone and earthquakes can affect the country anytime.*

Other hazards identified by this respondent included poisonous plants and huge trees that fall during storms.

Another respondent (R3) from the Eastern Cape commented that:

> *I teach learners about road accident, floods, fire, heavy rains, wind, storms, tornadoes and droughts.*

A respondent commented that:

> *The questionnaire has highlighted the importance of an educated and intelligent response to the circumstances of man-made disasters vis-a-vis a house burning or a road accident.*

A respondent (R4) from the Western Cape commented that:

> *Potential hazards I taught them are about medical waste dumped in nearby areas where needles are often used by them to inject one another which might have been used on people with serious infection diseases, playing on wetland (Bloudam) or swimming there.*

Another respondent (R5) from the Western Cape commented that:

> *There's a need to teach our communities through our learners about mechanisms to protect them against man-made disasters such as shack fires.*

Other respondents from the Western Cape identified floods, veld fires, heavy rains as disasters prevalent in their area while Gauteng respondents added road accidents to fires and floods as the main hazards and disasters prevalent in their area as indicated by a comment by a respondent (R6) that:

> *Fire department did training for learners in 2008 about how to escape fire and traffic safety department as well trained educators and learners about safety in the road.*

Although the data provide evidence that educators in South Africa are aware of hazards that affect their communities, it should be noted that they were not asked directly, which makes the data more important. What is evident strongly from these comments is that they provide relevant evidence that some educators are not only aware of disasters but they teach learners about things that affect their communities, like the comments about medical waste, mud houses and road and fire safety. The educators comments reiterate the points discussed above, that the question has contributed by elucidating the high level of awareness detected from educators' response.

4.2.3 Interview responses in relation to the prevalence of disasters in South Africa

Individual interviews are regarded as essential in this study as the main data source. As discussed in Chapter three the respondents were coded as first, second up to the tenth with P1 to P10 referencing used. The first participant (P1), a senior manager from the National Disaster Management Centre maintained that a distinction should be made between hazards and disasters. Hazards are those incidences with potential to result in disasters while disasters are characterised

by loss of life and property. The most prevalent hazards in South Africa are floods, storms, veld fires, lightning, sinkholes and social conflicts such as those caused by xenophobia.

The same principle was supported by the second participant (P2), a lecturer from Wits University who distinguished between biophysical phenomena that include floods, droughts, storms, fires, cyclones and heat waves and socio economic disasters such as HIV/AIDS, xenophobic attacks as well as other chronic disasters. Much of what the third respondent had to say was aligned with many of the comments already reported in the previous paragraph. The third participant (P3), a lecturer from North West Emergency Response College identified hazards such as droughts, fires, floods, industrial explosion and chemical spillages as affecting North West Province and South Africa at large. P3 also identified some mine related disasters where mineworkers in the Rustenburg area and adjacent areas are continuously affected.

The fourth participant (P4), a curriculum coordinator from Gauteng, maintained that Gauteng experienced disasters such as floods, shack fires, dolomite; sinkholes, and in some cases communities experience extreme cold weather and transportation accidents, while the fifth participant (P5), a director in the curriculum unit in the Eastern Cape confirmed that the province experienced disasters that range from floods, and storms to fires. It is obvious that the Eastern Cape does not hold similar hazard threats as does Gauteng province, mainly because it has many more rural settlements as opposed to Gauteng, which has many informal settlements.

Both participants (P6). national curriculum coordinator and (P7), a provincial curriculum coordinator, from Northern Cape, were of opinion that South Africa was having a serious problem with floods, droughts and fires in areas such as the Northern Cape. These concerns were reiterated by the eighth participant (P8), a lecturer for disaster management from the University of the Free State, who argued that South Africa was experiencing hazards such as droughts, floods, veld fires, shack fires and added some more disasters such as rift-valley fever, foot and mouth disease and problems with water quality. He stressed HIV/AIDS as another critical hazard that needed attention.

Participant (P9), a senior manager from EnviroServe who previously worked for Ekurhuleni emergency services, added new value to the discussion by exposing additional hazards such as spillages by rail and road tankers and vehicle and public transport accidents. Possible risks caused by floods and fires were also highlighted by the same respondent.

The last respondent (P10) a curriculum coordinator, maintained that Mpumalanga was experiencing hazards such as floods, droughts and industrial accidents such as those that occurred in a SASOL plant situated in Mpumalanga (pipe bursts and car accidents caused by company tankers). P10 also mentioned that when you drive on the N4 between Middleburg and Emalahleni there was another hazard of fog in the morning making it difficult for drivers to see clearly which makes them vulnerable to accidents especially as there are huge trucks driving on the road.

4.2.4 Document and picture analysis in relation to the prevalence of disasters in South Africa

Reflecting on what literature has recorded on issues pertaining to the prevalence of hazards and disasters in South Africa, most data were gathered from scholarly articles, newspaper articles and policy documents from international organisations such as ISDR, UNEP, UNESCO and NMDC. According to the NDMC framework (2005:1), 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.

According to Mayosi et al. (2009:34) South Africa is in the midst of a health transition that is characterised by the simultaneous occurrence of epidemic infectious diseases and a rise in non-communicable diseases, in a population facing a heavy burden of prenatal and maternal disorders, injury, and violence. Cardiovascular disease, type 2 diabetes, cancer, chronic lung

disease and depression are the major non-communicable diseases now reaching epidemic proportions in the former socialist states and low-income regions of the world. Bradshaw et al. (2000) maintain that by 2000 South Africa experienced a unique quadruple burden of disease experienced in a combination of the pre-transitional diseases and conditions related to poverty, the emerging chronic diseases, injuries and HIV/AIDS.

Acutt, Medina-Ross and O'Riordan (2004:309) argue that in South Africa, the history of many communities, both formal and informal, surrounding chemical facilities has been shaped by apartheid planning that resulted in racial zoning associated with industrial development.

An analysis of pictures taken in Ivory Park and Khayelitsha informal settlements reveals that these areas experience multiple hazards. Picture 1.1, 2.1, 2.2 and 4.1 reflect the complexities that characterise the vulnerabilities of the two informal settlements but could be similar to other informal settlements in South Africa as well. Picture 1.1 and 2.2 depict Ivory Park informal settlement hazards. Picture 1.1 depict shacks directly facing the storm water pipe with eight water channels. The number of the water channels and height of the storm water pipes reflect that engineers and architects expect that a high volume of water might pass through. Considering the weak materials used to build shacks such as cardboard boxes and plastic, one wonders how disastrous it would be if a storm hits the Ivory Park area. Picture 2.2 depicts a different angle of the Ivory Park informal settlement, providing another dimension to disasters experienced in the area. The picture depicts multiple hazards such as high voltage electric cables with some shacks built underneath the poles and cables. The chances of these shacks being destroyed by fire from the electricity and lightning are high. Furthermore, the picture depicts the sewerage pipe passing among the shacks. The danger with sewerage pipes running through the shacks is that if they burst the residents of the informal settlement will experience health challenges. Some of the dangers of this type of hazard are reported in 4.3.3 where the press raised the alarm about residents of informal settlement around Jukskei River facing a possible disaster from a deteriorating sewerage pipeline.

4.2.5 Discussions on the findings of questionnaires, interviews and literature review in relation to the prevalence of hazards and disasters in South Africa

The interviewed participants made it clear that fires, floods and droughts were the main prevalent hazards in South Africa followed by storms, sinkholes and accidents such as industrial explosions, and spillages from rail and road accidents. Other hazards identified by the participants include epidemics (such as HIV/AIDS, foot and mouth disease, rift-valley fever and avian flu), water quality, extreme cold, heat waves, social conflict and fog. The significance of identifying these hazards is that it helps in the development of curriculum and instructional design. While not every disaster needs to be included in teaching in just one grade, the teaching could be spread across different grades, from foundation to senior phase. The combination of natural hazards, epidemics and human vulnerability and risks increases the magnitude of disasters. These disasters have severe implications for education because in some instances learners are unable to go to school or are affected by the disasters when they are at school or on their way home. The greatest challenge for the education fraternity is whether to respond to this by including all these hazards in the curriculum or not.

Data collected through the interviews were consistent with the comments made in the questionnaire where educators identified floods, veld and shack fires, droughts and road accidents as hazards experienced in their area. Additional information emerging from the questionnaire comments included the potential hazards that could be caused by medical waste carelessly dumped next to communities and falling trees as a result of storms. Compared with data from the literature review, Mgquba and Vogel (2004), Napier and Rubin (2002), Reid and Vogel (2006), Vogel et al (2007), Frost-Killan (2008), the NMDC report (2009) and *The Times newspaper* (2009) all support the evidence that floods are a serious hazard in South Africa. Fire and droughts are mentioned as other types of hazards affecting South Africa. It is, however, important to note that Mgquba and Vogel (2006:30) emphasise that future changes in climate as well as changing social conditions including the role of HIV/AIDS, governance and conflict pose huge challenges to society. Napier and Rubin (2002) argue that natural disasters that affect people in informal and tradition settlements most adversely are floods, famine, drought, fires, wind storms and epidemics. They further state that creeping disasters that relate to conditions of

poverty such as high infant mortality, HIV/AIDS and other illnesses should also be considered. A Harvard publication (2002) notes that the current HIV/AIDS epidemic could be considered a disaster in a number of nations, especially in sub-Saharan Africa because there is substantial evidence indicating that in nations afflicted by the epidemics a serious disruption of the functioning of society begins to occur.

Newspapers and television news have extensively reported floods and fires that affect South African communities and neighbouring countries. There is therefore strong evidence that data gathered through questionnaires and interviews are congruent with the literature review. Moreover, some of categories identified in the Shaluf (2007) disaster tree and what was identified by the National Disaster Management Centre (2005), Mulegeta, et al. (2007) and some scholars as discussed in Chapter two are congruent. Since it has been ascertained that South Africa is likely to be hit by disasters and is currently experiencing some forms of hazards, it is essential to determine the extent to which South African communities are vulnerable to such disasters.

In Chapter two, Hartnady (2010) was quoted saying that 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. He stresses that it is not a question of if, but when. This prediction combined with Frost-Killan (2008) who was quoted in Chapter one saying South Africa has a history of geohazards and disasters such as having the deepest mines in the world with some going down nearly 4km that lead to high rates of seismic activity from gold mining districts, that are higher than elsewhere in the world. Sinkholes found in underlain and dolomite show that instability could result in unstable soil, resulting in the collapse of mountains. These activities might trigger an earthquake, landslide even huge sinkholes.

In summary, the sub-question 1, posed as, *what hazards and disasters are prevalent in South Africa?* has been addressed in the discussions above. The literature review, questionnaire respondents and interview participants provided conclusive evidence that South Africa has a prevalence of major hazards such as floods and fires and it is experiencing other hazards and disasters such as droughts, storms, epidemics, social conflict reflected as xenophobia, road

accidents, chemical spillage and minor hazards such as cold weather, lightning, fog and heavy rains. Even though the country has not experienced major disaster such as earthquakes, volcanic eruptions or hurricanes, these catastrophic events nevertheless should not be ruled out as a possibility. Moreover, global change experts are concerned, as reported by van der Walt (2010:14), that irreversible man-made alterations to the global environment that have a negative impact on the ecosystem most obviously have potentially serious consequences for human well-being. This idea is supported by Barnard and Underhill (2010:28) who maintain that these are rapidly changing times for the rest of the world as climates are changing perceptibly and people and industries are altering the landscapes in dramatic ways that are unprecedented in human history with pollution and toxins all around us.

The categories emerging strongly from the interview responses were floods and fires followed by droughts and accidents such as industrial, road, rail and spillages. Two respondents identified HIV/AIDS as a hazard while new hazards such as fog alongside the N4 highway, cold weather, heat waves, water quality and epidemics such as rift-valley and foot and mouth disease show that South Africa is experiencing many hazards that could easily result in disasters.

What emerged strongly from the responses of P2, P6 and P8 is that there is a need to differentiate the concept hazard from disaster as they mean two completely different things. In fact P2 and P8 maintained that the questions incorrectly referred to disasters and P2 suggested that the interview should refer to hazards and vulnerability, while P8 stated that it should focus on disaster risk reduction. However, the question posed asked what hazards and disasters are prevalent in South Africa and the respondents were expected to distinguish between hazards and disasters.

While floods and fires emerged as major hazards prevalent in South Africa, one hazard that cannot be ignored is the fog mentioned by P10. The same day I was working on the interview transcript, I watched the seven o'clock E-TV news on 13 August 2010 which reported an accident that happened when a truck was trying to make a u-turn and was hit by a 1400 Nissan bakkie which was subsequently hit by a truck. The driver of the Nissan 1400 died on the spot while the passenger was taken to a nearby hospital and was in a critical condition. The cause of

the accident apart from the truck driver who was doing a u-turn was a dense fog as the E-TV video footage showed.

In conclusion, the responses have provided a fair amount of data to make a decision whether South Africa has a problem with hazards and disaster. It is important for learners to know and understand the types of disasters affecting their community, province and those affecting the entire country. They should also be taught about disasters that are affecting the global community as these are important in case learners find themselves visiting some of the countries affected by specific disasters. The questionnaire responses have shown that educators were aware that their area could be affected by disasters and the next step for them is to develop learning programmes including unique disasters that have been identified by interview participants such as epidemics, natural hazards, human-made and hybrid disasters. The next section will discuss the findings of sub-question 1in relation to the results of questionnaire, interviews and the literature review.

4.3 An analysis of data collected to determine the extent of South African communities' vulnerability to disasters

Sub-question 2 of this research intended to determine the extent to which South African communities are vulnerable to disasters. The inclusion of this sub-question was motivated by numerous scholars such as Reid and Vogel (2006:195) who report that rural, resource-poor communities currently experience a number of stressors that curtail livelihood options and limit the quality of life and Napier and Rubin (2002:3) who point out that it is interesting to note how discussions about informal settlements and the livelihoods of people occupying such settlements have begun to intersect with the discussions and rhetoric around environmental hazards and disaster risk management. In Chapter two, section 2.3, the issue of vulnerability was discussed in depth. Scholars such as Reid and Vogel (2006:196), Mgquba and Vogel (2004:37) and Napier and Rubin (2002:5) argue that communities residing in informal settlements are more vulnerable and are the ones who suffer greater losses than their counterparts in established settlements. King (2000), Gaillard (2007: 534), Napier and Rubin (2002:3), Reich (2006:796), Pelling (2003) and Mgquba and Vogel (2004:34) stress the fact that poverty contributes to vulnerability of

communities and is reflected in structurally poor houses and vulnerable areas, which increase the chances of these communities becoming victims of disasters.

4.3.1 Educator responses to the extent to which South African communities are vulnerable to disasters

Although there was no specific question that asked educators about the extent of their communities' vulnerability to hazards, some educators provided data under the additional comments section that addresses the extent of South African communities' vulnerability to disasters. For example, a respondent (R7) from the Western Cape commented that:

> *Most of our learners live in shacks; this alone makes them to experience disasters because of hazards like fire and flood.*

Another respondent (R8) from the Western Cape commented that:

> *There is a need for hazards to be included in the curriculum because in our area there is an informal settlement and the community is also affected by floods.*

It was stated in a previous section on the prevalence of hazards and disasters in South Africa that a Western Cape respondent (R4) showed concern about medical waste dumped in Khayelitsha that was easily accessible by school children of whom some were seen injecting one another. To emphasise how storms are experienced in the Eastern Cape, R9 commented as follows:

> *One of the local schools was recently blown away by wind storms and there have been some houses which burned from fire. In the Eastern Cape some houses are built with raw bricks made of mud and when it rains heavily, these houses are eroded which forces the inhabitants to leave their homes.*

These few comments provide evidence that educators are aware of the extent to which their communities are vulnerable to disasters. This evidence is complemented by the fact that 95.3 percent of the 150 respondents who completed the questionnaire as discussed in 4.2.1.1 of the previous section indicated that there was a likelihood for their area to be affected by disasters. The significance of the responses here is that respondents have commented on some issues of

poverty which the literature review emphasised, that although disasters affect everyone in the vicinity of the outbreak, it is poor people who suffer the most. A respondent mentioned that people living in a house made of mud bricks usually experience problems during heavy rains. Recently SABC news reported on two families struck by lightning in KwaZulu-Natal in December 2010. The deaths of more than five family members in each incident were noteworthy for the fact that these families were living an a mud house with a grass roof. The question that arises here is whether school education could have saved the lives of the KwaZulu-Natal families. In the literature review some scholars emphasised that disasters happen fast and in most cases are unexpected which makes it difficult for people to survive. Ronan and Johnston (2001:1056) although sceptical about the effects of hazard education programmes maintain that they might help and specifically mention the turtle response as another way that learners could survive. Here, if the two KwaZulu-Natal families had been taught about the turtle response where a person is expected to crawl to the nearest exit and avoid standing, they might have survived.

It would be essential for educators to start assessing what disasters are likely to affect learners based on the environment they come from, such as those that live in shacks; those that have to cross rivers and streams; those that have to cross busy roads. More importantly they would have to assess any other potential hazards that may result in death or other catastrophic outcomes.

4.3.2 Interview responses in relation to the extent to which South African communities are vulnerable to disasters

The participants who participated in the interviews were not asked directly to give their views on sub-question 2 as it was to be addressed from the literature review. The respondents were asked to name disasters that were prevalent in South Africa and it became apparent that some respondents, while addressing the first sub-question, automatically addressed the question about the extent to which South African communities were vulnerable to the identified disasters. As indicated in the previous discussions of sub-question 1 that South African communities are vulnerable to specific hazards and disasters.

The response of P1 showed that other countries experience disasters; South Africa has not seen major catastrophes but there are small scale hazards such as earthquakes being reported, storms that recently affected Musina next to the border with Zimbabwe. Although there was no loss of life as a result of the storm, the incident left people destitute as their houses were destroyed as well as property, furniture, cars and food. Schools in the area were damaged and luckily the storms sprung up during the night otherwise learners would have been highly affected. P1 further stated that South Africa would be hosting the FIFA soccer world cup in June to July 2010 and that there was a need to ensure that disaster risks such as those caused by terrorism, stadia collapsing and fatal roads accidents were reduced. A task team was established specifically to look at what possible disasters could happen during the soccer world cup and make plans to mitigate such risks.

P2 stressed that hazards are not an issue of concern as the human race has been living with them through one generation to another. The problem arises when these hazards are linked to the vulnerability of communities as paraphrased below:

> *The issue to understand is that these hazards are here all the time and it is not an issue, take droughts and floods as an example, we will always have those, the problem is when you link the hazard to vulnerability then it becomes a disaster. If there is no vulnerability the hazards will happen anywhere all the time and there would be no problem as people will learn to cope.*

P2 further stated that in her current work, she tried to ensure that the legal framework on disaster management focused on risk reduction issues which are in essence vulnerability issues. She was a member of the Intergovernmental Panel on Climate Change (IPCC), and they have focused their work to have issues of vulnerability take centre stage as they are essential if we are to win the war against disasters. P2 gave examples of floods and the earthquake in Haiti to illustrate the role of vulnerability. On issues of floods, P2 maintained that it is not a problem as long as communities do not settle or build roads in areas prone to flooding or prevent the water flow to the river. Another example given by P2 to support the statement is that the Haiti earthquake was devastating because of people and structural vulnerability and most of the people who suffered heavily were the poor residing in marginal areas. The participant further stated that the massive hurricane Katrina could be used as another example in that a large sector population that was poor and consisting mostly of the black population of the city was largely affected. To illustrate

the effect of vulnerability, P2 believed that if the hurricane had struck the affluent and white population the damage would have been minimal because of the structural resilience of the houses in the vicinity.

P2 emphasised that if the issue of vulnerability is not understood and there is no best science generated on the phenomenon, we will miss the boat all the time and end up with a small event ending up becoming a devastating disaster. R2 stressed that it is not the prevalence of disasters that we should be concerning ourselves with but how vulnerable communities are to disasters.

P3 maintained that South Africa was fortunate not to have experienced any disasters like tsunamis, volcanic eruptions and earthquakes such as that in Haiti, Japan and Chile. Most disasters experienced in South Africa do not lead to mass death as in Haiti where more than 700 000 people died. The South African incidents only require that victims be handed humanitarian relief necessities such as shelter and food. There is, however, still loss of life in some incidents such as flood, truck accidents and mining accidents in South Africa. Most South Africans are not aware that disasters such as earthquakes, storms and volcano eruptions could happen in their area. Even though they are aware of floods and fires, they do not think that these could increase in magnitude.

P4 added his voice by saying that Gauteng experienced disasters such as floods, shack fires, dolomite, sinkholes and in some instances communities experience extreme cold weather. Disasters are area-specific, for example, Alexandra township has experienced much flooding and many shack fires while other areas like Germiston and the West Rand have experienced sinkholes and houses have developed cracks. What is referred to as a disaster at Jukskei River informal settlements may not necessarily be seen as a disaster. Fires that are raging in the province in some informal settlements, or in industrial buildings and on farms are specific to that area. Car accidents are problematic, especially during the festive season. You hear that in Gauteng more than 300 people have died and most deaths are taxi and bus related. There are some train accidents but they mostly involve people crossing railway tracks without looking. But cars, buses and trucks ferrying people are sometimes involved in train accidents.

P5's views on communities' vulnerability were that these disasters do affect the community very much. Floods were problematic because people were now building houses in areas that are not demarcated for human settlements. Building houses in a mountainous area above a river is a recipe for disaster because all water that flows from the mountain to the river will first destroy any structure in its way. Like other participants, P6 stressed that floods were now becoming serious because of the establishment of new settlements where streams of water used to run. New buildings and big roads cause water to be rechanneled, making the communities susceptible to flash flood disasters.

According to P7, the recent floods in the Northern Cape affected communities residing close to the river banks, especially those that built shacks in an informal area. Schools were also affected by the floods.

P8 stressed the fact that the hazards (listed in 4.2.2) were prevalent and they would continue to bother communities. What mattered most was to have disaster risk reduction strategies to ensure that communities did not get seriously affected. P9 commented by giving an example of how communities were vulnerable to spillages of dangerous materials from road and rail accidents by stating:

> *Sometimes trucks transporting dangerous materials and chemicals pass through cities and there are possibilities for accidents to happen as they move with dangerous materials on a daily basis in South African roads. For example, informal settlements of Alexandra, Tembisa and other areas within the country in which shacks are built next to the tar roads and railway tracks. This is potentially dangerous if one thinks of the chemicals in the tankers.*

This comment is linked to a response by P3 who was concerned about people's behaviour of always running to the scene of an accident just to watch and not do anything to help as reflected in the phrase below:

> *When there is an accident, people run towards an accident scene without knowing what is happening.* I*n one instance we responded to an emergency where a truck was transporting cyanide which is a dangerous chemical and on the scene there were people just watching without knowing what was in the truck.*

There was a possibility of a disaster if there had been an explosion and spillage occurred. Many onlookers could have been affected; luckily the danger was averted before the chemical was released.

To support the notion that South African communities are vulnerable to disasters, P10 maintained that:

> *The SASOL plant in Mpumalanga poses threats to the neighbouring communities since it deals with highly hazardous materials and the pipe could burst or tankers could spill the hazardous materials which could heavily affect the community residing nearby. A similar accident once happened in Mpumalanga but not many people were affected.*

The responses above provide relevant data to prove that the participants think that South Africa is vulnerable to a great extent to some of disasters like floods, fires and accidents.

4.3.3 Documents and picture analysis depicting the extent to which the informal settlements are vulnerable to disasters

According to Napier and Rubin (2002:5), natural disasters that affect people in informal and traditional settlements most adversely are flooding, famine, drought, fires, wind storms and epidemics. As noted earlier, the creeping disasters, which relate to conditions of poverty such as high infant mortality, and deaths from HIV/AIDS and other illnesses, are also not captured in these figures. Technological disasters, affecting informal settlement residents, included transportation accidents, industrial accidents, and other miscellaneous accidents which accounted for the loss of lives. The miscellaneous accidents category included fires in informal settlements – and again the number of deaths from such events is vastly under reported. An analysis of Picture 2.2 reveals that the Khayelitsha informal settlement is located next to busy railway lines and according to the article from Railway Africa News reported in section 2.3, this settlement poses a high risk that includes theft, vandalism and sabotage of rail equipments. The most worrying aspect is that stealing of electric cables and other equipment happens at these informal settlements which could easily lead to an accident involving a train transporting hazardous materials.

4.3.4 Discussion of the data collected through interviews, questionnaires and literature review to address the extent to which communities are vulnerable to disasters

In Chapter two Section 2.3 I stated that disaster scholars and to a lesser extent the general public have acknowledged that disasters do not distribute risks indiscriminately; issues of poverty (Fothergill & Peek: 2004), housing (King: 2000, Napier & Rubin: 2002), being underprivileged (Alexandra: 1997), geographical marginalisation (Gaillard: 2007), and health (Bull-Kamanga et al.:2003) are at the centre of vulnerability. The Green Paper on Disaster Management (1998) maintains that like other countries, South Africa is at risk from a wide range of natural, technological and environmental hazards that can lead to disasters such as droughts, floods, major fires, major oil spills and even earthquakes.

My impression here is that South Africa is vulnerable to a greater extent to disasters such as flood, fires, and droughts, industrial and technological accidents. HIV/AIDS is fast becoming a disaster in South Africa, considering that the prevalence rate was standing at 18.8 percent by 2005 as reported in a study conducted by Weltz, Hosegood, Jaffar, Batzing-Feigenbaum, Herbst and Newell (2007) in KwaZulu-Natal, and which proved that South Africa has one of the highest HIV infection rates in the world.

Weltz et al. (2007:1472) found a prevalence of 21.5 percent among residents of KwaZulu-Natal rural areas where two-thirds of the population lived in sparsely populated areas, combined with evidence that non-participants may be at a higher risk of HIV, and the much higher infection rates among mobile non-residents who make up 30 percent of household members suggest that the burden of HIV in rural areas of South Africa may be higher than previously estimated. The authors reported that UNAIDS revised the South African HIV prevalence estimates from 20.9 percent to 18.6 percent with the 2005 estimates being 18.8 percent. These revisions and decline of statistics are an indication that HIV/AIDS is currently one of the highest causes of death in South Africa which in itself is an indication of a country moving towards disasters. HIV/AIDS should be treated as a disaster and should be given necessary attention through inclusion in the national curriculum and be taught to learners as such.

Data collected through the literature review, interviews and questionnaires provided evidence to determine the vulnerability of South African communities to disasters such as flood, fires, storms, epidemics, accidents, sinkholes, medical waste, and chemical spillages and weather related hazards. Climate change, technological and social development and people mobility could easily turn hazards that people were used to living with into disasters.

The Star of 24 August, 2010 reported that there was a possibility of a sewerage pipe burst in the Jukskei River area threatening the wetland and the communities surrounding the area. English (2010) of *The Star* reported this possible hazard in this way:

> *A total of 430 million litres of raw sewerage flow through Dainfern, Jo'burg pipeline every 24 hours, but the pipeline is deteriorating and is on the verge of bursting due to vandalism that leaves the pipe exposed to the element as people steal the aluminium sheets.*

English (2010) further reports that if the pipeline burst, it would flow from Diepsloot through to the Jukskei River. The material in the sewage would kill everything in its way and would pose a health risk for animals and informal settlement residents who lived along the riverbanks and used the water directly from the river. It was good that the municipal authority gave the assurance that there was a disaster management plan to deal with the burst if it occurred. However, one wonders whether the informal settlements in the area, especially the children were aware and prepared for this looming danger to their lives.

