Investigating how mediation tools enhance rural farmers' learning towards rainwater harvesting and food security: A case study of a Green Village programme

by

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Abstract

Training programmes are often detached from people's context and experiences. It is critical that training programmes are carefully situated and relevant to the target group. This can be achieved through the use of relevant mediation tools. This study investigates how the use of mediation tools within a training programme on rainwater harvesting and conservation conducted by the Water Research Commission (WRC) funded the Green Village project impacted on Community Works Project (CWP) farmers' practices. The study looks at how rural farmer learning occurs through the use of mediation tools in the context of the CWP farmers operating in Sinxaku village, in the Eastern Cape, South Africa.

The learning process in this study was tracked through observing a three-day training workshop. I observed the Green Village facilitator's choice and use of mediation tools to facilitate learning during the training. I looked at ways in which the Green Village facilitator engaged with the participants during the training and how they used different mediation tools to aid the learning process. I was interested in how the CWP farmers engaged with the mediation tools and how learning occurred from the training. I also looked out for changes in the CWP farmers' farming practices following the completion of the training.

The study constituted as an interpretative case study using Cultural Historical Activity (CHAT) theoretical tools. The study also drew on previous research on mediation and learning processes in the water management sector. Using interviews, observations and document analyses, the study found that rural farmers learn better by practising what they are being taught. They also learn from visuals and illustrations as these explain technical concepts in a clear and easy to understand manner. Factors that impact on rural farmer learning, particularly in the context of the CWP farmers operating in Sinxaku village include ecological factors, availability of farm equipment and the structuring of the training programme. The study found that in facilitating a training programme with rural farmers, more time should be given to practical activities at the demonstration site and that these practical activities should be interspersed with knowledge sharing in a workshop setup.

The study concluded that special attention should be given to the choice of mediation tools used in training programmes involving rural farmers. Attention should also be given to contextual factors that can potentially impact on learning and practice of rainwater harvesting and conservation practices that would have been taught in a training programme.

Dedication

This thesis is dedicated to my mum
who passed away at the beginning of my research journey.
Memories of your love kept me going during difficult times.
I also dedicate this thesis to all my nieces and nephews whose beautiful smiles
brightened my days whenever I visited home during my research journey.

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Acronyms

CWP	Community Works Project
IPCC	Intergovernmental Panel on Climate Change
SARUA	Southern African Regional Universities Association
WRC	Water Research Commission

CHAPTER 1
Context and Background to the Study

1.1 Introduction

This chapter introduces the context of this study. In this chapter, I first outline the broader context and then narrow it down to South Africa and the Eastern Cape Province where the study is based. I also discuss the key concepts and how they relate to the context of this study and outline the questions guiding my research. In this study I investigate mediation processes and tools used in a project setting to mediate rural farmer learning in relation to food security and climate change. As a focus for my research, I used the Green Village training on rainwater harvesting and conservation as a case study.

1.2 Broader context of the study

The Intergovernmental Panel on Climate Change (IPCC, 2007) defines climate change as the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically a minimum of three decades or longer. Climate change is one of the key factors said to be affecting development and future well-being in southern Africa (IPCC, 2014). The IPCC (2014) report and the Southern African Regional Universities Association (SARUA, 2014a) report on climate change and university responses, stated that globally, southern Africa is said to be one of the most vulnerable regions to the impacts of climate change.

The SARUA (2014a) report further noted that current climate variability and vulnerability to extreme events such as floods and drought is high. A range of existing stressors related to poverty and other development concerns in the region, including water availability, land degradation, desertification and loss of biodiversity constrain food security and development, pose further challenges to the region and its ability to adapt to climate change. The all-encompassing nature of the projected impacts of climate change highlight that climate change is not a narrow environmental problem, but a fundamental development challenge that requires new and broad-based responses (SARUA, 2014a).

It is important to note that based on many studies covering a wide range of contexts in Africa, "negative impacts of climate change on crop yields have been more common than positive impacts" (IPCC, 2014, p. 47); for example, climate change has a direct bearing on food

production as it impacts on crop yields (IPCC, 2014). Moreover, in southern Africa, drought is a prominent challenge, which is being exacerbated by climate change (IPCC, 2014). Similarly, the impacts of drought, according to the 2014 South Africa country report (SARUA, 2014b), are exacerbated by inconsistencies in yearly rainfall patterns. Consequently, these developments make the practice of agriculture challenging as inconsistencies in rainfall patterns reduce the growing season and often force farmers to limit their agricultural production or make them vulnerable to significant crop loses (ibid.).

Under these circumstances, the 2007 Intergovernmental Panel on Climate Change report noted that African farmers have already "developed several adaptation options to cope with current climate variability, but such adaptations may not be sufficient for future changes of climate change" (p. 435). This same report further noted that many studies have shown that resource-poor farmers and communities use a variety of coping and adaptive mechanisms to ensure food security and sustainable livelihoods in the face of climate change and variability (p. 28). Likewise, Rockstrom (2003) noted that enhanced resilience to future periods of drought stress may be supported by improvements in existing rain-fed farming systems. As an illustration, in its earlier reporting, the IPCC noted, for example, "water-harvesting systems to supplement irrigation practices in semi-arid farming systems" (IPCC, 2007, p. 452).

In its more recent reporting, the IPCC noted that "organizations bridging science and decision-making, including climate services, play an important role in the communication, transfer, and development of climate-related knowledge, including translation, engagement, and knowledge exchange" (IPCC, 2014, p. 26). As such, non-governmental organisations and the national Department of Agriculture, Forestry and Fisheries (DAFF) would find it beneficial to put in place communication strategies that facilitate and strengthen learning and practice of climate related knowledge.

Other challenges facing farmers in southern Africa include food insecurity, nutrition and water shortages (Altman, Hart & Jacobs., 2009; HSRC, 2014). Food security can be defined as the ability of individuals to obtain sufficient food on a day to day basis (South Africa. Department of Agriculture, Forestry and Fisheries [DAFF], 2011). Food security exists when people at all times have physical and economic access to sufficient, nutritional food to meet their dietary needs and food preferences for an active life (ibid.).

Having outlined the broader context of climate change and food security at a regional level, I will now discuss the state of climate change and food security in South Africa where the study is based.

1.3 Climate change and food insecurity in South Africa

A key challenge facing farmers in South Africa is water shortages resulting from drought (Turton, 2000). The Department of Water Affairs (2010) noted that agricultural productivity is impacted by rainfall availability and inconsistent rainfall patterns make farming challenging. Future predictions of climate change are that rainfall will be more infrequent but more intense and this will further negatively impact on the productivity of the agricultural sector (ibid.). The Department of Environmental Affairs (2013) further noted that for large-scale commercial farmers, adaptation needs to focus on maximising output in a sustainable manner and maintaining a competitive edge in changing climatic conditions. On the other hand, for rural livelihoods, adaptation needs to focus on vulnerable groups and areas and include promoting climate-resilient agricultural practices and livelihoods (South Africa. Department of Environmental Affairs [DEA], 2013).

According to the South African National Biodiversity Institute (SANBI), promoting alternative, sustainable sources of income will be important for subsistence households that are unable to continue farming (SANBI, 2013). Other adaptation interventions important to South Africa's agricultural sector include sustainable water resource use and management including catchment management, sustainable farming systems including integrated crop and livestock management, among others. Additionally, awareness, knowledge and communication on climate change and adaptation among others (ibid.), the latter being the focus of this study, are other adaptation interventions important to South Africa's agricultural sector.

SANBI (2013) has suggested that climate advisory services could usefully communicate key messages from the latest available science in an appropriate format to government, agri-business (e.g. seed companies), extension services and farmers. This should relate to the onset of rains, number of rain days, and persistence of rain days, enhanced rainfall variability, droughts and long and short cycle crops. Communication and trust should be increased between authorities and all farming sectors (commercial, smallholder and subsistence) and it should be used to disseminate relevant knowledge on climate change and to promote adaptation strategies. Such communication should be augmented with processes that support vulnerable

communities to interpret and respond to such messages (ibid.), which implies a mediation process.

The 2011 National Climate Change Response White Paper (NCCRP) (DEA 2011) noted that South Africa is a water scarce country with a highly variable climate and has one of the lowest run offs in the world. Official estimates suggest that South Africa faces shortages of between 2 and 13 percent of total water requirements by 2025, but some estimates that include climate change projections and other uncertainties, suggest that these could run to as high as 19 to 33 percent by 2025, and that South Africa will exceed limits of economically viable land-based water resources by 2050 (ibid.). The White Paper further states that measures should be put in place to reduce vulnerability and enhance climate change resilience in communities most at risk.

As a solution to these challenges, the NCCRP (DEA 2011) suggests that resources and capacity should be put in place to address climate change in the water sector. It also suggests that appropriate research and training programmes should be conducted as a way of strengthening the research base. Of importance are the barriers to adaptation to climate change, as these have implications for the success or failure of agricultural training interventions. Climate change, according to Neumann (2014), creates uncertainties in terms of rainfall quantity and this in turn influences the level of adaptability. Water availability has been identified as the single most important factor that limits agricultural production in South Africa (WWF, 2015). Furthermore, the situation is likely to become dire due to rapidly increasing demand for water from other sectors of the economy. Rainfed crops are the ones mostly affected, and thus an understanding of rainfall trends together with drought trends is essential for developing effective adaptation measures (Naumann et al., 2014). Thus an understanding of drought and rainfall patterns impacts on the success of training interventions aimed at increasing crop production (Kori, 2013).

As a means of addressing food insecurity in South Africa, the IPCC (2014) has highlighted the need to focus on both adaptation and mitigation, as noted in the statement that says, “climate-resilient pathways are development trajectories that combine adaptation and mitigation to realise the goal of sustainable development” (IPCC, 2014, p. 26).

The IPCC (2014) further noted that farmers need to put in place adaptation and mitigation measures to address water shortages resulting from inconsistent rainfall patterns. There are several adaptation measures that have been developed to cope with climate change. These

include rainfed farming systems and rainwater harvesting methods (IPCC, 2007). The South African Biodiversity and Ecological Impacts, Climate and Impacts Factsheet (2013) listed other adaptation interventions important to South Africa's agricultural sector as sustainable water resource use and management including catchment management, sustainable farming systems, integrated crop and livestock management, among others.

Additionally, South Africa has limited fertile soils and most crop farmers need to increase the fertility of their soils to achieve good crop yields (Lotz-Sisitka et al., 2016). Farmers in the fertile areas also need to maintain the fertility of their soils, as frequent cropping depletes the soil of nutrients (ibid.). How farmers improve or maintain soil fertility is central to the sustainability of their operations (ibid.).

Also contributing to food security challenges is poverty. Poverty refers to a condition of not having the means to afford basic human needs such as clean water, nutrition, health care, education, clothing and shelter (United Nations Development Program, 2006). Black South Africans mostly in rural areas make up the majority of the poor and food insecure households in South Africa (Food and Agricultural Organisation, 2008).

The southern African Second National Communication (South Africa. DEA, 2011) report identified the following barriers to adaptation to climate change communication:

• Knowledge: There is lack of accessible information on climate change, vulnerability and impact.

• Political and institutional: There are inadequate social structures for civil society engagement with climate change and there is poor climate disaster risk management.

• Socio-cultural: There are low educational levels, and the current technology used for climate change adaptation has not been proven for local use. Moreover, there is lack of knowledge about the use of the technologies.

• Financial: Financial barriers exist in the form of lack of market access and lack of financial systems for climate change adaptation.

Adaptation priorities defined for agriculture in the National Climate Change Response White Paper include a need to invest in and improve research into water, nutrient and soil conservation technologies and techniques, climate resilient crops and livestock, as well as agricultural production, ownership, and financing models to promote the development of 'climate-smart

agriculture (South Africa [SA], 2011). In this study, I focus on training that includes soil conservation and water harvesting as an adaptation measure to rainfall vulnerability. Water conservation practices have been explored as a response to water challenges in agricultural activities by the Water Research Commission (WRC). Lotz-Sisitka (2013) noted that the WRC have produced many resources over several years of research on rainwater harvesting and conservation practices, but dissemination of these materials has been neither wide nor effective. Hence, information on these practices is not readily available to agricultural educators, trainers and rural farmers.

1.4 Climate change and food insecurity in Eastern Cape, South Africa

The Department of Environmental Affairs (2011) in the National Climate Change Response Paper noted that the effects of drought in South Africa are felt mostly by small-scale and subsistence farmers and these impact on household food security. According to the WRC Amanzi for Food report (Lotz Sisitka et al., 2016), 59% of 13.7 million households in South Africa are food insecure. Wenhold and Faber (2008) further noted that within this group, hunger and malnutrition are widespread. The Department of Agriculture, Forestry and Fisheries (2015) has noted that more than half of the small-scale farmers in the Eastern Cape Province live below the poverty line.

According to a climate change vulnerability indicator developed for South Africa's farming sector, the Eastern Cape is said to be the most vulnerable province in the country (Gbetibouo et al., 2010). This is due to factors such as large numbers of small-scale farmers, high dependency on rain-fed agriculture, as well as extensive land degradation in some areas.

1.5 Context of study: Eastern Cape, Sinxaku Village, Ntabelanga

Sinxaku Green Village (see Figure 1.1), where this study is based, is located above the Ntabelanga Dam Catchment (see Figure 1.2) east of McClear village (see Figure 1.3) in the Eastern Cape (WRC report K5/2423).

Figure 1.1: Map showing the location of Sinxaku Village, Google Maps (n.d)

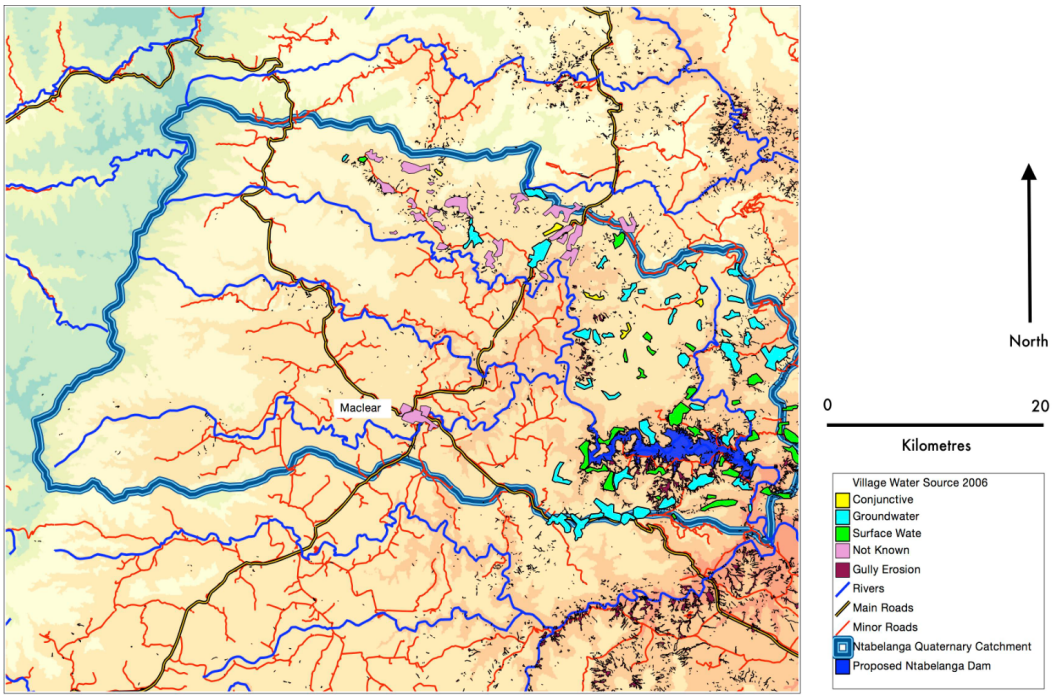


Figure 1.2: Map of Ntabelanga Dam catchment, Google Maps (n.d)

Maclear area where Sinxaku Village is located

Figure 1.3: Map showing Maclear were Sinxaku village is located (Google Maps, n.d)

The two Sinkaxu villages comprise seven enumeration areas (EAs): Upper Sinxaku, KwaMsobomvu, Zilandana in Upper Sinxaku, eSizindini, Maxesibeni and KuQulungashe in lower Sinxaku. Here young people (under the age of 20 years) comprise 36% of the total area population and older people (60 years and older) comprise 13% (Rowntree, 2015). The percentage of young people eligible for employment that are engaged in formal employment is very low – an average of 5% for the two villages (ibid.). The report further noted that those in employment are mostly in the formal sector with a significant number of people choosing not to work. This number includes stay-at-home mothers who are looking after their children or tending to their gardens (ibid.). The unemployment rate of those who are available for employment is on average 34% for the two villages (ibid.).

A major concern highlighted by Rowntree (2016) is the lack of access to clean and reliable water for village residents with about half of the houses in upper Sinxaku being linked to a water scheme, but only a tenth of those in lower Sinxaku where this study is based have access to a water scheme. A large infrastructure development programme is proposed for the area, namely the building of a dam, Ntabelanga dam. The average annual rainfall for the proposed Ntabelanga dam is estimated to be 700mm but it has a high variability (ibid.). The rain falls between October and March although any month can be wet. The driest month in terms of both

average and monthly rainfall is July. A major problem in the area is the highly erosive nature of soils developed on the Elliot mudstones and shales that are widespread in the lower areas of the catchment (ibid.).

