Learning for Climate Change Adaptation among Selected Communities of Lusaka Province in Zambia

Manoah Muchanga, University of Zambia

Abstract

This research was aimed at surveying perceptions of climate change and educational themes that would be contextually relevant for climate change adaptation. It locates within the United Nations' Educational, Scientific and Cultural Organization's (UNESCO's) Balaclava recommendations on Climate Change Education for Sustainable Development (2013). Uncertainty as to how residents of selected households understood the causes and effects of climate change as well as the content structure of learning for climate change adaptation constituted the problem. Using social constructivism, hermeneutics, survey design, semi-structured interviews and constant comparative analysis, the article shows that the challenges of climate change are comprehended in diverse ways. It also shows that drawing knowledge from diverse sources or cross-disciplines can evoke behavioural and social change that is critical in order to nurture best thinking and practices regarding adaptation.

Background, Statement of the Problem and Contextual Relevance

Climate change education (CCE) is an important process in building community resilience to, and coping strategies for, climate change (Gangwar, 2010). In order to adapt to the multifaceted nature of climate change through education, the focus should be on how to respond to societal challenges and needs (Tanner, Lockwood & Seballos, 2012).

Zambia is one of many countries threatened by the potential and actual effects of climate change. The mean temperature in Zambia has steadily increased over the last 40 years. It was 21.57 ºC between 1960 and 1990, but projections indicate that it will be an average of 25.86 ºC between 2070 and 2099. Moreover, the annual average rainfall was 2.75mm/day between 1960 and 1990, but, between 2070 and 2099, it is projected to decrease to 2.61mm/day owing to climatic changes (Ministry of Tourism, Environment and Natural Resources [MTENR], 2010).

Uncertainty as to how residents of selected households understood the causes and effects of climate change as well as the content structure of learning for climate change adaptation constituted the research problem. The MTENR (2010) and others have undertaken extensive research on, and produced considerable documentation in respect of, climate change, but they all focus on scientific approaches as intervention strategies; there is little evidence of a focus on learning or social learning as an intervention approach. This, therefore, provided the rationale for this research, the findings of which may be useful to the Ministry of Education, the MTENR, environmental researchers and others.

This research situates within the 2013 UNESCO Balaclava framework of Climate Change Education for Sustainable Development, which recommends drawing knowledge for climate change education from diverse sources. There is a need to cross-breed and cross-fertilise the ideas from diverse epistemological contexts in order to build communities' adaptive capacity with regard to, and resilience to, climate change (UNESCO, 2013).

Research Purpose and Questions

The purpose of this research was to conduct a snapshot survey of how residents of selected households perceived the causes and effects of climate change. Premised on respondents' perspectives on the causes and effects of climate change, *socially constructed perspectives* on educational themes that would be contextually relevant for climate change adaptation were solicited through interviews.

Some of the guiding questions in the survey were as follows: What causes climate change among selected communities? What effects of climate change do communities experience? The following was the key question in the interviews: *What priority issues and topics would be relevant in learning for climate change adaptation, and why?* It should be noted that the survey responses on the causes and effects of climate change formed the basis on which respondents suggested different educational themes that could constitute learning for adaptation.

Conceptual and Theoretical Framework

According to Hein (1991), *learning* refers to the continuous acquisition of new knowledge, as well as developing the ability to engage in new environmental behaviour and practice. *Learning* is a social and contextual activity because it is associated with the connection with other human beings and with acquaintances with the surrounding environment. *Climate change adaptation* implies adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (CARE, 2012). In the context of this article, climate change adaptation is defined as a socially initiated and contextually relevant way of coping with the effects of climate change. According to CARE (2012), *learning for climate change adaptation* refers to the acquisition of new knowledge and practices in order to develop and apply innovative approaches so as to generate best practice for adaptation. Owing to the stochastic nature of climate change temporally and spatially, the acquired knowledge and practices need to be contextually relevant and responsive to the immediate needs of the affected communities. In this article, *learning for climate change adaptation* is used interchangeably with adaptation learning or learning for adaptation or climate change education. The word '*communities*' is being used to refer to residential areas that were surveyed in this study. *Social constructivism* as a concept and theory guiding this research is expanded on in the following section.

Social constructivism emerged through the work of Lev Vygotsky, who drew attention to the manner in which language and culture shape learning (Hein, 1991). It has been developed as a wider sociological theory that applies the general philosophical framework of

constructivism to social settings (known as 'social constructivism'/'social constructionism'). Social constructivism recognises that groups construct knowledge of the world for one another, collaboratively creating a small culture of *shared knowledge* with *shared meanings* (Derry, 1999). This epistemological theory assumes that knowledge is constructed through human activity, language, culture and experiences and this is a social process. Knowledge is therefore seen as a human product that is culturally constructed. Learning does not simply involve understanding knowledge of what is seen to be the 'true' nature of things, nor is it remembering what are perceived to be fixed or perfect ideas. Rather, it also includes a personal, connective and social construction of meaning out of the bewildering array of sensations and inputs which have little order or structure for the individual besides the explanations that are constructed by and for them via social interactions and meaning-making processes (Hein, 1991). This theoretical lens enabled me, as researcher, to bracket 'external' academic notions (e.g. how scientific institutions construct knowledge of climate change) and, via a hermeneutical research process, to focus mainly on the respondents' construction of knowledge. Some insights into the sociocultural processes of knowledge construction in a climate change context can be gained from the work of Fumo, Sauda, Smart and Foumane (2008), Gordon (2008) and Madison (2007), who show that perceptions of climate change differ. For example, Madison (2007) analysed cultural understandings of climate change and found that, in Kenya, respondents thought it was caused by disobeying elderly people, while, in Zambia, they said it was caused by witchcraft.

According to UNESCO (2009), climate change is an interdisciplinary challenge and, therefore, education to address it needs to tap into diverse forms of knowledge. Nevertheless, Petra and Dietrich (2010) bemoan the absence of learning tools that explicitly encourage adaptation processes. They argue for adaptive and anticipatory learning, because it can make vital contributions to adaptation. However, they scarcely mention what would constitute learning in order to make it adaptive and anticipatory.

CARE (2012) proposes a *learning*-for-adaptation approach that is people-centred and which combines successful strategies from decades of development experience with scientific knowledge on climate change. The approach focuses on building adaptive capacity at the household and individual level by developing resilience of livelihoods and reducing disaster risks. CARE's framework of adaptation learning shows that tackling climate change through education has much to learn from experiences that are different from already existing ones, that is, there is an element of social innovation necessary in climate change education.