Although South Africa has not experienced earthquakes, volcanoes or hurricanes lately, it is important to heed Chris Hartnady's (2010) caution as reflected in 4.2.3 that an earthquake could happen in Southern Africa any time. Issues of medical waste dumps, changing climate conditions and extensive development should be noted. Something to consider is that most of the vulnerabilities identified by interview participants related to human-induced incidences rather than natural hazards. If Shaluf's (2007) disaster tree is considered, the disasters that South Africa is mostly vulnerable to could be categorised as hybrid or chronic disasters as P2 suggested. Hybrid disasters refer to those hazards which communities could live with but that could become catastrophic if communities were ignorant. For example floods would not pose much of a problem to communities who were always aware and built their structures to resist and channel

water appropriately. However, if people built their shelters on the river banks or next to the streams without properly channelling the water then a disaster would definitely happen. This is the case with informal settlements where people built their shelter without much planning. Chapter two, picture 2.1 of Ivory Park informal settlement depicts shacks erected next to multiple storm water pipes, which is highly dangerous.

The problem of informal settlement vulnerabilities is serious and not just because it was identified by some interview participants or reported in the newspaper and television. The researcher has been exposed to risks in these informal settlements when, in 1994 his family moved from a rented place to buy their own place in what is now known as Portion 9 in Hammanskraal. It is situated between the Apies River and the R101 to Warmbaths. There is also a railway track between the Apies River and the informal settlement where goods trains transport merchandise from and to neighbouring countries on a daily basis. When they settled in that area, it was a wonderful place but a few years later it had turned into a nightmare for the inhabitants. There has been much development since then which included the elevation and widening of the R101 road to prevent pedestrian accidents. Storm water pipes were laid to channel water without much consideration to the Portion 9 residents who subsequently dumped rubbish in the storm water pipes. Since the water could not pass, it either dammed or moved underground on the R101 and subsequently irritated the Portion 9 residents. As of now, the Portion 9 residents were experiencing challenges with sanitation as they did not have sewerage and relied on pit toilets which were always full because of underground water. Every rainy season, the community of Portion 9 experiences multiple hazards such as floods, mosquitoes, rubbish that flows through their yards; not to mention the dirt flowing from pit toilets in the area.

It is therefore important to raise awareness in communities about their vulnerability to a variety of disasters. Education has been hailed as one of many ways to raise awareness to learners. The next sections will focus on an analysis of data collected to determine whether education contributes to raising this awareness of learners about hazards and disasters.

4.4 An Analysis of data collected to determine how the national curriculum caters for the teaching of hazards and disasters

4.4.1 Literature review to determine how the national curriculum caters for the teaching of hazards and disasters

Following are discussions on how the national curriculum caters for the teaching of hazards and disasters drawing from the questionnaire and interview responses. Kirk and MacDonald (2001:552) maintain that any curriculum reforms that try to by-pass teachers or that are overly prescriptive will not succeed to achieve their aims. This phrase has implications for the NCS in South Africa especially considering Jansen (1999), Mason (1999), Botha (2001) Rogan and Johnson and other scholars who allege that educators were not involved at the initial stages of development and implementation. The empirical data collection provided an opportunity to determine whether educators were not involved in the development and initial implementation of curriculum reforms in South Africa. Although the emphasis of the study was on checking whether the curriculum reforms in South Africa catered for the teaching of hazards and disasters, it is important to reflect on what international scholars on curriculum and teaching of hazards and disasters have recorded.

Most of the curriculum scholars recorded in Chapter two agrees that changes in society necessitate curriculum reforms and therefore curriculum has to respond to the changes in society, Teodora and Estrela (2010:623) consider globalisation as a key driver of reforms, Popkewitz (2010:304), Wraga and Hlebowitsh (2003), Osler (2011:2) and Green (2010:452) consider political and social imperatives as drivers of curriculum change, while MacDonald et al. (2002:260), Kirk and MacDonald (2001:552), Osler (2011:1) and Brooker and MacDonald (1999:85) support the role of teachers as key drivers in curriculum development. Doll's (2003:282) assumptions that education is moving from copy-model curriculum, emphasising rote learning, to discovery curriculum is relevant here as a key driver in South Africa's adoption of Outcomes-Based Education which emphasised a learner-centred education approach.

It was discussed in Chapter two that South Africa's ever-changing national curriculum was introduced as Outcomes-Based Education in 1997, underpinned in Curriculum 2005, received a face-lift in 2001 and became National Curriculum Statements (NCS), is currently being reviewed and a new proposal is being discussed through a document named Curriculum Assessment Policy Statements (CAPS). Each facelift coincided with a new minister appointed to lead the National Education Department. The question that comes to mind is will the South African curriculum undergo changes every 5 years when a new minister is appointed. Another question that arises is whether the changes are addressing questions being asked. These two questions cannot be dealt with here but should serve as research questions for future studies. The significant question that needs to be raised here is whether the changes as they were introduced took into consideration the inclusion of hazards and disasters outcomes in the national curriculum.

Curriculum reforms in South Africa were concerned with the introduction of OBE which aimed to develop learners so that they work effectively with others as members of teams, groups and communities, used science and technology effectively and critically, showed responsibility towards the environment and health of others and demonstrated that the world is a set of related systems by recognising that problem solving contexts do not exist in isolation. The NCS provides opportunity or pointers for educators to include the teaching of hazards and disasters in various ways. The first pointer is that learners are expected to understand and demonstrate responsibility towards the environment, the second pointer is that educators are allowed to develop their own learning programmes which take into consideration local challenges affecting communities indiscriminately.

It has been acknowledged in Chapter two that curriculum plays a central role in teaching learners about hazards and disasters mainly because educators follow the curriculum as it is and textbook writers or learning programme developers use learning outcomes listed in the NCS as guiding principles. Also, while the NCS implicitly allows for the teaching of hazards and disasters, it is only in Grade 7 and in Grades 10 to 12 Social Sciences where learners are explicitly taught about hazards and disasters. With this information at hand, it is my view that literature and policy documents do not convincingly show that the inclusion hazards and disasters in the national

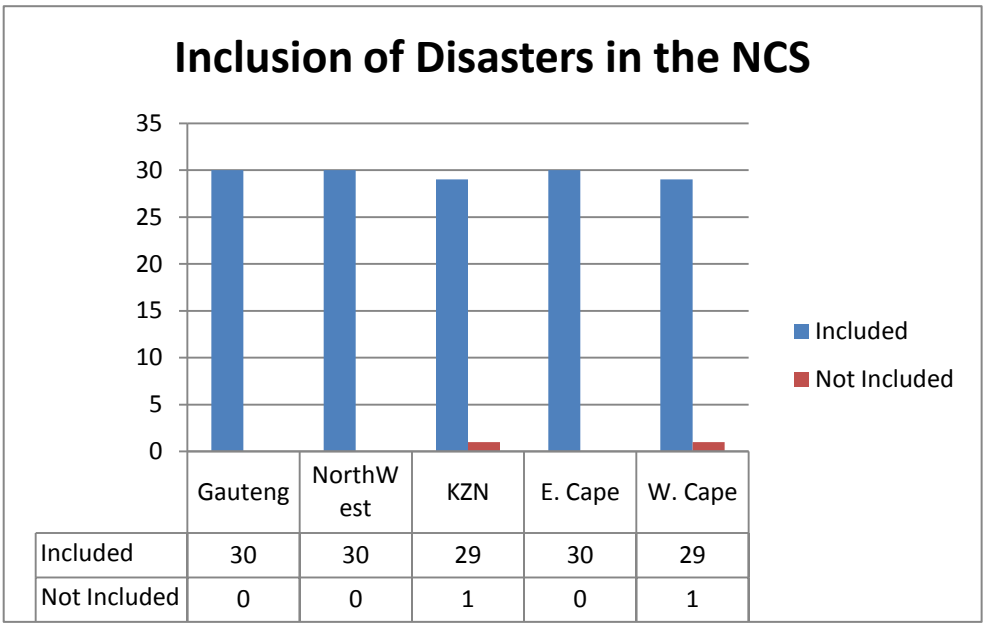
curriculum has been given the attention it warrants. The development within the South African education provides opportunity for change as discussed above. The idea of ever changing is supported by scholars such as Popkewitz (2010:308), Smith and Lovat (2003:193), Glatthorn, et al. (2006:96) and Slattery (2006), Carl (2009:40), Schiro (2008:36), Green (2010:455) and Wraga and Hlebowitsh (2003).

4.4.2 Questionnaire responses in relation to the inclusion of hazard and disaster learning outcomes in the national curriculum

The intention of sub-question 3 was to determine whether educators agreed or disagreed with the inclusion of teaching about hazards and disasters in the national curriculum. This question is essential for educators because it sets out to address the assumption that if educators' responses are positive they will teach learners about hazards and disasters. But if their answers are negative then they will not teach learners about hazards and disasters as it is not important.

4.4.2.1 Chart display of educators' response to the inclusion of learning outcomes on hazard and disaster in the national curriculum

A total of 150 educators responded to this question. One hundred and forty eight respondents indicated with a 'Yes' that hazards and disasters should be integrated while only two disagreed by selecting 'No', which implies that hazards and disasters should be included in the National Curriculum Statements. In terms of percentages, 98.6 percent supported the idea while only 1.4 percent thought it was not a good idea. The responses to question two in the questionnaire indicate that the majority of educators from five provinces sampled believed that hazards and disasters should be included in the national curriculum. Only two candidates, one from KwaZulu-Natal and the other from the Western Cape, responded that the national curriculum should not include hazards and disasters. The chart below provides evidence of the respondents:



	Gauteng	NorthWest	KZN	E. Cape	W. Cape
Included	30	30	29	30	29
Not Included	0	0	1	0	1

Figure 4.2: Chart display of educator responses in relation to the inclusion of hazards and disaster learning outcomes in the national curriculum

The conclusion that arises from question two's responses is that 98 percent of all educators who responded to the questionnaire agreed that inclusion of hazards and disasters in the school curriculum is essential. The significance of the responses in this chart is that they give an indication of whether respondents believed that hazards and disasters should be included in the national curricula. Of interest is the link between this question and the previous question. Since the majority of educators who participated in the study were aware that their area could be affected by disasters, the majority of them also believed that hazards and disasters content should be integrated into the national curriculum. What these questionnaires did not address is at what level should hazards and disasters be included and how much should be included. Another point coming out of the analysis of data collected through questionnaires is that the data do not tell whether educators are aware that hazards and disasters are included or not in the national curriculum. This information could have added more evidence about the contribution that curricula have on learner awareness on hazards and disasters. An analysis of interviews however has in some instances addressed some of the gaps which emerged during an analysis of questionnaires response in relation to the manner in which the national curriculum caters for the teaching of hazards and disasters.

Of the 35 respondents who made additional comments only nine explicitly mentioned the inclusion of hazards and disasters into the NCS. Some of the comments are listed below.

A respondent (R10) from the Western Cape commented not only on the inclusion but went a step further to suggest grades in which these hazards should be taught by stating the following:

> *Hazards and disasters should be included in the NCS from grade 1 to all other grades.*

To add to the inclusion of hazard and disaster learning outcomes in the national curriculum by nine respondents, (R4) from Gauteng stated the following:

> *Hazards and disasters should be integrated in NCS Life Orientation. At the moment the hazards and disaster learning outcomes focus on international hazards and less on the South Africa situation.*

These comments coupled with the response to the closed-ended question provide relevant evidence to decide whether educators agree that hazards and disasters should be integrated into the National Curriculum Statements. Since this has been established the next section will explore whether the specialists interviewed agreed about the integration, at what level the integration should happen and whether the issue had been adequately addressed.

4.4.3 Interview responses on how the national curriculum caters for the teaching of hazards and disasters in schools

The participants were interviewed on whether hazards and disaster education should be integrated in the school curriculum and at what level or grade the integration phase should be done. The follow-up questions were intended to solicit more data to give depth to the evidence of whether hazard and disaster learning outcomes should be integrated in the school curriculum, collected through literature and questionnaires.

P1 stated that disaster risk reduction should indeed be integrated into the NCS as mandated by the National Disaster Management Act of 2002 and the National Disaster Management Framework Enabler 2, which requires that hazards and disasters be integrated into the school

national curricula and in classroom teaching. Referring to the grade and level of inclusion, P1 stated that,

> *sustainable development concerns all levels from the foundation phase, intermediate right through to senior phase and tertiary level learners should be taught about hazards and disasters.*

P2 responded by stating that disaster risk reduction was essential and should be included in the school curriculum. P2 was certain that hazards and disasters are already included in the National Curriculum Statements learning outcomes for Grade 10 Social Science as they were already studying hazards, like volcanoes, earthquakes and cyclones but noted that it was a bit late as it should start earlier. P2 suggested that teachers could use rainfall, water issues and other environmental subjects such as deforestation as the content for teaching hazards and disasters since these aspects are part of the approved learning outcomes in the national curriculum statements. She also suggested that,

> *the integration should not only be done in Social Science but it should include all learning areas; Natural Science, Economics and Management, language, human sciences, Life Orientation as well as Mathematics. At tertiary level universities should ensure that all students are taught about disasters so that they could be able to integrate it in all spheres of their work life. For example, engineers and architects will ensure that the structures they design should be of such magnitude that could withstand the possible outbreak of any disaster, while Economics and Management students will take note that rushing for profits has resulted to negation of safety issues and eventually resulted in disasters.*

According to P3, basic safety issues like taking care of water, one's own health and the environment and consequences of not taking care of these important basics should be integrated as part of the national curriculum. This type of education should be introduced in the early learning phase such as pre-primary and primary schools or at home by parents. P3 added that together with his team, they were enlisting school leavers in extensive training which included basic safety principles, medical and fire skills. He added that it was crucial that educators and learners underwent some sort of training on these issues so that they developed understanding of basic safety principles, first aid and fire skills while at school.

According to P4, hazard and disaster education was already integrated in some grades, both in the intermediate and senior phase but whether that was enough depended on the feedback they

got from educators, researchers and curriculum reviewers. Even though in some grades the learning outcomes do not specify the hazards and disasters, issues such as deforestation, water, health and hygiene and industrialisation provided an opportunity for educators to integrate the hazards and disaster awareness. Learners learn best when good practices start early in their learning phases. Starting at lower levels such as the pre-school and foundation phase or lower school grades would enable learners to better understand hazards that were prevalent in their areas. At this level the focus should be more on disasters that are prevalent and issues of environment that relate to their everyday life.

P5's response was that hazards and disasters were already included in the curriculum through environmental awareness campaigns, community involvement and directly through the Social Science learning outcomes component of Geography as indicated in the NCS. The question is whether educators are teaching learners the hazards and disasters learning outcomes as stipulated in the NCS since there is no assessment mechanism to track it in particular. For teaching hazards and disasters, the respondents preferred to introduce it when learners started to read and write. Grade 3 seems to be the appropriate level to start learning about issues related to hazards and disasters which are context specific.

Regarding curriculum matters, P6 stated that while the provisions to teach hazards and disasters were included in the NCS, there was no depth and width in teaching learners about hazards and disasters. The problem was caused by the translation of the curriculum into textbooks by authors to be used by teachers in their classrooms. Teachers only taught what was contained in the textbook and rarely considered other sources of information. The participant stressed that the teaching was limited to identifying different types of disasters such as earthquake and cyclone without contextualising the teaching to learners situation. This implies that if the textbook is out of context, then the teaching as well could be out of tune. The outcomes of the national curriculum might therefore not be achieved. Curriculum advisors as well were not in touch with textbook authors which created a huge disjuncture. Additional information that emerged from P6 was that there should be a distinction between hazards and disasters. The emphasis of learning programmes should be on hazards rather than disasters because it showed learners that they had responsibility and control to reduce the risk of disasters.

According to P7 hazards and disasters were included in the National Curriculum Statements for Social Science, but as for other learning areas such inclusion was not clear. For Natural Science, disasters were not included but issues of global warming and change as well as the campaign for *Earth and Beyond* touch on issues of volcanoes, earthquakes and drought. Sometimes teachers were not empowered to have flexibility in teaching and they were not aware that the NCS gave them the flexibility to develop and introduce the learning programme that was essential for the learners' development. Regarding the level and stage of learners' exposure to hazard and disaster education, P7 stated that Grade 7 was the appropriate level to introduce disasters and thought that it was not a good idea to add content for learners at a lower phase. Up to Grade 3 learners are grappling with issues of switching from their mother tongue to English as a medium of instruction.

P7 added that sometimes the context was important. Learners residing close to the river banks would need to be exposed to strategies to cope with disasters affecting their area which implied that educators have to develop the learning programmes themselves. If you look at the NCS policy document you have 70 percent content and 30 percent context which makes provision for hazards and disasters. Most importantly, the national department does not prescribe what provincial schools should or should not teach. When the NCS was introduced, the Northern Cape provincial education received a schedule of learning outcomes and out of it they designed the provincial schedule, focusing on issues that were critical to the province.

As far as issues of curriculum integration are concerned, P8 responded that there was a great need to integrate disaster risk reduction into the school curriculum and the focus should not be on disaster management but on risk reduction. Learners should be taught about proper planning, awareness and adopting safe practices. Children should be taught about risks as early as possible before they started school. Parents should be made aware to teach their children about disaster risks as early as possible and all teachers for the foundation phase should be made aware of the need to teach learners about disaster risk reduction.

P9 was in agreement that hazards and disasters should be included in the national curriculum and emphasised that children needed to be taught so that they could notice and identify the level of danger of spillages from trucks or trains and that they should not go near the accident as the contents sometimes consisted of dangerous chemicals such as acids, and airborne effects or contents that may explode and cause fire after the accident. There is a huge need to make learners aware of the dangers related to spillages. While working for the Johannesburg emergency services P9 maintained that they used to visit schools to talk to learners about emergency issues such as first aid and dangers of fire. Teaching should commence as early as possible; for example, mathematics could assist learners in identifying hazards. Another example is that learners in primary school were usually the ones who started fires and in some instances were the ones who got burnt in the fires. The participant mentioned that learners at times played with acid or dangerous materials and as such they needed to be taught not to engage in such risky activities as early as possible.

P10 supported the idea of integrating hazards and disasters into the school curriculum and stated that it was important for learners to be taught about things that affect the community. She maintained that issues that can be integrated into the curriculum are environmental education, pollution, mining sinkholes and awareness issues. Learners must be taught about disasters from foundation phase where they learn about dangers associated with simple things, like not to throw a banana peel where people walk as they will fall and get injured, playing with a match or playing on the roads. Hazard and disaster content should be gradually increased as learners go through to the senior phase. The advantage of teaching learners about hazards is that they spread the message of awareness to their parents and other grownups.

The interview responses have provided essential data to decide whether hazards and disasters should be included in the national curricula. Some of the respondents pointed out that learning outcomes on hazards and disasters are already included in the NCS. However, there is not much data to determine whether it is integrated in the classroom teaching. While Social Science, in particular Geography, have some provisions on hazards and disasters, from the questionnaire, it seems that those that teach hazards and disasters in other learning areas do so of their own accord as it is not prescribed in the NCS.

While other participants felt that hazards and disasters should be included in all learning areas other participants were at pains to demonstrate that other learning areas such as Natural Sciences already include issues of hazards and disasters while dealing with water, deforestation, agricultural and mining issues. It is important to note that the fact that these issues are being taught to learners does not imply that the teaching of hazards and disaster is happening. This matter was explored in a different section of this study as it deals with translation of policy in the classroom. It is important though to mention that another participant noted the disjuncture of what the curriculum stipulates, what gets recorded in the textbooks or learning programmes and what is teaching in the classroom.

While I agree with those participants who maintain that inclusion of hazards and disasters in the national curriculum should be done in the early phases, I am sceptical of the participant who thinks that the integration should only be done at Grade 7. I also support that the integration should consider the level of learners and introduce content that is consistent with their growth level.

4.4.4 Discussions of literature review, interviews and questionnaires on how the national curriculum caters for the teaching of hazards and disasters in schools

According to the National Disaster Management Act 57 of 2002, Article 7 (2g), the national disaster management framework should facilitate disaster management capacity building, training and education. The National Curriculum Statements stipulate learning outcomes for learners to develop general knowledge of natural disasters and epidemics and make informed decisions about social and environmental issues. According to Rao (2007:9) disaster education should begin from childhood; school curricula should be infused with information on hazards such as tsunamis and the precautions that one should take in such vulnerability.

According to the NDMC (2010:10) commissioned report on national education, training and research needs and resource analysis, the conference on disaster risk reduction held on 17 to 18 October 2007 in Jeffrey's Bay adopted resolutions that all places of learning, and especially

places of higher education, should integrate disaster management into course materials across all subjects and ensure that they have educators with relevant skills presenting disaster management. Furthermore, the conference delegates resolved that the South African national Minister of Education should strengthen teaching about disaster risk reduction in the school curricula to develop future adults who are able to identify hazardous situations within their own community and ways of reducing disaster risks through proper application of sustainable development practices.

The NDMC (2010:11) commissioned study on national education training research needs for disaster management concluded the following:

> *Whilst it is acknowledged that educators are already under immense pressure with the current school curriculum, it is a cause for concern that DRM issues are treated in a generic manner in the subjects that include them. This leaves learners in areas where specific hazards occur unprepared to deal with such events. Because of the different hazards-native to different parts of the country - it is recommended that instead of a generic national approach, DRM issues in the school curriculum should be handled in the context of the risks that are present in particular provinces. Also of concern is the limited number of school grades with DRM related material in their courses. It was the findings of this project that grades 5, 6 and 7 were the ones that had the most in-depth coverage of DRM issues. This leaves learners with a very limited exposure to DRM issues in their secondary schooling.*

My impression is that the inclusion of hazards and disasters into the NCS is a welcome development. There is, however, strong evidence that has emerged from the interviews conducted with participants that most of them think that topics on hazards and disasters should be included in the early phase of learning such as the foundation phase where simple basic hazards topics will be taught to learners similar to those suggested by P10 and other respondents. It is important to note that P6 felt that there was no depth and width in the learning outcomes on cyclones, earthquakes and other hazards such as floods and fires. Learners are taught only basics and it is up to the educators to include how to respond when they find themselves affected by fire, floods, storms, earthquakes or volcanoes as listed in the NCS. The integration is in most instances explicitly stipulated only in the Social Science learning area. It would be beneficial if the inclusion was across all learning areas and if learning programmes reflected outcomes for all learning areas. The next section explores how the provisions from the national curriculum could

be translated into the classroom, mainly using the two suggested principles of integration and indigenous knowledge.

4.5 An analysis of data collected to determine the extent to which integrated teaching and indigenous knowledge contribute to learners' awareness and resilience to disasters

According to the DoE report (2003:3), the NCS guidelines on integration and indigenous knowledge serve as a baseline for improving learners' theory, practice and reflective competence as well as assisting the attachment of meaning to the world. Different sources on integrated teaching and indigenous knowledge were discussed extensively and this section seeks to validate those claims in the literature and determine whether these two concepts have the potential to improve learner awareness of hazards and disaster.

4.5.1 Educator responses on the extent in which indigenous knowledge and integrated teaching contribute to learners' awareness of hazards and disasters

Four questions were asked relating to sub-question 4 in this section to determine the view of educators concerning indigenous knowledge, integrated teaching and the inclusion of hazards and disasters in the learning areas and classroom teaching. The first part deals with indigenous knowledge and the second concentrates on integrated teaching. The total of 150 educators responded to each of these questions.

4.5.1.1 Chart depiction of the educators' response to the teaching of hazards and disasters in schools

According to the analysis above, 99.3 percent of educators thought that topics on hazards and disasters should be taught at school while only 0.7 percent thought that it was not necessary to teach learners about hazards and disasters. On the issue of the inclusion of hazards and disasters in their learning areas, 79.3 percent were positive that hazards and disasters should be included while 20.7 percent thought that it should not be integrated. Regarding an integrated teaching

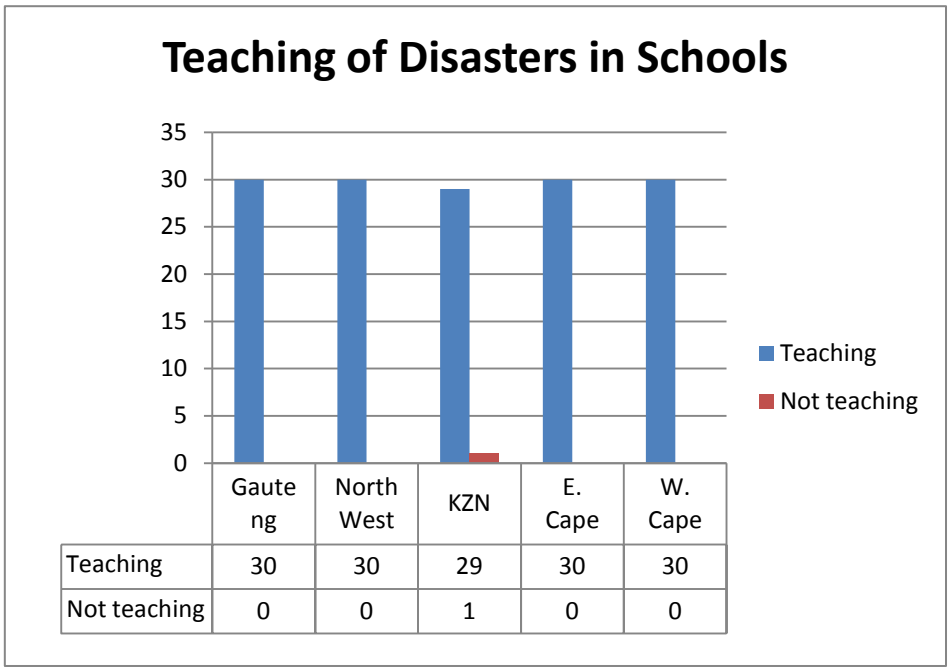
strategy, educators were asked whether they implement it and only 44.6 percent indicated that they are collaborating with other educators while 55.6 percent did not implement an integrated teaching strategy. Regarding issues of including indigenous knowledge in their teaching, 54.6 percent said that they do integrate it while 45.4 percent did not include indigenous knowledge in their classroom teaching.

Almost all respondents agreed that the teaching of hazards and disasters is essential except one from KwaZulu-Natal who seemed to have contrary ideas, as the chart below suggests. Fortunately the respondent was quizzed about the response and chose to stick to the answer and defend his answers by stating:

> *Learners should not be bombarded by dooms issues but by possibilities that life affords to them.*

Respondent (R12) emphasised that the focus should be on science achievements and technological advancement.

The conclusion deduced from the responses is that respondents agreed that the teaching of hazards and disasters to school learners was essential. The comment section has however shed light on new information on the teaching of hazards and disasters. Some respondents are concerned that teaching of hazards and disasters in Grade 7 is not enough. Learners should be exposed to information about hazards and disasters early in their school years.