The Green Village project is carried out in two villages in the headwater catchment of Uthukela and Umzimvubu catchment which were identified for research in the Tsitsa catchment above the proposed Ntabelanga dam (Rowntree, 2016). The proposed dam will be built in the upper reaches of the Umzimvubu river (ibid).

Figure 1.4: Map showing Mzimvubu River

Development of the area, with the express purpose of accelerating social and economic upliftment of the communities in the region, has been identified as a priority by the South African government (ibid.). The Mzimvubu River falls within the Mzimvubu-Keiskamma water management Area 12, with the Tsitsa River being one of the main tributaries of the Mzimvubu River (Van Tol et.al, 2016).

Villages like Sinxaku which lie in the former homelands of former Transkei and Zululand are characterised by high unemployment, low household incomes and limited access to basic services such as piped water and reliable energy for heating, cooking and lighting (Rowntree, 2016). Reliance on locally produced food has declined as soils have become impoverished and income from social security provides an allowance and possibly more reliable means to access staple food (ibid.).

My contextual profiling of Sinxaku village revealed that very little farming is taking place in the area, and most of it is being done by elderly women. As noted by the 2016 WRC Amanzi [Water] for Food report, most of the able-bodied men and women from Eastern Cape rural areas have relocated to cities in search of employment. Women are therefore a key group to target with initiatives aimed at boosting crop production as a way of ensuring food security in rural communities in the Eastern Cape (Lotz-Sisitka et al., 2016).

The Water Research Commission noted that formal water provision is outside the scope of the Green Village project Rowntree (2016). However, it should be feasible to use stabilising structures within gullies to harvest water at several points distributed through the villages. She further noted that garden cultivation has potential to improve family health and, in some cases, it is anticipated that it can provide additional income.

The Community Works Project (CWP)

> … is an innovative offering from government to provide a job safety net for unemployed people of working age. It provides a bridging opportunity for unemployed youth and others who are actively looking for employment opportunities. The programme provides them with extra cash to support them in their search for full-time or part-time employment. Programme participants do community work thereby contributing to improvements that benefit all community members. (Department of Cooperate Governance and Traditional Affairs, n.d)

The CWP members who participated in the Green Village training comprise a team of 24 young and middle-aged men and women from Maxesibeni and Qulungashe, which are located in Sinxaku village in the Ntabelanga Catchment Area.

An important factor identified in the Water Research Commission (WRC) Amanzi [Water] for Food Project knowledge mediation report (Lotz-Sisitka et al., 2016) was use of local languages applicable to farmers' contexts in trainings, so that farmers understand the rainwater harvesting and conservation practices. A challenge identified in the report is that current training is often detached from people's experiences in social-cultural contexts; training should be holistic, carefully situated and change oriented (ibid.). The report further noted that a challenge faced in the training of extension services and agricultural support was the issue of perceptions of agriculture; it is seen as unattractive to young people, and is seen amongst communities to be mainly relevant to elderly and poor people. As a solution to this challenge, Lotz-Sisitka et al. (2016) stated that there is a need in agricultural training and extension to raise a positive profile of agriculture, and to develop opportunities for youth around agriculture (ibid.). It was also

mentioned that there is a need to extend links with farmers' associations and local existing institutions (ibid.) indicating that there is a need to give attention to socio-cultural factors in knowledge mediation amongst farmers.

1.6 The significance of mediating communication linked to climate change and food insecurity in southern Africa

Organisations engaging in climate change communication expend significant resources promoting attitudinal change, but research suggests that encouraging attitudinal change alone is unlikely to be effective (Ockwell, 2009, p. 1). This view is supported by Rivers (2014) who stated that our challenges do not lie only with generating more understanding about complex socio-ecological situations or systems. She further noted that "our greatest challenge lies in supporting and changing practice towards being more sustainable" (p.16). In facilitating the sharing of knowledge amongst the farmers, NGOs should therefore seek to ensure that their choice of communication tools fosters learning and practice amongst the farmers. Rivers (2014) also observed that people do not become more responsive if they are simply given more and more information, no matter what form it is in. She argued that "what is needed is an investment in people's practice and building on these by mediating learning in response to practice and context" (p. 16).

Significant to this study, which has an interest in mediation and communication, Silverstone (2005) took a broad view of communication as an exchange of information through mediation, which in turn can influence the formulation, transfer, and reception of the shared information. Mediation processes allows for internalisation of externally available knowledge and concepts embedded in language and artefacts (ibid., p. 20). Castels (2007) went a step further stating that mediation techniques can include linear broadcast-style approaches, participatory and social media approaches, citizen-led approaches including street theatre and storytelling, and other forms of knowledge intermediary and brokerage work (p. 13).

An important aspect in climate change communication and mediation related to food security is the study of science communication on climate change. Kim (2012) pointed out that climate change offers serious challenges to the effectiveness of science, communication, and community (p. 268). It demands that we look back upon what we have done with regard to science and technology (ibid.). In addition, it leads us to examine human efforts invested to solve collective, shared problems by communication and community (ibid.).

Kim, in her paper on climate change, science and community observes further that a key challenge in climate change communication is the acceptance of scientific findings and then acting on these as a community. People's engagement with scientific knowledge on climate change is therefore a challenge that needs to be addressed by stakeholders working on issues around climate change education. For example, in a contextual analysis I conducted, I realised that a key challenge in communicating issues around climate change and food security is the translation of scientific words into local language which the farmers could understand.

An investigation of the mediation processes taking place within a training programme on rainwater harvesting and conservation can be useful in the development of effective adaptation measures to climate variability (Kim, 2012).

Below are the research questions that have guided this study.

1.7 Research question

The main research question was:

> How do mediation tools enable rural farmers' learning towards rainwater harvesting and food security?

1.8 Sub-questions

The main question can be divided into three sub-questions:

> 1) What mediation tools are being used to improve knowledge sharing and learning around rainwater harvesting and food security related to climate change?
>
> 2) How are these mediation tools being used to facilitate knowledge sharing and learning?
>
> 3) How is learning taking place because of the CWP farmers' interaction with these mediation tools?

The following section looks at the main concepts used in this study. A discussion of the main concepts in this study lays the ground for the discussion of my analytical and theoretical framework in Chapter 2.

1.9 Key concepts in this study

Key concepts in this study are communication, mediation, learning, and rainwater harvesting. Below is a short summary of each of these concepts.

1.9.1 Communication

Communication is an exchange of information through mediation, which in turn can influence the formulation, transfer, and reception of the shared information (Silverstone, 2005). Communication is the act or process of using words, sounds, signs, or behaviours to express or exchange information or to express your ideas, thoughts and feelings to someone else (ibid.). In this study I was interested in how knowledge on rainwater harvesting and conservation is communicated to the CWP members during the training. I was also interested in understanding the communication tools that were used during the training.

1.9.2 Mediation and mediators

Mediation involves internalisation of externally available knowledge and concepts embedded in language and artefacts (Silverstone, 2015). Such a process is often supported by mediators. The Common European Framework of Reference for Languages (CEFR) says that a mediator is "the language user not concerned to express his/her own meanings, but simply to act as an intermediary between interlocutors who are unable to understand each other directly" (2001, pp. 87-88). CEFR added that "the mediator is a social actor who monitors the process of interaction and acts when some type of intervention is required in order to help the communicative process and sometimes to influence the outcome" (ibid.). To play his/her role effectively, the mediator is required to interpret and create meanings through speech or writing for listeners or readers of a different linguistic or cultural background (Daniels, 1996). Here, the mediator takes on an active role as an arbiter or arbitrator of meaning. That means that s/he must decide on the meaning of something said or written (ibid.). In the case of this study, mediators will be the Green Village facilitators who are sharing knowledge on rainwater harvesting and conservation with the CWP members. The Water Research Commission and the Amanzi for Food Project are also mediators of meaning as they developed the learning materials used in the Green Village training programme.

1.9.3 Mediation, communication and learning

The theory of mediation as developed by Vygotsky (1978) (and other socio-cultural learning theorists have further developed his work) provides a useful theoretical lens with which to examine how mediated communication on climate change and food security is taking place and what learning and practice is taking place as a result. Vygotsky, writing in the 1920s, problematised the idea that knowledge was transferred from one person to another and that it will be understood and applied in the exact same way by everyone given access to the knowledge (Burt et al., 2014, p. 20). Vygotsky (1978) argued that cognitive development is a

process which is socially and culturally shaped as people internalise that which is represented in social and cultural forms (e.g. language, symbols, signs, and artefacts) and integrate this into their knowledge and activity (ibid.). In this study I am investigating the mediation processes and tools as mentioned in my research questions. I am particularly looking at the mediation tools used to facilitate knowledge sharing and learning and how these were used in the training programme.

Burt and Berold (2012) stated that mediation is often thought of in terms of a person facilitating knowledge with a group of people. Mediation can be both explicit, that is mediation that occurs though people, resources and training programmes, or implicit, that is mediation that occurs through culture, history, values, morals and beliefs (Rivers, 2013). I will look at both implicit and explicit mediation and how it occurred during the training. According to Burt and Berold (2012, p. 20), an understanding of mediation processes means:

> a) an understanding of practice, what we are trying to achieve, b) history of practice, how things were done in the past and how this influences the way we are doing things now, c) how knowledge is generated and shared in relation to a given practice, how did we learn to do what we are doing now, and what do we need to learn for it to be sustainable?

1.9.4 Learning

A very basic definition of learning refers to the changes in the behaviour of an organism that result from regularities in the environment of the organism (Domjan, 2014). Domjan (2014) defined learning as an "enduring change in the mechanisms of behaviour" (p. 17). Likewise, Lachman typified learning as a process that underlies or influences behaviour as it involves the communication of messages to the target group. This definition is, however, limited to concepts of behaviour modification, and has been significantly enriched and extended by socio-cultural theory, which I discuss in more detail in Chapter 2.

Daniels (2008) defined learning as a process involving knowing what we know and what this means for how we act in the world. According to Daniels (2008), "the relationship between the internal vision and the external world is what moulds and shapes what we influence, hurt and love" (p. 17).

He likened the learning process to "a relationship where the internal vision or image of the external object is defined by how we know it. Just as in any relationship, the internal vision or image of the external object, be it mother, child, lover or enemy, is defined by how we know it" (ibid.).

This two-way dynamic form of knowing is the relationship that creates us. This is at the core of learning as defined by Vygotsky (1978) in his cultural historical theory of learning. Within this theory, Vygotsky (1978) showed how mediation is necessary for internalising that which is produced externally, and which becomes available to us via language and cultural artefacts.

1.9.5 Awareness raising

Awareness raising is a process, which offers opportunities for information exchange to improve mutual understanding and to develop competencies and skills necessary to enable changes in social attitude and behaviour (UNESCO, 2006). To be effective, the process of awareness-raising must meet and maintain the mutual needs and interests of the actors involved (ibid.).

Burt and Berold (2012) also noted that learning occurs regardless of whether we know it is happening. They gave the example of an engineer or technician who might not necessarily consider if what they know about the world has a direct impact on their relationship with the world or how their knowledge affects others. The engineer may design a water harvesting technology that benefits the community's existing practices. Without learning, mediation and deliberation of how this technology relates to the community's existing social practices, the technology may remain underused. For instance, an observation they made was that in communities that were being supplied with rainwater tanks, many socio-cultural aspects of using the tanks, such as security, were not being considered. This affected the successful uptake and use of the rainwater tanks.

1.9.6 Rainwater harvesting and conservation

Rainwater harvesting (the accumulation and storage of rainwater) is already widely used throughout the world as a method of utilising rainwater for domestic and agricultural use (Denison et al 2011) . The International Water Management Institution (IWMI, 2003) defines rainwater harvesting as:

> The collection and/or concentration of runoff water for productive purposes. It includes all methods of concentrating, diverting, collecting, storing, utilizing and managing runoff for productive uses. Water can be collected from natural drainage lines, ground surfaces, roofs for domestic uses, stock and crop watering.

Although it has wide application for the provision of drinking water, water for livestock and water for irrigation, the percentage of households using rainwater harvesting in rural areas of South Africa is low (ibid.). However, with increasing populations and high unemployment, there is more pressure on agriculture to provide food. Rainwater harvesting has the potential to improve food production for communities who have a high dependence on agriculture (ibid.).

There are two major forms of water harvesting that are generally recognised in agriculture, see Figure 1.5 below. These are: (1) micro-catchment (in-field rainwater harvesting), collecting rainfall on the surface where it falls, and (2) macro catchment (ex-field water harvesting) which is a system that involves the collection of run-off originating from rainfall over a surface elsewhere (ibid.).

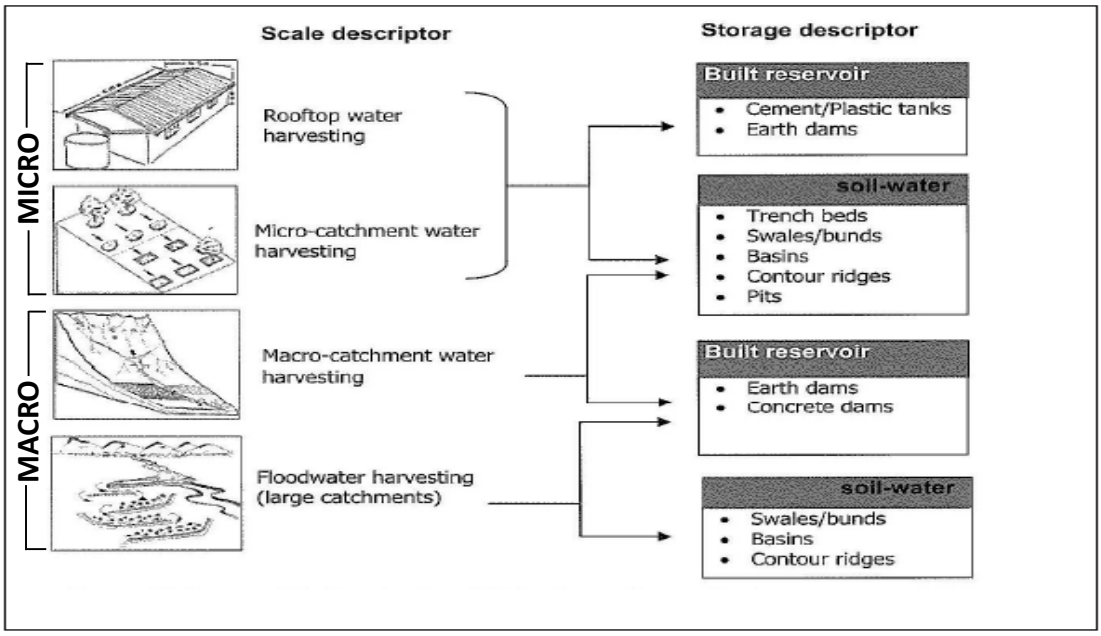


Figure 1.5: Proposed categorisation of water harvesting methods diagram (Denison & Wotshela, 2009, 18)

The term water conservation is used in different ways and requires a definition in the context of the study. Woyessa in Denison & Wotshela (2009) defined water conservation as "a reduction in runoff that result from practices that successfully increase the infiltration capacity of the soil, increase the contact time, and/or reduce surface sealing" (p. 4).

Practices of soil conservation that contribute to water conservation include covering the soil with dry organic materials (mulch), using cover crops and other practices that reduces evaporation or deep percolation (water percolation below the plant root zone) (Denison & Wotshela, 2009).

The concepts of rainwater harvesting and conservation are important to this study because I was looking at the learning processes within a training programme on rainwater harvesting and conservation practices. Examples of rainwater harvesting and conservation methods include:

1.9.6.1 Roof water harvesting

This method involves collecting rainwater from the roofs of houses for garden or household use. The water collected can also be used for biogas production (Denison et.al 2011). This method is widely practised in South Africa (ibid.)

1.9.6.2 Greywater harvesting

This involves harvesting and reusing water used in bathrooms, from washing and cleaning, and also from cooking and rinsing dishes (Denison et.al 2011). Non-toilet waste water from households is thus used to water the garden. The water can also be used for biogas production (ibid.)

1.9.6.3 Fertility pits

Run-off water can be captured and conserved in 1m deep pits filled with organic matter such as compost or manure (Denison et.al 2011). This soil conservation method increases the fertility of the soil and minimises water loss from evaporation (ibid.)

1.9.6.4 Diversion furrows

This method of harvesting rainwater involves directing runoff from gullies, grasslands and hard surfaces to croplands or into a storage tank (Denison et.al 2011). This increases the water available to plants and additional water is diverted to underground tanks for later watering (ibid.)

1.9.6.5 Trench beds

Trench beds are used to "harvest, conserve and use water" (Water Research Commission, 2018). Normally 1 metre deep and 2 metres long, they are packed with dry grass and leaves or compost, manure and soil (ibid.). Trench beds are used in food gardens and they create high fertility soils which can absorb and store water. They are often used with diversion furrows which collect water from adjacent areas and direct it to trenches (ibid.)

1.9.6.6 Mulching

This is a soil conservation method which involves spreading organic materials like compost, straw, manure, dry leaves, grass and wood onto the surface of the soil (Denison et.al 2011). Mulching reduces evaporation and can be used on all croplands. Advantages of using mulching include that they limit weeds and make watering easier by protecting the soil (ibid.)

1.9.6.7 Matamo/Ipitsi (homestead ponds)

These are small-scale ponds used to store runoff; the water can be used for irrigation or livestock (Denison et.al 2011).