McKeown and Hopkins (2010) ask penetrating questions as to what must constitute learning for change in the context of adaptation to climate change. Like UNESCO (2009) and CARE (2012), they recognise that learning for adaptation to climate change requires engagement of interdisciplinary themes. Generally, they posit that learning for change in the context of adaptation to climate change should involve *issue analysis* as a 'generic' process that can be applied to a wide range of environmental, social and economic problems. McKeown and Hopkins (2010) further advocate for encapsulation of *community and personal decision-making* where every member of the community collaborates in co-creating an action plan to address problems. *Political process* is another aspect deemed by McKeown and Hopkins (2010) to be significant in climate change education. They argue that climate change is inherently political and, therefore, that learners need

an understanding of political processes embedded in decision-making and policy formulation for adaptation. They argue that a mechanical understanding of climate change gained only from textbooks and classroom knowledge-sharing cannot be of much value unless contextual ties and connections with community experiences are established. These perspectives provide some insight into the spirit and substance of climate change education.

McKeown and Hopkins (2010) further argue that climate change presents an array of effects, including environmental refugees. Therefore, 'learning to live together' with people of different cultures requires *intercultural sensitivity and competences*. They add that effective learning for climate change adaptation should include aspects of *social justice*, because we live in a world full of gargantuan inequalities – inequalities that are likely to be widespread in the face of climate change. Last, but not the least, they propose a *behaviour change*-oriented approach to learning for adaptation, adding that behavioural change would address the indifferent consumerism that has contributed to environmental changes. However, based on long-standing critiques of education that have focused on behaviour-change approaches (e.g. Robottom 1987), it can also be said that behavioural change is not sufficient if not complemented by social change. In this regard *behavioural change, seen in the context of social change,* would be better than the consideration of behavioural change alone. Such an approach also brings social-learning processes into focus (Lotz-Sisitka, 2012). McKeown and Hopkins recommend that good climate change education should focus on lifelong learning, as opposed to confining it to primary and secondary school education only. It should be a programme for all age groups.

Volume 26 of the *Southern African Journal of Environmental Education* (*SAJEE*) includes various think pieces on climate change education research. Some of the ideas presented by various scholars are worth noting in the present article. For example, Ogbuigwe (2009) argues that, despite much scientific and technological research as well as policy development, there is still not a clear capacity to present climate change facts and issues in a manner that influences behavioural and social change. She therefore advocates a cross-disciplinary approach to deal with climate change in education. Like CARE (2012) and UNESCO (2009), she also emphasises alternative practices that can best change existing practices. These alternatives could potentially be sourced from contextual and diverse lived experiences of communities as proposed in this article. Kronlid (2009) also construes climate change and education within the sustainable development framework, noting that learning takes place in spaces of capabilities and that learning conditions are likely to be improved if learners' spaces of capabilities are expanded and enriched. The present article argues that drawing from diverse sources of knowledge and practices is what would actually expand and enrich people's capabilities to adapt. In fact, Namafe (2009) emphasises that climate change education should respond to societal needs and incorporate cross-disciplinary issues in order to build human agency and positive individual and social change. Moreover, Lenglet (2009) states that climate change education should go beyond mere learning instructions about climate change, its existence and causes, and its potential and actual consequences. It should venture into interactions between climate change, human and social formations as well as a *variety of learning experiences*, thereby allowing individuals and communities to acquire competencies, knowledge and predispositions for being active participants in co-creating a sustainable future and climate change adaptation.

Methodology and Research Approach

Paradigmatic orientation

This article is located within the research tradition known as interpretivism or hermeneutics. Interpretivism is directed at understanding phenomena from an individual's perspective and at investigating interactions among individuals, as well as the historical and cultural contexts that people inhabit (Creswell, 1994). The *ontological assumption* underlying this research tradition is that reality is not 'out there', but rather exists in inner human beliefs and is conditional on human experiences and interpretations. Moreover, reality is not independent but is socially or culturally constructed and can have varied meanings depending on a particular practice context (Kukla, 2000). Interpretivism meshes with the philosophical core of deconstructive post-modernism, which rejects any sense of the 'real', because the objects and meanings that constitute our existential 'reality' are social constructions. The ontological position of interpretivism is relativism, which is the view that reality is subjective and differs from person to person (Guba & Lincoln, 1994). Therefore, during the data-collection process and analysis, this researcher was open to respondents' multiple beliefs, knowledge and practices as they were expressed, and these were freely allowed to emerge in and through the research process. There are some problems, however, with a relativist ontological position in research on issues such as climate change, and these will be commented on towards the end of the article. Guba and Lincoln (1994) suggest that *epistemology* deals with the nature of knowledge, for instance how people know and how they know what they know. *Subjectivity* was a key epistemological assumption in this research. Using the epistemic lens of interpretivism, knowledge was constructed through intersubjective dialogue between the researcher and key respondents from various households. The researcher was conscious that, in such a research paradigm, there are multiple realities for all phenomena that require multiple theories of knowledge in order to fully understand them (Lotz-Sisitka, Fien & Ketlhoilwe, 2012).

Research design and selection of respondents

This qualitative research study employed hermeneutic survey research design in order to facilitate succinct interpretations of respondents' views premised on their lived experiences. A small-scale hermeneutic survey enabled the capture of just a representative fraction of the target population, much as a camera takes a single-frame photograph to represent larger landscapes (Leedy & Ormrod, 2001). Lenglet (2009:95–96), in his review of different research approaches that can possibly be used in climate change education research, states that 'surveys of climate change education practices and understanding perceptions and beliefs among different actors and actants are useful tools for gathering information for determining the "lay of the land" when climate change education initiatives are being proposed and introduced'.

The survey sample of 165 households was drawn from a larger population of 178 081 households in Lusaka Province, Zambia (Zambian Central Statistical Office [CSO], 2003). Targeting households, as opposed to residents (who numbered in the millions), relatively reduced the population and helped in the selection of the survey sample.

As indicated, the survey sample comprised 165 households. From each selected household, one respondent over the age of 17 was chosen to respond to the questionnaire. This age group was deemed to be shrewd and experienced enough to provide informed responses. Cluster sampling was used to divide residential areas into relatively small clusters of households. A probability sampling approach (*simple random*) was used to select specific households from each cluster of a residential area (Leedy & Ormrod, 2001).