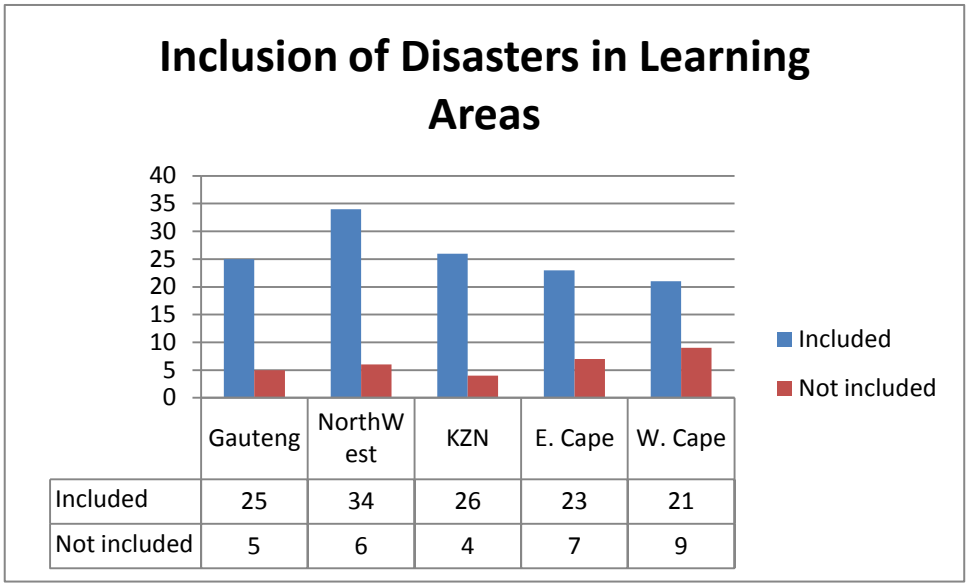
	Gauteng	North West	KZN	E. Cape	W. Cape
Teaching	30	30	29	30	30
Not teaching	0	0	1	0	0

Figure 4.3: Chart display of educators' responses to determine whether they teach learners about disasters in schools

4.5.1.2 Inclusion of natural and human-induced hazards and disasters in the learning area when teaching learners

The response to question 4 shows some more deviation among respondents because the differences per province are clear from the chart below. Twenty five of the Gauteng respondents, twenty four from North West Province, and twenty six from KwaZulu-Natal, twenty three from the Eastern Cape and twenty one from the Western Cape indicated that they included natural hazards and disasters in their classroom teaching. A follow-up in some provinces revealed that Grade 7 educators had such learning programmes or what is referred to as lesson plans in the old education dispensation. It is difficult to compare the findings of this question with the literature study because little or no research has ever touched on the teaching of hazards and disasters in South African schools. The only studies referred to are those that investigate the teaching of Science and most of them concluded that whereas there is teaching of Science in schools, it is not based on the ideals of the new curriculum. The closest study reported in Chapter two was conducted by Ronan and Johnston (2001) who investigated the benefits of hazard and disaster education in helping to increase children's resilience to hazards. Responses to this question

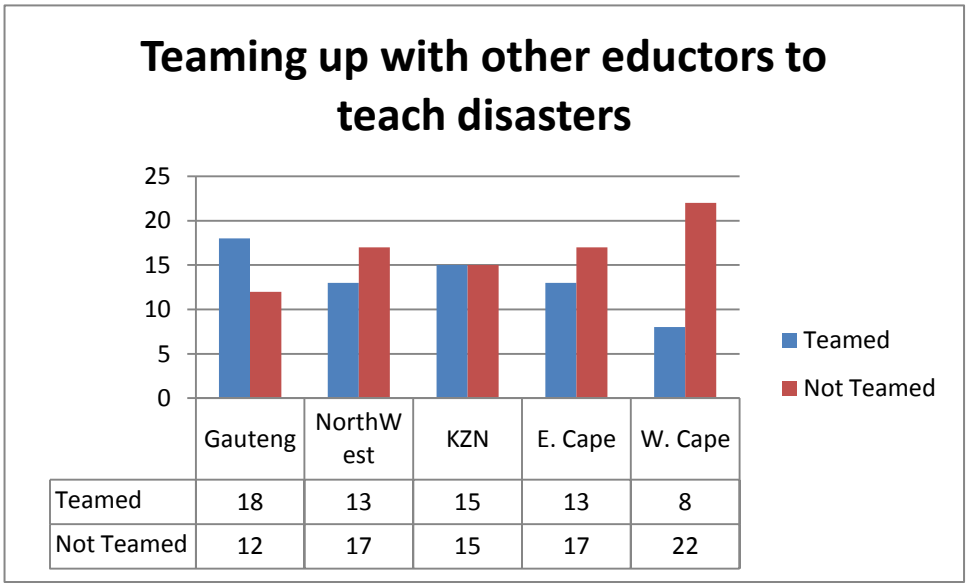
added the most important and valuable insight that the teaching of hazards and disasters in South African schools features in Grade 7 only, mainly because it is part of the learning outcomes of the Grade 7 National Curriculum Statements.



	Gauteng	NorthWest	KZN	E. Cape	W. Cape
Included	25	34	26	23	21
Not included	5	6	4	7	9

Figure 4.4: Chart display of educators' responses to whether they include the teaching of hazards and disasters in their learning areas

4.5.1.3 Educators' response to whether they use an integrated teaching strategy to enhance learners' awareness of hazards and disasters



	Gauteng	NorthWest	KZN	E. Cape	W. Cape
Teamed	18	13	15	13	8
Not Teamed	12	17	15	17	22

Figure 4.5: Chart display of educators' responses to the use of an integrated teaching strategy to enhance learners' awareness of hazards and disasters

The inclusion of this question in the study was motivated by the provision in the National Curriculum Statements that educators from different learning areas should implement an integrated learning programme, which implies that educators are expected to develop learning programmes across learning areas that will help learners to appreciate the interconnectedness of different learning areas. As in other questions, the responses were not so far apart if viewed together. However, if viewed in isolation or per province the picture is different. The outcome was that 44.6 percent stated that they were implementing an integrated teaching strategy by working with other educators to teach learners while 55.4 percent did not implement an integrated teaching strategy. The majority of Western Cape respondents indicated that they did not team up with more than twenty respondents or fewer than ten, confirming that they did team up to teach about hazards and disasters. North West Province and the Eastern Cape have more respondents that disagree. KwaZulu-Natal is on a 50/50 percentage basis while Gauteng seems to be implementing the integration with twenty four educators collaborating with their colleagues.

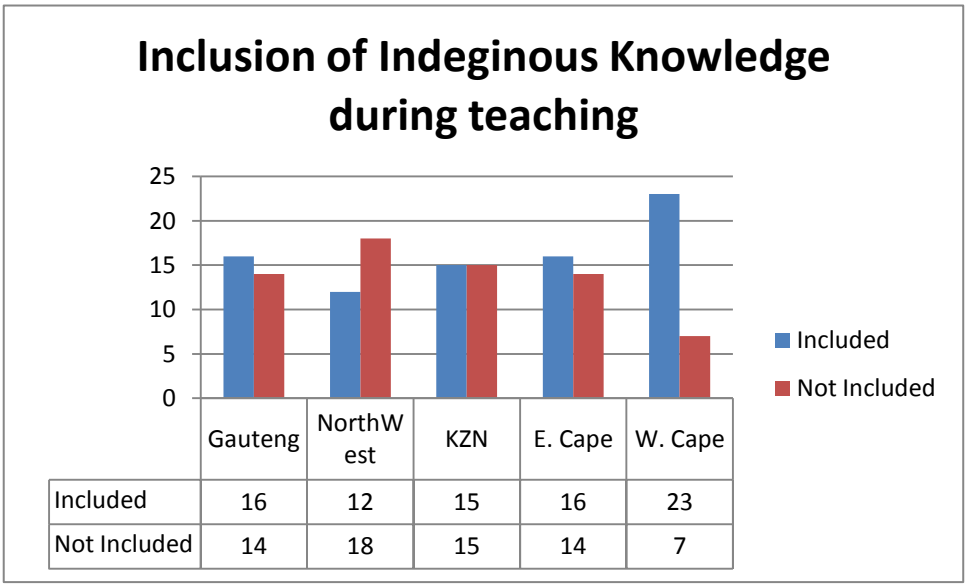
Follow-up questions were asked to educators who completed the questionnaires in my presence to determine how they implement the integrated teaching strategies. It emerged that the collaboration with other educators does not relate to the teaching of hazards and disasters but could be on any topic. HIV/AIDS emerged as the most favoured topic where educators from different learning areas collaborated. It emerged from follow-up questions from interview participants that even though an integrated teaching strategy was used in some schools, it was based on self-initiative and most of the time it was done between two educators without even designing a learning programme.

The conclusion from the responses to question 8 is that in three provinces, the Western Cape, North West Province and the Eastern Cape the teachers seem not to be teaming-up as much as they should as in Gauteng and KwaZulu-Natal. On the whole this implies that educators do not blindly follow the curriculum.

4.5.1.4 Educators' response on the inclusion of indigenous knowledge as a teaching strategy to enhance learners' awareness of hazards and disasters

The response to sub-question 6 is the direct opposite to that of sub-question 5 which reflect a 55/45 against 45/55 percent response from questionnaire respondents. While 54.6 percent of respondents supported the inclusion of indigenous knowledge in the classroom teaching 45.4 percent were against teaching learners indigenous knowledge. The response to this sub-question reveals that the majority of educators could be teaching indigenous knowledge or desire to do so. The data will be compared with the interviews and literature findings to synthesise the research findings.

The surprise in the pattern of responses that emerged from provinces is reflected in Western Cape educators' responses. More than 20 respondents from the Western Cape indicated that they included indigenous knowledge in their lessons. One would have expected KwaZulu-Natal, the Eastern Cape and North West Province to take a lead in this regard because of strong traditional cultures in these provinces.



	Gauteng	NorthWest	KZN	E. Cape	W. Cape
Included	16	12	15	16	23
Not Included	14	18	15	14	7

Figure 4.6: Chart display of educators' responses to the inclusion of indigenous knowledge as a teaching strategy to enhance learners' awareness of hazards and disasters

4.5.1.5 Educators' comments on the inclusion of indigenous knowledge and integrated teaching as strategies to enhance learners' awareness of hazards and disasters

Regarding the matter of an integrated teaching strategy to enhance learners' awareness of hazards and disasters, only one respondent, (R13), commented by stating the following:

> *We do not exchange views as teachers in our schools or from schools to schools and therefore we do not have teams to develop integrated learning programmes.*

The remaining 149 educators were silent on the use of integrated strategies to enhance learners' awareness of hazards and disasters. Regarding indigenous knowledge two respondents, one from the Western Cape and the other from Gauteng, maintained that completing this questionnaire made them realise that there was a need to teach learners to talk to their families and this could include grandparents as well. To quote the respondent (R14) from the Western Cape Province:

> *I intend to teach learners more about hazards and disasters and exercise extra care about these concepts as well as putting more emphasis on teaching learners to talk about them to their families.*

The discussion below looks at the contribution of interview participants on the use of indigenous knowledge and integrated teaching strategies to enhance learners' awareness of hazards and disasters.

4.5.2 Interview responses on the inclusion of indigenous knowledge and integrated teaching strategies to enhance learners' awareness of hazards and disasters

The discussion in this section is presented starting with the inclusion of indigenous knowledge as a teaching strategy to enhance learners' awareness of hazards and disasters and then following by the use of an integrated teaching strategy to enhance learners' awareness of hazards and disasters. At the end of the section, a discussion of these two principles drawing views from the literature review findings is presented.

4.5.2.1 Interview responses to the inclusion of indigenous knowledge as a teaching strategy to enhance learners' awareness of hazards and disasters

From NCS, educators are expected to teach learners to value indigenous knowledge and interview participants were asked whether inclusion of indigenous knowledge would make a difference to enhancing learners' awareness of hazards and disasters. P1 responded by saying that any kind of knowledge that would enrich learners' awareness of hazards and disasters was welcome and that indigenous knowledge was important because elders could teach learners about the environment, using the moon and other environmental aspects; for example, when swallows fly in a specific pattern, elders know whether it denotes a storm or just an ordinary rain. If teachers and elders could discuss this knowledge with their learners' awareness of hazards and disasters would be enhanced.

P1 further elaborated on indigenous knowledge; while he thought that it was important, other factors should be considered when teaching indigenous knowledge. It should not be done at the expense of scientifically proven knowledge such as knowledge about lightning. According to some indigenous people, lightning originates from witch-craft and the only way to prevent it is to consult traditional healers. Lightning occurs with every thunderstorm and that there are different ways of protecting one from lightning. Any technique that could enhance learner awareness is welcome.

On how indigenous knowledge could contribute to learner awareness, P2 stated that there was a distinction between indigenous and local knowledge; the former is concerned with knowledge that reaches into the past and is rooted in people's culture. Local knowledge refers to a common understanding of things as they happen in a specific place. P12 provided an example:

> *If a person that resides in Johannesburg knows the weather, the dangerous place where they should not be at specific time and intervals. If a person from Pretoria visits Johannesburg, he/she will have to be made aware of the situation there as he will not be in the position to keep up with developments and patterns of weather.*

P2 emphasised that both indigenous and local knowledge are important in understanding vulnerability and hazards. Local knowledge is very important for learners because teaching could

be aligned with their environment. Indigenous knowledge could be used where it has been tested and found to be reliable. There is a great need to create awareness in a community rather than just waiting for schools to do the job.

Regarding indigenous knowledge, P3 mentioned that while this knowledge is important, it should be noted that scientifically developed knowledge is more important. Indigenous knowledge is a matter of cultural preference and if it works it is in order but it should not be emphasised more than scientifically proven knowledge.

P4 was of the view that indigenous knowledge is fundamental to learning because it does not only give wisdom but it makes learners connect and respect the traditional and cultural ways in which the older generation lived. I feel that this part of knowledge has not been integrated as it should and more work still needs to be done to make these connections. For this knowledge to be implemented in South African schools, other cultural sensitivity issues need to be considered that might raise questions in some schools. To some people traditional knowledge is not scientific and it depends on cultural beliefs which differ among South African cultural groups.

P5 reckons that indigenous knowledge is essential to learners as it makes them learn, appreciate and respect the contribution of cultural practices. If it had meaning to the old generation then it must be taught to learners, which makes indigenous knowledge important in classroom teaching.

P6 maintains that there is a specific focus on indigenous knowledge in some learning areas like Natural Sciences and Social Sciences. It makes sense to use indigenous knowledge on natural hazards. Hazards have been part of people's world for ever and people can read signs before disasters occur. For human-induced disasters, it will be difficult to use indigenous knowledge because these disasters are based on the risks of what communities do. For example, if we look at how people build houses and other structures on vulnerable areas, there is nothing learners could do and there is less chance that there will be indigenous knowledge to support people's resilience. P6 argues that if one considers the belief about solar eclipses which encouraged children to stay indoors, it has now been shown that if people look at the solar eclipse they might

become blind. To some extent, where the information is useful, it should be used to teach learners basic knowledge.

P7 confirmed the importance of indigenous knowledge by stating that it is important that different learning areas such as Natural Sciences make provision to integrate indigenous knowledge in classes, which allows for using disasters in that context. Cultural stories could be covered within the Natural Sciences learning area.

According to P8, the famous story told about a tribe that survived the tsunami by running to the mountains before there were visible signs of the danger to happen is misrepresented. The truth is that a young girl, who had just learned at school about the signs of earthquakes in the ocean, noticed the signs before the tsunami outbreak and informed the parents about the signs. Those who listened to the child survived but those who did not perished. The fact of the matter is that the knowledge that she shared with her parents and other community members was known and had been used before. The only problem with indigenous knowledge is that it is not documented nor tested; we need to work with old people who have this knowledge to preserve it through documenting it before they all die.

According to P9, if there are still people who have indigenous knowledge, they should be involved in training learners about old ways to deal with disasters. An example is the common method of extinguishing fire through using buckets of water. P 6 pointed out that when he was an emergency response officer, he noted that when people extinguished a fire with buckets of water before the arrival of fire fighters, it made a huge difference for fire extinguishers.

P10 responded that it is important to integrate indigenous knowledge into classroom teaching. It might be difficult for learners to grasp the essence of this learned knowledge. There are no longer grannies with that kind of information and those that could share the information, are not always reliable. Their knowledge was not documented and therefore it is disappearing or is no longer accurate.

While almost all participants agreed that indigenous knowledge is important for enhancing learners' awareness of hazards and disasters, there were some doubts raised by other respondents. They stressed the notion that indigenous knowledge is not tested scientifically nor documented and the bearers of this knowledge are disappearing. My impression here is that indigenous knowledge is disappearing because schools discourage learners from recognising the value of this knowledge. This became evident in a discussion with a teacher in the Eastern Cape while she was completing the questionnaire:

> *While at school, if a teacher asks a question and you answer it using something that you were told by either parents or grandparents, the teacher will make a joke of your answer which suggests that you are an idiot.*

This discourages learners from listening to their parents if they have not been to school or only attended lower grades. This notion is supported by a teacher in the Eastern Cape; it is difficult for learners to consult their grannies because they think that their grannies are not intelligent if they cannot write or read. This idea is captured well by Uy and Shaw (2008:62) who observe that in many cases traditional knowledge is regarded as primitive and therefore it is often discouraged or disregarded. For instance, the Ivatans school buildings were constructed without taking native wisdom into account. The project became an exercise in futility since no building remained after the passing of just a few typhoons. It is important to recognise the value of traditional knowledge, especially that which is time-tested and effective, despite modern-day technology.

While presenting seminars to Science educators in Mpumalanga during the National Science Week both in August 2009 and August 2010, I emphasised how a teacher's response can make or break a learner's future. I use the mathematical logic of 1 + 1 = 2; sometimes it is difficult for a child to comprehend this. I emphasised that sometimes it was difficult for me to see the logic because I was taught that a stick + a stick = 2 sticks and when the teacher was demonstrating I saw only two sticks. But when the teacher wrote the equation on the board, I saw more sticks and the answer to me could have been six, three, four or more. I tell seminar participants that some learners will not see the logic no matter hard they try to explain. When in contact with teachers, I have always encouraged them to teach learners to be innovative and think outside the box rather than to try and force learners who cannot observe logic. I emphasised to the seminar

participants that they were breeding smart criminals who wanted to prove that they were better than those who could see that 1 + 1 = 2. In actual fact we lose a lot of talent by not encouraging innovativeness at school level. Agrawal (2004:1) quotes Brokensha et al. (1980) who believe that to ignore people's knowledge is to ensure failure of development.

The dilemma that faces the interview participants is whether indigenous knowledge should be taught to learners even though it has not gone through a scientific validation process. This point has been raised by Agrawal (2004:2) when he states the following:

> *In accentuating the importance of indigenous knowledge, theorists of indigenous knowledge are caught on the horn of a dilemma. On the other hand their focus on indigenous knowledge has gained them an audible presence in the chorus of development, at the same time talking about indigenous knowledge commits them to a dichotomy between indigenous and western knowledge.*

Another critical point emerging from the interviews is that of the indigenous knowledge undergoing scientific testing which Agrawal (2004:4, 5) has raised as well when he states:

> *However, the ultimate irony in the attempt to valorize indigenous knowledge may lie in the willingness to adopt the methods and instruments of Western science. Most writings first propose the validation of indigenous knowledge by means of scientific criteria. If western science is the ultimate arbiter of knowledge then there seems little point in advocating the distinction between scientific and indigenous knowledge.*

Agrawal (2004:6) concludes by saying:

> *If the primary motive for highlighting the knowledge of the marginalised poor is to find them a greater voice in development, then it would seem preferable to foreground this objective rather than framing it in terms of the confounding rhetoric of indigenous v/s Western/scientific knowledge.*

The argument by Agrawal (2006) above should not be looked in isolation from what Briggs (2005:23) refers to as:

> *That the challenge will then be for proponents of indigenous knowledge to make a difficult choice between arguing for promoting indigenous knowledge as a radical alternative western science and knowledge, or instead negotiating a way into mainstream development practice.*

These discussions by Briggs (2005) and Agrawal (2004) relate clearly to sub-question 4, whether indigenous knowledge should be integrated into classroom teaching. Another alternative is to let indigenous knowledge develop as an alternative learning area and be taught outside the school environment to all learners. It was mentioned in Chapter two that the discussions of the conceptual framework that other scholars such as Rautela (2005), Stevenson (1996), Gaillard (2007), Gupta and Sharma (2006), Snively and Corsiglia (2001) and Hellier et al. (1999) support the idea of including indigenous knowledge as a teaching strategy that could enhance learners' awareness of hazards and disasters education.

From the discussion above it is clear that indigenous knowledge needs to be integrated into the schooling system provided the knowledge is documented and its relevance verified.

4.5.2.2 Interview responses to the use of an integrated teaching strategy to enhance learners' awareness of hazards and disasters

The participants were asked whether the use of an integrated teaching strategy would enhance learners' awareness of hazards and disasters. According to P1 integrated teaching is important because it would definitely improve learners' awareness of hazards and disasters and educators understanding of different disaster dimensions.

Regarding issues of integrating disaster education into the school curriculum and instructional design, P2 highlighted that although it is already integrated in the senior schooling phase, there is a need to start early and focus on hazards to avoid alarming learners unnecessarily. The participant propagated new ideas, but how to generate them was a challenge. A building block is needed first before teachers can be expected to move into a new mode of thinking. Where possible it would be beneficial to introduce this mode of teaching. Learners enjoy a new way of teaching but this is problematic in an environment where schools are expected to reach certain percentages and targets. The teaching of hazards education is not only essential at school level, it is even more important in institutions of higher learning in areas such as engineering, business studies, physical science, biological sciences and social sciences.

On the use of integrated teaching, P2 was concerned that we are bombarding educators with more and more work which will make it difficult for them and even confuse them. In her own words P2 stated that:

> *In an ideal world it would be perfect to include any new technique to improve learning, but thinking of our teachers out there, I think it is a huge burden to them, there is new curriculum they have to think of, making them play together is too much to expect, they do not have enough time, unless if we could train them to do all these things, we must not run before we can walk.*

This comment indicate that P2 is not for an idea of introducing any techniques but she acknowledged that the integrated teaching strategy could make a huge difference to learners especially on hazards and disasters her concerns are mostly on timing. In her own words she maintained that:

> *Other schools are doing this like private schools or the so called Model C and in formerly white schools they use team teaching on a daily basis but in your everyday school like Soweto it would be difficult to implement the strategy.*

P3 stressed that teamwork is important because people have different capabilities; multicultural dimensions bring in diversity. The emergency response model of teaching, which is similar to integrated teaching where lectures plan as a team in developing the curriculum, teaching learners and assessing them, would fit Geography well. This model of teaching could be integrated in other school subjects; for example, Biology, where one would explain how the body parts could be prone to damage by some hazardous material.

P4's view on integrated teaching is that it might be effective, especially where learners are taught the same topic by different educators. For example, the language educator could ask learners to develop a diary account of a disaster, the Natural Science educator would prefer them to look at gas emissions while the Economics and Management Sciences educator looked at issues of profit and loss related to a disaster. This type of teaching is ideal but whether it could be successfully implemented in Gauteng schools is questionable as educators have pressures to complete learning programmes and have much paperwork to do. Nevertheless there are schools that are already implementing some of the activities although not on a large scale.

Another participant (P5) mentioned that educators are used to working alone in classes and any involvement of other educators might disrupt and threaten their productivity. The integrated teaching strategy is not being implemented at the moment and as to whether it will have a positive effect on learners' awareness of hazards and disasters is questionable.

While most rural schools have not moved from the old paradigm of teaching, such as rote learning, some schools such as Dinaledi[3] schools have progressed well and are implementing outcomes-based education in its entirety. Organisational culture plays a crucial role in ensuring that some schools perform well while others perform poorly which makes it difficult for some instructional techniques to be implemented in schools.

P7 stated that an integrated teaching strategy is ideal because on a theoretical level it is easy to implement. However, on the practical level it would be difficult to be implemented because educators do not have guidance on how to use such strategy. Educators use textbooks as resource material as it is what they are trained to do and in most instances the books are the only source available. The challenge is that in some instance the specific learning outcomes that learners must achieve are not specified. The only prescription made is the outcomes that must have been achieved at the exit phase of the lower phase, the intermediary phase or the senior phase. Depending on the context in which learners find themselves, teaching about hazards and disasters could be included as additional resource materials.

According to P8 there are instances where integrated teaching could work and where it will definitely not work. In Mpumalanga there are some schools where there are large classes and one teacher has to teach more than two learning areas in that school. The integrated teaching strategy needs much time to plan and prepare and I doubt whether educators in Mpumalanga will be able to afford the time, especially as some teachers use public transport which has predetermined time schedules. Educators have been complaining of an overload considering that they have to do some administrative work and teach at the same time and they are currently battling with OBE

[3] Dinaledi Schools initiative is a project where schools are earmarked for further developing and increasing the number of promising students in Maths and Science as well as improving the teaching of Mathematics and Science in those schools

and the NCS's implementation. I think the strategy could work well for multi-grade classes where educators could plan as a cluster and take ownership of their work.

P9 stressed that teaching of learners about hazards and disasters should be a two-way stream where parents first teach their children before they go to school and during their schooling year they should reinforce the teaching that they get from schools. Educators should always be prepared to broaden the minds of their learners and make them aware that they are always vulnerable to various disasters; they should always keep an open mind that danger could face them any time. Educators themselves should seek help from other specialists in the area.

P10 strongly feels that although hazards and disasters are integrated into the school teaching programme especially for Grade 7 Social Science, the Mpumalanga Department of Education is not doing much to ensure the effective integration of information on hazards into teaching. There is a need to teach learners more about environmental issues such as pollution and mining sinkholes in the early grades. Grade 4 would be the appropriate level to introduce disaster concepts. Especially at that early age kids are good at teaching their parents about what they have learned at school. P10 prefers a combination of strategies to teach children.

P10 added that in some schools teachers travel distances to their work and use public or shared transport which makes it difficult for them to spend more time after school to plan their teaching. Integrated teaching is ideal in such cases but there is no way in which it would be successfully implemented considering the experience with outcomes-based education, Curriculum 2005 and National Curriculum Statements in the province. However, there is a need to spread the gospel of awareness of hazards in their environment, and learning how they can survive disasters. Integrating hazards and disasters into teaching would make a huge difference and teachers could organise their teaching around themes such as HIV/AIDS and pollution as starting points.

The next section will focus on whether the participants provided conclusive data to determine the extent to which indigenous knowledge and integrated teaching strategies would enhance learners' awareness of hazards and disasters.

4.5.3 Discussions of how indigenous knowledge and integrated teaching strategies enhance learners' awareness of hazards and disasters

The evidence that emerged in this section suggests that while respondents acknowledge that indigenous knowledge and integrated teaching are important in enhancing learners' awareness of hazards and disasters, there is some doubt about educators being ready to implement them. Most of the concerns raised relate to educators not having time to implement the strategies, the fact that they would be overburdened and that they have not been empowered adequately to take up these new challenges. If these reasons are considered, then the role that the NCS envisaged for educators as key contributors of education transformation in South Africa is far from being achieved. It seems as if some respondents doubt whether educators are capable of fulfilling various roles, such as mediators of learning, interpreters and designers of learning programmes and materials, scholars, researchers and lifelong learners.

There is enough evidence, however, to indicate that the respondents, although they have some reservations regarding integrated teaching, nevertheless support the idea of using integrated teaching. R2, R3 and R8 pointed out that they were implementing this strategy in their environment and it is producing marvellous results at institutions of higher and further education. R10 was confident that if implemented integrated teaching wouldl help educators who teach multi-grade classes as those educators would be able to plan together and teach learners the same content but assess them based on individual outcomes. R7 stressed that integrated teaching is consistent with OBE objectives and would work well to anchor OBE principles. Other respondents supported the idea and listed some important enablers such as school organisational culture, enhanced teacher training and more resources. This analysis of interview responses validate the educators responses results as outlined below.