1.9.6.8 Roof tanks

These are small-scale water storage tanks for domestic use or irrigating small to medium cropping areas (Denison et.al 2011).

1.10 Overview of the study

The next chapter, **Chapter 2**, introduces the conceptual and theoretical framework. The chapter explores a key concept in this study, that of mediation. I drew on studies conducted around mediation in water management processes to build my argument as to why it is important to look at mediation tools and processes within training interventions on food security and sustainable agricultural practices. In drawing on previous studies conducted on mediation tools and processes, I was particularly looking at and reflecting on some of the enablers and constraints to learning and practice within the training interventions. This chapter builds the main argument in my thesis which states that mediation processes within training programmes in community contexts should be strengthened as a way of ensuring the effectiveness of the training programmes and that learning materials used in training programmes should be relevant to the people that are being trained. In this chapter I introduce third-generation cultural historical activity theory and the interaction between the two activity systems in this study as this provides a theory of mediation relevant to the context in which I did my research.

Chapter 3 explains the research methodology used in this study. The chapter discusses the different ways used in generating data in order to answer the research questions. It also explain the analytical framework and describe how third-generation Cultural Historical Activity Theory (CHAT) analyses (Engestrom, 1987) and the double stimulation framework (Sannino, 2015) were used to analyse data. The third-generation activity system analyses helped in mapping out the different elements of the two activity systems in this study, while the double stimulation analytical framework assisted in refining my analyses of how learning was taking place from the training. In this chapter I also explain how I addressed validity and ethical considerations.

Chapter 4 presents data collected to address my research questions. This chapter was guided by the analytical framework, namely the double stimulation framework and the CHAT third generation activity system analyses through which I mapped out the different elements of the

two activity systems, and identified interactions between the two activity systems as they were working towards realising the shared object of improving food security for the CWP group. The chapter drew on the conceptual framework of mediation to illuminate the learning that took place in the training programme. I conclude by providing a summary of the factors that impacted on the mediation tools and processes.

Chapter 5 I critically analyse my findings as a way of drawing out the learning processes that occurred during and after the training. The chapter therefore links findings from my literature review to the evidence from my data and my theoretical framework in order to develop analytical statements which summarise my research findings. This chapter answers my research questions drawing from the findings in this study. Recommendations for further research are provided at the end of each section of this chapter.

1.11 Conclusion

This chapter presented the context, the key concepts used and the research questions that are guiding this study. The chapter thus provides an overview of what the study is about and how I am working with the different concepts and theories in exploring the concept of mediation and how this is helping me track the learning processes in the study. The following chapter considers different studies conducted on mediation and learning, and how different authors looked at the mediation tools and processes and explained how these impact on learning

CHAPTER 2

Theoretical Framework: Learning and Mediation Tools

2.1 Introduction

This chapter reviews related studies on learning and mediation tools. I start off by discussing literature on learning processes in the water management sector. I also discuss factors that enable or constrain learning and practice of water management and sustainable agricultural practices. I then move on to discuss the mediation theories and how the theories' views on learning processes is essential in analysing mediation tools and processes in this study. I also introduce Cultural Historical Activity Theory's three generations of mediated action and the Double Stimulation Analytical framework, and how I apply it in this study. This chapter thus discusses the theoretical and analytical framework informing the study.

2.2 Learning processes in sustainable agricultural practices

Research indicates that there are a number of reasons why people learn sustainable agricultural practices. These include to increase food production and for income generation (Mukute, 2009). Mukute's (2009) study on Cultural Historical Activity Theory, Expansive Learning and Agency in Permaculture Workplaces noted that a person's background and social upbringing can motivate their interest in farming. Thus a person is likely to also want to practise farming if he or she grew up in a family which practised farming. As mentioned in Chapter 1, in this study I am investigating the use of mediation tools by the Green Village project facilitators during the training. I am particularly looking at how the mediation tools were used to facilitate learning, how the CWP farmers engaged with the mediation tools, what factors impacted on the CWP farmers engaging with the mediation tools, what factors impacted on the CWP farmers' learning and practice of rainwater harvesting and conservation practices. I am also looking at how learning took place following the completion of the training programme.

Additionally, an understanding of the context and challenges faced in a community is important for facilitators to know when designing training interventions. This can inform the design and suitable training interventions for the challenges identified. A key challenge identified by Mukute (2009) was that of a mismatch between participants' training needs and the training programmes that facilitators bring in. This can potentially lead to the failure of a training programme as participants may not be interested in fully participating in such training.

Before implementing a training programme, facilitators should therefore understand the context and challenges faced by the target group.

A study which looked at learning processes within a community context was conducted by Masara (2010). His study focus was on "how rural communities learn to commercialise natural resource products" (p. 1). His study is similar to this study, in that both studies look at the learning processes within rural communities in the Eastern Cape in South Africa (ibid.). The study shed light on factors that can potentially enable or constrain learning and practice in a community context. These factors are mostly contextual factors such as social, political and cultural factors. A good understanding of how these factors impact on learning processes is important as it provides a basis for my analyses of how learning occurred during and after the Green Village training programme.

Masara's study further noted that "social learning in intervention workshops is supported by different knowledge bases of participants" (ibid., p.1); thus, by implication in a training programme such as the Green Village training with CWP farmers, the introduction of new concepts on rainwater harvesting and conservation should complement the knowledge that the farmers already have on these practices. Masara's study offers insight into analysing how mediation tools were used together with knowledge from the training programme to enhance famers' learning and practice. In this study, I looked at how the CWP farmers' local knowledge of farming influenced their farming practices. This information assisted me in understanding the various mediation tools used by the CWP trainers and farmers to improve knowledge sharing and learning around rainwater harvesting and food security related to climate change.

A study on learning processes within Integrated Water Resources management (IWRM) that was undertaken by Phiri (2011) also sheds light on learning processes in community contexts. Phiri's study revealed that learning happens all the time and that people learn through social processes they engage in daily. Thus, according to Phiri, people learn from engaging with other community members in their everyday food and water practices. They also learn from social interactions and conversations where they share knowledge, experiences and best practices. In this study, I draw insights from Phiri's study in seeking to understand the various ways that the CWP farmers learnt rainwater harvesting and conservation concepts and practices from mediation tools used in the training programme.

Phiri's study also highlights the importance of involving participants in decision-making processes when designing training interventions. This helps in fostering ownership and

acceptance of ideas and information shared. This view is particularly important as the success of the Green Village training programme may be related to its acceptance and ownership by CWP members. This could be evidenced in the CWP members' rainwater harvesting and conservation practices.

Phiri's (2011) study highlighted some of the challenges that exist in community learning contexts. These challenges are mostly contextual factors that influence participation and learning. These include power relations, language, education levels, culture, history, policy, knowledge and attitude, among others. These challenges, according to Phiri (2011), impact on ways in which communities learn. In this study, I was particularly interested in looking at ways in which these factors act as mediation tools in facilitating the sharing and learning of knowledge on rainwater harvesting for enhancing food security among the CWP members.

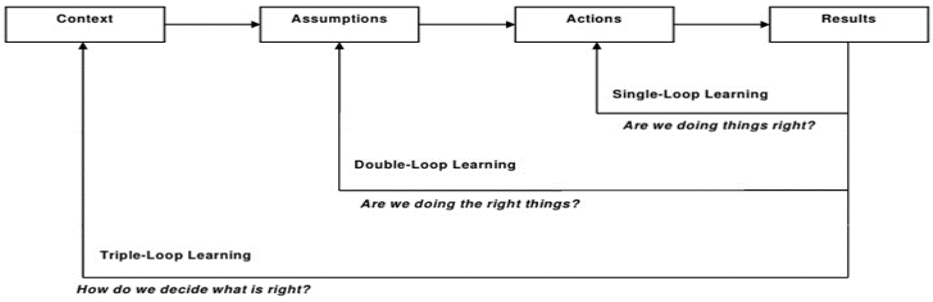
2.3 Social learning processes in water management and sustainable agricultural practices

According to Bandura (1977, 1986), there are many definitions for social learning. These definitions can be categorised into two: namely, individual learning and organisational collaborative learning (ibid.). Individual learning happens in people's everyday interactions while collaborative learning involves "long-term interactions between stakeholders, ongoing deliberation, and the sharing of knowledge in a trusting environment" (Cundill & Rodela 2012, p. 9).

Pahl-Wostl et al.'s (2008) study investigated the relationship between social learning and culture in sustainable water management practices. Lee and Krasny (2015) noted that learning does not occur in the head, but through people's social interactions and cultural practices. They also noted evidence of higher learning in advanced adaptation strategies for dealing with floods and drought. I anticipated that there may be evidence of learning among the CWP members which would be reflected in a change in their farming practices. For example, should the CWP members use some of the knowledge and strategies of harvesting rainwater from the training as a way of mitigating the impacts of water shortages resulting from drought? This could indicate that learning took place from the training.

Another finding from Pahl-Wostl (2008) study was that there is need to create a balance between top-down and bottom-up processes. Thus, in training programmes, knowledge sharing should be two ways, that is knowledge being shared by the facilitator as well as the participants sharing their knowledge amongst each other.

Much of the research on social learning in the area of natural resource management focuses on models and approaches that guide social learning in water management practices (Cundill and Rodela, 2012). For example, Cundill and Rodela (2012) gave examples of the adoption of learning theories such as community of practice and Bateson's three levels of learning (1979) namely: single-, double-, or triple-loop learning. Figure 2.1 below is an illustration of Bateson's three levels of learning.



- Single-loop: Change the action
- Double-loop: Change the assumption
- Triple-loop: Change the context and commitment

Figure 2.1: Bateson's three levels of learning (Bateson, 1979)

I have drawn insights on learning processes from Bateson's three levels of learning. Bateson's framework on learning assisted me in understanding the type of learning that occurs, for example, evidence of single-loop learning could be witnessed by the CWP members practising rooftop rainwater harvesting after the training. Double-loop learning could be observed in terms of stakeholder behaviour, for instance if the CWP members were using artificial pesticides to chase away pests but after the training, they started using natural methods of pest control, they would have learnt from the training programme; this could be evidence of double-loop learning.

Burt and Berold (2012) defined social learning as an activity that we engage in all the time simply by participating in collective activities and social practices that make up our daily lives. This type of learning involves engagement with practice. "Thus, how people learn from each other as they participate in water practices can transform the way that knowledge is thought about in the water sector. This is because the focus of these theories is not only in providing information, but also on collectively transforming practice" (Burt & Berold, 2012 et al., p. 9). The social learning concept also describes the individual as an active agent in development.

This alludes to learners being active agents in learning and development processes and not passive recipients of information.

Lotz-Sisitka, Belay and Mukute (2012) noted that very little research has been done on learning and mediation leading to "ontological collapse" in social learning research. This means that social learning research does not describe the how of mediation processes, giving mainly insights into the outcomes of social learning. I am particularly looking at how mediation tools were being used to facilitate knowledge sharing and learning by the Green Village facilitator and how learning was taking place because of the CWP farmers' interaction with these mediation tools.

Lotz-Sisitka et al. (2012) further noted that this has consequences for participation in social learning processes in water and land management. They noted that this is because it is in the detailed mediation interactions that real participation occurs as people engage with each other and with more experienced others to form new knowledge and capabilities for action in relation to their existing contexts and practices (ibid.).

Burt and Berold (2012) explained that individual and long-term interactions with stakeholders are important in influencing learning processes. I am of the view that where the aim of these interactions is to introduce new interventions aimed at changing people's practices, there is need for sustained interactions as these build relationships based on trust amongst the people involved.

Materials used in training programmes are important mediation tools as their relevance determines the success of a training programme. Lupele's (2003) study on participatory materials development highlights the importance of adopting a participatory approach when designing community based interventions. The focus of Lupele's study was on ways in which "community members in Chieftainess Chiawa's area (a community context in rural Zambia) participated in the development of learning resources in response to environmental issues that affected their livelihoods" (p. 8). In Lupele's study, training materials such as posters were developed in a participatory manner using "action research orientation and process" (p. 85). A number of insights associated with participatory materials development in community contexts emerged from this research. These included "the influence of factors such as social and political structures, ethnicity, language and literacy, local knowledge in the development of materials" (ibid., p. 86). I find these factors essential to this study of mediation tools and their influence on learning. For example, language and concepts used in manuals that are given to participants

during the training is an important mediation tool as it impacts on the participants' ability to learn and implement the rainwater harvesting and conservation practices they read about in the manuals.

The presentation of the materials was taken into consideration in the designing of the materials in Lupele's (2003) study. He stated that the learning materials were presented in the form of "briefs (descriptions of visual expressions) and the briefs were subjected to critical reviews" (p. 86). Lupele raised an important issue of how the materials were presented, particularly taking into consideration the people that the materials were developed for. In a community context where most people's literacy levels are low, it is important to make more use of visuals and illustrations as these help in improving understanding of the concepts introduced.

Also part of the materials development process in Lupele's study was the design of new ideas and suggestions for change. These were made by participants collectively. Another workshop then set out to gather the opinions of community members on the draft materials with a view to improving them. In looking at the various stages that were followed in the designing of the training materials, it is possible to say that the process was quite rigorous, and it presumably required a lot of capital investment as well. The various stages outlined by Lupele (2003) in the process of material development are important in laying a strong foundation for implementing developmental programmes.

Having discussed views on social learning processes as advanced by different scholars, the following section will look at CHAT's conceptualisation of learning. The theory's conceptualisation of learning will assist me in looking at learning processes within the training programme. In this study I chose to use Cultural Historical Activity Theory's analysis and double stimulation analytical framework to investigate how learning took place

2.4 CHAT conceptualisation of learning and development

A CHAT conceptualisation of learning and development provides useful insight on learning and mediation processes. Daniels (2008, p. 136) stated that CHAT provides a bridging theory for investigating agricultural extension through three interrelated ways of learning, namely:

1. Scaffolding, where the learner moves to the next level of understanding with the assistance of a more knowledgeable other who leads the learner to mastery.

2. Cultural interpretation of learning, where a more knowledgeable other uses instructional conversation to help a novice make connections between his or her everyday knowledge and scientific knowledge

3. Collectivist interpretation of learning, where a group of people with different experiences and perspectives work together on the same object and seek to jointly develop new knowledge or tools to address the problems (Daniels, 2008)

The CHAT bridging theory assisted me in tracking the mediation processes that occurred in the training programme. It also shed light on the different forms of learning that the CWP members went through during the training.

Vygotsky, in Daniels (2008), stated that "people construct knowledge, they do not passively reproduce what is presented to them, thus learning is more than a mirror as it involves learners creating their own meaning" (p. 137). Vygotsky's views on knowledge construction and learning assisted me to understand how the CWP farmers were learning from their interaction with the mediation tools used by the Green Village facilitators during the training programme.

Vygotsky studied Piaget's early work on thought and learning which provides an interesting perspective on learning and development (Daniels, 2015). Piaget argued that knowledge is not always constructed but that it is co-constructed and thus learning involves more than one human being (ibid.). However, as argued by Daniels (2015), Vygotsky's views on learning differ from Piaget's views in his early writing, in that he viewed learning as having the potential to impact on development. Where learning is relevant to the needs of participants, it can potentially lead to development in line with Vygotsky's argument.

Thus, according to Vygotsky who was also inspired by Marx, the process of learning and development is shaped by people's interactions in their everyday lives (Daniels, 2008). In looking at learning processes, Vygotsky, in Daniels (2008, pp. 136-137), noted that

> the material and communicative circumstances obtaining at the beginning of the twenty-first century presented new challenges for conceptions of learning. These challenges are themselves mediated and shaped by the culturally and historically understandings of learning that have been developed and are available at specific moments in time and space.

A concept that assisted me in tracking learning processes in this study, was the "zone of proximal development" (Daniels, 2008, p. 137). According to Vygotsky, in Daniels (2008), the zone of proximal development is the "distance between the actual development level as

determined through problem solving under adult guidance or in collaboration with more capable peers" (p.137).

The 'zone of proximal development' therefore refers to learning which occurs with the help of others (Daniels, 2008). Thus, as noted by Daniels (2008, p.137), the zone of proximal development refers to the relationship between the "learner and a supportive other". In a classroom setup, for example, the zone of proximal development would be reached when the learners are able to read with the help of their teacher. In this instance, learning occurs with the help of a more knowledgeable person who is the teacher. The 'zone of proximal development' assisted me in investigating ways by which the CWP members learned about rainwater harvesting and soil conservation methods related to food security and climate change, from the mediation tools used by the training facilitator. Independent problem solving is evidence of a learner having reached the zone of proximal development and learning of a higher level is evidenced by a learner being able to solve problems with guidance from an adult or in collaboration with more knowledgeable peers (Daniels, 2008).

In this study, the zone of proximal development was observed from the activities taking place during the training, for example, during group discussions and at the demonstration site, the CWP members could assist each other in understanding scientific concepts being introduced by the facilitators. For example, one of the CWP members could explain their understanding of a soil conservation technique to other members and thus assist them to have a better understanding of the concepts introduced. Where the CWP members applied the knowledge, they would have gained in their farming practices. This could possibly indicate that learning has occurred with the help of their peers, thus pointing to the achievement of the zone of proximal development. The zone of proximal development can also be achieved even if that other is not physically present in the learning context at that point in time (Daniels, 2008). An example of this was when the CWP members practised some of the soil conservation methods they learnt from other training in their farming practices.