Sampling involved five levels, with the first level being used to gather statistics on communities in Lusaka Province. The second level involved a simple random selection of 165 communities. The third level involved the division of simple randomly selected communities into clusters, with each cluster containing a manageable number of households. The fourth level involved the simple random selection of clusters from communities. The final level involved simple random selection of households from each randomly selected cluster and, thereafter, respondents were chosen. For the purpose of obtaining respondents' construction of reality, the researcher deliberately did not include policymakers, educators and others in the sample.

Methods of data collection and ethical issues

Semi-structured interview and survey schedules were used to collect primary data because they made it possible for follow-up questions to be put in order to gain greater insight into certain responses from respondents. They also allowed for sufficient flexibility so that different respondents could be approached differently while still covering the same areas of data collection (Leedy & Ormrod, 2001). Some reflective and unstructured discussions and observations were also incorporated for validation purposes. Secondary data was obtained from reports, journals and books in order to support the primary data.

To safeguard the interests of the respondents, ethical issues were considered. These included obtaining permission from relevant community authorities before conducting surveys and interviews. The researcher requested respondents' consent and conformed to the cultural norms and values of each community visited so as to gain the confidence of the respondents and the general community.

Data validation and analysis

Methodological triangulation was used to validate the primary data. This involved the use of multiple qualitative methods of data collection, such as the use of a survey guide, interview, informal discussion and unstructured observations, to analyse a research question from multiple angles (Patton, 2002). Iterative questioning through the variation of techniques enabled the comparison of responses and reflexive checking of their consistency.

This research used constant comparative analysis, which involved the classification of words and phrases that related to the same content, into major themes (Leedy & Ormrod, 2001). The aim was to allow prevailing patterns, themes and phrases of results to emerge rather than be controlled by predetermined factors. The emerging themes and ideas were manually coded, synthesised and transcribed into percentages as descriptive statistics.

Limitations

Owing to limited financial resources and time, the researcher undertook a small-scale survey (n=165) which, though providing only a snapshot, could serve as the basis for further research. Moreover, updated statistics on households in Lusaka Province were inaccessible. Therefore, only the 2000 census statistics in respect of households were used to determine the sample size, when, in reality, households had mushroomed within the ten-year period between the national census and the research. Moreover, lessons based on lived experience may no longer be meaningful if contexts change.

Results and Findings

Survey data

A survey guide was used to capture perceptions of the causes and effects of climate change, as presented in Tables 1 and 2 respectively.

Based on Table 1, it was found that the causes of climate change were perceived from a diversity of angles, including the biophysical, spiritual, political, sociocultural, economic, and behavioural, amongst others. Among these, spiritual understanding was widely distributed in almost all the communities, showing a strongly held perception that God was the source of climate change. Although not very frequent in Lusaka, Kafue and Luangwa districts, deforestation was cited as a common cause (13.3–33.3%) of climate change in Chongwe District. Both intraspatial and interspatial variations and similarities in the perceptions of the causes of climate change were common. Table 1 also reveals numerous erroneous perceptions or misperceptions about the causes of climate change; in fact, a large proportion of the perceptions on the causes of climate change were erroneous perceptions or misperceptions (e.g. climate change is caused by 'deciduous trees', 'biblical prophecies being fulfilled', 'God', 'leap years', 'mountains', 'alien beings', 'urinating in public by men', 'valleys', 'women from Monze Town', 'witchcraft' and 'women wearing pairs of trousers'). Another cluster of responses may be said to be potentially indirectly related to the causes of climate change, depending on the situation, and would need to be qualified, such as 'government' (i.e. where governments fail to make policies that address carbon emissions)', 'deforestation' (reduction of carbon sink potential)', the 'sun' and the 'ozone layer' (more sunlight penetrating due to breaches in the ozone layer), and so on. Very few respondents related the cause of climate change to increases in greenhouse gases. This actually confirms the International Union for Conservation of Nature's earlier finding that while some communities in Zambia were aware of climatic change, their knowledge about why it occurs is not widespread (IUCN 2007).

The responses regarding the perceived effects of climate change on the community's well-being and activities were generally more accurate and entailed fewer misperceptions than the responses concerning the perceived causes of climate change. Major categories of responses related to an increase in health risks, increased crop failure, impacts on farming practices and activities, and impact on water security, as can be seen from Table 2.

As shown in Table 2, perceptions of how climate change will negatively affect communities' health and well-being emphasised escalating diseases such as malaria, cholera, diarrhoea, and others (including HIV/AIDS, which may not be directly related to the impact of climate change). For example, between 18% and 40% of the responses from three communities in Lusaka District attributed the increase in malaria cases to climate change. Perceptions around heat stress, and changes in farming and household practices associated with increased heat, were also noted. This actually influenced some interviewees to suggest that health-oriented priority issues or topics be included in adaptation learning. Table 2 also shows that, across districts, there was an understanding that climate change would lead to increased temperatures, and there appeared to be a clear understanding that this would have impacts on crop production, livestock, water security and other associated issues. There was also a strong perception in the Lusaka District that climate change would lead to increased flooding, with associated increases in cholera cases and an increasing shortage of clean water. In the Luangwa District, perceptions of increased temperatures were related to perceptions of increased crop failure, less farming, and increased poverty. These results reveal possibilities for the initiation of adaptation learning programmes.

Semi-structured interview

The semi-structured interview allowed for probing of different educational responses to the perceived causes and effects of climate change, as shown in Tables 1 and 2. A range of suggested educational themes were distilled from the data via thematic categories focusing on education related to the main existing disciplines of agriculture and natural resource management, health, history, and culture and artefacts. Additionally, the researcher was able to gain insight into the scope of education and training suggested, and to establish if the educational responses proposed were focused more on environmental education, education for sustainable development and/or climate change education specifically; although it is recognised by UNESCO (2013) that climate change education involves environmental education and is part of the wider framework of education for sustainable development. Table 3 shows the results of the interview responses.