Comparing the interview responses with the 55.4 percent response rate of educators who do not implement integrated teaching, it is without doubt that the reasons given above of educator overload and training would have a negative impact on the use of integrated teaching strategies. The percentage could be reduced if one considers that the respondents were not asked about the extent of their collaboration with other educators. Responses to a probing question asked of

educators who completed questionnaires in my presence showed that educators were not regularly using integrated teaching. Instead they were collaborating with not more than one as most of them indicated that they only did it once. The purpose of the sub-question was to determine the extent of awareness of integrated teaching and it seems that from 150 educators only 44, 6 percent are aware of the integration principles.

The literature is silent on integrated teaching as it is a new principle in South Africa; where it has been implemented there is not much peer-reviewed literature that reports on the principle. Some literature is discussed in Chapter two where researchers conducted empirical studies to determine the effectiveness of OBE and curriculum reforms in South Africa in relation to the principle of teacher collaboration or integrated teaching. Botha (2002), Jansen (1998 &1999), Fiske and Ladd (2005), Rogan and Grayson (2003), Rogan (2007), Cross et al (2002) and Vandeyar and Killen (2007) maintain that the curriculum reforms do not reach classroom teaching. The study was informed by scholars such as Arredondo and Rucinsky (1997), Ranby and Potenza (1999), Loepp (1999), Robinson and Schaible (1995), Venville et al (2001) and Gehrke (1998). The comment made by R6 on the role of school organisation culture of implementing integrated teaching is supported by Creese (2005) who maintains that the organisational structures in schools seem to discourage the culture of developing interaction and shared knowledge with fellow teachers.

The participants supported the concept of the integration of indigenous knowledge but pointed out the challenges concerning its inclusion in classroom teaching. One such challenge relates to the fact that the knowledge has not been documented anywhere and it will pose a challenge for educators to go looking for people with such knowledge. Other challenges include that since some of the knowledge has not been scientifically tested, it remains myth and if taught to learners it night mislead them or put them in danger. Lightning was used as an example; some indigenous communities believe that it is a source of witchcraft and the only way to counter it is consulting a traditional healer. In some instances examples were given which, if used, could raise learners' awareness of dangers associated with some hazards. Such examples include the one on the eclipse, the pattern of swallows' flight, reading signs of animals and living in harmony with the environment.

Literature was reviewed to confirm R8's account about a young girl who had just learned from her teachers how to recognise tsunami signs. When reporting this incident Rao (2007:8) said the following:

> *It is by now a well known story how a 10-year old British girl, Tilly Smith with her presence of mind and quick thinking saved about 100 lives on that day at one of the beach resorts in Phuket, Thailand. All she did was to alert people on the beach about the possible tsunami, when she saw a bubbling on the water, right on the edge and foam sizzling just like in the frying pan which she had leant in her geography class a few days before.*

In conclusion Rao (2007) argues that while people were complaining that there was no tsunami warning system in India, the British young girl provided evidence that it was a failure of mind rather than an absence of machinery, and simply put it that it was a lack of tsunami education that led to the deaths of several thousands in India on that day.

According to the questionnaire results 54.6 percent of educators are aware of the need to include indigenous knowledge in their classroom teaching. Not all have included the knowledge in its entirety, or they mentioned in passing some aspects of indigenous knowledge. From the results one can conclude that there is at least some form of awareness of integrating this knowledge in the classroom.

The literature on the effectiveness of indigenous knowledge implementation is silent and the only data available are debates on whether the knowledge should be introduced in classrooms or not. The most important aspect to note here is that through NCS, the South African education policy accords a special value to the knowledge and emphasises that if learners are taught at an early age they will be able to contribute to the development of indigenous knowledge as a part of scientific knowledge. Some scholars such as Gupta and Sharma (2006), Agrawal (2004), Stevenson (1996), Hellier et al. (1999) and Gaillard (2007) are concerned that this knowledge is disappearing even though it has a lot to offer to enhance learning.

My impression is that these two strategies would make a huge difference to improve the standard of education in South Africa if supported and implemented well. The literature review has provided relevant information in this regard. What remains is to go to the field and collect data

on best practices and as well as to conduct action research to determine the effectiveness of these strategies.

4.6 Empirical data collected to identify other teaching strategies that could enhance learners' awareness of hazards and disasters

According to the Hyogo Framework for Action 2005 – 2015 (2005:9) countries are expected to promote the inclusion of disaster risk reduction knowledge in relevant sections of school curricula at all levels and in the use of other formal and informal channels to reach learners with information. The purpose of sub-question 5 is to determine whether there are any other teaching strategies that could be implemented, apart from the inclusion of indigenous knowledge and the use of integrated teaching.

4.6.1 Educators' response to the question on what other teaching strategies could enhance learner's awareness of hazards and disasters

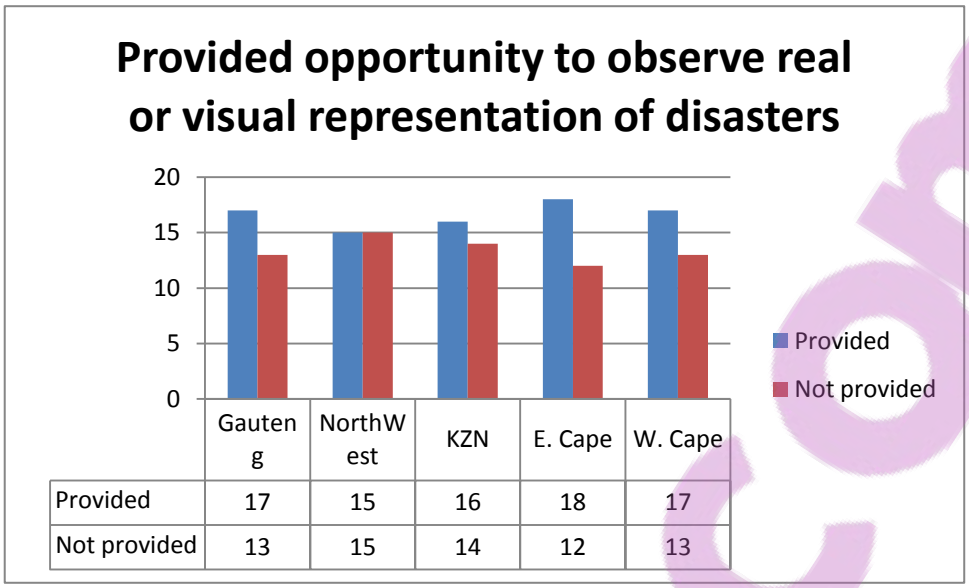
The intention of sub-question 5 is to identify other strategies that could enhance learners' awareness of hazards and disasters. The respondents were asked to tick whether they have used pre-identified strategies in their classroom to enhance learners' awareness of hazards and disasters.

Four questions were asked in relation to sub-question 5, which probed whether educators exposed learners to observing visual representation of hazards and disasters, whether they were taught to identify hazards in their area whether they were encouraged to talk to their parents. The analysis of responses to this question was done in conjunction with data displayed in Table 4.3 above. According to the results of those two questions, 99.3 percent of respondents agree that hazards and disasters should be integrated in school teaching while 79.7 percent indicated that it should be included across other learning areas. The question that emerges here is in what way the teaching of hazards and disasters should be taught to learners. This section provides data from educators as to what other methods they are using to enhance learners' awareness of hazards and disasters.

4.6.1.1 Educators' responses to the provision of an opportunity for learners to observe a real-life or visual representation of hazards/disaster incidence

Responses to question 5 are interesting, mainly noting the decline in responses and the notion that the responses are 55.3 percent affirmative and 44.7 percent negative. On face value one can conclude that 55.5 percent of educators from the five provinces do give learners real-life or visual representations of hazards and disasters while 44.7 percent do not. If the data are analysed per province this conclusion changes dramatically with other provinces being 60 percent affirmative and 40 percent negative with some even being to 70 percent affirmative like the Eastern Cape where 18 respondents answered in the affirmative and 12 in the negative. Some respondents were asked to show evidence of visual representation and in one school from Gauteng the respondents showed me drawings of disasters done by learners. Another school had a video of hazards and disasters while in one school in the Western Cape one respondent showed a picture from emergency services hanging on the wall with images of things that can burn shacks and a message of what learners could do to avoid accidents and other disasters.

If the matter is scrutinised closely, it becomes apparent that the respondents who have not taught learners about hazards and disasters are in the minority. If one consider that in question 4 on average seven respondents per province had not included hazards and disasters in their learning area, the implication is that approximately fifteen educators (on average) do give learners an opportunity to view visual representations of hazards and disasters while eight educators on average do not. The fact that educators who responded to the questionnaires were aware of the need to use different strategies to teach learners about hazards and disasters, gives hope that when a large scale implementation of the programme commences, educators would be familiar with the process as some had been involved.



	Gauteng	NorthWest	KZN	E. Cape	W. Cape
Provided	17	15	16	18	17
Not provided	13	15	14	12	13

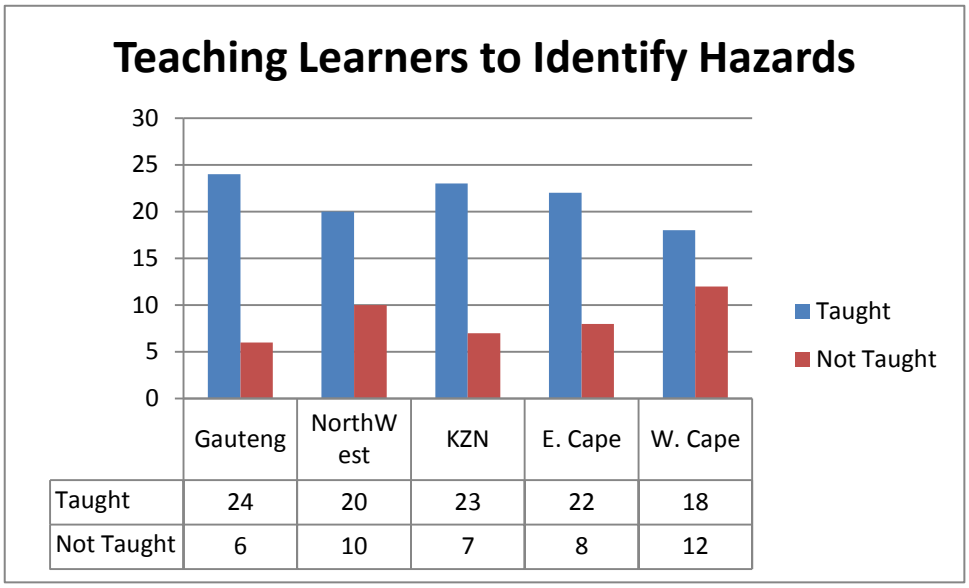
Figure 4.7: Chart display of educators' responses to exposing learners to observe real-life or visual representation of disasters

4.6.1.2 Educators' response to teaching learners how to identify potential hazards in their environment

Question 7 is similar to question 4 but phrased slightly different mainly to check if respondents were thinking about their responses. There are not many differences in the four provinces. North West Province respondents gave a different perspective from their question 3 responses. Whereas in question 4 twenty-five educators indicated that they do include hazards and disasters in their classroom teaching only twenty affirmed that they did teach learners to identify potential hazards in their environment. It could be that North West Province educators teach learners according to curriculum statements and do not reflect on hazards that are in their environment. This is evidenced by some comments from the province that educators are expected to teach learners about earthquakes and cyclones which are far removed from learners' environment.

The conclusion that can be drawn from question 7 responses are that 71.3 percent of educators who are teaching hazards and disasters value the need for learners to identify potential hazards in their environment; 28.7percent of those that reported that they do not teach hazards and disasters

did not see any need to help learners identify potential hazards and disasters. A closer scrutiny of the chart above reveals that Gauteng educators had a stronger need to help learners, while those in the Western Cape had less of a need. The results are surprising because Gauteng and the Western Cape have a greater prevalence of informal settlements and seem to be experiencing many hazards and disasters. Educators in the other three provinces, KwaZulu-Natal, the Eastern Cape and North West Province are more concerned with floods and road accidents than in Gauteng and the Western Cape that have fires and flooding as their concerns.



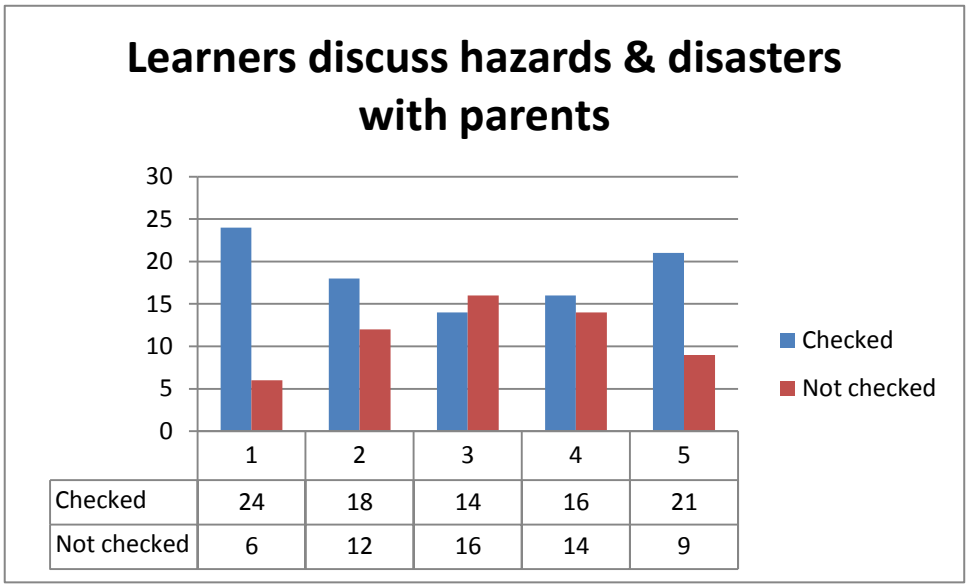
	Gauteng	NorthWest	KZN	E. Cape	W. Cape
Taught	24	20	23	22	18
Not Taught	6	10	7	8	12

Figure 4.8: Chart display of educators' responses to teaching learners to identify potential hazards in their environment

4.6.1.3 Educators' response to checking whether learners discuss what they have learned about hazards and disasters with their families

Much educational research concurs that families play a critical role in enhancing learning. Regarding hazards and disasters, families could play an enormous part in creating awareness of hazards and disasters, starting with minor accidents or day-to-day hazards that are visible within their area. The response to question nine reveals that Gauteng and the Western Cape seem to be doing well in working with families as reflected by responses from Gauteng where twenty-four educators out of thirty do check whether learners discuss hazards and issues with parents while

in the Western Cape only 21 indicated that they do check whether learners talk to their families about hazards. KwaZulu-Natal, the Eastern Cape and North West Province seem to be close to a 60/40 split. The reason for these discrepancies between Gauteng and the Western Cape compared with KwaZulu-Natal, the Eastern Cape and North West Province could be that the first two provinces have bigger informal settlements with numerous hazards and have experienced most of these disasters while in the other three provinces, the hazards are not so visible and discussions depends on educators' discretion.



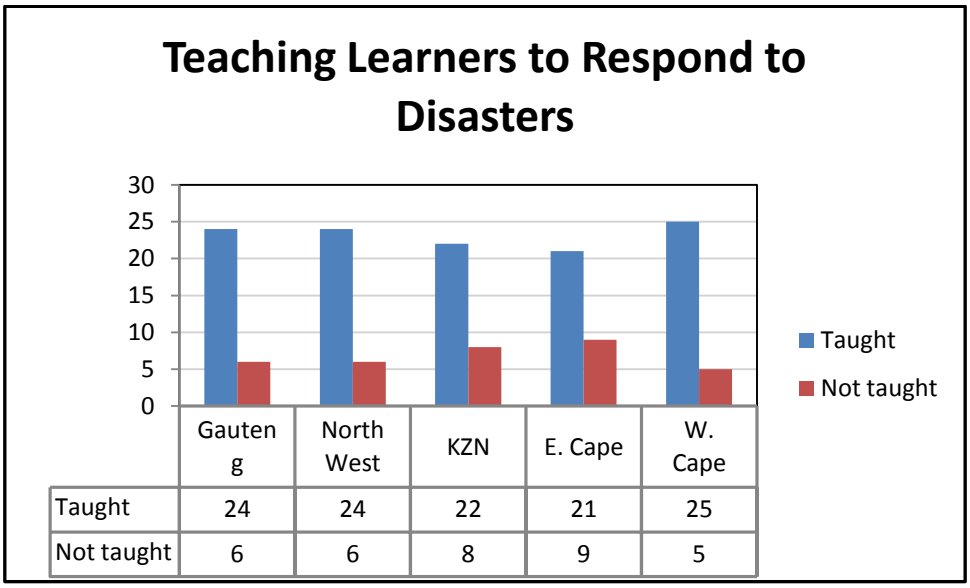
	1	2	3	4	5
Checked	24	18	14	16	21
Not checked	6	12	16	14	9

Figure 4.9: Chart display of educators' responses to checking whether learners discuss what they have been taught with their parents

The responses to this question indicate that 64.6 percent of the respondents do ask learners to discuss what they have learned with parents even though it is not related to hazards and disasters. Only 35.4 percent of the respondents do not involve parents in enriching their learning. The conclusion emanating from this analysis is that the majority of educators who completed the questionnaires are indeed aware of the value of involving parents in enhancing their teaching. The implication is that it would not be difficult to convince the 35.4 percent of educators to ensure that they involve parents in enhancing learners' awareness of hazards and disasters. It should also be noted that the percentage is limited to only those who responded and if it were to be applied to the country as a whole, the implication would be huge.

4.6.1.4 Educators' response to whether they teach learners how to respond when faced with disasters

Question 10 was included in the questionnaire mainly to check whether the respondents' understanding of questions 1, 2 and 3 is in fact related to the desired outcomes of the National Curriculum Statements. The response to this question from provinces varies considerably. Gauteng, the Western Cape and North West Province seem to be well ahead in teaching learners how to respond to disastrous events basis while KwaZulu-Natal and the Eastern Cape are trailing behind with an 80/20 split.



	Gauteng	North West	KZN	E. Cape	W. Cape
Taught	24	24	22	21	25
Not taught	6	6	8	9	5

Figure 4.10: Chart display of educators' responses to whether they are teaching learners ways in which to respond appropriately when faced by disasters

The percentage of educators who indicated that they do teach learners to respond to disasters is 80 percent. Considering additional comments from educators, it becomes clear that this percentage was due to the fact that educators talk to learners about road accidents, crossing rivers, playing with fire and even invite specialists to talk to learners about basic safety and first aid. It should be noted that the responses of educators were not based on the full spectrum of disasters but on only a few incidents, some of which do not qualify to be labelled as disasters.

4.6.1.5 Comments from educators on the use of other teaching strategies to enhance learners' awareness of hazards and disasters

Although not asked specifically to comment on the strategies, some educators responded that they have invited fire department and traffic safety officials to train learners how to play safe. Another respondent maintained that learners are quite aware of disasters as they had observed a real-life incident in which a school was blown away by a storm and occasionally some homesteads had burned down while they were watching. A respondent from the Western Cape commented as follows:

> *I think learners should be exposed to various videos of disasters that are happening all over the world. Educational excursions should be implemented to these various places when these man-made or natural disasters occur randomly and learners should be taught how to protect themselves against these natural hazards.*

Other comments were made that they do not directly relate to teaching strategies but stress the need to excite learners as a respondent from Western Cape commented:

> *I have found it very challenging and interesting to teach natural hazards to our children and they seem to enjoy it.*

Another respondent from the Western Cape commented that resources must be made available to all and also the mother-tongue motivation should be used. A respondent from Gauteng commented that the main challenge to enhance learners' awareness of hazards and disasters is the involvement of parents in learners' activities. The respondent further commented that audio-visual aids would be useful and that prescribed books should focus on disasters happening locally.

4.6.2 Responses to the question of whether other strategies could enhance learners' awareness of hazards and disasters

The respondents were asked to identify other teaching strategies that could enhance learners' awareness of hazards and disasters and they gave a variety of strategies; some of them are similar to the ones included in the questionnaires. P1 stated that there is no need for educators to reinvent the wheel; they should use brochures developed by the NDMC, such as those on informal settlement fire awareness, extreme cold awareness, lightning awareness, thunderstorm awareness, flood awareness and drought awareness. Teaching should be relevant and stimulate learners so that they know what they should do when faced with disaster. The curricula should be based on real risk, not perceived risk to enable learners to apply the acquired knowledge in real life.

P2 maintained that although theoretical input is useful, experiential learning is important because it brings fun and excitement and stimulates many senses. P2 stressed that the best way for learners to benefit from learning is through being involved. If you are a learner, experiential learning is beneficial. P2 stated that when she teaches her learners they enjoy practical illustrations that she makes, She maintained that when she teaches learners about overpopulation, she demonstrated how uncomfortable it was to have two people in a space that could fit one person. P2 elaborated on this example as follows:

> *If you draw a square, after every one minute add one student in the square in few minutes they will quickly become uncomfortable as the space becomes smaller and smaller.*

It is important to expose learners to observe hazards and disasters in real life or in a visual representation. Learners should be given the opportunity to embark on study tours and to watch disaster movies such as the popular TV series of *Nature Unleashed Volcano, Storm, Earthquake, Fire, Landslide and Flood*). They could also be encouraged to watch other TV series such as the ETV *Seconds to disasters* where events leading to disasters captured on video and evidence from people who survived disasters are discussed. In some cases older people from the community could be asked to share with learners their experiences of dealing with disasters. P2 stressed that

we should go beyond the textbook, and make the mental shift to have many senses stimulated, not just eyes or ears. Learning should be made exciting through engaging all senses.

P3 is of the opinion that school learners should be taught basic safety principles and be encouraged to master emergency response measures even though they would be following their ordinary careers. To have volunteers who could be called up to assist if a disaster strikes in South Africa is important. For example, the military have volunteers while the police force has reservists who are called up when there is need to safeguard the country. The interesting part of the mission is saving lives and if there is a way to do that before any disaster it would save a lot of efforts.

Regarding teaching strategies, P4 mentioned that they should vary from school to school and area to area but educators could supplement textbooks with other teaching material such as tasking learners to share experiences of disasters they have seen on television, heard or read about and to collect newspaper clips of disaster news items. They could do mind-maps and narration of issues related to recent disasters. This type of teaching depends on the teachers' enthusiasm as they are the ones tasked with ensuring that learners grasp learning outcomes. It is part of outcomes-based education to teach learners beyond the textbook.

P5 believed that consistent underscoring of awareness is important; and role players can be invited to the classroom to give talks or demonstrate disaster-related content. Different grades should include issues related to disaster awareness that encourage them to understand what hazards are prevalent in their area. It is of the utmost importance that disaster education is formalised in the curriculum as it will compel educators to teach it at a different level. Teaching strategies such as including indigenous knowledge, integrated teaching and visual representation of disasters seem to provide better options to make learners aware. There are many things that need to be done if a high level of awareness is to be achieved which, amongst others, includes having full knowledge of the impact of disasters on learners, and ensuring that curriculum developers, advisors and educators from all learning areas meet at various stages of their work to ensure that the integration of hazard and disaster education happens at all levels. Doing impact studies of teaching or getting feedback from educators, using a targeted approach to the

vulnerable schools and getting in touch with all areas through school visits as part of the assessment practice and distributing printed materials on hazards and disasters that could be used as learning materials by learners will go a long way to raising awareness of hazards and disasters in schools.

P6 reckoned that hazards and disasters should feature prominently in the National Curriculum Statements. However, the challenge is to make sure that book authors interpret the curriculum correctly and design an appropriate learning programme aligned with textbooks. Teachers usually welcome what is ready and they do not go the extra mile to get additional resources.

Commenting on teaching strategies to raise awareness in learners in the classroom, P7 maintains that different teachers have different ways of teaching and children also have different strategies; it is most important to balance the attainment of outcomes with experiential learning. Each school has its preferred teaching strategies and teachers usually comply with the school policy. Rural schools need a strategy that fits the multi-graded teaching where you have learners doing Grade 3, 4 and 5 together.

P8 maintained that teachers must be aware of the Internet and computer games available free of charge that could be used by learners. Educators should do everything in their power to ensure that learners have access to relevant online resources. Learners' awareness could be enhanced using different learning areas such as Art.

According to P9, learners should not only be given explanations of hazards and disasters; they should be given practical examples of hazards and disasters and be taught about their own surroundings. Since teachers are sometimes not directly involved in disaster risk reduction, they need to be trained or they can invite a specialist from emergency response services to present lectures to learners. Pictures and drawings appeal to learners; to make learners understand complex issues of disaster risk reduction, they should be encouraged to play games related to disaster risk reduction. Through subjects such as Mathematics, schools should raise awareness of disasters by teaching learners how negligent actions could lead to disaster. Parents should be involved in sharing their knowledge and experiences of hazards and disasters with learners.

According to P10 teaching strategies should allow learners to grasp basic concepts, complete assignments and self-study projects, work on a collage with various pictures of disasters and depending on the level of learners, watch videos and take excursions. Any strategy introduced should consider the learning environment which in most cases in Mpumalanga boasts large classes; teachers do not have enough time to cover the syllabus or complete required administrative tasks.

It can now be stated that the participants provided adequate data to determine whether there are other teaching strategies that can enhance learners' awareness of hazards and disasters. The next section discusses how the questionnaires, interviews and the literature review have provided conclusive data to determine what other strategies could enhance learners' awareness of hazards and disasters.

4.6.3 Discussion on what other teaching strategies could enhance learners' awareness of hazards and disasters

Sub-question number five intended to find out from the respondents if there were any other strategies to enhance learners' awareness of disasters. Rogan and Aldous (2005:315) illustrate that the effective implementation of science education involves classroom interaction. Such interactions include presentation by a teacher, attentive listening by learners and engaging learners through demonstrations, specimen exhibition, using graphs and involving learners on everyday life activities, conducting site visits and inviting specialists to school. According to Rogan (2007:117) while educators are willing to use new teaching strategies, they do not have the know-how to design worth-while learning experiences. This observation is in line with Vandeyar and Killen (2007:112) who state that educators conceptualise teaching in ways that are consistent with the old educational paradigm and are unwilling to entertain any conceptualisation outside their past experience.

While the responses proved that 55.3 percent of 150 respondents affirmed that they do use real or visual representation of hazards and disasters in their teaching, 71.3 percent affirmed that they do

teach learners to identify reality, 64.6 percent of 150 respondents affirmed that they asked learners to talk to their parents and 80 percent of respondents do teach learners about responding to disasters. There are other variables that could affect the results of responses; this method could have been used for other topics, not necessarily for hazards and disasters; educators could select an option to make their teaching look good. Nevertheless, the study was an attempt to look at the awareness of educators in relation to these teaching strategies.

A look at what evidence surfaced from the interviews to address sub-question 5, revealed categories such as excursions, tours, real-life examples, practical illustrations, videos, drawings and games. The most important consideration is that learning should be exciting and get learners involved. Some of the strategies include involving parents, inviting an expert to the class and using materials developed by organisations working in a similar environment.

My impression here is that enough evidence has been provided to address sub-question 5 and that helpful insights have surfaced.