Important to this study are the implications of the zone of proximal development for learning (Daniels, 2008). According to Vygotsky, the implications of the zone of proximal development are that "it causes educators to rethink how to intervene, what mediation or action to take that will help children make their next step into understanding" (ibid.). Applying this viewpoint to this study, I observed how learning facilitators intervened and their mediation actions when the CWP farmers faced challenges during the training programme.

2.5 The development and expansion of the process of mediation

In this section I provide a detailed account of mediation theory and how I use it in this study. The emphasis of mediation theory is on the development of meaning (Wertsch, 2007). With an emphasis on meaning making in Vygotsky's work, an understanding of psychological tools moved from an initial instrumental form to an emphasis on the development of meaning (ibid.).

According to Daniels (2008), the concept of mediation has gained support from a wide range of contributions (ibid.). Wertsch in Daniels (2008) noted that

> Mediated action typically serves multiple goals and that these may often come into conflict with each other. For example, in many classrooms children are given what are unambiguous tasks, such as problem solving in mathematics or science. However, when such problem solving is enacted it may take place in a context where complex matters of identity formation are in play. In some classrooms girls may not wish to present themselves as too adept at mathematics for fear of being positioned as socially unattractive. Boys may not wish to be seen to be trying too hard lest they be perceived as 'uncool'. (p.61)

At the centre of Wertsch's work "is the idea of a basic description of agency as 'individual(s) acting with mediational means'" (Daniels 2008, p. 61). Wertsch offered an analytical framework, which focuses on three central considerations:

(1) agents and their cultural tools, for example, language used by participants in a training programme;

(2) mediated action or 'agent-acting-with-mediational means', for example, community relations among learners as they would be working with the knowledge gained from the training to improve their farming practices;

(3) the link between action and broader cultural, institutional and historical contexts, for example, farmers could be practising rainwater harvesting and conservation practises as a way of improving their water and food security. (Daniels 2008, p. 61)

Wertsch's analytical framework assisted me in investigating the interaction amongst the object, subject, community and the mediation tools (see sections 4.7 and 4.8) within each activity system and how this impacted on learning and mediation processes.

Wertsch, in Daniels (2008), described ten properties of mediated action that govern the interactions between the elements, the understanding of which can aid analysis. These claims provide an account of affordances and constraints to the process of mediated action as follows:

1. There is an irreducible tension between the agent and the mediational means (tools).
2. The materiality of mediational means.
3. Action has multiple, often conflicting goals.
4. Mediated action is historically situated.
5. Mediated action provides both affordance and constraints on action.
6. New tools transform action because they determine the structure and flow of action.
7. Mastery of tools involves following the patterns, the cultural, historical and institutional requirements of a tool.
8. Appropriation of tools which refers to making one's own the affordances and constraints inherent in the tool.
9.Consumption of tools in ways that are no longer applicable in a given situation and time can impede performance.
10. Power and authority are to varying degrees inherent in tools. (Daniels, 2008, p. 62)

A study closely related to my research focus was done by Burt and Berold (2012) who investigated mediation and change-oriented learning in water management practice. Their study noted that community-based water management practices should consider who is mediating (Burt & Berold, 2012). This could be NGO workers, water affairs officials, teachers, community members or others who may be interpreting and explaining scientific information to communities (ibid.).

The role of the mediator is important in ensuring easy comprehension of knowledge shared. What is being mediated should also be considered (Burt and Berold, 2012); this could be tools such as knowledge resources, learning materials, representations of scientific information. This study therefore builds on Burt and Berold's (2012) propositions.

2.6 Mediation tools and processes

The Russian cultural-historical school of social theory developed in the wake of Vygotsky's contributions. It placed emphasis on the need to "develop robust theories and methodologies which would enable social scientists to study the ways in which humans both shape and are shaped by the artefacts which mediate their engagement with the world" (Daniels, 2008, p. 10). In this study, I examined the various ways in which artefacts such as diagrams, flip charts and language were used to mediate learning and practice of rainwater harvesting and conservation methods during the training.

Knox and Stevens, in Daniels (2008, p.10), noted that "Vygotsky was stating that humans master themselves from the 'outside' through symbolic, cultural systems". What needs to be stressed here in his position is that it is not the tools or signs, in and of themselves, which are important for thought development, but the meaning encoded in them (ibid).

> The type of symbolic system embedded in the tools should not matter, as long as meaning is retained. For instance, all systems (Braille for the blind and for the deaf, dactylology or finger spelling, mimicry or a natural gesticulated sign language) are tools embedded in action and give rise to meaning as such. They allow a child to internalise language and develop those higher mental functions for which language serves as a basis. (Daniels, 2008, p. 15)

Firstly, it speaks of the "individual as an active agent in development". This alludes to learners being active agents in the learning and development process and not passive recipients of information (Daniels, 2008)

Secondly, it "affirms the importance of the sociocultural context in that development takes place using tools which are available at a time in a place" (ibid., p. 15). The here is on the use of mediation tools in influencing learning and practice. Vygotsky distinguished between "psychological and other tools and suggested that psychological tools can be used to direct the mind and behaviour" (ibid). An example where the introduction of a mediation tool influenced learning is within the Imvotho Bubomi Learning Network under the Amanzi for Food project in the Eastern Cape. Here introduction of a whatsapp group where farmers could share information and ideas on different farming practices facilitated learning and practice of rainwater harvesting and conservation methods. Information on these practices was shared widely via the whatsapp group amongst the members of the learning network.

Linked to mediation tools are mediation processes. The mediation processes encompass individual and collective agency and the historical influence (Daniels, 2015). The introduction of new tools into a human activity system transforms its functioning (ibid.). Thus, tools such as language, culture and historical products mediate thinking and feelings are in turn transformed through their use in the human activity (ibid.). For example the introduction of roof top rainwater harvesting can transform the way people collect and store rainwater. Thus through the use of tanks and containers to collect water from the roof, farmers are able to secure more water for their gardens and for household use.

In describing the mediation process that learners go through, Mukute (2009) stated that knowledge mediators assist learners to link local knowledge they have with scientific knowledge that they bring in a way that enables the learners to practise what they would have

learnt. Mukute noted that "much of farmers' learning has a practical orientation and includes learning by doing, observing, trying, and innovating" (2009, p. 8). Thus, training interventions with farmers should incorporate many hands-on and practical activities as mediation tools and processes.

Mukute (2009) further noted that

> Farmer learning is influenced by both intrinsic and extrinsic factors. Extrinsic factors include the need to produce adequate safe and nutritious food for the household and a surplus to generate income; to improve their resource base for their own good and for the benefit of future generations; and to generate ecological services. Some farmers have taken up the 'trade' because "it is in their veins" or they have a passion for it; or because of a concern for the future of the people and the Earth...or because of a disposition to farm. (p. 8)

Vygotsky distinguished between a tool and a symbol (Daniels, 2015). He described a tool as technical and altering "the process of natural adaptation by determining the form of labour operations", a sign as psychological and altering "the entire flow and structure of mental functions" (ibid., p. 137). Bernstein has suggested that "the metaphor of the 'tool' itself serves to attract attention away from the relation between its structure and the context of its production" (ibid., p. 17). An example of a mediating tool in this study would be a rainwater tank. An example of a sign would be the language used in facilitating the training.

Vygotsky provided an understanding of artefacts as carrying out different functions. For instance, they could be both material and ideal and circulate between inner and outer worlds in which meaning is developing. An example of material tools in this study are learning materials used during the training, namely posters, manuals, tanks, mulch, flip charts, among others. Examples of ideal tools could be concepts of rainwater harvesting and conservation such as tied ridges, trenches, rooftop rainwater harvesting and *gelesha*. *Gelesha* is the "practice of turning the ground ready to catch and hold the rain before planting" (Amanzi for Food website, n.d.).

Different mediation tools serve different purposes, for example, flip charts can be used to illustrate a rainwater harvesting concept or technique. A demonstration site, on the other hand, can be used to support what was learnt by providing the practical side. Mukute (2009) highlighted the importance of diverse mediating tools for facilitating farmer learning in ways that accommodate a plurality of knowledge and perspectives. He noted that mediating tools have different uses with some suitable for sharing explicit knowledge, for example, books and training manuals, while others are suitable for communicating abstract or experiential

knowledge (ibid.). Tools that are good for communicating experiential knowledge include demonstrations, look-and-learn visits, and experimentation (ibid.). Mukute also described different mediation tools that could be used in learning processes, and how each of these tools aid learning and practice.

The language used in the materials is also an important mediating tool, especially when tracking mediation processes within a community context. Dalvit, Murray and Terzoli, in Masara (2012), noted the importance of language as a mediating tool for learning and teaching. They noted that learning materials are more relevant to participants when they are written in their local language. The following section will carry the discussion on mediation forward by focusing on implicit and explicit mediation.

2.7 Implicit and explicit mediation processes

Wertsch introduced the concepts of implicit and explicit mediation which also seek to explain further mediation processes in training interventions (Daniels, 2015). Wertsch, in Daniels (2015), distinguished between explicit and implicit mediation as follows:

> Explicit mediation involves another person directing an individual overtly and intentionally by introducing a "stimulus means" into an ongoing stream of activity. Thus, the materiality of the stimulus means, or signs involved tends to be obvious and non-transitory. Wertsch contrasts this with implicit mediation which he sees as a feature of the cultural historical phase of Vygotsky's work… (p. 180)
>
> Implicit mediation typically does not need to be artificially and intentionally introduced into ongoing action (as in explicit mediation). Instead, it is part of an already ongoing communicative stream that is brought into contact with other forms of action. (p. 183)

In this study, for instance, explicit mediation tools took the form of the training facilitators materials and activities and their way of teaching and sharing knowledge on rainwater harvesting and conservation with the CWP group. An example of implicit mediation tools in this study is the use of past experiences of food production.

Wertsch stated that one of the properties that characterises implicit mediation is that it involves

> … signs, especially natural language, whose primary function is communication. In contrast to explicit mediation however, these signs are not purposefully introduced into human action but emerge from the purpose of organising it. Instead, they are part of pre-existing, independent stream of communicative action. (Daniels, 2015, p. 184)

Daniels (2015) further noted the constant changes that mediation tools may go through. He noted that some mediation tools may become explicit at different moments in time while some forms of mediation tools may only become explicit after considerable time has passed (ibid.).

Speaking on implicit and explicit mediation, Hasan, in Daniels (2015,) noted that:

> Participation in social practices, including participation in discourse is the biggest boot strapping enterprise that human beings engage in. Speaking is necessary for learning to speak, engaging with contexts is necessary for recognising and dealing with contexts. This means that the contexts one learns about are the contexts that one lives, which in turn means that the contexts one lives are those which are specialised to one's social position. (p. 153)

This statement draws attention to the importance of understanding the context one is working in, in order to design training initiatives that are suitable to that context. This argument advances the case for an account of the structuring of the discourse in relation to that of implicit and /or invisible semiotic mediation.

Rivers (2012) explored the implicit and explicit mediating processes within the social learning of women's food and water security practices in the rural Eastern Cape, South Africa. Implicit mediation tools identified by Rivers (2012) included when one of her research participants, Nomathemba and her husband shared knowledge on plants, soil and water with other community members. Examples of explicit mediation tools in Rivers' study included learning how to draw water out of a reservoir when the water level was low. Another example of an explicit mediation tool is when Nothemba and her husband invested in gardening tools so as not to be constrained in their practice by relying on tools from others (Rivers, 2012).

As noted by Rivers (2012) an understanding of the implicit and explicit mediation processes alerts researchers to the sociocultural dynamics inherent within social learning processes and therefore informs how learning resources, educational and development programmes should be designed and implemented (ibid.). In line with Rivers' (2012) argument, this study will explore the explicit and implicit mediation processes that shape learning among the CWP farmers.

Adding another dimension to the study of mediation processes, Hasan and Bernstein, in Daniels (2015), provided "a sociological perspective to the concept of mediation and allude to invisible semiotic mediation" (Daniels, 2015, p. 202). What they term "invisible semiotic mediation is concerned with the ways in which the unselfconscious everyday discourses mediate mental dispositions, tendencies to respond to situations in certain ways, and how it puts in place beliefs about the world one lives in" (ibid.). Leander, in Daniels (2015), noted that it is difficult to draw sharp distinctions between semiotic and material artefacts. He stated that it is difficult not to find at least some material dimensions in all mediation means. He argued that:

> the materiality of artefacts is always deeply embedded in their ideational (cultural and historical) meanings … Thirdly, transformations between semiotic and material realizations of any artefact are in constant flux, as are the realizations of any artefact as internal (e.g., mental models, scenarios) or external (charts, diagrams, material tools). (Daniels 2015, p. 202)

2.8 Factors impacting on learning processes and practices

2.8.1 Cultural historical factors

Vygotsky, in Daniels (2015), referred to the development of a person's mental process as being shaped by cultural and historically developed artefacts and mediation tools. An example of a historically developed artefact or mediation tool in a farmer's context would be traditions and beliefs around certain agricultural practices. Thus Engeström (1987), drawing from Vygotsky and Leont'ev among others, developed his concept of an activity system for understanding how people operate within the socio-cultural context within which they continuously interact. Learners' behaviour is therefore shaped by various factors which may include their past experiences and local knowledge and beliefs around certain farming practices.

2.8.2 Socio-cultural factors

According to Wertsch, cultural tools are in themselves powerless and only have impact when agents use them (1998, p. 30). The statement carries an important reminder about the focus and methods for research on learning. With his concern for the materiality of means (including speech), he underlines the way in which the material properties of tools can illuminate "how internal processes can come into existence and operate" (Wertsch, 1998, p. 31).

Research on mediation and learning in southern Africa shows that social, cultural and economic factors can enable or constrain social learning in a rural community context (Masara, 2010; Mukute, 2010). Similarly, Silo's (2009) research on children's participation in school-based waste management activity systems showed how cultural factors constrain and shape expansive learning in southern African sustainability-oriented activity systems. Findings from Masara's (2010) study added an interesting dimension to community learning processes. He noted that learning interactions take place through formal processes such as meetings, training workshops, conversations and interactions with outsiders. In this study, I specifically look at how learning took place from training activities and practical sessions introduced during the training.

Phiri's (2011) study noted that people learn from 'external groups' or training programmes which bring new knowledge and expertise, but these need to be contextualised in the local

communities of practice (ibid.). In light of the observations above, I concur with Masara and Phiri as I am of the view that learning occurs in various ways ranging from people's everyday interactions to learning in a training workshop setting and from practical activities.

2.8.3 Language plays a central role in mental development

Vygotsky viewed language as a mechanism for thinking and as the most important means by which knowledge is passed from one generation to another (Daniels, 2008). As noted by Vygotsky in Daniels (2008), language enables us to make sense of the world. A study of language as a mediating tool within a training programme is important as it determines the extent to which people understand what they would have been taught and are able to incorporate it in their farming practices.

2.9 Cultural Historical Activity Theory: Activity systems

An activity system comprises of the object of activity, the subject involved in the activity, mediating tools and artefacts relevant to the activity, rules and procedures that shape participation in the activity, the community relevant to the activity and the division of labour involved in carrying out the activity (Engeström, 1987). Cultural Historical Activity Theory (CHAT) is a learning and development theory, which focuses on how people learn from social interactions and from those who are more knowledgeable in the process of collectively generating knowledge (Mukute, 2015), building on Vygotsky's work.

The subject refers to the person engaged in an activity (ibid.), for example in this study individual members of the CWP group form the subjects of the activity system. Within an activity system, a subject can also refer to a collective subject such as a team whose agency is motivated towards the solution of a problem or purpose (Engeström, 1987).

Following Vygotskian 'genetic tradition', a historical analysis in the development of an activity is adopted in which contradictions are thought of as sources of change and development (ibid.). In this study, I attempt to bring out these contradictions within the two activity systems as a way of identifying factors that impact on the CWP farmers learning of rainwater harvesting and conservation practices. Engeström saw the "construction and redefinition of the object as related to the creative potential of an activity" (1999, p. 381). The third generation of activity theory aims at developing conceptual tools to understand dialogues, multiple perspectives and networks of interacting activity systems (Daniels, 2008).

A critique of Engeström's (1996) work is that within activity theory, the production of the outcome is discussed but not the production and structure of the tool itself (Daniels, 2015). The rules, community and division of labour are analysed in terms of the contradictions and dilemmas which arise within the activity system, specifically with respect to the production of the object (ibid.). However, the production of the cultural artefacts and the discourse itself is not analysed in terms of the context of its production; that is, the rules, community and division of labour that regulate the activity in which subjects are positioned (ibid.).

2.10 Three generations of the Cultural Historical Activity Theory

The first-generation activity theory was developed by Engeström (1987) from Vygotsky's theory of mediation (Daniels, 2008). Vygotsky viewed "the concept of mediation as being central to his account of social formation" (1978, p. 87). Mediation thus serves as the means by which the individual acts upon social, cultural and historical factors in the course of ongoing activity (ibid.).

In this study, I looked at the role played by mediators in sharing knowledge on rainwater harvesting and conservation. The mediators were the Green Village lead facilitator and the local translator who was translating from English to Xhosa during the training. In this study, I looked at ways through which the CWP food gardeners' background, culture and history impacted on their learning and practise of rainwater harvesting and conservation method.