According to Table 3, agriculture and natural resource management-related topics and priority issues of livestock and crop production, flood management (in Lusaka Province) and forest management were proposed the most among communities. Proposed educational priority issues and topics were influenced by the perceived effects of climate change (flooding, crop failure and loss of agricultural production capacity), and the perceived causes of climate change (deforestation). For example, all communities surveyed in Lusaka District expressed concern about increased flooding and its subsequent effects. Therefore, they prioritised flood and health-related themes for adaptation learning. The diversity of educational themes suggested by respondents generally show that cross-disciplinarity is an important facet of learning for climate change adaptation. As can be seen from Table 3, education programmes were also suggested for a range of recipients, including adults, children, and businesses, with it being proposed that such education also be part of life skills and literacy education. The type of education most requested was climate change education (amongst environmental education and education for sustainable development), as shown in Table 3.

Table 1. Perceived causes of climate change among respondents from selected households in Lusaka Province

Perceived causes of climate change	Percentage (%) Responses																			
	Luangwa District						Chongwe District					Lusaka District						Kafue District		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Absence of clouds	–	–	–	–	–	–	10	–	–	–	–	–	–	–	–	–	–	–	–	–
Air pollution	–	–	–	6.25	10	–	–	10	13.4	–	–	15	8.3	9.1	–	–	–	–	–	40
Alien beings	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	–	–	–	–
Ancestors are not happy	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–	–
Aridity	–	6.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Beer drinking	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–
Bible Prophecy	14	–	–	–	–	–	–	–	–	–	–	–	16.6	–	–	–	–	–	–	–
Bush burning	–	13.3	–	6.25	–	–	–	25	13.5	–	25	–	–	–	–	–	–	32	–	10
Change of seasons	–	–	–	–	–	8.3	–	–	–	20	–	16.6	–	–	–	–	–	16	–	–
Charcoal burning	–	–	–	6.25	–	–	20	–	20	30	–	–	–	–	–	–	–	–	22	12
Clouds	–	–	10	–	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Deciduous trees	–	–	–	6.25	–	–	–	–	–	–	–	–	–	–	–	–	10	–	–	–
Decreased temperature	–	–	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Deforestation	–	–	–	12.5	–	16.6	–	25	13.3	30	33.3	–	8.3	–	–	–	–	–	14	8
Environmental illiteracy	–	13.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Firewood collection	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Global warming	–	–	–	–	–	8.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
God	7	6.6	10	12.5	10	16.6	–	5	–	–	–	–	–	9.1	–	30	20	20	8	–
Government	–	–	–	–	–	–	–	–	–	–	–	–	–	36.4	12.5	20	–	4	–	–
Green house gases	–	–	–	–	–	–	20	–	5	–	–	10	8.3	–	–	–	–	–	–	–
I do not know	7	6.6	–	–	10	–	20	15	–	–	–	30	–	9.1	–	10	–	12	–	–
Increased floods	–	–	–	–	–	–	–	–	–	–	–	–	–	–	50	5	–	–	–	–
Increased rainfall	–	–	10	–	–	–	–	5	–	–	–	–	–	–	–	–	–	–	4	–
Increase in sin	–	–	–	–	–	–	–	10	6.7	–	–	–	–	–	–	–	–	–	12	–
Industries	–	–	–	–	–	–	–	5	–	–	–	10	10	18.2	–	–	–	–	–	16
Leap years	–	–	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 1. (cont.)

Perceived causes of climate change	Percentage (%) Responses																			
	Luangwa District							Chongwe District					Lusaka District					Kafue District		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Location of the area	-	6.6	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Loss of catchments	-	-	-	6.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Luangwa River	-	-	-	6.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Motor vehicles	-	-	-	6.25	-	-	-	10	6.7	-	-	-	24.6	-	-	-	-	-	-	8
Mountains	14	20	10	6.25	10	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Municipal waste	-	-	-	-	-	-	-	-	6.7	-	-	-	-	-	-	-	20	16	6	-
Natural cause	-	-	10	-	-	-	-	10	-	-	-	-	-	18.2	-	-	-	4	-	-
Oceans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Open burning	-	-	-	-	-	-	-	-	-	-	-	25	-	-	-	-	10	16	-	-
Ozone layer	-	-	-	6.25	10	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-
Poor drainage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	-	-	-
Poor government policies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Poor sanitation	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Population increase	-	-	-	6.25	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-
Rise in temperature	-	-	10	-	10	8.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shifting cultivation	-	-	-	-	-	-	-	-	20	-	25	-	-	-	-	-	-	-	-	-
Soil erosion	-	-	-	6.25	-	-	-	-	-	-	-	-	-	-	12.5	15	-	-	-	-
Sun	14	20	-	-	10	8.3	-	-	-	20	-	-	-	-	12.5	15	-	4	6	-
Urinating in public by men	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.5	-	-	-	-	-
Valleys	21	6.6	10	-	-	8.3	-	-	-	-	-	-	-	-	12.5	-	-	-	-	-
War	-	-	-	-	-	-	-	-	-	-	-	8.3	-	-	-	-	-	-	-	-
Wind from Mozambique	7	-	-	6.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Witchcraft	-	-	-	-	-	-	-	-	-	-	16.6	-	-	-	-	-	-	-	-	-
Women from Monze town	-	-	-	-	-	-	-	---	-	-	-	-	-	-	12.5	-	-	-	-	-
Women wearing trousers	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 2. Perceived effects of climate change among residents of selected households in Lusaka Province

Perceived effects of climate change	Percentage (%) Responses																			
	Luangwa District						Chongwe District					Lusaka District						Kafue District		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Able to cultivate new crops																		1.7		
Aridity	-	4	5.4	6.1	7.1	6					8.4							5	13.5	
Boosts soil moisture																			1.3	
Change of seasons							8	-	6.7	8.3	8.4							6.3		
Change of vegetation											12.6									5
Closure of flooded schools													5.5							
Crop failure	4.4	8	5.4	12.1	-	14			6.7		16.8							8.4	3.8	12.5
Decreased fishing activity	6.6	-	-	3	-	2														
Decreased rainfall	-	-	-	-	-	-	-	5	28.3	-	17					4		2.5		
Decreased temperature											4.2							5.1		
Displacement of people												3								
Drying up of crops	4.4	-	8.1	9.1	-	4														
Drying up of rivers									13.3											
Early departure of rains																		7.6	11.3	
Fear of uncertainties							8									6				
Food shortage	6.6	4	-		-	8	17	10										0.8		
Increased beer drinking															10				2.5	
Increased cholera cases												10	11		10	10		2.5		
Increased deforestation								10												
Increased diarrhoea	6.6	-	-	3	28.6	10									10		5.8			
Increased drought	4.4	8	8.1	3	7.1	4							5.5							
Increased floods								20			4.2		22	35	15	18	23.6			
Increased HIV/AIDS	-	-	2.7	-	7.1	-												0.8		
Increased hunger	9	8	5.4	12.1	21.3	8		15		25								4.2	5	
Increased loss of soil fertility	4.4	4	5.4	-	-	4		15	13.3											22.5

Table 2. (cont.)