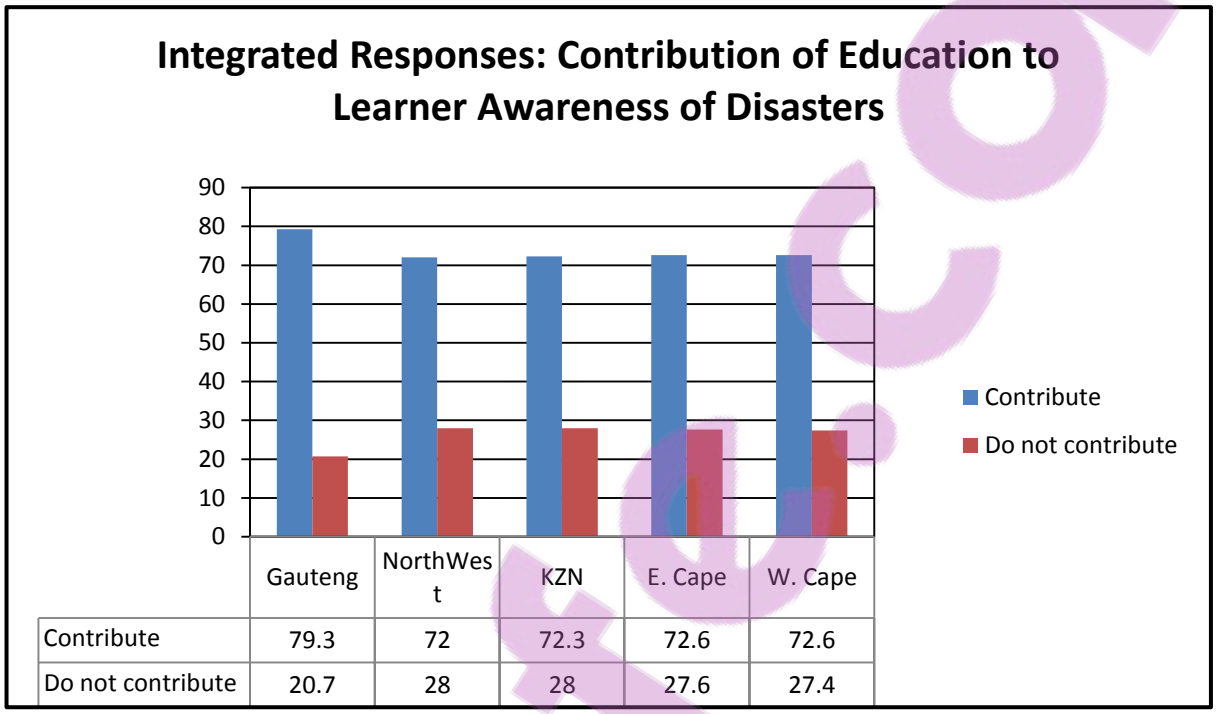
4.7 Discussions on whether the empirical data presented has provided conclusive evidence to determine how education contributes to learners' awareness of hazards and disasters

The aim of the study was to explore how education, in particular national curriculum and instruction design, contribute to learners' awareness of hazards and disasters. The discussions below will tap into some key points from the educators' responses, the responses from interview participants and the literature study to determine whether the main research question has been addressed.

4.7.1 Discussion of the educators' response in relation to the main research question

A total of 150 respondents were asked closed-ended questions to determine their awareness of hazards and disaster-related issues. It was argued in Chapter three that whereas dichotomous questions are not ideal for a PhD study; if combined with other qualitative methods as in this

study the combination of questionnaires to interview with 10 specialists, the validity of data can be enhanced. Below is the consolidated chart representation of educators' responses:



	Gauteng	NorthWest	KZN	E. Cape	W. Cape
Contribute	79.3	72	72.3	72.6	72.6
Do not contribute	20.7	28	28	27.6	27.4

Figure 4.11: Chart display of consolidated educators' responses to learners' awareness of hazards and disasters

The results above indicate that 73.8 percent of the respondents realised the need for education to contribute to learners' awareness of hazards and disasters. In view of some of the concerns raised about using closed-ended question especially the dichotomous ones, the findings of data collection through questionnaires do not provide conclusive evidence that education contributes to learner awareness of hazards and disasters. However, if the dimension of the literature review and responses from interviews with specialists are taken into consideration, the reliability of the evidence is enhanced. The section below discusses whether the additional comments provide any evidence that education contributes to learners' awareness of hazards and disasters.

4.7.1.1 Comments from questionnaire responses to whether education contributes to learners' awareness of hazards and disasters

The majority of comments were from the Western Cape Province with 19 comments, followed by the Eastern Cape with seven comments, Gauteng with six comments, North West Province with two comments and KwaZulu-Natal with only one comment. North West Province and KwaZulu-Natal registered few comments. The interesting part with regard to these comments is that they are not the same across the five provinces. In North West Province and the Eastern Cape, the majority of educators commented on road accidents, strong winds, and drought and to some extent flooding. KwaZulu-Natal commented on fire and accidents while in Gauteng the comments were about issues of curriculum and strategies to teach hazards and disasters.

Some comments from Gauteng and the Western Cape respondents raised a concern about the current National Curriculum Statements. Much emphasis is placed on disasters that are not common in South Africa such as earthquakes, volcanoes and cyclones.

What captured my attention was a comment by a respondent from the Western Cape who stated that he teaches learners about medical waste dumped in a nearby area where used needles are picked up by children to inject one another. My attention was captured because I had just read the *Star* newspaper which published an article about Khayelitsha residents who buy TB infected saliva so that they can access health grants for people infected by TB. The situation was also reported on by David Smith of the Guardian in UK as quoted below:

> *South Africans in an impoverished township are profiting from an illegal trade in a precious new currency - saliva. Tuberculosis sufferers in Khayelitsha, Cape Town, were found to be selling samples of their sputum to healthy people to pass off as their own in a scam to gain medical grants. An investigation by the West Cape News identified people with TB charging R50-100 (£4.10-£8.20) for saliva samples contained in bottles stolen from health clinics. The paper said that buyers of the samples were then able to get a card from a clinic indicating they have TB and use this to fraudulently obtain a temporary disability grant of R1, 010 per month from the department of social development. A 54-year-old man told a reporter that he makes an average of R500 per month from selling his saliva to people seeking to trick their way on to the benefits system. But he said business was "not good" because so many people were infected with TB in the township that he had a lot of competition. John Heinrich, chief executive of the SA National Tuberculosis Association, said: "It is definitely happening. People are trying to get a grant by pretending to be TB positive. Instead of handing their own sputum in, they buy it from*

> *people who have TB-positive sputum." He added: "They go to the clinics and get treated as TB patients. People are supposed to produce their sputum under supervision, but I'm sure when the clinics get busy, that doesn't happen." South Africa has one of the highest TB rates in the world with around half a million new cases each year, resulting in 78,000 related deaths. Poverty, malnutrition, HIV and cramped conditions in townships such as Khayelitsha, one of the biggest in the country, help the infectious disease to thrive.* (Guardian, 17 September 2009)

This article reminded me of my visit to one school in the same area (Khayelitsha) where I observed three learners struggling to bite the same ice-cream at the same time. A few minutes after the struggle one of the boys was coughing to such an extent that the other two boys laughed at him and one of them jokingly said “uzo khohlela igazi wena” which means, you will cough blood. I asked myself what if the boy was infected to a lesser extent by a flu virus or to an extreme extent by TB virus.

When I think of this incident I consider a comment by two educators in the same province who mentioned that since hazards and disasters are not mentioned in their schedules, it is therefore not necessary to teach learners about hazards and disasters. What if these boys were in the class of one of the teachers who felt that it was not necessary to teach learners about hazards and disasters? It simply means that these learners should wait until they are in Grade 7 to be taught about health related hazards so that they should not engage in activities that make them share saliva, especially with those that have symptoms of illness.

The health hazards coupled with vulnerabilities experienced by the Khayelitsha community as the picture below indicates, highlight the urgency of teaching about learners about hazards and disasters. The hazards depicted on the picture include high voltage electric cables with shacks beneath the electric poles and thousands of shacks grouped together without any space to allow for a vehicle to drive through, which imply that if there is fire in the area the fire trucks will not move through. Another challenge posed by the picture below is the dumping, and storm water pipe build by rocks. Having visited one school in the vicinity where this picture was taken, I felt that disaster education should be implemented as early as possible to help learners from the vicinity.

Picture 4.1: A depiction of vulnerabilities at Khayelitsha informal settlement

Impressive comments were made by some respondents across all five provinces that these questionnaires have brought awareness to them about issues that they never thought to implement when teaching learners; hazards and disasters and encouraging them to share with their parents. For example, some educators like the idea of including indigenous knowledge in their lessons and involving parents in the teaching of hazards and disasters.

In general, the educators' comments show a dire need for work schedules, textbooks and other learning resources to facilitate the teaching of hazards and disasters or what other participants call disaster risk reduction. There is a further indication that visits from fire and safety department officials could contribute to learners' awareness of disasters. Although the NCS should prescribe learning outcomes of what needs to be taught to learners, it is provincial and district education offices that should decide what must be taught in the schools. A respondent from the Western Cape suggested that hazards and disasters are experienced by learners especially in the area where the school is situated. In depth knowledge of how and what hazards

affect the community is crucial to empower learners to transfer what is learned at school to their community and household.

4.7.2 Discussions on how the interview responses addressed the main research question

Ten participants consisting of a senior manager from the South African National Management Disaster Centre, a professor of Geography from Wits University, a disaster management lecturer from Free State University, a lecturer from North West Province Emergency Response Training College and a team leader of the Rescue Mission to Haiti, a national curriculum coordinator from National Basic Education Department, a curriculum director from the Eastern Cape provincial education, and Gauteng, three Provincial curriculum coordinators from Gauteng, Northern Cape and Mpumalanga as well as a senior emergency response officer from Enviroserve who is also a former Ekurhuleni Metropolitan Emergency Response Officer were interviewed and provided rich data to address the main research question.

Some of comments from the participants related to the main research question are displayed below to complement the results of the questionnaire data from educators.

> *Build Social and intellectual capital by educating people to practice risk averse behaviour, making communities' resilience to disasters a priority by inculcating a culture of risk reduction.*

With this statement, P1 was simply appreciating that education has a crucial role to play, first by inculcating a culture of risk reduction, which in turn would lead to risk averse behaviour translated to social and intellectual capital. In short, P1 agreed that education contributes to enhancing learners' awareness of hazards and disasters even though there are many challenges that need to be overcome.

P2 on the other hand, has this to say:

> *Communities are always surviving; they learn from each other, it's all about how they survived. We teach Eurocentric views even though there are African ways that have stood the test of time; we do not have mechanisms to take up such knowledge and integrate it into our teaching.*

From the literature study it was noted that King (2000) strongly believes that everyone in the community must know how to deal with hazard, because the reality is that during an event, many thousands of people are actively involved in providing assistance to the victims of disasters.

With the fast rate of development in South Africa, where new urban settlements are being established daily, one wonders how much of the natural vegetation is being lost. Mulegeta et al. (2007:5) maintain that human-induced causes of flash floods include land degradation, deforestation of catchment areas, and increased population density along river banks, poor land use planning and lack of control of flood plain development. The panel of experts working with Mulegeta et al. (2007) further identified toxic waste disposal such as raw sewage, and incinerated ashes, contaminated oils, nuclear materials, acids and poisonous solvents ejected by chemicals, pharmaceuticals and fertilisers. They cautioned that the dumping of toxic waste materials poses a grave environmental threat to communities that are not aware of the dangers and are not equipped to handle the ensuing consequences.

Smith, Guastella, Bundy and Mather (2007:276) reported on the storms and cyclones that devastated the coastal regions of KwaZulu-Natal in 2007 and argue that the spectacular damage to property that took place on 19 and 20 March was a consequence of the building boom of the previous twenty years; they stress that the unprecedented destruction by the storm was due mainly to buildings being erected at the wrong place.

4.8 Triangulation of empirical and literature data collected to determine whether education contributes to learners' awareness of hazards and resilience to disasters

A good place to start in exploring whether education contributes to learners' awareness and resilience is to use the conceptual framework as a summary of issues emanating from the literature study such as distinction between hazards and disasters, vulnerability, resilience, indigenous knowledge and integrated teaching. It has been emphasised throughout the study that hazards are part of everyday life but they only become disasters if there is vulnerability. For example an earthquake can occur and not kill a single individual if people are aware that it might occur in their environment. They could avoid building houses next to earthquake-prone areas or

they could build structures that are resilient to the event. This is the same with fire, floods and droughts which are the main disasters experienced in South Africa. While most natural disasters cannot be prevented, the loss of life and property could be reduced through awareness and preparedness mainly dealing with vulnerabilities. Education has been hailed as a means to attain awareness and preparedness for disasters and also to attain resilience when disasters could not be avoided. Below is a table depicting the triangulation of data collected through the literature study, the questionnaire and interviews.

Table 4.1 Triangulation of data collected through interviews, questionnaires and literature

Themes	**Literature & Policy Documents**	**Questionnaires**	**Interviews**
Prevalence of hazards and disasters in South Africa.	South Africa like any other country is prone to many disasters with major ones consisting of floods, fires, storm, HIV/AIDS and accidents (road, rail and industrial)	Comments from educators revealed storms, floods, heavy rains, fires as disasters prevalent in South Africa	Floods, storms, fire, HIV/AIDS, chemical spillages, mist, road accidents and other epidemics have been identified as disasters common in South Africa. New insight that came though is that these hazards are not catastrophic if there is no vulnerability and also they become catastrophic when they become hybrid like the earthquake and tsunami that hit Japan in March 2011.

Vulnerability of communities in South Africa	Poverty is the key driver for vulnerability resulting in people residing in areas not suitable for human habitation. Informal settlements are the most vulnerable areas in South Africa.	There was mention of houses built using mud bricks, shacks and grass roof which made them vulnerable to heavy rains, storms, fire and lightning by questionnaire respondents.	Responses from the interview participants revealed that most of SA communities are vulnerable to disasters because some schools are located in river banks, learners have to cross rivers and busy roads to schools, learners use candles and coal fire which is not safe in houses built by shacks and that when there are accidents people including school children gather at the accident scene without understanding the nature of the accident which makes them vulnerable to chemical and other dangerous items.
Inclusion of hazards and disasters in the NCS.	Explicitly included in Grade 7 & 10 – 12 Geography Implicitly included in the Social Science learning outcomes –	98% of respondents agrees that it should be included	Almost all curriculum specialists agree that it is already included in the NCS (P4, P5, P6, P7 and P10) supported by P2.

	understand and demonstrate responsibility towards the environment		Although others did not explicitly agree to the inclusion, they did not have any contrary ideas.
The level in which inclusion should take place	The NCS policy documents indicate that hazards and disaster education is included in Grade 7 & 10 – 12. Also there is mention of environment, water issues and deforestations as well as mining and industrialisation.	Comments from some respond reveal that it should be taught to learners as early as possible.	Some of the participant indicated that it should start as early as possible, while some suggested grade 3/4 and some preferring it to be where it is. One participant mentioned that it should be taught even at university level
The nature of hazards and disasters content to be included in the curriculum	Natural, human-made and hybrid disasters should form the basis of hazards and disasters taught in schools.	The content should consist of local disasters and not emphasise on global disasters such as earthquakes and tsunamis.	Apart from the types of disasters, one participant indicated that basic safety issues such as first aid, fire safety. The teaching should go beyond the types of disasters and challenge learners to explore ways in which they can reduce the risks of disasters and to become resilient.

			Learners should be taught meaning of chemical symbols so that when there is a spillage, they should know how to respond.
Strategies used for teaching hazards and disasters	Educators should apply different strategies depending on the situation of learning. Integrated learning and the use of indigenous knowledge were regulated in the NCS as possible strategies. Integrated learning is suggested as the best technique to enhance learners holistic understanding of learning phenomenon (hazards and disasters)	Respondents were asked whether they think integrated teaching and indigenous knowledge should be used to teach learners about hazards and disasters which 44.6% affirmed positively that they apply integrated teaching while 54.6% affirmed that they apply indigenous knowledge.	While the integrated teaching seems to be appealing and has been successfully implemented in some of the schools in South Africa, in previously some of disadvantaged schools it will not make any difference as educators are over committed and are struggling to adapt to the new changes brought by NCS.
Other categories emerging related to the inclusion of hazards and disasters	Curriculum change in South Africa coincide with appointment of new ministers which should be exploited if a difference is to made.	There is a need to determine what housing structure learners come from and what type of settlements so that the disaster education	The teaching of hazards and disasters should be included in other subjects and also at university level and introduced across all subjects and

		programmes could be tailor made to suit	courses for example in engineering, economics and law etc.

4.9 Conclusion on the empirical data collection to collection to determine whether education contributes to learner awareness of hazards and disasters

The discussions in section 4.7.1 revealed that the consolidated responses of 73.8 percent of educators support the notion that education contributes to learner awareness of hazards and disasters. This analysis provides important evidence to argue that education does contribute to learner awareness of hazards and disasters. Almost all interview participants agreed that South Africa has a prevalence of disasters, that hazards and disasters should be integrated into the national curriculum from the early phase right through to senior phase and at universities. Also the response from the participants support multiple teaching strategies including integrated teaching and the inclusion of indigenous knowledge in the classroom teaching should be considered as a means to enhance learners' awareness of hazards and disasters even though some had reservation on the timing part for implementation.

Chapter 5

Findings, recommendations and implications of the investigation on learners' awareness of hazards and disasters

5.1 Introduction

This chapter focuses on the significance of the study and its implications for educational policy change regarding the inclusion of hazards and disasters in classroom teaching. The intention here is to revisit the research questions and the conceptual framework discussed in Chapter one in the light of data presented and discussed in Chapters two and four. Throughout this chapter an interpretive narration is provided in order to explain and describe what contribution this study has made to the scholarly fraternity and to hazards and disaster education for school learners.

At the beginning of this study it was mentioned that the aim of the enquiry was to explore how education, in particular curriculum and instructional design, contribute to learners' awareness of hazards and disasters. This main research question was divided into five sub-questions: what hazards and disasters are prevalent in South Africa, to what extent are South African communities vulnerable to those hazards and disasters, how does the South African National Curriculum contribute to learners' awareness of hazards and disasters, would integrated teaching and indigenous knowledge enhance learners' awareness of hazards and disasters, and what other teaching strategies should be used to enhance learners' awareness of hazards and disasters.

In addressing these sub-questions, data were collected through questionnaires and interviews and analysed, using a combination of qualitative and quantitative strategies to make sense of the information emerging from these sources. Data collected through interviews and questionnaires were triangulated with data emanating from the literature review to determine whether there are any similarities, differences or corroboration recorded in Chapter four. A summarised version of the findings and recommendations focusing on significance and implications of the study is discussed in this final chapter of the study.

5.2 Summary of the problems that led to the study

In Chapter one section 1.3 it was indicated that climate change researchers predict that the incidence of disasters will increase, considering the unpredictable nature of climate. This has proved to be true in South Africa considering the pronouncements in the literature; and media reports (both print and electronic) with some of the articles reported in chapters two and four. The interview participants confirmed the increase in the incidence of disasters and one could even say that a high rate of awareness of the prevalence of disasters amongst educators was reflected in responses discussed in section 4.2.2. To emphasise this point, Vogel et al. (2007:349) maintain that:

> *climate-related catastrophes, such as the 2003 floods, 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.*

As the final report was being prepared in August 2010 more devastating floods were reported in China and Pakistan. An *IOL* online news bulletin of 24 August 2010 reported that:

> *Two people had died and about 500 residents had been left homeless after a fire at the Overhill informal settlement in Kleinmond. Approximately 270 and 280 shacks were burnt to the ground.*

The IOL online news of 24 August 2010 further reported that:

> *floods and associated disasters, such as mudslide in China, miners trapped due to floods in Pakistani, more than 800 Pakistanis who died because of floods, Europe hit by floods and North-west Korea affected by floods as well.*

This data as well as the discussions in Chapter two provide substantial evidence to say that South Africa and the global community are experiencing an increase in the number of hazards and

disasters. This has serious implications for education which has to respond to societal challenges and ensure that learners are able to navigate their way through life. One important thing to note here is that while the incidence of disasters is increasing there is a need to teach learners about these catastrophic events and ensure that they understand and know what needs to be done during the events.

In section 1.3 it was stated that Ronan and Johnston (2001:1060) argued that:

> *lack of awareness and knowledge, combined with unrealistic risk perceptions, has a negative impact on preparedness and responses to disaster warnings and that hazard education programmes helps children to increase awareness, knowledge, and more realistic risk perceptions significantly.*

The Disaster Risk Reduction Begins at School, the National Disaster Management Framework Enabler 2 and the National Curriculum Statements take cognisance of the fact that learners should be taught about hazards and disaster topics to enhance their preparedness and resilience. Hence this study sets out to determine how South African education, in particular curriculum and instructional design, contribute to learners' awareness of hazards and disasters.

A conceptual framework was discussed, which included the increasing number of disasters world-wide, the vulnerability of communities, the need for ensuring that communities are prepared and resilient when faced with disaster outbreak. The framework went further to explore some educational factors contributing to learners' awareness of hazards and disasters and here national curriculum, learning programme design, integrated learning and indigenous knowledge were interrogated and tested through questionnaires and interviews. Irrespective of opposing views from scholars such as Green (2007) and Botha (2010) that indigenous knowledge as it is currently is not beneficial for South African schools, the NCS has included IKS as one of the principle of the new dispensation. These scholars views that IKS is not beneficial to schools stem from the fact that the pronouncement are made through policy but they have not been followed up. Based on the available limited scholarly data in South Africa and data collected from other countries, my belief is that indigenous knowledge and local knowledge have a role to play in risk

reduction amongst school learners. Integrated learning also has the potential to help learners develop awareness of hazards in their environment, and preparedness and resilience towards disasters.

Figure 2.4 summarised factors included in the conceptual framework and indicated the link amongst them. From the framework it is clear that education through curriculum and instructional design, which include indigenous knowledge and integrated teaching could enhance learner awareness and preparedness which subsequently helps in ensuring that learners become resilient when faced by disasters. The absence of education on hazards and disasters results in loss of life and property. While it should be mentioned that education in itself cannot prevent disasters from happening and stop loss of lives, it can assist learners to heed the warning signals and if they find themselves in the centre of disasters, they can adopt survival strategies.

5.3 Summary of the research question and sub-questions

The first sub-question was concerned with what hazards and disasters are prevalent in South Africa. The respondents were asked whether there was a likelihood of disasters occurring in their area while the interview participants were asked what disasters were prevalent in South Africa. The literature consisting of print media, scholarly publications and policy documents was consulted to investigate whether it made mention of disasters that are prevalent in South Africa.

The second sub-question enquired about the extent to which South African communities are vulnerable to disasters. The questionnaire respondents were not asked directly about the extent to which South African communities were vulnerable to disasters but the general comments made by educators in the questionnaires were checked to determine if there was any reference to the vulnerability of South African communities concerning disasters. The interview participants were asked to give their views of whether South African communities are vulnerable to disasters. Literature sources were reviewed to determine if they made any reference to the vulnerability of South African communities to hazards and disasters.

The third sub-question was concerned with whether hazard and disaster education should be integrated into the national curriculum. In the questionnaire, educators were asked whether hazards and disasters should be integrated in the national curriculum while the interview participants were asked the same question. Educators were also asked at what level the integration should occur. A review of literature sources such as scholarly publications, policy documents and media articles was conducted to determine whether hazards and disasters should be integrated in the national curriculum.

The fourth sub-question related to whether indigenous knowledge and integrated teaching strategies should be used to enhance learners' awareness of hazards and disasters. Both the questionnaire respondents and interview participants were asked whether these two strategies should be used to enhance learners' awareness of hazards and disasters and literature sources were reviewed to determine what they contain about the two strategies.

Through the fifth sub-question, the questionnaire respondents and interview participants were probed as to what views they had on other strategies that could enhance learners' awareness of hazards and resilience of disasters. Literature sources were consulted to identify possible teaching strategies and the identified strategies were then used to probe questionnaire respondents on whether they had used any before. Interview participants were asked whether there were other strategies that could be used to enhance learners' awareness of hazards and disasters.

5.4 Summary of the aim and objectives of the study

As stated in Chapter one, the aim of this study was to determine how education, in particular curriculum and instructional design, contributes to learners' awareness of hazards and resilience to disasters. After scrutinising literature on disaster risk reduction, a number of concepts emerged which were used to develop sub-questions that would ensure that the problem was properly addressed. From the sub-questions the following objectives framed the course of this investigation:

- 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 of hazards.
- Determine whether learning strategies such as indigenous knowledge and integrated teaching would enhance learners' awareness of hazards and resilience to disasters.
- Determine how other instructional design strategies could inform and enhance learners' awareness of hazards and resilience to disasters.

5.5 Findings of literature review on the contribution of education

In addressing the *first sub-question*, Shaluf's (2007) disaster tree was used as a consolidated list of disasters affecting the global community. For South Africa, researchers such as Mgquba and Vogel (2004), Reid and Vogel (2006), Vogel et al. (2007), Napier and Rubin (2002), Ronan and Johnston (2001) as well as Frost-Killian (2008) identified prevalent disasters. It was found that floods and fires are the most prevalent disasters in South Africa followed by other disasters such as epidemics, accidents, droughts, heat waves, lightning, extreme cold weather, etc. Although South Africa has so far not experienced any disaster of the magnitude of a tsunami, the Haiti earthquake or hurricane Katrina, the South African communities should not live in comfort thinking that catastrophic disasters will never happen to the country, as disasters, such as hurricanes or volcanoes, or any disaster for that matter, can happen at any time.

To complement the ideas generated by these researchers, the South African policy documents such as the Green Paper on Disaster Management of 1999, the Disaster Management Act of 2002, the National Disaster Management Framework of 2005 and guidelines for the implementation of National Curriculum Statements give an indication as to what is happening within the country with regard to disaster education issues. Although these sources acknowledge that South Africa has not experienced huge disasters like tsunamis, hurricanes and earthquakes,

the sources nevertheless stress that South Africa should have disaster risk reduction plans from all sectors of society in order to minimise the loss of life and property in case disaster strikes.

In summary, Arnold (2002:4) has given a summary of factors that are most likely to produce hazards during the 21st Century that include population growth; environmental degradation; global warming; deforestation; infectious diseases; hazardous materials; chemical warfare; nuclear materials; economic imbalance and cultural tribalism. On issues of vulnerability this study found that population growth and economic imbalance contribute to disaster in relation to the mushrooming of informal settlements. All the ten factors identified by Arnold (2002) are important disasters and need to be considered for effectively reducing the effects of disasters. Infectious disease is discussed in the next sections and thereafter the vulnerability of informal settlements. Indigenous knowledge and integrated teaching are given attention as insights emerging from the study.

Napier and Rubin's (2002) article on the contribution of informal settlements and poverty to disasters was discussed in Chapter two. They discuss the increasing number of informal settlements, aggravated by a lack of proper housing and economic conditions. Regarding the contribution of environmental degradation, global warming and deforestation resulting in disasters, scholars such as Barnard and Underhill (2010), Bollig and Schulte (1999), Van der Walt (2010), Hellier et al. (1999), Reid and Vogel (2006) and Pelling and Uitto (2001) are of the opinion that these aspects are serious and need to be given the attention they deserve.