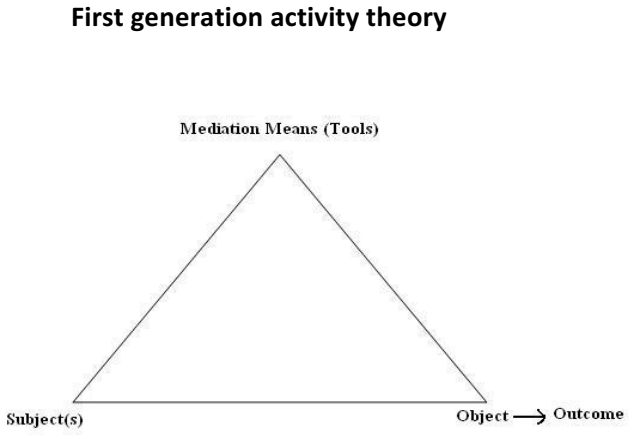


Figure 2.2: First generation activity theory (Daniels, 2015)

First-generation activity theory examines work and learning within a historically evolving activity system (Daniels, 2008). The focus of the first-generation activity theory is on "culture

as a mediating tool that shapes people's actions" (ibid.p.208). Thus, culture is viewed as having the potential to transform relationships, influence people's own and other's behaviour and develop their worldviews. According to Engeström (2001, p.134), "an individual could no longer be understood without his or her cultural means and society could no longer be understood without the individuals who use and produce artefacts". For example, in farming most of the knowledge that farmers have emanates from their culture as they would have gained this knowledge from their forefathers and those who have passed it on.

An example of first generation activity theory in the CWP activity system would be the CWP member or members using knowledge from rainwater harvesting manuals that are in isiXhosa. These manuals carry cultural knowledge from the Green Village facilitators and other stakeholders who developed the materials. The CWP members would be using mediating tools such as manure and grass which were historically used to fertilise the soil. The object would be to increase food production for their family consumption and for selling as a way of generating income.

The first-generation activity theory posits that learning takes place through internalisation of knowledge in two stages namely: interpsychological and intrapsychological (Daniels, 2008). Vygotsky stated that: "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological) (ibid., p. 134). Thus, according to Vygotsky, learning takes place collectively in people's social interactions before it transfers to an individual level. In a workshop set-up, for example, where farmers are being trained on innovative ways of growing their crops and increasing their produce, learning occurs collectively during the workshop as people discuss issues and sharing knowledge and ideas on what they know. This information is then internalised by individual farmers, who then later use this knowledge to improve their farming practices.

Vygotsky, in Daniels (2008), referred to the development of a person's mental process as being shaped by cultural and historically developed artefacts and mediation tools. An example of historically developed artefacts or mediation tools in a farmer's context would be their traditions and beliefs around certain agricultural practices. Engeström, drawing from Vygotsky and Leont'ev (1978; 1981), among others, developed his concept of an activity system for understanding how people operate within the socio-cultural context with which they continuously interact (Daniels, 2001). Learners' behaviour is therefore shaped by various

factors which may include their past experiences, local knowledge and beliefs around certain farming practices.

The first-generation activity theory speaks about the 'zone of proximal development' which is also important for understanding learning and development processes as referred to earlier in section 2.3. The second generation of activity theory refers to the work of Leontiev (Daniels, 2008). The theory focuses on the learning process that occurs when people take part in collective activity (Mukute, 2017). Whereas the first-generation activity theory focused on individual activity, the second-generation activity theory focuses on activities that are done collectively as a way of achieving a set target or goal (Engeström, 1987). The theory thus focuses on processes and relationships between people and their community as they would be working towards achieving a set object (Daniels, 2001). Figure 2.2 below illustrates second generation activity theory.

Within the second-generation activity theory, the unit of analysis are mediation tools or artefacts (Engeström, 1999). Within this activity system, the focus of the study of mediation is on its relationship with other components of the activity system (ibid.). The modelling of a single activity is articulated in terms of the rules, community and the division of labour (Engeström, 1987) in relation to the subject, mediating tools and object of activity as shown in Figure 2.3 below.

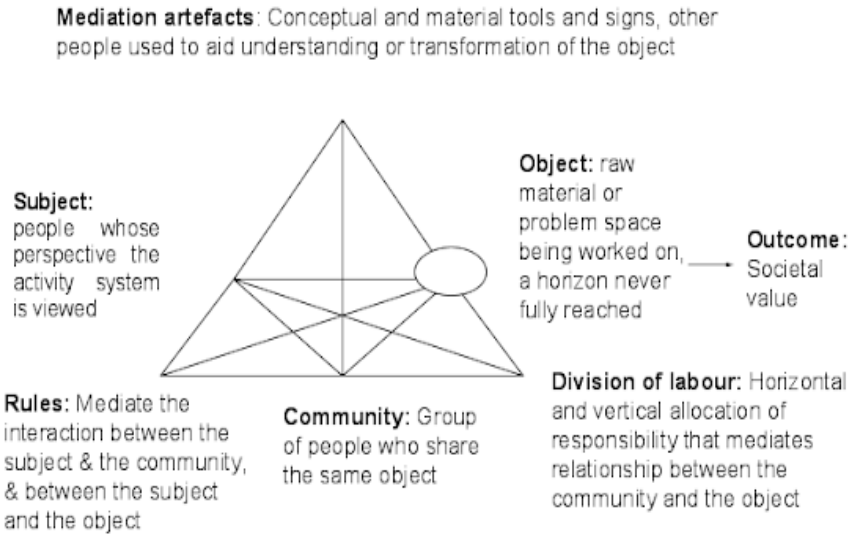


Figure 2.2: The Structure of second generation human activity theory mode

Figure 2.3: Structure of second generation human activity theory (Engeström, 1987)

A limitation of the second-generation activity theory is that it only focuses on one individual activity at a time (Cole, 1988). Another critique of the second-generation activity theory is that it does not take into consideration cultural diversity (ibid.). The third-generation activity theory, which I use in this study, focuses on the interaction between two or more activity systems and a shared object of activity.

Third-generation activity theory presents a more holistic process of learning. Its focus is on the social relations and interactions between two or more activity systems using mediation tools or artefacts (Engeström, 1995). Third-generation activity theory is object oriented and has the potential to enable expansive learning (Mukute, 2017). It assisted me with understanding the interactions between the CWP members and the Green Village facilitators and their use of different mediation tools as they were working towards realising the shared object of increasing food productions and income generation. Third-generation activity theory emphasises collective learning processes amongst different actors, organisations and cultures that have a shared object (Mukute, 2015).

The third-generation activity system goes beyond the limits of a single activity system and takes, as its unit of analysis, the plurality of different activity systems that mutually interact, promoting multiple perspectives and voices, dialogues and collaboration between activity systems (Yama-zumi, 2006). In this study I considered the dynamics amongst the Green Village project activity system and the CWP food gardeners' activity system and how each element within the activity systems relates to other elements, with an emphasis on the mediation tools. The relations between the subject and the object are mediated by tools, artefacts, rules, the division of labour and the community in each activity system, but mediation tools from one activity system can influence those from another activity system.

The three generations of activity theory portray development of the activity theory and the contribution thereof of each generation. Cultural historical activity theory (CHAT) is a learning and developmental theory which encompasses "intergenerational knowledge transmission", learning from more knowledgeable others and collective generation of knowledge and innovations (Mukute, 2015, p. 25)

The success of the learning processes within the third generation activity theory results in boundary crossing which comprises solution development (Engestrom, 1995). Engestrom (1987) argued that the focus of mediation within the third generation activity systems should be on its relationship with other components of the activity (Daniels, 2008). For example, in

this study, I looked at how Green Village facilitators used the demonstration site to illustrate the different ways of practising soil conservation methods (see Chapter 4 and 5).

Within third -generation activity theory, analyses should focus on the interconnectedness and relationships between the subject, object, tools, rules, community and the division of labour (Daniels, 2008). All these elements work together towards the realisation of the outcome, which is to increase food security in the case of this study. I explore in detail the various elements of the two activity systems. A detailed account of these elements and their interactions is outlined in Chapter 4. The third-generation activity theory as illustrated in Figure 2.4 below represents the social/collective elements in the activity system through the elements of instruments, community, rules and division of labour while analysing their interactions with each other (Engeström, 1999).

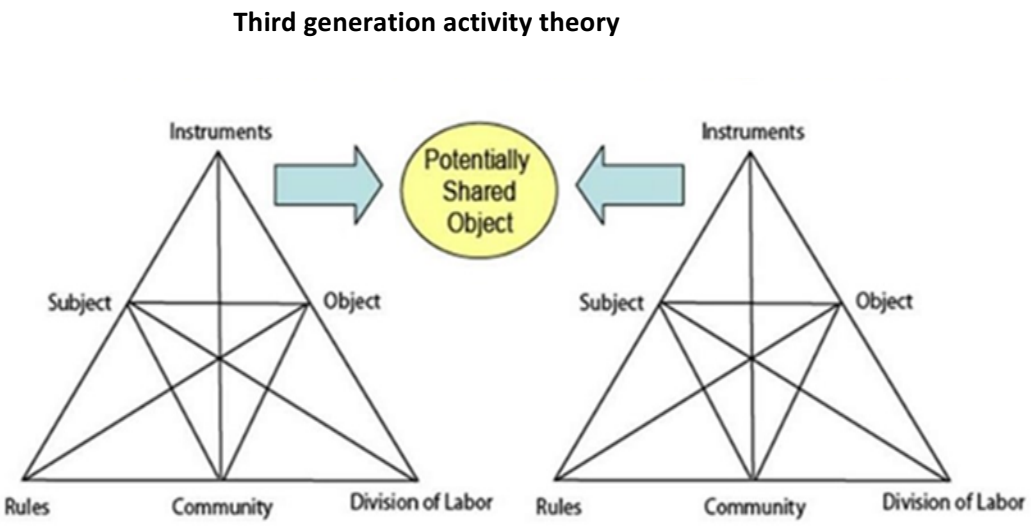


Figure 2.4: Interaction between two activity systems (Engestrom, 1987)

As outlined above, Engeström explained the development of three generations of activity theory (Daniels & Warmington, 2007). I use the third-generation activity theory of mediated action, although I borrow ideas from the other two generations of the activity theory to develop my thoughts on mediation and learning processes.

According to Engeström (1999), the process of mediation is conceptualised from its context; "it then moves to the modelling of a single activity in a setting that is mediated by rules, community and the division of labour" (p. 121).

In analysing the relationship between the various elements within the two activity systems, I look at production processes whereby the object is being used to satisfy a need that the subject has (Engeström, 1999); for example, within the CWP activity system, the CWP members' farming activities could be aimed at generating income which the CWP members could use to buy food to feed their families. According to Engeström (1999), production can also involve consumption related to the individual's abilities and means of production.

In analysing the interactions among the various elements of the two activity systems, I also looked at consumption process which, according to Engeström (1999), aims at satisfying a given need, for example, growing a food garden could be a way for the CWP members to ensure food security for their families.

In analysing the relationship between the different elements of the activity system, Engeström (1999) talked about the distribution process, which could entail the distribution of instruments of production and distribution of members of society among different kinds of production. For example, in this study, distribution could be in the form of division of labour among the CWP members as they would be working in the community garden.

Processes of production, distribution, exchange and consumption therefore form the totality within an activity system (Engeström, 1999).

2.11 Overview of the application of CHAT in this study

Activity theorists seek to analyse the development of consciousness within practical social activity (Daniels, 2008). Vygotsky's views provide useful insights into how people learn in other context, for example in this study, I will use some of his insights to investigate the mediation process in the training programme. Vygotsky was therefore interested in the idea of the social nature of the human mind (ibid). For Vygotsky (1930) the key concepts were consciousness and communication. Likewise, this study focuses on the communication and learning processes within a training programme. I refer to these communications and learning processes as mediation processes as discussed in detail above.

2.12 Double stimulation is an analytical tool

The process of double stimulation refers to the way in which human behaviour is regulated (Engeström & Sannino, 2010). Volition involves participants committing to something and it is a characteristic of higher mental functioning (Engeström & Sannino, 2010). According to Engeström and Sannino (2010), the process of double stimulation is "central to expanding

learning and human agency" (ibid., p. 2). The process begins with conflict of motive which is resolved through volitional action or will. The process of double stimulation thus begins with identifying a problem and acting aimed at resolving that problem. Within an activity system for example, if community members are faced with a challenge of water shortage (conflict of motive), using jojo tanks to store rainwater can be viewed as a volitional action aimed at addressing the challenge of water shortage.

Double stimulation processes are aimed at changing human behaviour. According to Engeström and Sannino (2010, p. 2), the process of double stimulation comprises conflictual aspects and conflicts of motive which constitutes the core of strategic setup that human beings establish to intentionally affect their behaviour and the world around them. The process of double stimulation is therefore aimed at coming up with ways of addressing key challenges that are faced by people.

Vygotskian double stimulation is interested in the use and development of conceptual tools/artefacts – ideas and practices that change our understanding of a problem and our responses to it (Sannino, 2015). Vygotsky argued that all higher mental functions, including volitional action, rely on mediation connected with the use of signs as auxiliary devices to solve psychological problems (ibid.)."These two interpretations lead to a model which may enrich our understanding of double stimulation and open up interesting new avenues for further research" (Sannino 2015, p. 2). In describing the role of the learner, Sannino (2015) stated that

> Within this perspective of teaching experiments, the experimenter's involvement is described also as an active pursuit of the desired instructional goal: "the 'teacher' or experimenter is actively trying to attain the goal of the subject's learning a new task. In the process, the input and guidance provided by the 'helper' serve as a basis for stimulus input, of which some become used as stimulus-means. (p. 2)

This interpretation of the double stimulation process is related to Vygotsky's Zone of Proximal Development, where a learner is able to grasp a concept with the help of another person. Blunden (2010) explained the learner's involvement in collaboration with the subject. He described the role of the experimental subject or learner as having an influence in the way in which mediational means are created with the intention of changing individual action" (Wertsch, 1991, p. 32). Thus, mediation tools or symbols are used to shape human action.

Double stimulation according to Van der Veer (2001), lays ground for actions. Critiques of Vygotsky's work (Engeström, 2011; Valsiner, 1988) expand further the concept of double stimulation and states that the concept of double stimulation gives freedom to participants to

do tasks themselves and not simply solve something. Thus, the concept of double stimulation lays the foundation for action (Sannino, 2015).

Engeström (2011) stated that initially the process of interpreting a situation is linear with the learner interpreting a situation as an experiment where one is supposed to follow the set rules. He goes on to say that "however, by using external cultural artefacts such as the clock, the participant is able to change the situation and take agentive action" (p. 611). The clock will thus be used as a stimulus to influence a certain behaviour. The emphasis on double stimulation is on the construction of the task itself. Wertsch (1991) added another dimension to the reconceptualisation of the stimuli and stated that the experiential subject has the more profound meaning according to which "mediational means were created with the express intent of shaping individual action" (Wertsch, 1991, p. 32). Thus, according to Wertsch, mediation tools are drawn with the intention of imparting meaning to the participants.

The concept of double stimulation developed in response to Vygotsky's work. The concepts present commentaries and interpretations of Vygotsky's work as it is situated within the cultural historical activity theory. Double stimulation is understood as

> … a particular method of experimental investigation … using two groups of stimuli … One group of stimuli has the function of a task toward which the activity of the experimental subject is directed, whilst the other takes on the function of signs which help to organize the activity. (Vygotsky, as cited in Sannino, 2015)

Thus, the first stimulus is aimed at addressing a challenge faced within an activity system, while the second stimulus makes use of tools to address the problem. Sannino (2015) critiqued Vygotsky's work on mediation, saying he looked at the concept of double stimulation unsystematically. According to Sannino (2014), Vygotsky's work referred to:

> Second stimuli but does not mention double stimulation or equivalent terms. No comprehensive account was left by these authors which would cover the different types of experiments conducted and the broad theoretical implications of their results. The fragmentation in these texts is due most likely to the academic, historical and political circumstances in which the works of these authors were conducted. (p. 32)

The concept of double stimulation refers to everyday practices and process used by people to undertake difficult actions (Engeström & Sannino, 2010): "For example, counting to yourself before jumping into cold water resolves the conflict between being cold and staying warm, alarm clocks resolve the conflict of a tired person to get out of bed".

Double stimulation can be used as the means to promote volitional action (ibid.), that is how is it used in everyday life/professional practices to help people gain control in situations where

this control is lacking (e.g. parental support, social service support etc.) For example, tying a knot in a handkerchief resolves the conflict between remembering and forgetting (ibid.). The process of double stimulation thus uses mediation tools to influence behaviour change or act as a reminder.

A critique of the double stimulation concept is that it is more positivist and experimental and may not be able to surface mediation processes at a deeper level (Engeström & Sannino, 2010). Furthermore, the analytical tool is said to be more westernised and may be limited in its application to the African context (ibid.). But for purposes of this study, the concept of double stimulation allows me to refine understanding of mediation processes. It also provides me with a descriptive tool to track learning in this study. Using both mediation theory and double stimulation as an analytical tool allowed me to get a deeper understanding of how learning occurred within the training programme.

An important aspect of double stimulation to look for when analysing data using the analytical tool, are volitional action and conflict of motive. Volitional action is when people are using culturally available artefacts to gain control or to gain volitional action (Engeström & Sannino, 2010). Engeström and Sannino (ibid.) also highlighted the link between volitional action and mediation. They stated that volitional action is never a direct, unmediated process, but that it is mediated by tools and symbols. These mediation tools are what people use to make decisions and take action.