Perceived effects of climate change	Percentage (%) Responses																			
	Luangwa District						Chongwe District						Lusaka District					Kafue District		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Increased malaria incidences	6.6	4	10.8	-	14.2	4		10	26.7	8.3				40	20	18		15.8	2.6	20
Increased malnutrition											8.4									
Increased poverty	2.2	-	13.5	9.1	-	6			13.3	16.6		10							3.8	
Increased rainfall	-	8	-	-	-	4							22		10		23.6	0.8	3.8	15
Increased temperature	9	4	10.8	12.1	7.1	6		10	6.7	8.3	4.2	10	11	10	10	8		10	5	25
Increase in pests (i.e. Ntata)																			5	
Late onset of rainy season							17	-	-	-	12.6							4.2		
Little or no farming	4.4	12	8.1	9.1	-	8	17	15												
Loss of livestock	2.2	-	-	-	7.1	2					12.6	7			10			10	16.3	
Loss of people's lives												7								
Loss of property												10				10				
Mental disturbances																2				
No source of monetary income due to crop failure	2.2	4	5.4				8						11							
Promoted organic gardening																	1.3			
Pupils miss school lessons		-	-		-															
Recharging of aquifers																			1.3	
Seasonal overlaps													11	15				4.7	3.8	
Shortage of clean water																6	23.6		7.6	
Shortened rainy season	4.4	16	8.1	3	-	2														
Skin & eye diseases	2.2	-	-	9.1	-	6	8													
Spending nights outside our houses owing to excess heat	8.8	8																		
Washing away of earth roads	2.2	-	-	6.1	-	-														
Tsunamis															5			8.4	12.5	
Water scarcity	9	8	2.7	3	-	2					8.4									
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 3. Relevant educational themes for climate change adaptation

Suggested educational themes	Description	Priority issues & topics	Percentage (%) responses																			
			Luangwa District						Chongwe District					Lusaka District						Kafue District		
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
	Agriculture & natural resource management	Irrigation	15																			
		Fishing	15					20														
		Pest control			10	10																
		Livestock & crops	25	40	30	50	40	40	25	20		20	30							36	35	
		Water																		20		
Main existing disciplines		Flood management								10				35	37.5	27	60	65	33			
		Forest management								30	40	40	40								25	40
		Chemical management									10	10										
		Fire control											20								30	
		Soils							25	20				30								
		Waste management																10	17			
	Health	Baby care															10					
		Personal hygiene & sanitation			10		40							20	12.5	18		25	17	44		
	History, culture & artifacts	Morality								10					10							
		Traditional norms					20				20											
		Crafts				10					10											
		Anthropology											10									
		Beer drinking															10					
		Adult education								10		10										
Scope of education and training		Civic education	10																			
Scope of education and training		Life skills education	10			10											20					
		Literacy education						20														
		Children's education for adaptation	15	20	10	10																
		Business education			30	10		10														
New subfields of education		Environmental education							12.5			20		15								20
		Climate change education		20	10				37.5		20				25	45			33		10	40
		Education for sustainable development						10														
TOTAL			90	80	100	100	100	100	100	100	100	100	100	100	85	90	100	100	100	100	100	100

Source: Field data, 2011) (Responses <10% and 'I do not know' not included in table.

Summary

Understandings of the causes of climate change

With reference to Table 1, the causes of climate change were understood from different perspectives. *Biophysically*, respondents thought that climate change was caused by seasonal changes, geographical location, loss of catchment areas, and natural processes. *Politically* oriented views showed that climate change was caused by the government and its poor policies. Those who understood the causes of climate change from a *sociocultural* context, associated climate change with witchcraft and indicated that the ancestors were frustrated by the moral decay in the communities. *Morally and spiritually*, climate change was thought to have occurred because of an increase in sin, a rampant increase in beer drinking, and owing to the fact that women were dressing in trousers or that men were urinating in public. Others thought climate change occurred because of God's power and as a fulfilment of biblical prophecy. Moreover, *economic activities* such as charcoal burning, deforestation, automobile and industrial activities were thought to have contributed to air pollution and greenhouse gases that depleted the ozone layer. From the *behavioural* perspective, it was thought that climate change occurred because of environmental illiteracy or men urinating in public places. As noted in the preceding section, and specifically with regard to the discussion of Table 1, there was a wide range of *misconceptions*, namely that climate change was caused, for example, by alien beings, clouds, and women from Monze Town (also see the other factors noted above). This clearly and urgently calls for education to clarify what may or may not cause climate change. Some respondents mistook the effects of climate change for its causes, citing increased rainfall, flooding and increased temperature as causes, when, in reality, they are the effects of such change. These outcomes are similar to earlier research findings of Fumo *et al*. (2008), Gordon (2008) and Madison (2007). However, this is not to say that this research is generalisable.

Understandings of the effects of climate change

Climate change was thought to have affected various sectors. *Environmentally*, climate change was considered to have led to an increase in temperature (most widely known among communities), loss of vegetation, droughts (especially in Luangwa District), floods (especially in Lusaka District), and the early departure of rainfall, among others. These results are similar to earlier research findings by Fumo *et al*. (2008). With respect to the *agricultural and natural resources context*, climate change was thought to be contributing to loss of soil fertility, increased crop failure, the presence of animal pests, loss of livestock, water scarcity and a decrease in fishing activities due to the drying up of rivers. These responses were very notable in the rural communities of Luangwa and Kafue, and partly in Chongwe District, where respondents also bemoaned *social* challenges such as increased food shortages, hunger and poverty. Other notable social effects included displacement of people, especially those in Misisi Compound where, sometimes, schools closed owing to flooding. *Health* maladies such as skin and eye diseases, increased malnourishment, malaria and cholera cases were also blamed on climate change, when, however, these could be related to a complex of interrelated factors and not climate change only.