Having been involved in three forums that discussed the biosecurity issues in Hungary, Uganda and Johannesburg between 2008 and 2009, I have come to the realisation that chemical warfare and nuclear materials pose a serious threat that could easily wipe out the entire community in South Africa as part of human-made disasters. However, these aspects are not the focus of this study. Acutt (2004) and *Railway Africa News* (2006) provide evidence to support the views presented by interview participant P9 relating to hazardous materials and chemical spillages. These present another challenge for all South African citizens but for informal settlement residents the possibility of them being affected is huge because they have built their shacks next

to rail tracks and major roads without considering the legally required distance between the houses and the roads.

Cultural tribalism referred to as xenophobia in this study was also mentioned during interviews and some scholars such as Shaluf (2002), Mgquba and Vogel (2004) and Trim (2004) also mention that it could result in loss of life. Reflecting on South African xenophobia, the International Organisation for Migration (2009) reported that:

> *Violence against foreign nationals did not begin with the May 2008 attacks. Since 1994, hundreds of people have been harassed, attacked, or killed because of their status as outsiders or non-nationals. For many within and outside of government, previous attacks were an unfortunate but largely insignificant by-product of South Africa's rapid social transformation and integration into the global economy. This perception was rapidly dislodged in May 2008. The ferocity, intensity and scale of the violence against outsiders were extraordinary in both their scope and the attention they attracted. What started as but another isolated anti-foreigner attack in Alexandra on 11 May, quickly spread to other townships and informal settlements across the country. After two weeks, and the deployment of the army, the melee had subsided. In its wake, 62 people were reported dead; at least 670 wounded; dozens raped; more than 100 000 displaced; and millions of Rand worth of property looted, destroyed or appropriated by local residents.*

All these disasters are possible and one wonders whether an education system could manage to include every possible disaster, imagined or real as part of school curricula. While we expect educators to teach learners about all disasters mentioned here and those that are specific to environments, it should be noted that it would be difficult for educators to cover them all. The new education system in South Africa, based on OBE, which aims to teach learners problem solving and thinking skills could be a panacea to the challenge for educators to cover all disasters. The role of educators would be stimulate the learners' thinking by sharing with learners information about commonly known disasters and ask them to gather data on any other hazards that could affect their community focusing on the nature of the hazard itself and how to respond when it becomes a disaster. Facilitating this type of learning is possible and it does not need or expect educators to do more than what is expected of them as learning facilitators.

The *second sub-question* looked at the extent to which disasters listed in the previous paragraph affect South African communities. It has been discussed in Chapter four that King (2000), Gaillard (2007: 534), Napier and Rubin (2002:3), Reich (2006:796), Pelling (2003) and Mgquba

and Vogel (2004:34) stress the fact that poverty contributes to vulnerability of communities and this is reflected in structurally poor houses and vulnerable areas which increase the chances of these communities to become victims of disasters. Reid and Vogel (2006:196), Mgquba and Vogel (2004:37) and Napier and Rubin (2002:5) argue that communities residing in informal settlements are more vulnerable and are the ones who suffer the greatest losses compared to their counterparts in established formal settlements.

From the argument advanced above, it is clear that issues of poverty increase the risks of communities to suffer greatly during disasters. While the issue of poverty and informal settlement is overemphasised here, it is important to note that disasters affect everyone indiscriminately and could wipe-out the entire community both rich and the poor as with the Haiti earthquake and the 2004 tsunami. One however, will have to take note that in the literature review it was reported that other communities who become aware that their area could be affected took steps such as building stronger structures and evacuating when they heard the first warning signals either from scientific or traditional alarms. Hazards and disaster education and awareness programmes for schools are needed to help learners to respond and become resilient to disasters.

Disaster preparedness plays a crucial role in ensuring that communities at risk adopt traits to assist them to live in harmony with the prevalent hazards. Where communities cannot avoid a disaster, resilience plays an important role to ensure that the community continues living irrespective of the losses. Resilience has been explained in Chapter two and indicated as a possible ideal to aspire towards. Resilience though has some challenges such as the fact that learners sometimes do not have power to change their situation, like evacuating an area that is deemed as hazardous or rebuilding their house so that it could be resilient. However in Chapter two it was noted that Shaw et al. (2004:41) are of the idea that if learners are taught about disasters they will share with their parents what they learned and even ask more questions related to the topic.

The *third sub-question* was concerned with how the national curriculum caters for the teaching about hazards and disasters. The Hyogo Framework of Action 2005 – 2015 and the National

Disaster Management Framework stipulate that disaster risk reduction should be integrated into school curricula. According to the ISDR (2007:14) the *Disaster Risk Reduction Begins at School* campaign, increasing hours allocated to disaster preparedness in the regular school curriculum and organising sensitisation and education presentations to be given at schools, would increase learners' awareness of hazards and disasters. A review of the National Curriculum Statements Grades 0 to 9 and 10 to 12 indicated that only Grade 7 has learning outcomes explicitly related to hazards and disaster content while in Grades 10 to 12 only Geography learners would be able to learn how to shoulder the impact of disasters. There are also some indications which emerged from literature and interview responses that the inclusion of concepts such as environment, deforestation, water and industrialisation provide educators with opportunities to include hazards and disasters.

The problem with this status is that most educators only teach what is prescribed in the curriculum and translated into textbooks. Anything that is not in the textbook will not be taught to learners. This point was emphasised by one of curriculum specialist in section 4.4.3 and has also been noted in the literature as well as discussed in section 1.3 of this study where Vandeyar and Killen's (2007:101) views were discussed. The issue arising from this state of affairs is that learners could go through from preschool to Grade 6 without knowing or understanding anything about hazards and disasters. Since it would then be just one grade to learn about hazards and disasters, those who choose learning streams other than Social Sciences in their senior phase, might not learn as much as is needed to make them resilient during disasters.

The aim of the *fourth sub-question* was to determine how indigenous knowledge and integrated teaching strategies enhance learners' awareness of hazards and disasters. A literature review was conducted and views of 150 educators were solicited through a closed-ended questionnaire as well as asking the interview participants their views on these two phenomena. Below are the responses as an attempt to address the sub-question.

The literature is silent on integrated teaching as it is a new principle in South Africa and where it has been implemented there is not much peer-reviewed literature that reports on the principle. There is however, some literature discussed in Chapter two where researchers conducted

empirical studies to determine the effectiveness of OBE and curriculum reforms in South Africa in relation to the principle of teacher collaboration or integrated teaching. Botha (2002), Jansen (1998, 1999), Fiske and Ladd (2005), Rogan and Grayson (2003), Rogan (2007), Cross et al (2002) and Vandeyar and Killen (2007) maintain that the curriculum reforms are not being implemented in many of South African schools. The study was informed by scholars such as Aredondo and Rucinsky (1997), Ranby and Potenza (1999), Loepp (1999), Robinson and Schaible (1995), Venville et al. (2001) and Gehrke (1998) who promote collaborative teaching or integrated teaching as it is referred to in this study. The comment made by R6 on the role of school organisational culture in implementing integrated teaching is supported by Creese (2005) who maintains that school organisational structures seem to discourage the culture of developing interaction and shared knowledge with fellow teachers.

It was reported in the conceptual framework section in Chapter two that scholars such as Briggs (2005), Agrawal (2004), Rautela (2005), Stevenson (1996), Gaillard (2007), Gupta and Sharma (2006), Snively and Corsiglia (2001) and Hellier et al. (1999) support the idea of including indigenous knowledge as a teaching strategy that could enhance learners' awareness of hazard and disaster education. While some of these scholars have argued that there is the dilemma of whether to have a separate discipline focusing on indigenous knowledge or one integrated into the mainstream education and scientific fields, this study noted that indigenous knowledge should be integrated in all learning areas. Another issue about indigenous knowledge that is a bone of contention is that the knowledge is disappearing with older generations, while the younger generation is not interested in preserving such knowledge. In the literature discussed above it was noted that there is a need to document indigenous knowledge so that it can be preserved for later generations and be used to determine how those generations survived disasters that were prevalent then.

Sub-question 5 probed whether educators have or have not used other teaching strategies to enhance learners' awareness of hazards and disasters. The Hyogo Framework for Action 2005 – 2015 (2005) was used as a basis for promoting the inclusion of disaster risk reduction knowledge in relevant sections of school curricula at all levels. Scholars such as Rogan and Aldous (2005), Rogan (2007), Vandeyar and Killen (2007), Botha (2002) and Jansen (2009) identified strategies

such as experiential learning, visual representation of subject matter, excursions, etc. as effective ways of enhancing learners' knowledge and awareness of hazards and disasters. Jansen (2009) shares his experience regarding the question that puzzled him for a long time, namely how do the Afrikaans students develop deep cultural values and knowledge in their veins? He came to the conclusion that schools, churches, playgrounds and family activities play a crucial role by consistently inculcating the same ideals to learners. To frame this in Jansen's (2009:70) words:

> *The modes of transmission of knowledge are multiple, complex, mediated by numerous variables, they include both informal means of transmission such as food, stories, songs, friends, and speaking native language as well as formal means such as educational, religious, political, cultural, and charitable activities.*

The literature clearly propagates multi-strategy teaching to enhance learners' awareness of hazards and disasters. My proposition here is that integrated learning could enhance learners awareness of hazards and disasters. It has been explained in Chapter two that integrated learning is equated with integrated teaching, collaborative teaching and team teaching although in some instances these might not mean the same thing. The proposition of using integrated teaching assumes that educators from different learning areas will meet and develop a learning programme on hazards and disasters that includes content from all learning areas.

My view is that the literature findings provided important and relevant data that helped in framing questions used during the interview and questionnaires data collection. There is not much literature on the topic, although some have written scholarly articles about some important parts of the research question. For example, there are scholarly articles on disaster reduction and curriculum issues but few on the contribution of school education on disaster risk reduction. However, literature findings created a good platform for data collection from interviews and questionnaires. One of the greatest input concerning the study relates to the arguments put forward by Slattery (2006:214) proposing for a curriculum for interdependence and ecological sustainability which supports interconnectedness of knowledge and traditional education thereby creating a basis for this study to explore the integrated teaching and indigenous knowledge as possible instructional design elements to determine how education contributes to learners' awareness of hazards and disasters.

5.6 Findings of the empirical investigation

As indicated above, South Africa like many countries is experiencing devastating disasters and with climate change and the prevalence of many hazards not forgetting the vulnerability of informal settlements, the incidence of these disasters will increase which means that something will need to be done to reduce the effects of disasters on communities. It has been pointed out in Chapter two that education and awareness are key to addressing some of these challenges. Considering the curriculum scholars views that curriculum reforms are driven by numerous forces such as political authority, globalisation, social imperatives and economic development, hazards and disasters is well positioned to serve as a key driver for curriculum change, in this instance regarded as curriculum integration which has been extensively discussed in Chapter two and four. This argument caries much weight considering that disasters prevent economic development, disturbs the social fabric of communities, are a global phenomenon, More importantly the argument urges the political authority to safeguard the wellbeing of society.

As discussed in Chapter three, both quantitative and qualitative strategies were used to collect data for addressing the main research questions. The quantitative data were collected through questionnaires distributed to schools located in informal settlements found in Gauteng, the Western Cape, KwaZulu-Natal, the Eastern Cape and North West Province. A total of 150 educators completed the questionnaires with thirty from each province. An in-depth analysis of the results from the questionnaires is discussed and a summarised version of the findings is reported in the next section of this chapter.

The qualitative data collection strategy adopted for this study was through individual interviews with curriculum coordinators, disaster management specialists and disaster management lecturers. Ten participants were interviewed and their responses were recorded in Chapter four of this study. Section 5.6.2 discusses the findings of the qualitative data collection. The qualitative data collection was complemented by document analysis of policy publications and some scholarly work as discussed in the previous section of this chapter. The participants provided important evidence that was complemented by other data collected through questionnaires and document analysis.

5.6.1 Findings of the quantitative study on learner awareness of hazards and disasters

If positive responses are to be regarded as an indication that the questionnaire respondents affirm that education does contribute to learner' awareness of hazards and disasters, one can conclude that 73.8 percent of the respondents agree that education does contribute to learners' awareness of hazards and disasters. Unfortunately this is not the case as one has to look at each sub-question in isolation and consider the variables emerging from discussions. For the first sub-question, which looks at the prevalence of hazards and disasters, it was reported in Chapter four that 95.3 percent of the respondents agreed that South Africa was likely to be hit by disasters. If the general comments relating to this sub-question are considered, disasters such as floods, forest and shack fires, road accidents, storms, medical waste dumps and drought could be considered prevalent in South Africa.

The second sub-question looks at the extent to which South African communities are vulnerable to disasters. There was no direct question relating to this sub-question and as reported in Chapter four, some of the questionnaire respondents made comments that relate to the vulnerabilities of communities. Issues such as communities living in shacks located in informal settlements, building houses with mud bricks and learners having access to medical waste dumps give an indication of the extent to which communities are vulnerable to disasters.

The third sub-question is on the inclusion of hazards and disaster learning outcomes in the curriculum; 98 percent of all questionnaire respondents agreed that the inclusion of hazards and disasters in the school curriculum is essential, which affirms the importance of this topic. The three respondents who made additional comments stated that hazards and disaster should be taught to learners from Grade 1 up to Grade 12. The other respondents maintained that hazards and disasters should be integrated into Life Orientation teaching. Some regard hazards and disaster education as a separate learning area.

In response to the fourth sub-question, it was noted that indigenous knowledge and integrated teaching strategies are partly included as teaching instruments by educators. It should, however,

be noted that this does not directly relate to the teaching of hazards and disasters but indicates some form of awareness of the need for using these strategies to enhance learners' knowledge of hazards and disasters. The general comments as well reflected that respondents appreciated the value of using different strategies. One respondent stated that they have not collaborated to design learning programmes on hazards and disasters while another respondent stated that this questionnaire has generated his interest to teach learners about hazards and disasters and to get them talk to their families about the hazards and disasters. To some extent, the comments from educators provided some insights that managed to close the gap created by the use of closed-ended questions especially the dichotomous questions.

The fifth sub-question was divided into four questions; the first one focusing on giving learners opportunity to observe real life or visual representations of a phenomenon was recorded as question 5 on the questionnaire. The second one focused on teaching learners to identify hazards and disasters and was recorded as question 7 on the questionnaire. The third question probed whether learners discussed what they have been taught with their parents and was recorded as question 9 in the questionnaire. The last question focused on teaching learners to respond appropriately when faced with disasters and was recorded as question 10 in the questionnaire.

From the responses to question 5 on real-life experiences or a visual representation teaching strategy, one can conclude that 55.5 percent of educators from the five provinces used learners' real-life or visual representations in their classroom while 44.7 percent did not. The conclusion that can be drawn from question 7 responses is that 71.3 percent of educators who responded to the questionnaire are aware of the need for learners to identify potential hazards in their environment. The response to question 9 of the questionnaires showed that 64.6 percent of the respondents did ask learners to discuss what they have learned with parents even though it was not related to hazards and disasters while only 35.4 percent of the respondents did not involve parents in enriching their learning. Regarding the response to question 10, the percentage of educators who responded that they did teach learners to respond to disasters is 80 percent but to what extent they taught learners ways of responding to disasters was not made clear owing to the limitations of the questionnaire.

The findings of the fifth sub-question were that the majority of educators used other strategies to enhance learners' awareness of hazards and disasters while some did not. It is cautioned, however, that the percentages recorded above should not be seen in isolation from the comments and interview responses as they could be misleading. The educators were not probed as to how many times they have used the teaching strategies discussed above and whether they were related to teaching learners on topics of hazards and disasters. The quantitative data, however, provide relevant evidence to show the awareness of using teaching strategies to enhance learners' awareness of hazards and disasters.

In general, data collected through the questionnaire, although important for the study, had some limitations. It could have been enhanced if some of the educators who responded were interviewed to gather deeper insight rather than limiting the responses to yes or no answers. Nevertheless, the statistics provided in this section are essential because they help to support the literature findings. If the responses are compared with the literature findings one realises that there are some level of awareness amongst educators about the need to enhance learner awareness of hazards and disasters. The question of how much knowledge of disasters do educators have was not tested nor was whether they will start to include disasters in their teaching. The data on the prevalence, inclusion in the national curriculum and the use of different teaching strategies was useful to indicate that education is important in ensuring that learners are aware of hazards and disasters. Educators affirmed that the inclusion is important both in the curriculum statements and in the classroom teaching, which is a good indication that they are receptive to the idea of including hazards and disasters in their teaching.

5.6.2 Findings of the qualitative study on the contribution of education to learner awareness of hazards and disasters

With reference to the issues pertaining to sub-question 1, the categories that emerged strongly from the interview responses were floods and fires followed by droughts and accidents - industrial, road, rail and spillages. Two respondents identified HIV/AIDS as a hazard while new hazards such as fog along the N4, cold weather, heat waves, water quality and epidemics such as rift-valley fever and foot and mouth disease show that South Africa experiences many hazards

that could easily result in disasters. What emerged strongly from P2, P6 and P8 is that there is a need to differentiate the concept *hazard* from *disaster* as they mean two completely different things. In actual fact P2 and P8 maintained that the questions were wrong by asking about disasters and P2 suggested that the interview guideline should refer to hazards and vulnerability, while P8 stated that it should focus on disaster risk reduction. However, the question was posed as to what hazards and disasters are prevalent in South Africa and the respondents were expected to say which are hazards that are prevalent in South Africa and which are disasters.

The responses to sub-question 2 by interview participants revealed that most of them acknowledged that South Africa was vulnerable to disasters such as floods, road accidents, forest and shack fires, trucks and rail spillages. Almost all participants (P2, P4, P5, P6, P7, and P8) maintained that human-induced incidences such as building houses next to river banks are the ones that make the country vulnerable to disasters. Participants P3 and P9 viewed peoples' tendency to stand and watch at the accident scene as another trait of vulnerability, as people might be affected if a dangerous material could be accidentally released. These are just some of the traits that make South Africa vulnerable to disasters. It is essential to mention P2's observation that poverty is another aspect that makes communities vulnerable to disasters.

The interview participants strongly supported the idea of teaching hazards and disasters at an early school phase with others preferring it to be taught before learners start school; the majority preferred to start teaching learners about hazards and disasters from Grades 3 and 4. Strong evidence emerged from the interviews conducted with participants in relation to the third sub-question that most of them thought that topics on hazards and disasters should be included in the early phase of learning such as the foundation phase where simple basic hazards topics would be taught to learners. It is important to note that P6 felt that there was no depth and width in the learning outcomes on cyclones, earthquakes and other hazards such as floods and fires. Learners were taught only basics and it was up to the educator to include how to respond when they found themselves affected by fire, floods, storms, earthquakes or volcanoes as listed in the NCS. The integration is in most instances explicitly stipulated only in Social Science. It would be beneficial if the inclusion entailed all learning areas

The interview responses for the third sub-question have provided essential data to decide whether hazards and disasters should be included in the national curricula. Some of the respondents pointed out that learning outcomes on hazards and disasters are already included in the NCS. However, there are adequate data to determine whether they are integrated in classroom teaching. While humanities and Social Science, in particular Geography, have some provisions on hazards and disasters, from the questionnaire respondents' point of view, it seems that those that teach hazards and disasters in other learning areas do so of their own accord as it is not prescribed in the NCS.

The interview participants responding to the fourth sub-question supported the integration of indigenous knowledge but pointed out the challenges concerning its inclusion in classroom teaching. One such challenge relates to the fact that the knowledge is not documented anywhere and it will pose a challenge for educators to go out looking for people with such knowledge. Other challenges include that some of the knowledge, since it is not scientifically tested, remains potentially a myth and if taught to learners it might mislead them or put them in danger. Lightning was used as an example where some indigenous communities believe that it is a product of witchcraft and the only way to avoid being bewitched is to consult a traditional healer. In some instances examples were given which, if used, can raise learners' awareness of dangers associated with some hazards. The examples include the eclipse, the flight pattern of swallows and reading signs of animals.

The fifth sub-question considers what other teaching strategies are used to enhance learners' awareness of hazards and resilience to disasters. Most of the respondents supported the idea of using a variety of strategies to teach learners about hazards and disasters and some strategies included inviting a disaster management expert or emergency response officer to visit the schools and present talks to learners, and taking learners to dolomitic areas or an area that has been destroyed by fire. As indicated in Chapter four in one of the schools I visited, a teacher asked her learners to define disasters through drawing or collecting pictures of disaster events. She displayed the learners' work on the walls and it was very stimulating. The different depictions of disasters definitely contributed to learners' becoming aware of disasters. There is indeed a need to capture these isolated cases where educators go out of their way to motivate

learners while contemplating important issues about their environment. It is therefore of the utmost importance for disaster management institutions to work with school management and to raise learners' awareness through developing and disseminating learning materials such as videos, biographies and diaries of disaster management efforts. Furthermore, disaster management centres and institutions of higher learning should apart from contributing to the development of learning materials such as textbooks, posters and learning programmes, organise exhibitions of disasters that have occurred in the past. Learners from different schools could visit the displays to learn more about issues related to disasters that cannot be taught in the classroom.

In summary, the interview participants have provided relevant data, which one can now compare with the literature study and questionnaires findings to determine whether education in particular, curriculum and instructional design contributes to learner awareness of hazards and disasters. The contribution of data collected from curriculum and disaster specialists reveals that while the inclusion is important there are some critical issues that need to be considered such as the fact that educators are being bombarded with new techniques and are expected to do administrative work. From these data, I am of the view that there is much that still needs to be done to ensure that learners' awareness, preparedness and resilience to disasters is attained. Some challenges have been identified such as using new teaching strategies when educators are not yet ready to use them and stretching the contents of hazards and disasters to include every day things that learners should appreciate such as access to water, healthcare, food and education which play an important role during disasters.

5.7 The significance of this study to the South African education system

As a researcher the question that is occupying my mind is what new insight has this investigation contributed to the body of scholarly knowledge. While the entire report from the problem statement, the literature review, research methodology, data collection and analysis, to the research findings and recommendations serves as the contribution of the entire study, this section will highlight a few specific and the most outstanding insights emerging from the investigation. There is a need to not only focus on taxonomies of disasters which is at the level of knowing how many disasters are there and just listing them, but to go deeper and identify which ones are

affecting South Africa and those that are affecting specific communities. This is significant for learners as it will teach them not only to identify hazards in their communities but it will also help them to read warning signals. If they are caught unaware, they would have learnt that they need not force their way home but should seek an appropriate shelter closer by. This might include the fact that if there is lightning or storms they should not take shelter under tall trees, or during heavy rains they should not go closer to rivers or dams. It could also include not playing near what could be sinkholes or old mines.

The critical outcome that needs to be achieved by learners upon learning about hazards and disasters is to develop awareness, preparedness and resilience. Awareness implies that learners should know about different types of disasters that could affect their area and spot any possible hazard or warning signals for disaster. Preparedness has to do with knowing what needs to be done to avoid causing disasters and responding appropriately to avoid being affected by disasters. Resilience has to do with what could be done during and after the disaster. All these concepts are important and need to be reflected in the national curriculum. Based on the data discussed in Chapters two and four, my proposition is that awareness, preparedness and resilience to hazards and disasters could be attained by using indigenous knowledge, integrated teaching and specialised learning programme design and development. This proposition is informed by the NCS as the three concepts have been identified as the core principles of South African educational reform.

The inclusion of indigenous knowledge into the classroom is important and essential for learners to help them understand that their culture is important and needs to be valued. While there are diverse cultures in South Africa engaging learners to share their culture and the contribution it has made to development is crucial. For example the use of traditional medicine combined with current scientific medicine and how people in the past lived in harmony with nature. Indigenous knowledge could also be used to illustrate how past generations relied on water coming out of streams but emphasise why this trait is no longer possible because of water pollution by mine acids, medical waste and chemical disposal and that other rivers are used for sewerage disposal or have leaking pipes as in indicated in section 4.3.4. The expected outcome here is that learners will respect water and stop littering dams and other water sources.

One takes note of Green (2007) his critique of IKS that it is good on policy but its implementation is not convincing as there are lots of questions to be answered. Botha (2010) is concerned about the contradiction that will arise from the national NCS learning outcomes focus on Eurocentric and traditional knowledge which might confuse learners. Also to consider is the increasingly multiracial classroom in South Africa that might make it difficult for the teacher to reconcile what learners are taught in their homes and what is in their learning programme. Irrespective of these challenges indigenous knowledge has a role to play in enhancing learners awareness of hazards and disasters.

The inclusion of integrated learning in the NCS is meant to enable learners to gain a holistic view of the learning phenomenon and in this case awareness, preparedness and resilience to hazards and disasters in South Africa. In this study the concept of integrated learning has been used interchangeably with integrated teaching, curriculum integration, team teaching, teaming and collaborative teaching. While each terms could have its specific meaning, in this study the terms used to denote a process where all or most learning areas contribute to just one topic. For example a learning programme on HIV/AIDS as suggested by one of the interview participants could be designed to include Mathematics, Language, Life Orientation, Social Science, Economics and Management Sciences and Natural Sciences educators. Each educator would focus on her specific learning outcome but the topic is the same.

Asked whether this teaching strategy would work, interview participants felt that it would overburden educators who were already swamped with administrative work. I am however confident that if implemented this strategy would have the fruitful impact of enhancing learners' awareness, preparedness and resilience to hazards and disasters. The way forward is to initiate a pilot study to collect data from schools that have used this strategy and to sample a few schools where this strategy could be implemented to see if it improved learners' knowledge and understanding of hazards and disasters in relation to awareness, preparedness and resilience.

The NCS also makes provision for a learning programme to be developed which seems like replacing the old textbook. The significance of a learning programme is that it is not developed

for commission purpose and also that it could be developed by practitioners and educators instead of the old textbook developed by experts or university professors. It is meant to be engaging to the learner and teaching key skills such as problem solving, critical thinking and reflection rather than providing facts. The learning programme is important and its use should be encouraged as it gives learners a different dimension and if integrated learning is used it will enrich learners' knowledge and understanding of the connectedness of life.

The study has major implications for educational change in South Africa in that firstly, it calls for revisiting the national curriculum to ensure that hazards and disasters are included as learning outcomes for some grades in foundational, intermediate and senior phases. Secondly, the study makes the proposition that the use of indigenous knowledge and integrated learning should be fast-tracked. Learning programme design should be encouraged through inviting practitioners, educators and learning area experts to contribute to its development. possible way is to initiate a pilot study in all provinces to determine whether the propositions made here are effective. The study will include sampling schools, training of educators to use the principles of integrated learning and indigenous knowledge, data collection and analysis and an announcement the findings.

5.8 Other insights emerging from the study

Generally, the new insight which emerged relating to curriculum design and development is that the South African national curriculum has been ever changing since 1994 and every time a new Minister is appointed, a review committee is set to advice on the curriculum reform needs. This curriculum change is in line with findings from literature as reported in Chapter two that curriculum is ever changing and also drives change in society. The implication here is that the suggested curriculum change could be part of the next review committee recommendations.

It has been mentioned in the policy document review that one of the NCS's principles is to give educators the flexibility to design their learning programmes to integrate local context. Almost all curriculum specialists have confirmed this point but whether it is being implemented is

debatable. Educators are overburdened by administrative tasks and do not have the knowledge and skills to undertake the mega task of designing learning programmes.