Engeström and Sannino (2010) emphasised the concept of volitional action where they stated that:

> Volition is the key factor in all activity, all abilities… The whole building will collapse if, while taking pleasure only in the external trimmings and decorations, you forget to add the cementing substance to your work, that is, if you do not bind together the new possibilities, which you have developed to your pupils, with an organic link: free will (pp. 220-221).
>
> Behind the play of stimuli–responses, what really occurred was active intervention of man in the situation, his active role, his behaviour which consisted in introducing new stimuli. And this is exactly what comprises the new principle, the new unique relation between behaviour and stimulation (ibid.).

This relationship between behaviour and stimulation is closely linked to the mediation process which is the focus of this study. The relationship between behaviour and stimulation as explained above, helps in analysing ways through which participants engage with the mediation

tools in a certain context, how they create meaning from the mediation tools and how they use that knowledge to change their practices (Sannino, 2015).

Sannino (2015, pp.1-15) distinguished between voluntary and volitional, and stated that

> A voluntary refers to the possibility of deliberate choice, while volitional has the connotations of strong will demonstrated by overcoming obstacles. This distinction points at the general quality of "voluntariness" in all higher mental functions, on the one hand, and on the specificity of volitional actions stemming from conflicts of motives, on the other hand (Sannino, 2015, p.1-15).

An important aspect of volitional action pointed out by Leont'ev in Sannino (2015) is the presence of obstacles: "If an action is carried out without obstacles, it cannot be volitional" (p. 80) and "a volitional act is an act carried out under conditions of poly motivation, when different motives have different affective signs, that is, some are positive, and others are negative" (p. 82). Problems or contradictions are important concepts to look for when studying for mediation processes within an intervention. In analysing conflict of motives, it is important to look at what is bothersome within an activity system and what are the interesting scenarios of decision-making that exist within the activity system (Sannino, 2015).

The second stimuli has a special mediating function and must be distinguished from the occurrence of more than one (first) stimuli that presents a problem or conflict. To do something we need "stimulus that will allow us to move ourselves" (Sannino, 2015). Lotz-Sisitka (2017) gave an example of the Environmental Learning and Research Centre where people find themselves challenged with transforming to sustainable practices such as being able to effectively recycle materials. The second stimuli can therefore be used to direct or control one's actions, for example, by introducing a more effective way of recycling materials.

The second (auxiliary) stimuli assist in a variety of ways:

- Helping to organise behaviour and render visible relevant information in or for remembering
- Helping a participant or group to conceptually re-interpret a situation in a new and potentially expansive way.
- Helping to support remembering. (Sannino, 2015)

Of interest to this study is how these elements help to shape learning and practice of rainwater harvesting and conservation techniques.

2.13 Conclusion

This chapter has discussed key debates and discussions pertaining to this study. The chapter also discussed key concepts within my research namely, mediation, communication and learning. I have attempted to discuss the concept of mediation from the perspectives of different scholars. I have also discussed the mediation processes and learning and how this occurs in a social setup. The discussion on mediation and mediation processes sets the foundation for the following chapter, which discusses the methodological framework for this study. The following chapter will present the research methodology adopted for collecting and analysing data.

CHAPTER 3
Research Design and Methodology

3.1 Introduction

In this chapter I discuss the different ways I generated data which would answer my research questions. I also explain the analytical framework where I used third-generation activity system analyses and the double stimulation framework to analyse my data. The third-generation activity system analyses helped me to map out the different elements of the two activity systems, while the double stimulation analytical framework assisted me to refine my analysis of how learning was taking place from the training. In this chapter, I also explain how I addressed validity and ethical considerations.

The research methodology used in this study is aimed at answering my research questions copied below for easy reference:

How are mediation tools being used in a project setting to mediate rural farmer learning in relation to food and water security?

This questions was guided by the following sub-questions that were guided by the CHAT methodology:

1) What mediation tools are being used to improve knowledge sharing and learning around rainwater harvesting and food security related to climate change?

2) How are these mediation tools being used to facilitate knowledge sharing and learning?

3) How is learning taking place because of the CWP farmers' interaction with these mediation tools?

3.2 Research paradigm: Interpretative study

This research is constituted as an interpretative study using CHAT methodology. Neuman (2006) defined an interpretative study as a study which assigns significance or coherent meaning to the data collected. When analysing data within an interpretative case study, the researcher draws on and attaches meaning to the collected data (ibid.). This data can be in the form of words, quotations, or descriptions of an occurrence (ibid.). In presenting data in this study, I first of all gave an outline of the Green Village training. I then outlined the different elements of the two activity systems that I studied. I used thick descriptions in the form of

quotations, to describe how the CWP members were learning rainwater harvesting and conservation methods (see Chapter 4)

According to Metzler (2014), an interpretative researcher thus looks for frames that shape meaning. Researchers in this paradigm are thus sensitive to the role of context (ibid.). Trauth (2001, 219) further noted that an interpretative researcher attempts to understand phenomena through the meanings that people assign to it. Metzler (2014) also noted that an interpretative paradigm does not concern itself with broadly applicable rules and laws, but seeks to produce descriptive analyses that emphasise deep, interpretative understanding of social phenomena. Thus data from observations, focus group discussions and individual interviews assisted me in understanding the enablers and constraints to learning from the training as well as the socio-cultural factors impacting on learning and practice of rainwater harvesting and conservation methods.

Using an interpretive research paradigm allowed me to analyse the influence of participants' social-cultural background on their learning and practice of rainwater harvesting and conservation methods. In analysing these entities, I used a CHAT analytical framework, which focuses on the relationship between the subject, object, community, rules and division of labour to categorise and analyse data. Using a CHAT analytical framework, I was able to analyse the relationship or interaction between these elements and the mediation tools used in the study. How learning took place was deduced from my analyses and interpretation of the data collected. Garrick (1999, p. 149) summarised the fundamental assumptions of an interpretative study as follows:

- Individuals are not considered to be passive vehicles in social, political and historical affairs but have inner capabilities that allow for individual judgements, perceptions and decision making autonomy (agency).
- The belief that an event or action is explainable in terms of multiple factors, events and processes.
- The world is made up of multifaceted realities that are best studied, recognising the significance of the context in which the experiences occur.
- Inquiry is always value laden and that such values influence the framing, focusing and conducting research.

These assumptions underlie all elements of interpretative study (Metzler, 2014). In my analyses of the mediation processes within the training, I was not only interested in the outcome of the

training, but in the learning processes, particularly looking at how the participants engaged with the mediation tools. Factors such as the participants' social cultural and historical background were analysed as mediating tools to the learning and practice of rainwater harvesting and conservation methods. Having outlined the research paradigm for this study, the following section discusses the case study methodology used in this research.

3.3 Research Design: Case study methodology

A case study researcher typically observes the characteristics of an individual unit (Cohen & Manion, 1989, pp. 124-125). The purpose of such observation, according to Cohen and Manion (1989), is to probe deeply and to analyse intensively the phenomena that constitute the life cycle of the unit with a view to establishing generalisations about the wider population to which that unit belongs (ibid.).

Other researchers define a case study as the study of an instance in action (MacDonald & Walker, 1975). Stake (1995, p. 2) defined a case study as "the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances". Similarly, Yin (1984), a leading exponent of case study in the social sciences, defined a case study as an inquiry into the real-life context, as opposed to contrived contexts of experiment or survey. A case study enquiry "copes with technically distinctive situation in which they will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulation fashion" (Yin, 1984, p.13). Case studies are used mostly to contribute to our knowledge of individuals' or organisations' social, political and related phenomena (Yin, 2015). Likewise, a case study analysis assisted me in understanding the factors that impact on learning and practice of rainwater harvesting and conservation methods in the Green Village project in one village. Hamilton and Whittier (2012) stated that case studies in educational research enhance understanding of contexts, communities and individuals. Yin (1994, p.13) further noted that "a case study benefits from the prior development of theoretical propositions that guide data collection and analysis".

As indicated in Chapter 1, this study was developed as a case study of the Water Research Commission (WRC) Green Village rainwater harvesting and food security mediation work. Within this case, I focused on one community site, namely Sinxaku village, which is an area above the Ntabelanga Dam Catchment, located east of McClear village in Eastern Cape (see section 1.4).

3.3.1 Types of case studies

Stenhouse, Ruddick and Hopkins (1985, p.50) identified "four broad styles of case studies namely: ethnographic, evaluative, educational and action research study". An educational case study is:

> when researchers are concerned with understanding educational action. They are concerned with enriching the thinking and discourse of educational theory or by refinement of prudence through the systematic and reflective documentation of evidence" (ibid).

This study is an educational case study as it focuses on investigating the mediation processes within a training programme on rainwater harvesting and conservation, as mentioned above. Recommendations from the study are discussed in detail in Chapter 5; these could potentially inform future community-based trainings in environmental education.

3.3.2 Quality criteria for a good case study

Social science researchers such as Flyvbjerg (2006) have emphasised the importance of real life practical methods of learning such as those found in case studies to be more useful in studying human behaviour than theoretical, context independent knowledge. Some researchers, however, have argued that there is need for both general theoretical knowledge and concrete practical knowledge in strengthening the validity of a case study (Christensen & Hansen, 1987).

Commenting on the learning processes within a case study, Flyvbjerg (2006, p. 292) statesd that "more credible experiences can be achieved through continued proximity to the studied area and via feedback from those under study".

In using case studies, it is difficult to try and prove the effectiveness of an issue under study (Eysenck, 1976); rather it is better to look at individual cases with the hope of learning something. "Proof is hard to come by in social sciences because of the absence of hard theory whereas learning is certainly possible" (ibid., p. 393). Likewise, I investigated the learning processes within the training programme as opposed to analysing the effectiveness of the training. Evidence of learning within my case study was deduced from follow-up interviews and observations of CWP food gardeners' farming practices following the training.

I solicited feedback on how the CWP farmers learnt from the training as a way of improving the credibility of my research findings and thus ensuring the quality of my case study analyses. Flyvbjerg (2006) further noted that greater distance to the object of study and lack of feedback stifles the learning process and distorts research findings; thus using a case study methodology can effectively address this challenge.

3.3.3 Criticisms of the case study methodology

Yin (1994, p. 9) recognised that within the academic community, there is opposition to the idea of case studies on the grounds of their "lack of rigour" and "little basis for scientific generalizations". I ensured rigour in this study by endeavouring to provide as much evidence as possible of how learning took place during the training.

Yin (1994) went on to say that case studies take too long, and they result in massive, unreadable documents (ibid., p. 10). Furthermore, he noted that "good case studies are very difficult to do" (ibid., p11). In my analyses of the Green Village training, I sought to ensure rigour by using different methods of data collection to investigate the learning processes.

For instance, I used observation and interviews to investigate ways through which the CWP members used the knowledge from the training to improve their farming practices. I also audio recorded the whole three-day training session as a way of keeping a record of the learning processes within the training. I used thick descriptions from the interviews and focus group discussions, as well as data from my observations.

Walker's in Maxwell (1998) concerns with case study methodology are that "a case study can be an uncontrollable intervention in the lives of others and that it can give a distorted view of the world". He also argued that case studies "embalm practices which are always changing" (p. 10). I am aware of the challenge of intervening into the lives of the CWP food gardeners; thus, in this study I interviewed participants and got their first-hand responses on their learning processes.

Having outlined the strength and weaknesses of case study methodology and how this study addressed these in ensuring quality for my case study, the following section considers the application of the CHAT analytical framework.

3.4 Application of Cultural Historical Activity System analysis in this study

CHAT provided me with theoretical lenses to identify the mediating tools and processes within the training on rainwater harvesting and conservation. I used both second and third generation activity systems to present the different elements of the activity system analyses that mediate learning on rainwater harvesting and conservation practices in the context of Sinxaku village CWP project.

The second-generation CHAT helped in identifying the social-cultural factors that influence learning and practice of rainwater harvesting and conservation practises. I also used the second-

generation activity theory to explore the relationship between the mediation tools, the subject, object, rules, community and division of labour (ibid). For example, I analysed the relationship between the CWP group's culture (mediation tool) and how they divided work amongst themselves as they were working on their food garden (division of labour). I also looked at the relationship between the mediation tools, the rules, community and division of labour. While third generation CHAT analyses revealed the relationship between the two activity systems. Daniels and Warmington (2007, p. 377) observed CHAT's intention to "develop conceptual tools to understand dialogues, multiple perspectives and networks of interacting activity systems".

In tracking learning processes within the training, I looked at the interaction among the various elements of the two activity systems in this study, namely the CWP activity system and the Green Village activity system. A short description of each of these elements is provided in the Table 1 below.

Table 3.1: Summary of the various elements of the activity systems in this study

Subject	**Individual**
Mediating artefacts or tools	Conceptual tools such as manuals, flip charts, language, culture, history and others. Physical tools such as demonstration sites, grass, soil and water
Rules	Collective rules or individual rules and these could include government legislation, land ownership rights, cultural rules such as traditional ceremonies practised in December
Community	Various stakeholders in the study including government departments, Rhodes University, neighbours interested in buying produce from the CWP members community garden
Division of labour	Labour distributed between collectives or between individuals within an activity system such as watering the garden, digging trenches, attending training workshops
Object	Purpose or motives for subjects, for example, to increase food production
Outcome	The result of an object, in the case of the CWP members it could be sustainable livelihoods

Adapted from Engestrom (1987) and Daniels (2001)

Firstly, I looked at the interaction between the subject and the mediation tools within the CWP activity system. I looked at how the CWP members (subject) were engaging with the mediation tools which comprised conceptual, material and physical tools. I also looked at how the CWP members were using these mediation tools to achieve their object of increasing food production. Thus, my first stage of analysis was at the production level where I studied how the subject was using the mediation tools to achieve their object.

In studying the mediation process, I also looked at the intermediation tools and other elements within the activity system. For example, I looked at the interaction between the community and the mediation tools. I looked too at the relationship between the mediation tools and the division of labour. For instance, how the CWP members delegated tasks amongst themselves as they were working in their community food garden. Figure 3.1 below outlines the various elements of a human activity system.

The structure of the human activity

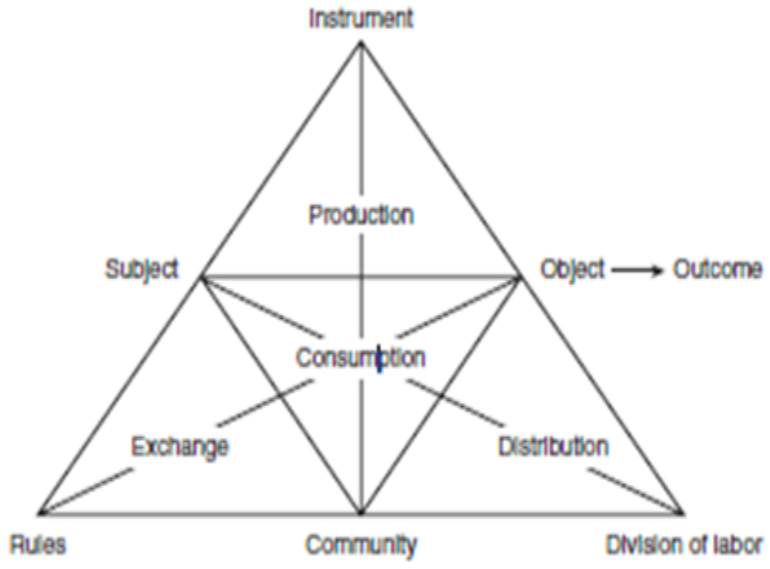


Figure 3.1: The structure of the human activity system (Engestrom, 1987)

Some of the main mediation tools that I studied and their use during the training include the training itself. The training was used as a mediating tool to share knowledge on rainwater harvesting and conservation. I also studied the training facilitators as mediators of meaning as they were using mediating tools such as flip charts, diagrams and manuals to illustrate some of the rainwater harvesting and conservation methods that the CWP members could use to improve their farming practices. Other mediation tools within the CWP activity system

included practical sessions at the demonstration site, ecological factors, local farming knowledge of the CWP food gardeners.

Linked to mediation tools are the rules and regulations guiding the activity system analyses. Within the CWP food gardeners' activity system, I looked at how the CWP members worked together and how they allocated duties amongst themselves in the work they were doing. Other rules that I considered in this study included the governance of and availability and utilisation of farming resources. An outline of how these different elements where used in mediating learning during the training, is presented in Chapter 4.

I looked at the interaction between the CWP activity system and the Green Village activity system as highlighted above. The Green Village activity system refers to the training programme as it was used by the Green Village facilitators to share knowledge on rainwater harvesting and conservation. The subject within the Green Village activity system was the Green Village facilitators who shared knowledge on rainwater harvesting and conservation with the CWP group. I also looked at the mediation tools they were using in sharing knowledge; these included the demonstration site, practical activities used during the workshop and material tools such as grass.

In looking at ways in which the Green Village facilitators were using these mediation tools to facilitate learning and practice in this study, I was able to track the mediation processes taking place during the training. Key mediators within the Green Village activity system included the Green Village lead facilitator and interpreter. Language was also a key mediator of meaning. I looked at how the lead facilitator and the local translator used Xhosa and English to facilitate knowledge sharing and learning of rainwater harvesting and conservation methods. An analysis of the two activity systems also provided me with insight into how the CWP members were interacting with the mediation tools used during the training. Understanding the interaction between the two activity systems also shed light on how learning took place during the training. Below is a diagram of the interacting activity systems (see Figure 3.2).