Conversely, some respondents from Kafue District expressed satisfaction that climate change presented some *opportunities*, such as the boosting of soil moisture and the recharging of aquifers, which made possible the cultivation of new crops and organic gardening. Also worth noting is a *misconception* on the part of respondents from Kafue and Lusaka districts that climate change is brought about by *tsunamis*. As much as this could be possible in coastal areas such as Mozambique, Namibia and others, it does not apply to Zambia because of it being a landlocked country; but these perceptions may be related to recent news items on the impacts of tsunamis on India, Japan and other Eastern countries. Climate change education needs to be alert to such issues too. It was interesting to note that perceptions of causes were generally less accurate than perceptions of impacts. This may be related to the emphasis on adaptation responses in Zambia, which fail to provide education that allows people to develop in-depth understandings of causes. However, it was not possible to fully determine this in the present research.

Educational Themes: Priority Issues and Topic for Adaptation

Existing educational disciplines

Agriculture and natural resource management
Over 80% of the Zambian economy, and particularly the communities studied, depends on climate-sensitive agriculture and natural resources (MTENR, 2010). Agriculture and natural resource management, with emphasis on irrigation, fishing, gardening, pest and chemical control, crop production, livestock management, and soil and water conservation, are indeed relevant in learning for adaptation to climate change in such a context. As noted earlier, learning conditions are likely to be improved if learners' spaces of capabilities are expanded and enriched (Kronlid, 2009). The diversity of priority issues and topics on agriculture and natural resource management as highlighted in Table 3 and Figure 1 can potentially partly expand peoples' capabilities and competences to cope with the potential and actual effects of climate change on agriculture and natural resource management. Variations in priority issues and topics under agriculture and natural resource management clearly show the need for contextual and flexible adaptation learning. This confirms McKeown and Hopkins's (2010) open acknowledgement that climate change education varies from one geographical area to another, depending on local ecological, social and economic challenges. From this, we can also see that we cannot effectively plan such programmes independently of the lived experiences of people.

Health
From Table 3 (see also Figure 1), it can be seen that health-based educational issues and topics were also deemed to be relevant in a broader portfolio of adaptation learning. Health education involves communication designed to improve health literacy and personal hygiene, and to develop life skills that are conducive to community and environmental health (UNESCO, 2009). Respondents noted that climate change has a propensity to expedite the spread of diseases. They therefore deemed health-related topics and issues such as waste management, good practices regarding malaria prevention, personal hygiene and sanitation to be contextually

relevant in learning for adaptation. This resonates with Namafe (2009), CARE (2012) and Tanner, Lockwood and Seballos (2012) that climate change education should respond to societal needs and should not only focus on the science of climate change. However, as shown in the section on perceptions of causes and effects, there is a need to support communities to develop accurate understandings of the causes of climate change and its potential effects so that their responses can be practised with understanding.

Culture
Culture-related priority issues and topics such as morality, traditional values, anthropology and beer drinking (shown in Table 3 and in Figure 1) were also deemed to be contextually relevant in learning for adaptation. The exact relationship between such moral issues (e.g. beer drinking or women's dress practices) and climate change would need to be probed in greater depth, as some perceptions may be founded on inaccuracies or misperceptions. However, intercultural learning is crucial in the face of climate change, especially in view of the fact that, in future, climate change may lead to an increase in the number of environmental refugees. It is therefore very important to learn about intercultural values, competences and sensitivity. Rather than simply dismissing responses as inaccurate, they should be carefully probed with participants in order to explore their meaning and logic and so establish the validity of the responses in relation to wider knowledge. This, however, does not mean that all responses should be accepted as 'correct' or 'accurate' (e.g. women wearing trousers has nothing to do with the causes of climate change).

   McKeown and Hopkins (2010) propose that behavioural change is key in climate change education. Behavioural and social change are arguably related to moral concerns. Moral-oriented education for adaptation can indeed develop people's moral obligation and sharpen their inner potential to do the right thing so as to reverse environmental changes. Although the beer-drinking issue may be too trivial in some contexts to be incorporated into learning for adaptation, it was locally deemed to be relevant in adaptation learning, and there may therefore be a need to 'follow the logic' of the respondents before simply dismissing the response as being trivial. Namafe (2006), for example, argues against a parochial adherence to one perspective of beer drinking, because it has both destructive and constructive sides. Through beer-drinking education for adaptation, communities could, for example, learn how to sustainably make use of beer to partly adapt to climate change-related psychological and socio-economic stresses and how to avoid overindulgent use. The two *field voices* recorded below justify the need for engaging with beer-related issues in climate change education.

   Kuno kumankara manzi yambiri chifukwa mvula iloka manyingi. Nthawi zina, bantu ba mooba bamamwena mumanzi. (We experience a lot of floods because of heavy rainfall. Sometimes people who drink beer drown in flood waters. – Respondent, Kalikiliki Compound, Lusaka District)

Sitingalime chifukwa mvula siiloka mushe. Zuba yachilamo kupya na vakudya sifikula. Apa nikumwa chabe mooba kwasila, tilibe chochita. (We cannot farm because of inadequate rainfall. There is intense heat, and crops are stunted. So we will just be drinking beer, because we have nothing to do. – Respondent, Kafue District)

Scope of education and training

Based on respondents' experiences, the *scope of education and training* for climate change adaptation should includes priority issues and topics such as adult and civic education, life skills and literacy education, entrepreneurship, as well as early childhood education. Teaching climate change adaptation especially to adult members of communities requires a careful application of adult- and civic-learning theories and principles (i.e. behaviourism and social constructivism), otherwise it will not be an easy task to change them from their conservative, yet unsustainable, practices to more sustainable ones. Moreover, observed misconceptions about climate change as reported on above require literacy to create an accurate awareness of climate change. Given the stochastic nature of climate change, learning to adapt to it requires alternative life skills such as entrepreneurship that can reduce overdependency on climate-sensitive agricultural activities. This entails a reflexive way of being and of doing things that would possibly be different from the way in which things were done before the advent of climate change (Lotz-Sisitka, 2010).