The role of designing learning programmes is currently left to consultants who develop textbooks for schools distributed nationally with much provincial input. This is not sufficient; there has to be input from the district level to ensure that curriculum design takes into consideration the local development of learning programmes. More work needs to be done to determine the feasibility of this approach, to investigate which countries have implemented the approach and what the benefits and impact of such an approach are. It might be beneficial for the national education department(s) to have abroad guidelines in the national curriculum for teaching about hazards and disasters. The provincial department will then streamline the national guidelines to fit the provincial situation and the district offices will focus on examples that are relevant to their environments.

If this approach is followed it will help address some of the complaints from educators as recorded in the comments section that they are expected to teach learners about cyclones, volcanoes and earthquakes which rarely happen in their area but have to ignore local types of disaster. The idea of localising curriculum was even mentioned by a curriculum specialist from Northern Cape who indicated that in his province the NCS is interpreted as giving them the leeway to decide what they should focus on as a province.

Boyce's (2000:256) argument could be used to support the localisation of curriculum:

> *Vulnerability to natural and technological disasters is to a large extent a public issue: such disasters typically strike communities, not isolated individuals. By the same token, measures to reduce vulnerability are to large extent public goods. Many measures to reduce disaster vulnerability are impure public goods, which when provided to one are provided to others, but not equally provided to all*.

The NDMC stands a good chance of taking the matter of designing learning programmes to enhance learners' awareness of hazards and disasters for all grades into its own hands and even to lend support to higher education institutions in developing future educators to take the matter of the awareness of hazards and disasters seriously.

5.8.1 The prevalence of epidemics as leading to disasters in South Africa

It has been emphasised in Chapter four and in the section above that floods, fires and droughts are the major disasters experienced in South Africa. There are, however, silent catastrophic epidemics which initially were not taken seriously as deserving to be categorised as disasters. Mayosi et al. (2009) and Bradshaw et al. (2003) discuss how communicable and non-communicable diseases should be categorised as burdens in South Africa and how they can quickly turn South African public health into a nightmare and crisis needing attention. According to Arnold (2002) the largest disaster of the 20th Century was caused by an infectious organism of which little is known except that it was labelled Spanish flu in 1918 which left approximately 100 million people dead. Epidemics are continuing to be major disasters considering that by now HIV/Aids has now led to the death of more than 12 million people worldwide.

During the process of empirical data collection, the responses from the interview participants (P2, P8 and P10) raised a new concern. They stated that HIV/AIDS is an epidemic that is experienced in the country and that learners need to know about it so that they can respond appropriately to avoid being victims of this scourge. Upon going back to the literature review, I noticed that scholars such as Mgquba and Vogel (2004) and the UNDP (2004) policy document mention HIV/AIDS as a disaster. Other literature mentions only epidemics as a disaster which affects communities. I then went back to do a literature review to determine whether HIV/AIDS could be categorised as a disaster in South Africa. From the literature review it emerged that the epidemic is devastating the country as reported by scholars like Wojcicki and Malala (2001), Bachmann and Booysen (2003), Mcdonald and Schatz (2006), Susser and Stein (2000), Martin (2005) and Martin and Williamson (2004). Although society is aware of the effects of HIV/AIDS, it has nevertheless not been declared a disaster, probably because of the limitations and connotations in the definition of the concept ‘disaster’. While responses to the questionnaire and the associated general comments from educators never mentioned anything about HIV/AIDS, it has strongly featured in three interview participants. According to an online

Havard[4] publication, a disaster is any serious disruption of the functioning of a society causing widespread human material or environmental losses which exceed the ability of a society to cope using only its own resources. The HIV/AIDS epidemic could be considered a disaster in a number of nations, especially in sub-Saharan Africa. This idea of HIV/AIDS as a disaster is supported by numerous researchers as indicated above who were discussed in Chapter two. Like other disasters, the epidemics should be included in the curriculum of the foundation, intermediate, senior and higher education phases and learners should be taught about HIV/AIDS from the earliest age to tertiary education with more targeted interventions in the communities, including the youth that are not in schools.

Participant 8 identified other epidemics such as rift-valley fever, foot and mouth disease and avian flu. Other interview participants only generalised the epidemics singling out HIV/AIDS. Arnold (2002) identifies infectious diseases that develop into pandemics such as Ebola, Hepatitis C, Hantavirus, Rotavirus and other re-emerging infections such as cholera, malaria and yellow fever acknowledging that the 1918 global influenza was the worst. Bradshaw et al. (2003) identify some of the diseases that could result in a disaster such as tuberculosis, diarrhoea, respiratory infections, diabetes, heart diseases and bacterial meningitis and state that HIV/AIDS tops the list in terms of the number that die from it. Mayosi et al. (2009) add cardiovascular disease, lung disease, cancer and depression on the list but also emphasise diabetes and HIV/AIDS as the greatest killer diseases.

Some of the epidemics such as HIV/AIDS and cholera are already integrated in the national curriculum but as has been discussed most educators teach only what is in their textbooks; they do not seek additional information or resources to enrich the existing information in the textbooks. My favourite approach is for public institutions involved in outreach initiatives to develop a learning programme or what could be called a learner workbook that could be used by different grades similar to the one authored on behalf of the Water Research Commission. Learners could be taught about basic safety principles of washing their hands, covering their

[4] This article can be accessed online at http://www.hsph.havard.edu/psb205/hiv/AIDS-as-a-disaster.htm, retrieved on 12 August 2009

mouths with their hands when they cough and avoiding contact with anyone showing symptoms of a particular disease and always being on the alert.

5.8.2 Vulnerability of informal settlements and associated educational requirements

While most literature on informal settlements focuses on the vulnerabilities and how these settlements are mushrooming in South Africa, there has been little if any focus on the type of education learners residing in these vulnerable places should receive. The assumption is that informal settlement learners are given the same education as all other learners in South Africa; if this is so, crucial information that could help learners survive in these places is being omitted from school education.

The four pictures depicted in section 1.1, 2.1, 2.2 and 4.1 were analysed and discussed in Chapter four as evidence of the vulnerabilities of South African informal settlements. The question that remains is what learners from informal settlements should be taught about the vulnerability of their habitat. There is no chance that learners from these areas could change the minds of their parents as it is because of poverty that they reside in these environments. However, there is much that learners from these areas could be taught, such as not to dump waste on drainage pipes or storm water pipes as well as warning them not to play on the rubbish dumps or eat any of the waste. Learners need to be warned about the danger of used condoms, needles and bandages; water from dams and rivers should be boiled before it is drunk. Learners could also be taught not to play with candles, paraffin or gas or to drink anything from unidentified bottles that have not been inspected by adults because people use milk and household containers for paraffin, herbal medicines and other dangerous materials such as oils, liquid soaps and chemicals. There are so many things that learners need to be taught about; some educators teach these voluntarily

5.8.3 The need to include indigenous knowledge to enhance learner awareness of hazards and disasters

The value of indigenous knowledge for learners cannot be over emphasised. What needs to be illustrated here is that developments are going on in other departments, like the policy documents on indigenous knowledge systems as a separate field developed by the Department of Science and Technology National Indigenous Knowledge Systems Office (NIKSO)[5] and the integration of indigenous knowledge research into the existing field, such as biosciences, health sciences etc. by the Council for Scientific and Industrial Research (CSIR) and other research institutions. These developments touch on the arguments about the dilemma of indigenous knowledge advanced in the literature review by Agrawal (2004), Briggs (2005) and Rautela (2005) complemented by responses from interview participants. One of the NIKSO programmes as indicated in the link provided in the footnote 2 below is a bachelor degree on IKS launched first at the University of Zululand and on the verge of being introduced to other universities in South Africa. This new development regarding indigenous knowledge means that mainstream education should prepare learners regarding indigenous knowledge so that those who pursue their study in the field will have a good background of the phenomenon rather than having to start learning it at tertiary level.

It is difficult to pinpoint what aspects of indigenous knowledge should be used to enhance learners' awareness of hazards and disasters because such knowledge has not been recorded. The United Nations Environmental Policy unit that initiated a programme to collect information in partnership with the Russian Association of Indigenous Peoples of the North (RAIPON) could serve as an example to design a programme for including indigenous knowledge in school teaching. The project includes indigenous knowledge about warning signals for natural disasters and how to cope and lessen their impact. The project further intends to raise awareness and enhance understanding of the application and use of traditional knowledge in disaster management.

[5] For more information on NIKSO, follow this link http://nikso.dst.gov.za/dd/about-nikso

According to Kamara (2006) indigenous knowledge is a precious resource that continues to contribute to knowledge about environmental conservation and natural disasters. What prompted this view is the information collected from the Russian indigenous communities who have indicated that blizzards, strong winds, wild fires, floods and freezing temperatures are the gravest concerns to residents. They describe how the appearance and colour of the sky, dogs rolling on their backs and crows circling the flocks are indications that something horrible might happen. For example, if a reindeer is seen running at night it might be testing its legs before danger. One resident from the Russian communities even narrated how the community was once saved from volcano ash by observing flocks of birds flying in a specific direction and the community followed the birds without first finding out what was happening.

This notion of observing nature and animals is supported by Arunotai (2008) who maintains that the Moken of the Surin islands communities were saved by a legend and keen observing skills of nature:

> *On the morning of Sunday December 26, 2004, the Moken of the Surin Islands observed a sudden change in the sea level. This occurred without any change of weather and it was considered a very unusual phenomenon. For several Moken elderly, it signalled the coming of "seven rollers", a legend that has been passed down for generations. The whole community ran up to the hill behind the village very quickly, and all survived the tsunami disaster though the entire village was swept away along with a few boats.*

Kamara (2006) concludes that with the disruption of traditional lifestyles and the settlement of indigenous communities, it is a challenge to maintain the continuity of traditional knowledge through transmission from generation to generation. One solution is to find new ways to ensure that this knowledge is not lost, including the development of products to preserve and disseminate traditional knowledge for use in primary, secondary and tertiary education.

I am convinced that if implemented in South African schools this knowledge will make a huge difference to learner awareness of hazards and disasters. Elders could be identified and asked to narrate the stories of how they survived disasters; these could be recorded and used as learning resources. Another option is to get the NMDC and DBE to collaborate and to introduce an award for learners who collect the best indigenous knowledge from their communities. The data collected could be peer-reviewed and published in scholarly magazines. These projects would

not only teach learners about hazards and disasters but would ensure that they valued indigenous knowledge and also respected and appreciated the knowledge that lies with elders.

5.8.4 The contribution of instructional design learners' awareness of hazards and disasters

The NCS principle of the integration of learning gives educators the opportunity to work together in developing learning programmes, thereby ensuring that learners gain holistic knowledge and understanding of subject matter. In this study the concepts of the integration of learning have been included as integrated teaching because for this type of learning to materialise there has to be collaboration of educators from different learning areas. In this investigation it has been found that while educators do collaborate with one another it is on small scale and not coordinated or pre-planned. The interview participants' views were that educators are not ready to use this approach even though it has been implemented in some schools. In higher education this approach works effectively and if it could be implemented in schools, the quality of learning could be enhanced. It is, however, important to note that interview participants pointed out that educators in most instances used only those learning resources that were at their disposal and the textbook is their most highly regarded source. The teaching of hazards and disasters in school could be used as an opportunity to pilot the use of integrated teaching as a teaching strategy.

The four key issues discussed above can be used by the national disaster management centre to develop a learning programme on hazards and disasters for all learning areas and all grades. A Water Learning Programme for Schools project[6] run by the Water Research Commission which developed a learning programme on water issues for Grades R to 7 could be used as a model to develop a learning programme on hazards and disasters. The learning programme could include indigenous knowledge and prescribe how educators should collaborate with one another to teach learners about hazards and disasters. Although a project of this magnitude would cost much, the benefits that would be accrued would be endless as it would result in learners that appreciated integrated learning, were aware of hazards and disasters, and in educators who were aware of

[6] The product of the WRC project was a learning programme titled 'Learning and teaching about water in our classrooms: a series of lesson plans for grade R – 7'. Peddie et al. (2008)

hazards and disasters, using collaborative learning or integrated teaching principles and a variety of resources at their disposal.

5.9 Recommendations and implications

The main aim of the study was to determine how South African education, in particular curriculum and instructional design, contributes to learners' awareness of hazards and response to disasters. The overarching findings were reported in the previous section; the two aspects of the education system, curriculum and instructional design, contribute to a greater extent to learners' awareness and response to disasters. The first one relates to the fact that the curriculum should explicitly state the outcomes about hazards and disaster education from the foundation to the intermediary and senior phases. This is essential because it has been ascertained that educators prefer to follow outcomes as prescribed in the curriculum and textbooks. It is therefore recommended that the current curriculum be reviewed and outcomes pertaining to hazards and disaster education be added to the foundation, intermediary and senior school phases. The second finding is that educators rely heavily on learning materials, in most cases packaged as textbooks. The conclusion here is that hazards and disaster education should be included in the textbook development phase with suggestions of strategies that could be used, such as the inclusion of indigenous knowledge, integrated teaching and visual representation of issues related to hazards and disaster management. It is recommended that the disaster management centre and other disaster management institutes collaborate with the Department of Basic Education to develop hazards and disaster education learning material. These efforts are urgent considering an observation made by Chagutah (2009:113) that:

> *South Africa has frequently been struck by damaging climate hazards which increasingly continue to threaten sustainable development efforts. Moreover, climate models predict that the incidence of major wet events such as floods and cyclones will increase in frequency against the background of a climate change.*

Below I discuss the recommendations and implications of this study for the higher education sector, basic education, stakeholders, communities and policy makers.

5.9.1 Recommendations to the Higher Education sector

Scholars such as Arredondo and Rucinski (1997), Ranby and Potenza (1999), Loepp (1999), Robinson and Schaible (1995), Venville et al. (2001), Chambers (1995) and Gehrke (1998), Cross et al. (2002) and Fisher and Mcdonald (2004) support the principle of integrated teaching. Although they do not directly link it with teaching learners about hazards and disasters, the basis of the link is provided by the National Curriculum Statements which make provision for educators to use integrated learning to enrich learners' knowledge and skills. When asked whether they use integrated teaching as a strategy to teach learners, 44.6 percent of 150 educators who completed the questionnaires affirmed that they do integrate but a follow-up question from some educators revealed that the extent to which integrated teaching is undertaken included a collaboration between two teachers and hardly goes beyond that. Almost all interview participants agreed that integrated teaching would enhance learners' awareness of hazards and disasters. However, some of them had reservations about whether educators have the time and skills to implement this new approach.

- It is against this background that this study recommends that an investigation be conducted to determine how effective the integrated teaching strategy is and what factors contribute to its effectiveness or failures in those schools that have already employed it. Furthermore, it is recommended that a pilot study be conducted in some of the schools located in impoverished areas to determine if the integrated strategy will enhance learners' awareness of hazards and disasters.

- Following from the findings that disaster lecturers recommendations that hazards and disasters should be taught in all fields of studies within universities and other tertiary institutions in preparation for future educators and to those that are improving their teaching qualifications, this study recommends that universities should ensure that their educator training programmes have compulsory themes on hazards and disasters for all students being trained to become educators. The university programmes for preparing students to become educators should also encourage the use of integrated teaching strategies.

5.9.2 Recommendations to the Department of Education

In Chapter two it was discussed that the National Curriculum Statements make provision for hazards and disasters only in Grade 7 Social Science learning area, which implies that learners will have to start their schooling and proceed to Grade 7 without knowing anything about disasters. The exception would only occur when an educator go an extra mile by using other learning outcomes like deforestation, water and safety issues to teach hazards and disasters. This in itself would be a rare thing to do by struggling schools with limited resources and overburdened educators expected to teach in multi-grade classrooms.

As discussed above, Kamara (2006) maintains that learners should be taught about indigenous knowledge's contribution to disaster risk reduction at primary, secondary and tertiary education level. Some interview participants have suggested that hazards and disasters issues should be taught in the foundation phase, some suggest it should even start at home while others favour it to start in Grades 3 and 4 respectively.

- Considering this background information, this study recommends that the national curriculum should include the development and teaching of learning outcomes on hazards and disasters across all learning areas and in all phases that include foundation, intermediate and senior phase as well as higher education.

The main challenge with the recommendation above is that it would have to overcome the concerns raised about the overload and limited resources for educators especially in struggling schools located in informal settlements. A pilot would need to be initiated in this regard so that it could inform curriculum makers before any curriculum change taking place within a period of next five years from 2011.

Some of the interview participants emphasised that disasters are area-specific; this is supported by scholars such as Holloway and Roomaney (2008) who maintain that residents of informal settlements in the Western Cape, as well as elsewhere in South Africa, bear the brunt of extreme weather and associated flooding. Thousands of households in the province and beyond suffer

severe losses caused by informal dwelling fires. During floods and fires poor families suffer significant development setbacks. These disasters are also costly for the affected municipalities and provincial departments, and divert resources from other urgently needed services. Because informal settlements in the Western Cape are diverse, risk reduction efforts will vary from one settlement to another or from one municipality to another, and almost always be tailored to local risk conditions and development capacities.

- In line with the findings above, this study recommends that classroom teaching should be aligned with the vulnerability affecting communities, which implies that teaching in schools located in informal settlements should emphasise safety issues and hazards for learners residing in those settlements. This requires that the national curriculum provides a broad guideline for the inclusion of hazards and disasters. The provincial governments should streamline the curriculum to fit the hazards and disasters in the province while the district and local municipalities work with schools in their surroundings to develop a localised curriculum for the schools in the vicinity.

Other recommendations for the education sector's role in enhancing learners' awareness of hazards and disasters include the following:

- Consider using an integrated teaching (multi-disciplinary) approach where educators of different learning areas team together to teach a similar theme.
- Educators should integrate indigenous knowledge in their day-to-day classroom teaching especially for hazards and disasters education.
- Educators should apply some form of flexibility with regard to the content of the learning programme and ensure that learners are aware of the hazards and disasters prevalent in their area rather than teaching them only the ones listed in the learning material.
- Educators should take a keen interest in the environment learners come from so that they are able to teach them about hazards and disasters that are familiar to them.
- Educators should invite disaster management and emergency response specialists to present talks to learners.

- Schools should create an environment where educators get used to developing their own learning programmes while complying with qualifications requirements;
- Allow educators from different learning areas to team-up and develop an integrated learning programme.
- Schools should attempt to understand hazards prevalent in the area and invite safety officers from disaster management centres to brief learners.

5.9.3 Recommendations to stakeholders

Moll (2004:7) maintains that a curriculum should be responsive to the needs of the learner and that some aspects of the curriculum should be tailor-made to suit the environment. To do this, educators should have extensive research skills and good networking skills that would enable them to identify the needs of learners. Currently as discussed in Chapter four, most educators do not have the time or skills to be able to undertake this huge and important task. It is therefore important to bring more stakeholders to assist with the task. It is against this background that this study recommends that:

- Educational and research institutions should encourage students to embark on studies that would generate scientific knowledge on the role of indigenous knowledge in disaster risk reduction.
- Disaster management centres should increase their school safety programme activities.
- Municipalities and health authorities should make educators aware of hazards that could affect learners.
- Research and academic institutions should encourage research on how indigenous communities survive disasters given the fact that they do not have the infrastructural advantages that modern communities have.

5.9.4 Recommendations to communities

Holloway and Roomaney (2008) propose a community participatory disaster risk reduction approach, which involves the entire community. Other participants as well suggested that a community participatory approach should be considered as another way to enhance learners'

awareness of hazards and disasters. Chagutah (2009) maintains that it is now accepted that community problems and solutions should be collectively identified and that participation is regarded as being necessary in order to share information, knowledge, trust, commitment and right attitude in the development, planning and implementation of disaster risk reduction strategies. This implies that all disaster risk reduction strategies including education and awareness could be enriched by this participatory approach. This study therefore recommends that:

- Parents need to be involved as they possess a wealth of knowledge about their heritage which could contribute to their awareness of hazards and disasters and they should share with their children how their great grandparents survived disasters.
- Schools should organise meetings and seminars for parents on safety principles and the need to share constantly with their children their traditional knowledge of how their ancestors survived disasters that occurred during their time.

5.9.5 Recommendations to policy developers

It has been exposed that only Grade 7 Social Science has learning outcomes for hazards and disasters and that educators specifically follow the textbook to teach rather than follow the national curriculum stipulations. Policy makers should regulate that all learning areas include hazards and disaster learning outcomes. Some curriculum scholars were quoted as saying that some educators in South Africa do not implement the stipulations of the current curriculum; instead they follow the old curriculum which focused on rote learning. The information emerging from the study requiring the attention of policy makers relates to the notion of allowing for flexibility for provincial, district and local education authorities to focus on hazards and disaster issues that are relevant to their area. This study recommends that:

- The NCS should specify that educators are allowed to develop their own learning programmes as long as they comply with the criteria set through outcomes.

- Policy makers should initiate seminars that would assist educators to embark on integrated learning and to team-up with colleagues while teaching hazards and disasters.
- The current national curriculum should be reviewed and outcomes pertaining to hazards and disaster education should be added to the foundation, intermediary and senior school phase as well as at post-school level such as FET colleges and universities.
- Educators should be encouraged and taught how to include indigenous knowledge in their day-to-day teaching of hazards and disasters.
- Learning outcomes on safety or awareness of hazards and disasters should be added from the foundation phase to the senior phase.
- Inter-school competitions and cooperation in addressing hazards prevalent should be encourages in provinces to stimulate learners' awareness.
- Learning area specialists should ensure that when they do evaluation of educators' teaching practice, they include hazards and disasters as a theme for evaluation.

One might close the recommendation to policy makers with an argument by Schilderman (2004:425) that changing the mindset of policy-makers and development agencies involved in those approaches should therefore be a priority. They need to recognize the relationship that exists between development and disasters, and also that the way out of the vicious circle of development contributing to disasters that in their turn set back development is mitigation. They will need to shift some of their budgets from relief and reconstruction towards mitigation; and they will need to incorporate disaster mitigation as an integral part of their development projects and programmes

5.10 Implications of the study for enhancing learners' awareness of hazards and disasters

The findings of this study have far-reaching implications for learners, educators, parents, schools, curriculum coordinators, curriculum developers, textbook authors, curriculum policy makers, disaster management centres and institutions as well as for disaster researchers. The discussions that follow outline the implications for stakeholders:

- Learners should be taught about hazards and disasters from an early learning phase (pre-school and foundation phase) to intermediary and senior phase right through to post-school (FET colleges, universities and school leavers).
- Educators should make use the opportunity provided by the NCS and design flexible learning programmes that would enhance learners' awareness of hazards and disasters. They should also embark on self-empowerment through reading additional resources for enhancing learners' awareness of hazards and disasters.
- Parents should start teaching their children at an earlier age about safety and hazard issues and always complement what educators have taught learners in this regard.
- Schools should create an enabling environment for educators to embark on different activities to enhance learners' awareness of hazards and disasters such as insisting on collaborations among educators and structuring the school organisational culture in such a way that it will enable flexibility for educators.
- Curriculum coordinators should meet provincially and nationally to discuss how the National Curriculum Statements could be aligned with the provincial challenges on hazards and disasters as well as to advise educators about additional teaching resources that could be used in the classroom.
- Curriculum developers should take note that learning outcomes on hazards and disasters should be included in all grades and across all learning areas. Furthermore there is a need for consulting more widely with stakeholders such as indigenous knowledge scholars and textbook authors.
- Textbook authors have a difficult task of balancing the provision of NCS learning outcomes; they need educator expertise and resources while developing textbooks.
- Curriculum policy makers should take into consideration the differences that exist among provinces and provision for deviations and consider as well that educators are overburdened with administrative work on top of their teaching activities.
- Institutions of higher education especially those that train educators, should ensure that the new generation of educators has been trained in integrated teaching and indigenous knowledge.

- Disaster management institutions should produce additional learning resources for schools, similar to those produced by the Water Research Commission which contains lessons for learners from Grade 0 to Grade 12.
- Disaster researchers should investigate better ways to integrate hazards and disasters into the school curriculum and instructional design.

5.11 Shortcomings and limitations of the investigation

In this study two research strategies were used to collect data to address the research problem stated in Chapter one. Like any other research, this study has limitations such as the use of dichotomous (Yes/No) options which is not recommended for a PhD study. Both the numbers of interview participants and questionnaires respondents are not representative of the South African population's views; however, it should be considered that the literature review was done widely and could be representative of all scholarly publications and policy documents.

Whilst South Africa promulgated the National Disaster Management Act in 2002 and the National Disaster Management Framework in 2005, which clearly spells out what needs to be achieved on disaster education and training, there is no approved policy document related to disaster management apart from the safety issues mentioned within the South African School Act. It should, however, be noted that in July 2010, the Department of Basic Education consulted specific individuals to make comments on the proposed draft National Disaster Management Guidelines for Schools to which I had an opportunity to make inputs. This implies that some of the issues raised here as a challenge might be undergoing considerations within the Department of Basic Education.

Another limitation of the study is that while disasters affect the communities in general, this study focuses much on their vulnerability caused by conditions such as poverty. Issues of biases could have motivated this investigation as discussed in Chapter four, the last paragraph of section 4.3.3 where I discussed the vulnerabilities experienced by Portion 9 residents where I spent most of my first years of employment as a teacher. This could have had an influence on

how I interpreted the research findings, however, data were collected from different contexts; five provinces and 47 schools situated in informal settlements.

An analysis of data collected through questionnaires revealed that data collection from learners would have enhanced the findings of this study because it would have pointed out whether learners are aware of hazards and disasters. This could be part of further research in this topic. A closed-ended questionnaire was used to collect data from educators which was limiting in nature because the analysis shows that there is a need for an in-depth understanding of what is the status quo in terms of teaching awareness of hazards and disasters. Probably an in depth interview would have yielded better results. An ethnographic study is needed to extract more insights on the classroom situation and determine which other teaching strategies could enhance learners' awareness of hazards and disasters.

5.12 Suggestions for further research

This study focuses on the national curriculum and the role of educators in enhancing learners' awareness of hazards and disasters. There are other issues that also need an in-depth investigation. Such variables include the school environment (leadership, infrastructure and resources, school culture and support structures), learners' contribution and the involvement of other stakeholders in hazards and disaster education.

Possible research topics emanating from this study include the following:

- The need to determine how the hazards and disasters identified by sub-question 1 could be integrated in the foundation, intermediary, senior and post-schooling phase and across all learning areas.
- There is a need to investigate the vulnerabilities of South African communities to prevalent disasters and those that have not happened so far, such as volcanoes, hurricanes, high magnitude earthquakes and tsunamis.
- South Africa has undergone curriculum change, revision and reviews on numerous occasions and any suggestion to overhaul the curriculum will be met with scepticism and

resistance from curriculum developers and implementers. The challenge here is to find ways to integrate suggested hazards and disasters additions into the existing curriculum. An investigation on the design of learning programmes could shed light on how hazards and disasters might be integrated into classroom teaching without changing the national curriculum provisions

- Disaster and indigenous knowledge scholars need to conduct field studies to gather existing knowledge on how indigenous communities have managed to live in harmony with hazards for so long and how they respond to disaster outbreaks.
- A case study to determine how integrated teaching could effectively enhance learners' awareness of hazards and disasters need to be done.

5.13 Summary of the investigation

In answering the main research question, data collected through the empirical study reveal that national school education has an essential role to play in the teaching of hazards and disasters firstly, by explicitly ensuring that the curriculum includes learning outcomes on hazards and disasters and secondly, by ensuring that educators from learning areas have adequate teaching materials on hazards and disasters.