Third generation activity theory

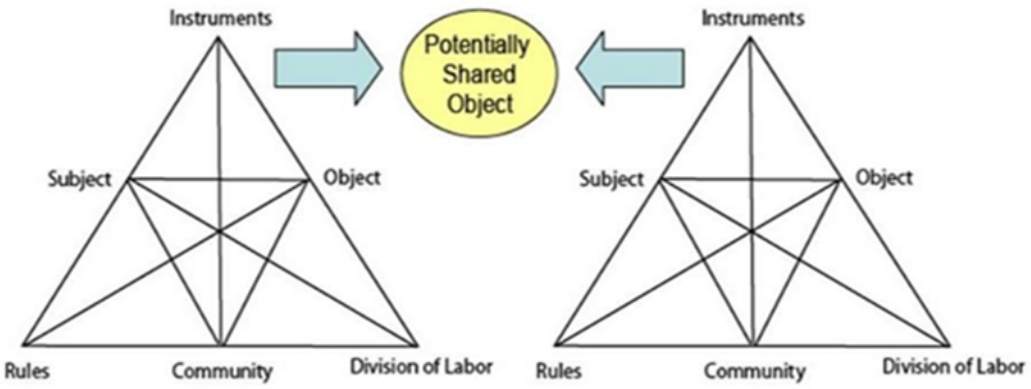


Figure 3.2: Two interacting triangles as described by Engestrom, 1987

In this regard, a CHAT enquiry assisted me in understanding the interaction between the Green Village activity system and that of the CWP group. It also assisted me with understanding how the various aspects of the two activity systems enable or constrain learning and practice of rainwater harvesting and conservation. The concepts of implicit mediation as discussed in Chapter 2 (Wertsch, 2007) helped me to study the use of mediation tools such as language used in communicating concepts and knowledge on rainwater harvesting and conservation during the training. I also looked at the use of explicit mediation tools (ibid.) such as the different rainwater harvesting and conservation techniques introduced in the training programme. I also studied diagrams and flip charts as mediating tools used in the training programme.

I used the concept of the 'zone of proximal development' to investigate ways through which the CWP members were learning rainwater harvesting and conservation methods from the training facilitators or from each other during the training. In this study the zone of proximal development was observed during the activities taking place during the training, for example during group discussions and at the demonstration site, the CWP members could assist each other in understanding scientific concepts being introduced by the facilitators. Where the CWP members applied the knowledge they had gained in their farming practices, this could indicate that learning has occurred with the help of their peers, thus pointing to the achievement of the zone of proximal development.

3.5 Data analysis using double stimulation analysis

"If the ***conflict of motives*** and ***the volitional aspect*** are disregarded, double stimulation is easily reduced to just another term for general mediation" (Engestrom and Sannino, 2010).

Building from this quotation, this study sought to analyse in detail the processes of conflict of motive and volitional aspects stemming from the Green Village training on rainwater harvesting and conservation. This was done by taking a closer look at the activity system and mapping out the problem or conflict existing in the central activity system, which is that of the CWP.

In developing a contextual profile and description of the activity systems, I looked at the first stimulus which presented the problem or conflict and the Green Village training.

Secondly, I looked at the relationship between the various elements of the two activity systems. In tracking the relationship between the various elements of the activity systems, I looked at ways through which the training on rainwater harvesting and conservation acted as a second stimulus in facilitating knowledge sharing. I specifically looked for the mediation tools used in facilitating knowledge sharing and learning and how participants were engaging with the mediation tools.

I further studied ways through which the mediation tools were being used to influence decision forming and decision-making processes within the activity system. Using Sannino's (2015) model of double stimulation, I looked out for conflict of stimuli in the two activity systems in this study. Here I was looking at demands or expectations that pull in opposite directions within the two activity systems that could potentially influence decision-making processes.

In analysing the Green Village training activity system, I looked out for real conflict of stimuli, which is the occurrence of neutral stimulus confronting subject with signal and meaningful connection (Sannino, 2015). Here I was seeking major obstacles that stood in the way of participants implementing what they learnt from the training.

In analysing the learning processes within the two activity systems, I also looked for auxiliary motives followed by closure of conditioned connection, which refers to participants' decisions to act in a particular way as outlined in Table 3.2 below.

Table 3.2: Sannino's Vygotskian model of double stimulation (Sannino, 2015c)

Phase	**Detail**
Apparatus 1: Decision forming	Comprises phases outlined below; at issue is the choice of closure path
1. Conflict of stimuli	Demands or expectations that pull in opposite directions.
2. Conflict of motive	Activated by conflict of stimuli, subject at the mercy of motives
3. Auxiliary motive	Conversion of stimulus to auxiliary motive, subject begins to control behaviour
4a. Real conflict of stimuli	Occurrence of real stimulus confronting subject with signal and meaningful connection.
4b. Closure of conditioned connection.	Decision to act in a particular way, subject makes decision based on occurrence of external stimulus
Apparatus 2: Decision implementing	Activation of conditioned connection

Using the third-generation activity system theory and double stimulation analyses allowed me to investigate the expansion of the partially shared object that is water for food production. I specifically looked at what was provided in the training that allowed for implementation of rainwater harvesting and conservation techniques by the CWP group.

Having outlined the case study methodology used in this study and how I used the CHAT analytical framework, the following section describes the different stages of data collection. Data in this study was collected in three phases. Stage one involved collecting data aimed at informing my contextual profile for the two activity systems. This data was in the form of interviews, focus group discussions and field visits to the study site in Sinxaku village. Stage two involved collecting data aimed at answering my second research question of how mediation tools were being used to facilitate knowledge sharing and learning. This data was collected during the training programmes and in the demonstration site. The last stage of data collection was conducted in the follow-up to the training programme. This data was collected from interviews and observations conducted with individual CWP members.

3.6 Data generation

Table 3.3 below outlines the data generation methods used to collect data in this study. It also explains how these data generation methods assisted me in collecting data aimed at answering my research questions.

Table 3.3: Data and research methods used in this study

Research question	Data source
1. What mediation tools are being used to improve knowledge sharing and learning around rainwater harvesting and food security related to climate change?	Document analyses, interview with Green Village Project Manager, interview with lead facilitator, interview with Interpreter, observations at the demonstration sites
2. How are these mediation tools being used to facilitate knowledge sharing and learning?	Observations of participants' engagement with the mediation tools during the training, noting their responses and engagements with the mediation tools as evidence of learning. Interview with the lead facilitator and focus group discussions with participants
3. How is learning taking place because of the farmers' interaction with these mediation tools?	Follow-up interviews with 9 CWP food gardeners, observations of the demonstration site following the training, field visits to the CWP food gardens (used as demonstration sites)

The following section explains the research methods used in this study.

3.7 Research methods

3.7.1 Semi-structured interviews

I conducted semi-structured interviews to generate data for my contextual profile. I interviewed the Green Village project manager. Interviews were also conducted as follow-up to the training, were I sought to understand the learning process that occurred following the training.

According to Bertram and Christiansen (2015), "an interview is a conversation between the researcher and the respondent'' (p. 80). Although it is different from an everyday conversation in that the researcher is the person who sets the agenda and asks the questions, interviews enable the participants to express themselves from their own points of view. Cohen et al. (2011)

highlighted the benefits of interviews, and stated that interviews are a flexible tool for collecting data and that they help to provide an opportunity for the interviewer and the interviewee "to discuss their interpretations of the world in which they live and express how they regard situations from their own point of views" (p.409). Interviews are a relevant tool to use in an interpretative study, such as mine, as they allow the researcher to draw meaning from the data collected.

> Semi-structured interviews … consist of several key questions that help to define the areas to be explored, but also allows the interviewer or interviewee to diverge in order to pursue an idea or response in more detail.
>
> (Burnard, Gill, Stewart, Treasure, & Chadwick, 2008, p.1)

An advantage of this method of interviewing is that it provides participants with some guidance on what to talk about, which many find helpful (ibid.). The flexibility of this approach, particularly compared to structured interviews, also allows for the discovery or elaboration of information that is important to participants.

I adopted an interpretative research methodology in conducting this study. Interview data is interpretative in the sense that research participants interpret the researcher's comments, questions and actions and in turn filter information in deciding what and how much of this knowledge they should share (Pepper & Wildy, 2009). Interview data was interpretative in that it sought to interpret participants and the facilitator's comments, questions and actions during the training, as a way of investigating the learning process that took place during the training.

3.7.2 Document analysis

I studied the Green Village annual reports and learning materials to gain a better understanding of the Green Village project. I also reflected on previous research on mediation processes within water management and sustainable agricultural practices (see Chapter 2) to gain perspective on how mediation processes occur in a community context.

Corbin & Strauss (2008) and Rapley (2007) defined document analyses as a systematic procedure for reviewing or evaluating documents. Atkinson and Coffey (1997) referred to documents as 'social facts', which are produced, shared, and used in socially organised ways (p. 47). Document analyses is a suitable tool to use in an interpretative study, as it seeks to examine and interpret data as a way of eliciting meaning from it (ibid.).

Document analysis is often used in combination with other qualitative research methods as a means of triangulation "involving the combination of methodologies in the study of the same

phenomenon" (Denzin, 1970, p. 291). The qualitative researcher is expected to draw upon multiple (at least two) sources of evidence, that is to seek convergence and corroboration through the use of different data sources and methods; such sources include interviews, participant or non-participant observation, and physical artefacts (Yin, 1994). I triangulated my data by supporting data from my interviews and observations with findings from document analysis. A summary of the documents I analysed are outlined in Appendix A.

3.7.3 Focus group discussions

As part of my data collection I conducted two focus group discussion with the CWP members during and following the first training. Qureshi and Saud (2014, p. 1) defined a focus group discussion as "a qualitative research method in the social sciences, with an emphasis and application in the developmental program evaluation sphere" (ibid.). He also defined focus group discussions as semi- structured group discussions, which yield qualitative data on the community level by facilitating interaction between participants (ibid.). A focus group discussion aims to:

> … facilitate interaction and thereby produce, via snowballing of thoughts, deeper insights. Focus group discussions provide information on a group/community level. Perspectives of individuals or households are not part of the focus. The strength of an FGD is the forum it creates for discussion between participants, thus eliciting new ideas and explanations, which would not have come up during an individual or a household interview. (Qureshi & Saud, 2014, p. 1)

Focus group discussions are predetermined semi-structured interviews led by a skilled moderator (ibid.). My first focus group discussion was held during the CWP training and it solicited information on the socio-cultural and historical factors that could potentially impact on the CWPs' learning and practice of rainwater harvesting and conservation. Some of the questions asked included: Are there any cultural beliefs around the use of rainwater harvesting farming resources? Are there any cultural beliefs around the use of food gardening resources? What are they? These questions and others are included in my data generation tools in Appendix D.

3.7.4 Questionnaire

A questionnaire is a research instrument used to collect data from individuals about themselves or people in a social context (UNESCO, 2005). A questionnaire is standardised and each participant answers the same type of questions (ibid.). This ensures that any differences in response are viewed as emanating from different viewpoints as opposed to a difference in processes that produced the results (ibid.).

In phase one of my data collection I administered a questionnaire to the lead facilitator for the training. Initially, I had planned to interview her, but she indicated she would prefer answering a questionnaire due to time constraints. The questionnaire had questions on the training materials the Green Village facilitators planned to use. For instance, some of the questions I asked were: What material or resources are you planning to use in your training on rainwater harvesting and conservation? I was also interested in finding out what the Green Village facilitators hoped to achieve by conducting the training. Since my research sought to track the mediation processes within the training specifically looking at the mediation tools used in the study, I also asked questions specifically on the learning materials (referred to as mediation tools) that the facilitator planned to use and how they were planning to use these (see Appendix E for the questionnaire).

After completion of the training, I administered another questionnaire to the lead facilitator. This questionnaire was aimed at soliciting information on the lead facilitator's perceptions of the training. The questions here solicited information on the lead facilitator's perceptions of the training, the challenges she faced in conducting the training and how learning occurred during the training.

3.7.5 Non-participatory observations

Observations were conducted during the training programme. In conducting observations during the training programme, I was not involved in the proceedings and thus I conducted non-participatory observations. Advantages of conducting observations according to Bryant (1988, p. 61-62) are:

- The research is better able to understand and capture the context within which the people interact.
- First-hand experience with a setting allows researchers to be open to discovery and inductive rather than guising what the context is like.
- The researcher may see things that routinely escape awareness of the participants using a different research method.
- It provides a chance to learn things that people may be unwilling to discuss in an interview.

3.8 Phases of data collection

Data was collected in different phases as outlined in Figure 3.3 that follows.

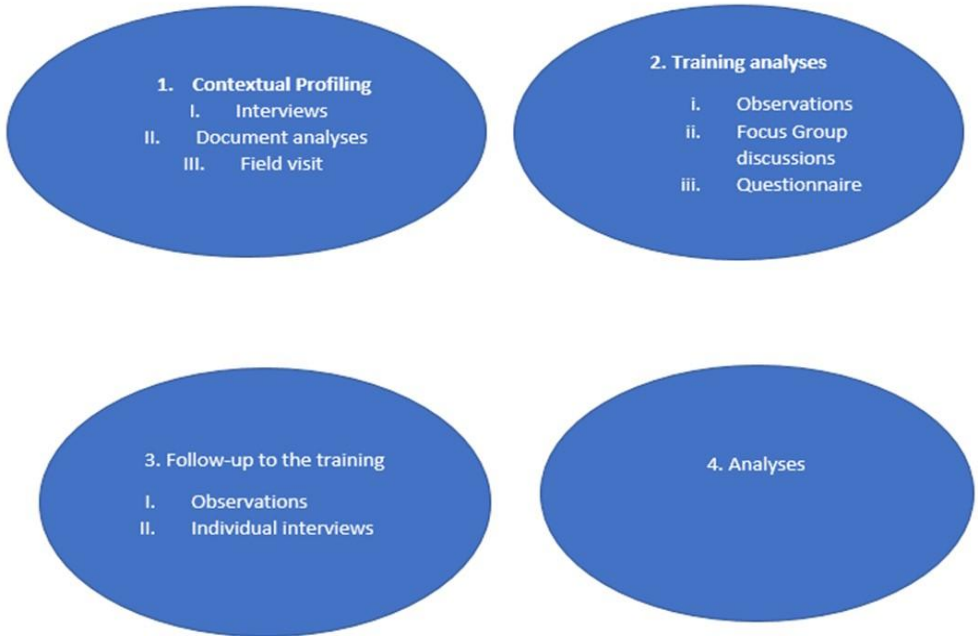


Figure 3.3: Phases of data collection

3.8.1 Contextual profile and activity system description

Using CHAT third generation enquiry, I generated data for a contextual activity system analysis of the two main activity systems namely: the CWP activity system and the Green Village activity system. The contextual profiling data generation was also aimed at identifying the mediation tools the Green Village facilitators planned to use in the training programme and how they were going to use them. Barab, Barnet, Yamagata, Lynch, Squire and Keating (2002) stated that an analysis of an activity system must consider the dynamics amongst its constituent elements and how they relate to each other. In conducting the activity system analyses, I interviewed the Green Village facilitators and conducted document analyses of the Green Village project documents.

I conducted the first round of interviews with the Green Village project officers, during the planning phase of the training programme. The first interview was with the Green Village project manager. The interview was aimed at soliciting background information to the Green Village project, their aims and objectives as well as the envisaged outcome of the training programme. The interview also explored the type of mediation tools in the form of learning materials and resources that the Green Village facilitators would use for the training.

3.8.2 Training programme

Data generation methods used in tracking the learning process from the training programme were observations, interviews and a focus group discussion. I conducted the first round of observations of the three-day training workshop on rainwater harvesting and conservation in March 2017. I conducted another round of observations of the CWP food gardeners' practices in July 2017.

I observed how the CWP food gardeners' local knowledge of farming influenced their farming practices. I also explored ways through which the CWP farmers combined their local knowledge of farming with the knowledge on rainwater harvesting and conservation that they obtained from the Green Village training.

Throughout the observations I developed a better understanding of how people learn from a training programme, within a community context. Thus, part of my observations was aimed at answering some of my research questions, thus adding value to my research.

Before conducting these observations, I asked for permission from the supervisors of the community gardens. These observations were aimed at noting the farming practices of the CWP food gardeners before and after the training with the Green Village facilitators.

I used observation schedules in noting down my observations during the training. Observation schedules were also useful to observe how people were interacting with each other during the training (see Appendix C for the observation schedules). Data collected from observations provided me with insight into the mediation processes taking place during the training. Conducting observations and listening to the discussions during the training provided me with useful information on how participants interact with each other during the training, the division of labour in their community garden project and the rules that govern their operations. These observations were thus used together with interviews in analysing the mediation process within the training.

Due to the similarities in my contextual research questions to questions that the lead facilitator had prepared for the training session, we decided to combine the questions and ask them during a focus group discussion held on Day 1 of the training. The combination of my contextual profiling questions with lead facilitator's questions was an advantage, as we would use the same interpreter to translate the questions. The interpreter was experienced and his facilitation of the focus group discussion produced very useful contextual profiling information as will be outlined in Chapter 4.