Newly emerged subfields of education

Among recently emerged subfields of education are education for sustainable development (ESD), environmental education (EE) and climate change education (CCE). ESD is a form of education that aims at educating a person to adopt a sustainable type of thinking, a skilful way of being and of doing things, and to be one with a deep sense of social issues and with moral–ethical values (McDonald, 2008). The deep meaning of ESD is the reason why McKeown and Hopkins (2010), UNESCO (2013), Lenglet (2009), and others propose an ESD framework for climate change education. Unfortunately, in the case of the present research, ESD as a pertinent pathway to adaptation found popularity only in Mphuka Village of Luangwa District. Nevertheless, and as noted above, the educational themes and topics discussed above, as well as the forms of education, are inherently linked to ESD. *EE* for climate change adaptation was also deemed to be contextually relevant. EE and ESD are inextricably linked, as ESD emerged from the field of EE. Further, EE has also reoriented within a stronger focus on sustainability; ESD and EE are thus similar in many respects. Given their systematic and systemic nature, they are able to create a common interface among different fields of education, which leads to *quality learning in diversity* for adaptation. As shown in Table 3, some responses show that CCE should be just one of the components of learning for adaptation. However, everything that has been discussed above can be seen to involve processes of CCE that are a relevant part of ESD and/or EE if viewed within a broader sustainable development framework as has been the case in southern Africa. Figure 1 shows a model of CCE as developed in and through the present research.

Figure 1. Proposed framework of learning for climate change adaptation among selected communities in Lusaka Province
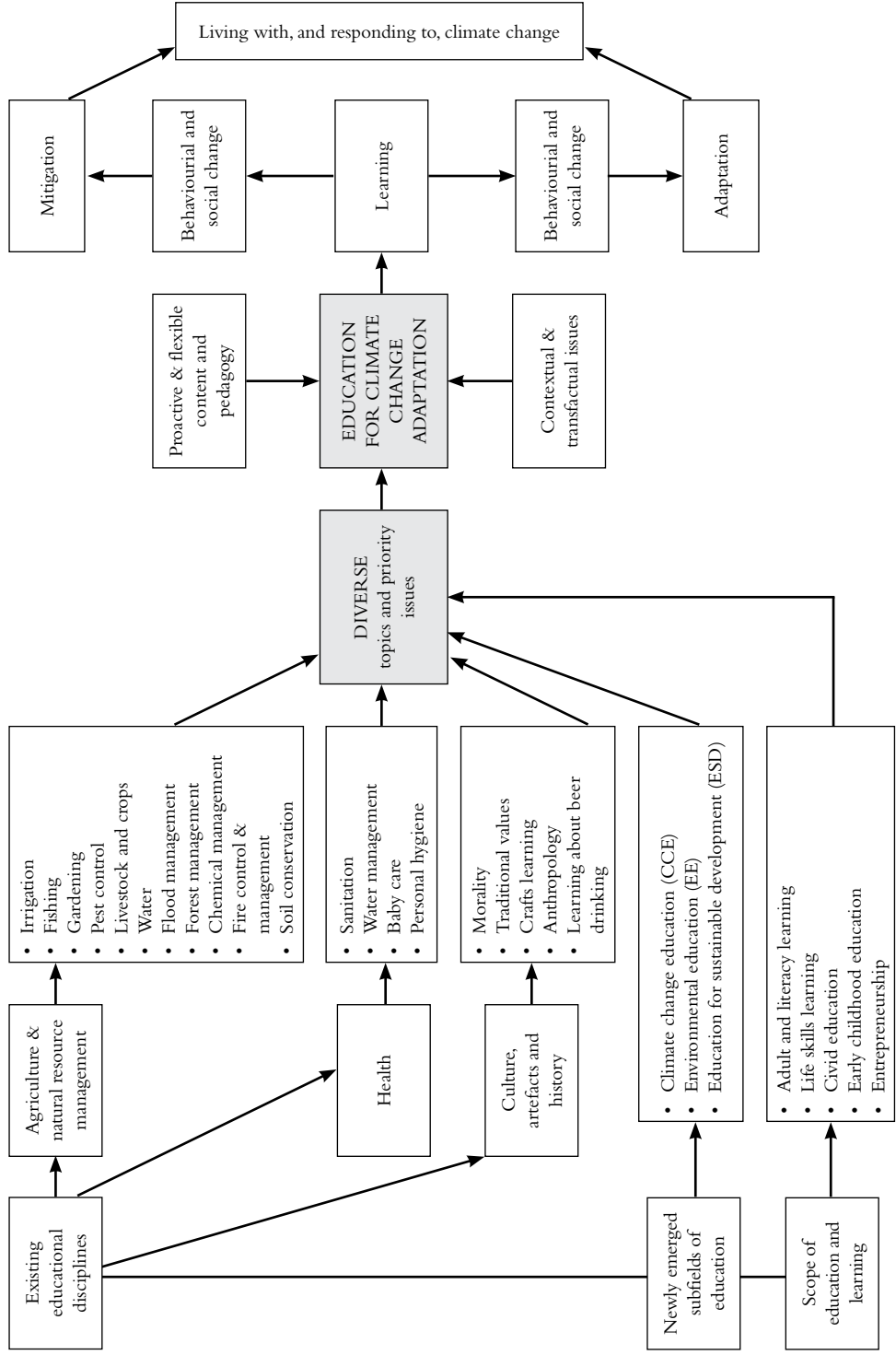
(Source: Field data, 2011)

Conclusion

This article has shown that climate change cannot be understood from a linear perspective, because there are diverse ways in which people understand it, depending on their social *contexts*. It has also been noted that CCE may mean different things, depending on how climate change affects different communities, and depending on their prior knowledge and perceptions of climate change. Drawing knowledge for CCE from *diverse cross-disciplines* in order to contextualise such knowledge in diverse contexts of climate change causes and effects may help to frame educational responses that can lead to behavioural and social change and to the application of collaborative social-learning processes that are critical, analytical and capable of enhancing *foundational*, *functional* and *reflexive competences* that would nurture best thinking and practices for adaptation.

As shown in this research, CCE, especially at community level, should consider the diverse views and perspectives of communities regarding the causes, effects and possible educational responses. It should also draw on knowledge from *diverse* and *cross-disciplines* in order to address misconceptions effectively and enrich learners' capabilities and adaptive capacities. It should focus not only on climate change *factuality* (empirically testable facts), but also on *transfactuality* (true facts, though not testable). Given the stochastic nature of climate change, CCE should also be premised on topical and pedagogical *flexibility* in order to address the ever-changing landscape of climate change issues. CCE needs to be *proactive* rather than *reactive*. As demonstrated in Figure 1, diverse forms of knowledge need to be engaged in and through diverse learning programmes so as to individually and socially prepare people to live with and adapt to some of the more *certain* and some of the more *uncertain* effects of climate change. *Contextual relevance* is also crucial in CCE because of the multiple impacts of climate change on diverse scales and levels.