If Shaluf's (2007: 687) framework of disasters in which he identified three categories of disasters is to be used, South Africa would fit all three categories. The most common natural hazards in the country are floods, droughts and thunderstorms; the human-induced hazards include fires, mine-related hazards and industrial accidents while the third category of hybrid disasters includes health-related disasters such as HIV/AIDS, multi-drug resistant TB and other medical-related diseases prevalent in South Africa as well as conflict-related disasters, such as xenophobic attacks. Something to note here is that some of these do not fit the definition of a disaster and could just be labelled hazards because there has not yet been human and property loss, but they could become a disaster if vulnerability is not addressed. Regarding tsunami disaster, Meiklejohn and Sumner (2005) maintain that South Africa has a relatively steep coast so the country would not experience as much devastation as was recorded in Indonesia during the 2004 tsunami.

In Chapter one section 1.8 and the framework in Chapter two figure 2.5 it was pointed out that awareness of vulnerability, resilience, indigenous knowledge, the curriculum and integrated teaching are essential for addressing the main research question of the contribution of education in enhancing learners' awareness of hazards and disasters. These concepts were integrated in the questionnaires and the interview guidelines to determine the views of respondents.

Something to note though is that poverty could make communities vulnerable to disaster and this point is supported by researchers such as King (2000), Gaillard (2007:534), Napier and Rubin (2002:3), Reich (2006:796), Pelling (2003) and Mgquba and Vogel (2004:34) who maintain that poverty reflected by communities that build poor structural houses in informal settlements increases their chances of becoming victims of disasters. In South Africa informal settlements are most affected by hazards such as floods, fires and epidemics related to a poor health environment. This is so because most of these settlements are located in areas that are not approved for human settlement such as river banks, mining dumps, dolomitic areas, high voltage locations and near industrial waste sites. Among all data collection sources, the literature, educators' responses and interview responses there is strong agreement that South African communities are vulnerable to disasters. Researchers such as Mgquba and Vogel (2004:36), Bull-Kamanga et al. (2003:193), Fothergill and Peek (2004:90), Alexander (1997:293), Pelling (2003) and Reid and Vogel (2006:195) strongly support the idea that in most cases poor communities are severely affected by disasters.

It is crucial to note that all South African communities are vulnerable to disasters and the conclusion emanating from the second sub-question of this study could be taken from the National Disaster Management Framework which states that hazards are seen as an integral aspect of our environment and include naturally occurring or humanly-induced processes or events with the potential to create loss. Exposure to a hazard need not necessarily mean disaster. It is the level of vulnerability of those who are exposed to the hazard that increases risk and thus the likelihood of a disastrous occurrence. The question that remains to be answered here, and ideal for future study is, "To what extent are school learners vulnerable to disasters occurring in informal settlements?"

The concept *resilience* was not included during data collection through interviews and questionnaires as it is embedded in the concepts of vulnerability, indigenous knowledge and issues of curriculum and instructional design. The UNDP (2004) introduced three factors involved in disaster resilience - taking ownership of disaster risk assessment, educating learners in disaster risk reduction and facilitating the documentation of local knowledge and interpretation of disaster risks. The discussions on the vulnerabilities of informal settlements covered the ownership factor. The second factor relating to education was covered by discussions of the curriculum, integrated teaching and other teaching strategies while the importance of local knowledge was covered through discussions on indigenous knowledge.

From the empirical data collected through the literature study, questionnaire responses from educators and interviews with disaster management and curriculum specialists there seem to be no data that contradict the observation of the Green Paper on Disaster Management (1998) that, like many countries in the world, South Africa is at risk from a wide range of natural, technological and environmental hazards that can lead to disasters such as droughts, floods, major fires, tornadoes, major oil spills and even earthquakes. While it seems that there is awareness of disasters prevalent in the country, there is, however, no evidence that this awareness is transferred to learners; neither has any study been conducted in South Africa to determine the learner's awareness of hazards and disasters. Literature by scholars and policy document suggests that there are problems in the teaching strategies used by educators as reflected in the debates of OBE, C2005 and the NCS implementation.

A review of the South African National Curriculum Statements from Grades 1 to 12 reveals that there is explicit inclusion of hazards and disaster outcomes in Grade 7 and to some extent an implicit inclusion of outcomes that relate to the environment, safety, transportation, water and industrialisation in other grades which educators can utilise to teach hazards and disaster education. Researchers such as and Frost-Killen (2007), Rogan and Grayson (2003), Jansen (1998, 2009) Rogan (2007) and Rogan and Aldous (2005) all agree that while educators follow the prescribed outcomes as listed in the curriculum they nevertheless do not adopt the flexibility given by the National Curriculum provisions such as integration of learning and designing their

own learning programmes. In fact Jansen (2009;197) maintains that smaller and less dramatic changes in curriculum knowledge and ideologies are hard to shift. This could simply mean that learners go through Grade 1 to Grade 6 knowing nothing about hazards and disasters unless an educator goes beyond the listed outcomes and volunteers to teach them about hazards and disasters.

Lidstone's (1996) remarks that natural hazards education is essential for producing a citizenry that is knowledgeable concerning the bio-physical environment and its associated problems, aware of how to solve problems and motivated to work towards their solution, fit well as a concluding statement to the third sub-question of the study. This conclusion necessitates that disaster education should be included during the curriculum development of all grades, from the foundation to the intermediary and senior phases. It is, however, not clear whether the teaching of disaster education should be done in all grades. A further study is needed here to determine what content should feature in what grade.

The principle of indigenous knowledge and integrated teaching have featured strongly in the section that discusses key issues emanating from the study and it has been indicated that a pilot study needs to be conducted, which will look at the development of a learning programme that includes both the principles. The principles are important in enhancing learners' awareness of hazards and disasters. The only challenge is that educators might not be ready for them as they are currently overloaded with administrative tasks and most of them have not been properly trained to implement the new learning principles. As suggested in section 5.7 above, the development of a learning programme on hazards and disasters that cuts across all learning areas and all grades would ensure less work for educators.

A look at the evidence that emerged from the interview participants to address sub-question 5 reveals that excursions, tours, real-life examples, practical illustrations, videos, drawings and games, are some of strategies that were suggested to enhance learners' awareness of hazards and disasters. The most important consideration is that learning should be exciting and involve learners. Some of the strategies include involving parents, inviting an expert to the class and using materials developed by organisations working in similar environments. It is therefore of

the utmost importance for disaster management institutions to work with school management to raise learners' awareness through developing and disseminating learning materials such as videos, biographies and diaries of disaster management efforts. Furthermore, disaster management centres and institutions of higher learning, apart from contributing to the development of learning materials such as textbooks, posters and learning programmes, could organise exhibitions of disasters that have occurred in the past. Learners from different schools could visit the displays to learn about issues related to disasters that cannot be taught in the classroom.

New information that has emerged from the interviews is that there should be close cooperation between curriculum developers, textbook authors and professional development practitioners. The cooperation among these parties will address the disjuncture currently making it difficult to teach learners about hazards and disasters. More data would need to be gathered as to how the three partners could work together in ensuring that learners' awareness and knowledge of disasters is enhanced. The inclusion of indigenous knowledge in teaching should not be left to educators; it should be prescribed in the curriculum and in the textbooks which will then compel educators to teach such content.

In closing, this study has determined how the South African education system, in particular curriculum and instructional design, contributes to learners' awareness of hazards and disasters. Numerous findings were reported in the previous sections that relate to the sub-questions listed in Chapter one.

Regarding the prevalence of hazards and disasters in South Africa, it was found that floods and fires are the most prevalent hazards and disasters followed by accidents, droughts, and epidemics such as HIV/AIDS, storms, fog, sinkholes, chemical spillages and social conflicts which include xenophobia. As far as the extent to which South African communities are vulnerable to the prevalent disasters, the findings were that while natural disasters affect all communities indiscriminately, there are some, referred to as hybrid with some element of human-induced disasters, that greatly affect poor communities, especially those that are living in informal settlements.

With reference to the inclusion of hazards and disasters learning outcomes into the NCS, the findings relate to the fact that the curriculum should explicitly state the outcomes about hazards and disaster education from the foundation to the intermediary and senior phases. This is essential because it has been ascertained that educators prefer to follow the outcomes prescribed on the curriculum. Regarding the use of indigenous knowledge, it has been found that while this knowledge is important in enhancing learner's awareness of hazards and disasters, it nevertheless has shortcomings. Apart from the fact that such knowledge is disappearing, it has not been properly recorded and it has not gone through a scientific testing process. As far as integrated teaching is concerned, the findings of this study are that the teaching strategy is important, and in use at some institutions of higher learning; it has produced marvellous results and if included in classroom teaching it will definitely improve learners' awareness of hazards and disasters. The only challenge though is that educators might not have the time or the know-how to implement this innovative way of teaching.

When all have been said and done, the critical challenge confronting education in South Africa is as summarised by Slattery (2006:226) that moving from environmental concerns to classroom arrangements, from post Katrina rebuilding to an ecological steps of activism there is a concern for curriculum development that recognises interrelationships, deep ecological holistic models which in its own way challenge educators to prioritise global interdependence and ecological sustainability. Slattery (2006:217) concludes that education is one human activity that is profoundly affected by attention to environment and interconnectedness of past, present and future

5.14 Conclusion

The four key areas of interest emanating from the research - HIV/AIDS, informal settlements, indigenous knowledge and integrated teaching are essential in determining the contribution of education to enhancing learners' awareness of hazards and disasters in their communities and developing more respect for the knowledge residing in communities. These areas in turn will contribute to learners taking care of their environment and ensuring that they desist from

engaging in practices that could transform hazards into disasters. The development of a learning programme by the National Disaster Management Centre as discussed in 5.7 above is crucial as it provides an opportunity to ensure that educators implement the principles of the National Curriculum Statements and above all, it will reduce some of the administrative tasks of educators to ensure that the kind of educators envisaged are qualified, competent, dedicated and caring and will serve as mediators and interpreters of learning programmes and materials. The advantage is that the skills that would be acquired during the implementation of hazards and disasters learning programmes could be used in other areas affecting communities, such as drugs and alcohol and HIV/AIDS.

"We shall not cease from exploring, and the end of all our exploring will be to arrive where we started, and know the place for the first time" T.S. Elliot

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UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

UNIVERSITY OF PRETORIA

FACULTY OF EDUCATION

RESEARCH ETHICS COMMITTEE

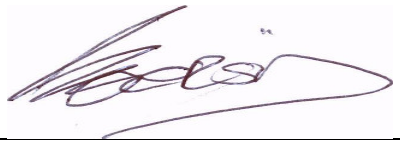
CLEARANCE CERTIFICATE	**CLEARANCE NUMBER :** CS09/06/02
DEGREE AND PROJECT	PhD: Cur. & Intruct. Design & Dev. Educational perspectives on learner awareness of hazards and disasters
INVESTIGATOR(S)	Simon Takalani Rambau
DEPARTMENT	Department of Education and Management Studies
DATE CONSIDERED	19 August 2010
DECISION OF THE COMMITTEE	APPROVED

Please note:

For Masters applications, ethical clearance is valid for 2 years

For PhD applications, ethical clearnace is valid for 3 years.

CHAIRPERSON OF ETHICS COMMITTEE Prof L Ebersohn



DATE 19 August 2010

CC Dr L.D Beukes
Ms Jeannie Beukes

This ethical clearance certificate is issued subject to the following conditions:

1. A signed personal declaration of responsibility
2. If the research question changes significantly so as to alter the nature of the study, a new application for ethical clearance must be submitted
3. It remains the students' responsibility to ensure that all the necessary forms for informed consent are kept for future queries.

Please quote the clearance number in all enquiries.

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University of Pretoria
Pretoria 0002 Republic of South Africa Tel (012) 420-56354111
Fax (012) 420- 5594 *http://www. up.ac.za*

ANNEXTURE B

Consent form to participate in the study to determine how education contribute to learners' awareness of hazards and disasters

I _____ hereby give consent to Mr ST Rambau for my participation in the study titled "The educational perspective on the learners' awareness of hazards and disasters" through interviews. I duly confirm that Mr Rambau explained to me the purpose of his research and informed me of my rights to withdraw from the interview if I wish to do so. He has assured me that my confidentiality will be guaranteed and will in no way disclose my name in the final report. I however agree to provide my contact details for verification process that this interview occurred. I therefore give my consent voluntarily and confirm that I was not coerced nor tricked to participate in this study.

Respondent Name _____

Occupation: _____

Contact Details: _____

Respondents Signature _____ Date _____

Interview Guidelines for Curriculum Specialists

1. What types of hazards and disasters are prevalent in South Africa

2. Should hazards and disasters education be integrated in the national curriculum?

3. At what stage/grade should learners be taught about hazards and disasters?

4. How could the need for learners' hazards and disasters awareness be addressed in the classroom?

5. To what extent would indigenous knowledge assist in developing learner awareness for hazards and disasters?

6. To what extent would integrated learning programme (different learning areas educator's team together) assist in raising learner awareness of hazards and disasters?

7. In your own view, what needs to be done to ensure that learners are aware of disasters prevalent in their area and know how to respond during the outbreak?

Interview Guidelines for Disaster Lectures

1. What types of hazards and disasters are prevalent in South Africa

2. Should hazards and disasters education be integrated in the national curriculum?

3. At what stage/grade should learners be taught about hazards and disasters?

4. How could the need for learners' hazards and disasters awareness be addressed in the classroom?

5. To what extent would indigenous knowledge assist in developing learner awareness for hazards and disasters?

6. To what extent would integrated learning programme (different learning areas educator's team together) assist in raising learner awareness of hazards and disasters?

7. In your own view, what needs to be done to ensure that learners are aware of disasters prevalent in their area and know how to respond during the outbreak?

Interview Guidelines for Disaster Management Specialists

1. What types of disasters are prevalent in South Africa

2. How is your department involved in raising disaster awareness to learners?

3. At what level or grade should the South African National Curriculum address the need for learner awareness of hazards and disaster?

4. How could the need for learners' hazards and disasters awareness be addressed in the classroom?

5. To what extent would indigenous knowledge assist in developing learner awareness for hazards and disasters?

6. To what extent would integrated learning programme assist in raising learner awareness of hazards and disasters?

7. In your own view, what needs to be done to ensure that learners are aware of disasters prevalent in their area and know how to respond during the outbreak?

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Educational perspective on learner awareness of hazards and disasters

Please complete the following questionnaire by ticking on the yes or no boxes provided after each question. If you need to provide additional information to any of the questions below please use the extra spaces provided at the end of the page. The demographic data is needed for statistical purposes.

What is the name of your school? _____
In which province is your school situated? _____
How many years have you been teaching _____
What teaching qualification do you have? _____
What is your gender _____

1. In your own view, is your area likely to be affected by natural and man-made disasters?	YES	NO
2. Should hazards and disasters be included in the National Curriculum Statements learning outcomes?	YES	NO
3. Is it necessary for learners to be taught about hazards and disasters in your school?	YES	NO
4. Have you ever included natural and man-made hazards and disasters in your learning area when you teach learners?	YES	NO
5. Have you given your learners an opportunity to observe a real-life or visual representation of hazards or disaster event?	YES	NO
6. Have you ever included any indigenous knowledge information on hazards and disasters in your teaching?	YES	NO
7. Have you ever taught learners how to identify potential hazards in their environment?	YES	NO
8. Have you ever teamed up with other educators to develop a learning programme for hazards and disasters?	YES	NO
9. Have you ever checked whether learners do discuss what they learned about hazards and disasters with their families?	YES	NO
10. Have you ever taught your learners how to respond when faced with disastrous events?	YES	NO

Additional Comments

_____
_____
_____
_____
_____
_____
_____
_____

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University of Pretoria
Pretoria 0002 Republic of South Africa Tel (012) 420-56354111
Fax (012) 420- 5594 *http://www. up.ac.za*

Consent Form

I _____ hereby give consent to Mr ST Rambau for my participation in the study titled "The educational perspective on the learners' awareness of hazards and disasters through completing the attached questionnaire. I duly confirm that Mr Rambau explained to me the purpose of the research and duly informed me of my rights and guaranteed my confidentiality in the final report. I thereby give consent voluntarily and confirm that I was not coerced nor tricked to participate.

_____ _____

Respondents signature Date

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
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PROVINCE OF KWAZULU-NATAL
ISIFUNDAZWE SAKWAZULU-NATALI

DEPARTMENT OF EDUCATION
UMNYANGO WEMFUNDO

Tel: 033 341 8610
Fax: 033 341 8612
Private Bag X9137
Pietermaritzburg
3200

228 Pietermaritz Street
PIETERMARITZBURG

INHLOKOHOVISI | PIETERMARITZBURG | HEAD OFFICE

Imibuzo: Enquiries: Sibusiso Alwar
Reference: Inkomba: 0030/2009
Date: Usuku: 13 May 2009

MR T S RAMBAU
P O BOX 2005
HAMMANSKRAAL
0400

RESEARCH PROPOSAL: EDUCATIONAL PERSPECTIVE ON THE TEACHING OF HAZARDS AND DISASTERS TO LEARNERS

Your application to conduct the above-mentioned research in schools in the attached list has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educator programmes are not to be interrupted.
5. The investigation is to be conducted from 13 May 2009 to 13 May 2010.
6. Should you wish to extend the period of your survey at the school(s) please contact Mr Sibusiso Alwar at the contact numbers above.
7. A photocopy of this letter is submitted to the principal of the school where the intended research is to be conducted.
8. Your research will be limited to the schools submitted.
9. A brief summary of the content, findings and recommendations is provided to the Director: Resource Planning.

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YUNIBESITHI YA PRETORIA

10. The Department receives a copy of the completed report/dissertation/thesis addressed to

The Director: Resource Planning
Private Bag X9137
Pietermaritzburg
3200

We wish you success in your research.

Kind regards

R. Cassius Lubisi (PhD)
Superintendent-General

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

PROVINCE OF KWAZULU-NATAL
ISIFUNDAZWE SAKWAZULU-NATALI

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Private Bag X9137
Pietermaritzburg
3200

228 Pietermaritz Street
PIETERMARITZBURG

INHLOKOHOVISI | PIETERMARITZBURG | HEAD OFFICE

Imibuzo: Enquiries: Sibusiso Alwar
Reference: Inkomba: 0030/2009
Date: Usuku: 13 May 2009

MR T S RAMBAU
P O BOX 2005
HAMMANSKRAAL
0400

PERMISSION TO INTERVIEW LEARNERS AND EDUCATORS

The above matter refers.

Permission is hereby granted to interview Departmental Officials, learners and educators in selected schools of the Province of KwaZulu-Natal subject to the following conditions:

1. **You make all the arrangements concerning your interviews.**
2. **Educators' programmes are not interrupted.**
3. **Interviews are not conducted during the time of writing examinations in schools.**
4. **Learners, educators and schools are not identifiable in any way from the results of the interviews.**
5. **Your interviews are limited only to targeted schools.**
6. **A brief summary of the interview content, findings and recommendations is provided to my office.**
7. **A copy of this letter is submitted to District Managers and principals of schools where the intended interviews are to be conducted.**

The KZN Department of education fully supports your commitment to research: **Educational perspective on the teaching of hazards and disasters to learners**
It is hoped that you will find the above in order.

Best Wishes

R Cassius Lubisi, (PhD)
Superintendent-General

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PROVINCE OF KWAZULU-NATAL
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Pietermaritzburg
3200

228 Pietermaritz Street
PIETERMARITZBURG

INHLOKOHOVISI | PIETERMARITZBURG | HEAD OFFICE

Imibuzo: | Reference: | Date:
Enquiries: Sibusiso Alwar | Inkomba: 0030/2009 | Usuku: 13 May 2009

MR T S RAMBAU
P O BOX 2005
HAMMANSKRAAL
0400

LIST OF SCHOOLS

1. Amagcino P
2. Mboko S.P
3. Mbuyazi P
4. Phuphuma J.P
5. Sibukeyana P
6. Emafezini J.P
7. Inkonkoni S.P
8. Isiphingo S.P
9. Isiphingo Hills P.
10. Isiphingo P.
11. Muzomuhle P.
12. Thamela P.
13. Thokozani P.
14. Umlazi J.P
15. Amanzimtoti P
16. Danganya J.P
17. Dlambula P.
18. KwaGumbi P.
19. Magabeni J.P
20. Mthombeni P.
21. Ophatheni P
22. Sheshisa S.P
23. Sidiya J.P
24. Umgababa P
25. Duze P
26. Ekudeyeni S.P
27. Emadundube P.
28. Empumelelweni P.
29. Empusheni P.
30. Engonyameni

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UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

UMnyango WezeMfundo
Department of Education

Lefapha la Thuto
Departement van Onderwys

Enquiries: Nomvula Ubisi (011)3550488

Date:	**23 March 2009**
Name of Researcher:	**Rambau Simon**
Address of Researcher:	**4013 Silicon Street**
	Clayville Ext 34
	Olifantsfontein 1666
Telephone Number:	**0128436486/0795158913**
Fax Number:	**0866810230**
Research Topic:	**Educational Perspective on Learner Awareness of Hazards and Disasters**
Number and type of schools:	**30 Primary Schools**
District/s/HO	**Johannesburg East, Tshwane North and South and Ekurhuleni East**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

Permission has been granted to proceed with the above study subject to the conditions listed below being met, and may be withdrawn should any of these conditions be flouted:

1. ***The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.***
2. ***The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.***
3. ***A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.***

4. ***A letter / document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.***
5. ***The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.***
6. ***Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.***
7. ***Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year.***
8. ***Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.***
9. ***It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.***
10. ***The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.***
11. ***The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.***
12. ***On completion of the study the researcher must supply the Director: Knowledge Management & Research with one Hard Cover bound and one Ring bound copy of the final, approved research report. The researcher would also provide the said manager with an electronic copy of the research abstract/summary and/or annotation.***
13. ***The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.***
14. ***Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.***

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

Pp Nomvula Ubisi
CHIEF DIRECTOR: INFORMATION & KNOWLEDGE MANAGEMENT

The contents of this letter has been read and understood by the researcher.	
Signature of Researcher:	
Date:	

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Navrae
Enquiries
IMibuzo
Dr RS Cornelissen

Telefoon
Telephone
IFoni
(021) 467-2286

Faks
Fax
IFeksi
(021) 425-7445

Verwysing
Reference
ISalathiso
20090305-0025

Wes-Kaap Onderwysdepartement

Western Cape Education Department

ISebe leMfundo leNtshona Koloni

Mrs Simon Rambau
4013 Silicon Street
CLAYVILLE
1666

Dear Mr S. Rambau

RESEARCH PROPOSAL: EDUCATIONAL PERSPECTIVES ON THE TEACHING OF HAZARDS AND DISASTERS TO LEARNERS.

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **15th April 2009 to 30th June 2009**.
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr R. Cornelissen at the contact numbers above quoting the reference number.
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

    The Director: Research Services
    Western Cape Education Department
    Private Bag X9114
    CAPE TOWN
    8000

We wish you success in your research.

Kind regards.

Signed: Ronald S. Cornelissen
for: **HEAD: EDUCATION**
DATE: 10th March 2009

PO Box 2005
Hammanskraal
0400
04 February 2008

The Superintendent-General
The Provincial Department of Education
North-West Province
Private Bag X2044
MMabatho, 2735

Dear Mr Mweli

Request to Conduct Research at the South African Schools located in all nine provinces

I am a registered PhD student at the University of Pretoria within the Department of Curriculum Studies. I am about to embark on a data collection process as part of my PhD research requirements and therefore request permission to collect data from educators in your province.

The research requires that I gather data from 30 grade 7 social science educators in each province through a questionnaire. The questionnaire would probe educators to provide information on whether they are aware of specific disasters in their province, how do they integrate the locally specific disasters in their teaching and learning and what needs to be done to make things easier for them to improve their teaching of hazards and disasters.

The data collected would be beneficial to South Africa mainly curriculum developers, policy makers and educators professional development because the data would be providing answers to the concerns raised by researchers with regard to increased disasters related to climate change and mushrooming of informal settlements.

It would be appreciated if you could sign the attached form as a prove that you have granted me permission to conduct the research as explained above. I have attached my research abstract and questionnaires for your perusal.

Thank You

Takalani S. Rambau
Tel : 012 843 6486
Mobile: 079 515 8913
Fax: 0866810230
takalani@assaf.org.za

To be completed by the Education Department Officials

Permission granted

YES	NO

As a duly authorized official I grant permission to Mr Takalani S. Rambau to conduct research at South African Schools

Signature ____________________ Date ____________________

Name H-M-~~A~~ Mwell ____________________

Position HOD ____________________

Contact Details 018 3874425 ____________________

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UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Province of the Eastern Cape
DEPARTMENT OF EDUCATION
ISEBE LEZEMFUNDO
DEPARTMENT VAN ONDERWYS
STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIALSERVICES
DIRECTORATE
Private Bag X 0032, Bisho 5606, South Africa

Enquiries: GF Mac Master Tel :040-608 4001/773 *Fax 040-6084574 Date: 23 February 2009

Attention : Mr TS Rambau

By Fax : 086 681 023 0
3 pages (including cover page)

Please find herewith attached document (Request to conduct research) for your information.

Have a wonderful day!

Regards

B.F. Makapela
Act. Secretary: CD. Srat. Man. Mon. & Evaluation

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UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Province of the
EASTERN CAPE
DEPARTMENT OF EDUCATION

Steve Vukile Tshwete Education Complex * Zone 6* Zwelitsha * Private Bag X0032 * Bhisho * 5605 * REPUBLIC OF SOUTH AFRICA*
Tel:+2740-6084537/4773* Fax:+27406084574*
Cell 083 387 172 3* Website: ecprov.gov.za * Email: rchigume@yahoo.com richard.chigume@edu.ecprov.gov.za

06 February 2009

Mr. TS Rambau
P.O. Box 2005
Hammanskraal
0400

Dear Mr Rambau

REQUEST TO CONDUCT RESEARCH AT THE SOUTH AFRICAN SCHOOLS LOCATED IN ALL NINE PROVINCES.

1. Thank you for your correspondence received about the above-mentioned subject.

2. Your application to conduct the above mentioned research in the Eastern Cape Secondary Schools is hereby approved on condition that:

   a. there will be no financial implications for the Department;

   b. institutions and respondents must not be identifiable in any way from the results of the investigation;

   c. you present a copy of the written approval of the Eastern Cape Department of Education (ECDoE) to the District Directors before any research is undertaken at any institutions within that particular district;

   d. you will make all the arrangements concerning your research;

   e. the research may not be conducted during official contact time, as educators' programmes should not be interrupted;

   f. should you wish to extend the period of research after approval has been granted, an application to do this must be directed to the Director: Strategic Planning Policy Research and Secretarial Services;

   g. the research may not be conducted during the fourth school term, except in cases where the ECDoE deems it necessary to undertake research at schools during that period. Such a request will have to be evaluated and determined by the Chief Director: Strategic Management Monitoring and Evaluation;

   h. your research will be limited to those schools or institutions for which approval has been granted;

l. a copy of the completed report, dissertation or thesis, accompanied by a separate synopsis (maximum 2 – 3 typed pages) of the most important findings and recommendations if it does not already contain a synopsis, must be provided to the Director: The Strategic Planning Policy Research and Secretarial Services upon completion of your research.

3. The Department wishes you well in your undertaking. You are most welcome to contact Mr. Richard Chigume on the above numbers should you need any assistance.

Mr. ML Ngonzo
ACTING HEAD OF DEPARTMENT