And, finally, as shown in this research, it may not be fully feasible to accept a constructivist *ontology* as the foundation for CCE and/or research, as the constituents and effects of climate change (e.g. climate variation and climatic cycles, droughts, cyclones, floods, etc.) are real phenomena and *do* exist (outside of our knowledge and/or experiences of them even). They are in themselves therefore not completely socially constructed; but *our perceptions and knowledge of them are*. As shown in this research, such perceptions and knowledge are not always gained through immediate experience (as shown by the listing of tsunamis as an effect of climate change – these have not occurred in Zambia, but they have occurred elsewhere, and, probably via the media, Zambian respondents were able to construct this response). Thus, one may rather suggest that it is possible to accept a constructivist *epistemology* in CCE and research, combined with a more realist (if still fallible) *ontology*. This may also help to establish what are misconceptions as reflected in perceptions (e.g. there is very little truth in seeing women from Monze as a cause of climate change). Accepting this would be inaccurate and would have the negative consequence of seeding dystopia and discrimination against women from Monze. Thus, the educator, too, has an ethical–moral responsibility to correct such misconceptions in CCE settings, whilst recognising that views *are* socially constructed and need to be carefully analysed and culturally and socially understood (as discussed in the case of beer drinking and climate change). While views are, importantly, socially constructed and can be usefully

read through hermeneutical lenses, not all views are equally valid in a given situation or knowledge context. Factuality (e.g. there are well-established, known causes of climate change), combined with transfactuality and in-depth analysis of social constructions, can help with such interpretations, as also shown in this research.

Notes on the Contributor

Manoah Muchanga is a lecturer in Environmental Education at the University of Zambia. He is also a PhD student in Geography and Environmental Studies at the same institution. This research has been drawn from a Masters in Environmental Education study undertaken at the University of Zambia. Email: manoahmuchangaa@yahoo.co.uk.

References

CARE. (2012). *Adaptation learning for Africa*. CARE.

Creswell, J.W. (1994). *Research design: Qualitative and quantitative approaches.* California: Sage.

CSO (Central Statistical Office). (2003). *Census of housing and population*. Lusaka: CSO.

Derry, S.J. (1999). *A fish called peer learning: Searching for common themes.* Manchester: IM.

Fumo, O., Sauda, M., Smart, C. & Foumane, W. (2008). *Assessment of climate change perceptions among arable farmers in Africa.* Missouri: Gates House.

Gangwar, R. (2010). *Building community resilience towards climate change adaptation*. Nagar: CEE.

Gordon, P. (2008). *The science of climate change.* Cleveland: Dties Co.Ltd.

Guba, E.G. & Lincoln, Y.S. (1994). *Competing paradigms in qualitative research.* New York.

Hein, G.E. (1991). *Constructivist learning theory.* Massachusetts: Lesley College.

IUCN (International Union for Conservation of Nature). (2007). Zambia 'hard hit' by climate change. http://www.inthenews.co.uk/news/science/zambia-hard-hit-by-climate-change$1087447.htm, visited 21 May 2007.

Kronlid, D. (2009). Climate capabilities and climate change education research. *Southern African Journal of Environmental Education,* 26:27–37.

Kukla, A. (2000). *Social constructivism and the philosophy of science.* London: Routledge.

Leedy, P.D. & Ormrod, J.E. (2001). *Practical research: Planning and design.* New Jersey: Prentice Hall.

Lenglet, F. (2009). Climate change educational research. What it could be and why it matters. *SAJEE,* 26:93–103.

Lotz-Sisitka, H. (2009). Piecing together conceptual training for climate change education research in southern African context. *South African Journal of Environmental Education,* 26:81–92.

Lotz-Sisitka, H. (2010). 'Learning climate change capabilities – What educational process can do', Conference Presentation at the Environmental Education Association of Southern Africa Annual Conference and Workshops, Copperbelt University, Kitwe, 23 September 2010.

Lotz–Sisitka, H. (Ed.) (2012). (Re) *Views on the social learning literature: A monograph for social learning researchers in natural resources management and environmental education.* Grahamstown/Howick: Environmental Learning Research Centre, Rhodes University/EEASA/SADC-REEP.

Lotz–Sisitka, H., Fien, J. and Ketlhoilwe, M. (2012). Traditions and New Niches: An Overview of Environmental Education Curriculum and Learning Research. In *AERA Hand Book on Environmental Education Research.*

Madison, D. (2007). *The Perception of and Adaptation to Climate Change in Africa.* Birmingham: Department of Economics, University of Birmingham.

McDonald, H. (2008). *Education for Sustainable Development in Teacher Education.* Mongolia: IMU.

McKeown, R. & Hopkins, C. (2010). Rethinking climate change education: Everyone wants it, but what is it? *Green Teacher,* 17–21.

MTENR (Ministry of Tourism, Environment and Natural Resources). (2010). *National Climate Change Response Strategy.* Lusaka: MTENR.

Namafe, C.M. (2006). *Environmental Education in Zambia: A Critical Approach to Change and Transformation.* Lusaka: New Horizon Printer.

Namafe, C.M. (2009). The wider context of climate change discourse. *South African Journal of Environmental Education,* 26:38–48.

Ogbuigwe, A. (2009). Climate change education in Africa. *South African Journal of Environmental Education,* 26:17–26.

Patton, M. (2002). *Qualitative Evaluation and Research Methods.* Newbury Park, CA:Sage.

Petra, T. & Dietrich, K.A. (2010). Anticipatory learning for climate change adaptation and resilience. *Ecology and Society,* 15(2):11. At: http://www.ecologyandsociety.org/vol15/iss2/art11/.

Robottom, I. (1987). Two paradigms of professional development in environmental education. *The Environmentalist,* 7(4), 291–298.

Tanner, T., Lockwood, M. & Seballos, F. (2012). *Learning to tackle climate change.* The Learning Hub, Brighton: IDS.

UNESCO (United Nations Educational, Scientific and Cultural Organization). (2009). *Learning to mitigate and adapt to climate change: UNESCO and climate change education.* Paris: UNESCO.

UNESCO. (2013). *Balaclava Expert Meeting report on climate change education for sustainable development.* Paris: UNESCO.