The second focus group discussion was aimed at investigating the knowledge uptake by the CWP members following the training. In conducting the second focus group discussion I was particularly interested in finding out how the CWP members learnt from training materials such as handouts, workshop resources such as flip charts and from the demonstration sites.

I asked the CWP members specific questions related to the learning material they found most useful during the training. Why where they useful? Which ones they did they prefer and which ones were confusing? I was also interested in how they were planning to use the knowledge they gained from the training in their farming practices. For this focus group discussion, I asked one of the ladies who participated in the training to assist with translation. The Green Village Interpreter helped to identify the lady, who was fluent in both isiXhosa and English. An overview of the translations is also provided in Chapter 4.

For the follow-up interviews, a colleague from the Environmental Learning and Research Centre, Live Matiwane, offered to assist with translations from Xhosa to English as I was not familiar with the participants' local language.

The focus group discussion was aimed at tracking the knowledge gained by the CWP members from the mediation tools used during the training. I asked the CWP members questions related to what there had learnt from the training workshop, what learning materials were most useful to them and what concepts or techniques they found easy or difficult to understand during the training. The focus group discussion was conducted with the two CWP groups from Qulungashe and Lower Sinxaku (Maxesibeni) village.

3.9 Follow-up to the training programme

Following the completion of the training, I conducted another round of non-participatory observations. These observations where conducted four months after the CWP members had been through the training. These observations were aimed at exploring the various ways in which the CWP members where using the knowledge from the training in their farming practices. In conducting the observations, I was looking for evidence of farming practices like the digging of trench beds, swales, intercropping, mulching and companion cropping as these were some of the rainwater harvesting and soil conservation methods covered during the training. Where the CWP farmers used any of the rainwater harvesting and conservation methods, I observed for any changes in their crop productivity. This information enabled me to trace the outcome of their learning and how this learning was connected to their current

farming practices. The two community gardens I observed were the CWP food garden in Qulungashe and the community food garden in Maqasibeni.

Conducting observations enabled me to answer my research question of how learning was taking place because of the farmers' interaction with the mediation tools used by the Green Village project facilitators. Observations were thus an appropriate method to identify how people interacted with each other, the division of labour, rules that govern their work and the mediating artefacts and tools that influence learning and practice of rainwater harvesting and soil conservation methods.

In addition to the observations, I conducted semi-structured individual interviews with nine CWP members. These interviews were conducted in July 2017 and sought to investigate the learning processes that occurred following the CWP food gardeners' participation in the training. The interviews were also aimed at soliciting information on how the CWP members were using the knowledge gained from the training in their farming practices. I specifically asked questions directed at their current farming practices following the training. Using semi-structured interviews allowed me to ask open-ended questions and follow-up questions where necessary. Interview schedules were prepared before going to the field. These were used to guide the interview sessions during the training. (See appendix C for some of the interview schedules used in this study.)

Semi-structured interviews therefore provided me with more detailed explanations of how the CWP members learnt from the training and how they were using the knowledge from the training to improve their farming practices. Appendix B provides a summary of interviews conducted. The questions I asked are included in Appendix D.

In the second round of interviews I realised that some of the participants were shy to express their views so I combined some of the individual interviews in order to interview two people at the same time. In order to create a relaxed atmosphere before conducting the interviews, I would walk with the participants in the community garden and ask them to show me how they were growing their vegetables and if they were using any of the knowledge from the training to do this. I started off my interviews by asking them general questions about where they get their water and seeds from before asking specific questions on learning from the training and if they were practising any of the rainwater harvesting and conservation methods they had learnt. I would ask the CWP food gardeners questions related to their use of the knowledge and information from the Green Village training in their current farming practices. From these

interviews I managed to get information to answer my last research question of how learning was taking place as a result of the farmers' interactions with the mediation tools. This last phase of interviews sought to link what the CWP members learnt from the training to their current farming practices.

3.10 Selection of participants

In choosing research participants for this study, I selected participants from the two areas where my study was based. I interviewed five farmers from Qulungashe area and four farmers from Maxesibeni. Qulungashe and Maxesibeni are areas under Sinxaku village were my study was based. I chose to interview CWP farmers from both areas so as to gain insights from farmers who were part of the training from both sites. Farmers selected were also in the CWP programme, and were active in growing food.

3.11 Analysis

In analysing data in this study, I used thematic coding guided by my research questions.

I first classified the data that I collected under each of my research questions. I then developed analytical statements that summarised my findings for that particular research question. I went on to explain how the findings linked to my conceptual framework and my theoretical framework in Chapters 2 and 3. At the end of each section I concluded by providing recommendations for further studies.

In analysing the data, I drew from CHAT activity system analyses in mapping out the various elements of the two activity systems, namely the Green Village activity system and the CWP activity system. I used a double stimulation framework to refine my analysis of the use of mediation tools during the training.

Data was also analysed using qualitative research methods. I transcribed interviews and organised the data under the different themes guided by my research questions as highlighted above. I also analysed field notes and observation data and classified it under the relevant themes. Data from focus group discussions and questionnaires was also classified under the relevant themes. I noted down observations during the training and classified them under the relevant themes. I then summarised and discussed this data using my analytical statements.

Data analysis was done concurrently with data collection. This allowed me to see any gaps to address in the next round of interviews. I used analytical memos to organise my data. This

made it easier for me to analyse the data thereafter. My analysis chapter drew heavily from my data presentation chapter as described above.

3.12 Validity and trustworthiness

Validity reinforces the trustworthiness of data. According to Bosk (1979), validity in qualitative research gives reason for the readers of the research to believe your research findings. In conducting this study, I sought to ensure validity and trustworthiness of data generated in this research as a way of strengthening its accuracy and authenticity. Maxwell (2012, p. 133) stated that "validity refers to accounts, conclusions or inferences, not data". Similarly, Hamersley and Atkinson (1983) stated that data cannot be valid or invalid, but the inferences drawn from the data are what determines its validity.

Drawing on this, I analysed data iteratively with data collection. This enabled me to see if there was a need to generate more data. During my data generation process, I tried to see if the data collected answered my research question, and if not, I would note down the question and ask it again in the following phase of data collection.

Triangulation was also used to ensure validity of my data. Flick et al. (2004) referred to triangulation as "the use of a variety of methods in one project with a view to exploring the research question from different angles" (p. 243). For instance, in this study, I used a variety of research methods, namely interviews, focus group discussions, and document analysis to triangulate my data. I compared the data and insights emerging from different sources, maintaining a data trail so that I would be able to refer to the original data source. For instance, before conducting the second round of interviews with the CWP members, I observed the farming practices in their community garden, noting down any changes in their farming practices as possible evidence of their use of knowledge from the training. I would then ask follow-up questions to what I had observed. In so doing I was able to cross-check and compare data from my interviews with data from my observations as a way of ensuring validity.

According to Maxwell, "triangulation reduces chance associations and systematic biases due to a specific method and allows a better assessment of the generality of explanations that develop" (ibid., p. 249). As noted by Diefenbach in Maxwell (1998, p. 882), "all research methods have their own strength and weaknesses and are appropriate for certain problems, the combination of a few good methods and tools helps to get a fairly good picture". Using interviews and observations assisted me in getting a good picture of the mediation processes that occurred during and after the training programme.

An example of triangulation is when I observed that following the training, the CWP members had dug a trench bed in their community garden. During the training, the lead facilitator mentioned the digging of trenches as one method of harvesting rainwater, thus the digging of a trench bed, could have been as a result the CWP members' utilisation of the knowledge from the training. An interview with one of the CWP members confirmed this observation, as he mentioned that the digging of the trench bed was learnt from the training.

Validity was also ensured during analysis of my findings. A common mistake that a researcher can make in analysing data is to impose their own interpretation on the data. Bless, Smith and Sithole (2013) stated that when analysing data, qualitative researchers should ask themselves whether they are posing their own interpretation to the respondents, or their words, thus changing any meaning. It is very important that researchers accurately transmit and communicate the results of their research (ibid.). A good way of preventing this from happening is by presenting a lengthy quotation from the data in the research report (ibid.), that is, using 'thick descriptions'. Thus, in presenting my data, I used extensive quotations from interviews that I conducted with the Green Village facilitators and the CWP food gardeners, to provide a thick description of the findings.

In preparing my data for analysis, I first audio recorded and transcribed data from interviews, focus group discussions and observations. For example, during the first phase of my data collection, I audio recorded the three-day training workshop, and transcribed parts of the discussions which related to my research questions. In the second phase of data collection, I audio recorded the nine individual interviews with the CWP members that I interviewed. I also followed this up with transcriptions of the interviews. In conducting the individual interviews, as mentioned, I was assisted by a colleague, Live Matiwane who offered to translate from isiXhosa to English, as I am not fluent in speaking isiXhosa.

Meeting CWP members in their everyday settings allowed me to see things in their own natural settings. For example, during the final round of interviews with the CWP members I was able to see the different ways in which they were growing their vegetables. From these observations I was able to conduct follow-up interviews aimed at surfacing how learning and practice of rainwater harvesting and conservation occurred following the training.

Before conducting observations and interviews, I developed observation schedules and interview schedules with questions for data collection. The questions contained in the interview schedule were aimed at answering my research questions. This was also a way of ensuring

validity of my account, as the data collection process was closely linked to my research questions. Another way I ensured validity was by mapping out the various elements of the two activity systems, using the CHAT activity system analyses as a guideline and explaining their relationship to the mediation tools. This was also a way of ensuring validity of my data as it brought out the factors that enable or constrain learning and practice in a community context in a systematic way.

I followed a careful process of managing my data through recording and transcribing the data I collected. I did this as a way of ensuring credibility for my findings.

3.13 Credibility of the study

Credibility in this study was ensured by making use of an interpreter who assisted me in translating from IsiXhosa to English during interviews and focus group discussions. The Interpreter was a local IsiXhosa speaker. Since my research participants were IsiXhosa speakers, I ensured that data from interviews was captured accurately by asking the questions in English and my interpreter would translate to IsiXhosa. She also translated the participants responses back to English so that I would be able to follow the discussion and ask follow up questions were necessary. I transcribed audio recordings of the interviews, and used the collected data to answer my research questions. Audio recordings of the interviews conducted with the CWP farmers were stored on my computer for future reference.

In ensuring credibility of the observations made in this study, I took pictures to support what I had observed. These pictures are displayed in chapter 4, illustrating the different mediation tools used during the training and how the CWP farmers were using them. As a follow up to the training programme, I also took pictures of the CWP farmers rainwater harvesting and conservation practices in their community food garden. These pictures together with accounts from the CWP farmers on their use of knowledge from the training programme formed evidence of the CWP farmers learning and practice. Data collected from interviews and focus group discussions was triangulated with data from observations thus contributing to the credibility of the study.

I also used thick descriptions from the training programme discussions and individual follow up interviews to provide evidence for the study and add to the credibility of my findings.

3.14 Researcher bias

Researcher bias refers to the ways in which data collection or analyses is distorted by the researcher's theory, values or preconceptions (Rog, 1998). Researcher bias can involve asking leading questions (ibid.). In the initial phase of my data collection I faced challenges with regard to researcher bias in the design of my research questions. Most of my questions were leading questions; however, after going over the questions several times with my co-supervisor, we restructured the questions in such a way that they were more open-ended and did not lead participants to give certain answers. This to some extent eliminated researcher bias.

A validity issue related to interviews is that the way researchers are socialised and their upbringing can influence their worldview and thought patterns (Diefenbach, 2008). This can result in attempts to mislead, thus bringing bias to the research findings (ibid.). This can be eliminated by "asking the same people several times in the hope of increasing trust and thus getting in-depth data or asking different people about the same issue in the hope that a certain pattern will image can improve the quality of interview data" (ibid., p. 882). Thus, through interviewing different people using the same questions, I was able to cross-check and compare data from my interviews. For example, I ensured quality for my interviews by asking the same set of questions to the nine CWP members I interviewed in my last round of interviews.

I noted patterns in some of the questions that I asked the CWP members. For example, when I asked them about the challenges they faced during the training, some participants mentioned that they had challenges with the use of English. Findings from these interviews were then triangulated with data gathered from my observations.

In ensuring validity for my findings, I used intensive interviews to probe the CWP food gardeners in my second round of interviews. Even though I had written down questions to guide me in conducting the semi-structured interviews with the CWP food gardeners after the training, I was rigorous in soliciting information on how there were linking the information from the training with their current farming practices. I asked them follow-up questions where I needed more detailed information. Intensive interviews enabled me to collect rich data that was detailed and varied enough to provide a full and revealing account of what was going on (Maxwell, 2009). For observations I collected rich data by compiling a detailed, descriptive account of the specific concrete events that I observed. Due to time limitations and the language barrier, I was not able to do member checking. However, according to Hamersley and Atkinson

(1995), participant feedback is as valid as their interview responses and both should be treated as evidence to support the validity of your findings.

3.15 Gaining access to research site and ethics

I took time to establish a relationship with the research participants and explained what the study entailed. In so doing I established a sense of trustworthiness with my research participants. I assured the participants that my research was purely for academic purposes and that I would use findings from the study for research purposes only. Vries (1992, pp. 47-84) provided some rules and guidelines which are important for successful fieldwork. These include rules of negotiating access to research participants or informants. These rules served as a guide when I was doing my research and in gaining access to the research site.

Before conducting the research, I read out a letter of introduction to the study to the facilitators and the CWP food gardeners (that is a letter introducing myself and a letter of consent requesting permission to conduct the study).

In observing the culture and language of the participants, I took into consideration that most of the people were isiXhosa speakers thus necessitating the use of an isiXhosa speaker to assist with translating the interviews and focus group discussions. This also ensured that data was captured accurately.

I paid particular attention to my competence and responsibilities as well as that of my supervisor, as well as to integrity and academic professionalism in conducting the study. I ensured integrity and academic professionalism by attempting to practice non-partisanship and independence. I also sought to conduct research that was either free from or explicitly disclosed any political, racial, gendered, religious or other bias. Lastly I ensured that the methodology of this research project was thorough and academically sound in terms of relevance and scientific integrity.

3.16 Delimitations and limitations of the study

The main limitations to this study were with regards to time constraints, accessibility to the research site and funding limitations. The delimitations and limitations to the study are discussed in detail in chapter 5, section 5.6.

3.17 Ethical Considerations

Before conducting this study, I obtained ethical clearance from Rhodes University. I ensured accountability and responsibility by conducting my study in accordance to the principles, codes

of ethics of the research site and Rhodes University ethical guidelines. The research was granted ethical clearance on 06 October 2016, under Class B, restricted matter.

Before conducting the research, consent forms were administered and signed by research participants. All the research respondents agreed to participate in the study. Participants' wish to remain anonymous was respected and as shown in Chapter 4, participants' faces were covered in the pictures. Research respondents gave consent to the use of photographs of themselves and their food gardening practices in my theses but did not want their names included, thus I ensured that faces were covered in the photographys to protect identities. The lead facilitator, requested anonymity and thus in photographs of the lead facilitator, I also covered up her face (see Chapter 4). I also assured the research participants that I would not misuse the research for personal power or gain.

3.18 Conclusion

This chapter has presented the research methodology used in this study. It outlined how different research methods were used in generating data for this study. It also discussed how the data would be analysed. I have presented the CHAT theoretical framework for this study and how it was used analytically. The following chapter will present data generated using the research methods highlighted in this chapter.

CHAPTER 4

Mediation Tools and Processes in the Green Village Programme

4.1 Introduction

This chapter will present data aimed at answering my research questions. As mentioned previously, this study is aimed at investigating the mediation tools and processes used in the Green Village training programme and how these mediation tools influenced learning and practice of rainwater harvesting and conservation practices. I will start off by presenting a brief outline of the Green Village three-day training activities. I will then explain the various components of the two activity systems, namely the Green Village activity system and the CWP activity system. This will be followed by a discussion on the interaction between the two activity systems, as they are working towards realising the shared object of increasing food production.

In presenting data in this study, I am focusing on how learning was taking place. This analysis is guided by the third-generation activity system analyses and the double stimulation analytical framework. The double stimulation analytical framework assisted in refining my analyses of mediation process and tools used in the study. Insights from the activity systems were developed using data generated from focus group discussions, observations, questionnaires and semi-structured interviews.

I will start by providing an outline of the training that the Green Village facilitators held with the CWP group. The outline will bring out the aims and objectives of the training, the contextual factors impacting on the CWP water and food gardening practices and the socio-cultural and historical context of the participants.

As will become evident from this section, all the mediating tools, the rules, the subjects, community and the object have a history that is embedded in cultural practices. Moreover, an understanding of the historical and cultural factors will help in understanding the factors that impact on mediation processes.

4.2 Contextual activity system analyses

The contextual activity system analyses solicited information on the mediation tools and processes being used by the CWP food gardeners in their farming practices, and to identify the mediation tools being used in the Green Village project to improve learning and practice of

rainwater harvesting and food security related to climate change. The analyses of the two activity systems also reflected ways through which the CWP food gardeners are engaging with the mediation tools provided by the Green Village project facilitators and how learning was taking place as a result of this interaction.

In conducting the contextual activity system analyses, I started off by interviewing the Green Village project manager (GVPM). The project manager explained the aims of the Green Village project:

> The Green Village project aims at training the CWP project members on different methods of rainwater harvesting and it's up to the people to practise what they would have learnt from the training. The Green Village project is therefore more of an experiment and learning action research and it's up to the people to use the knowledge they would have gained.

Commenting on the CWP group's willingness to take up rainwater harvesting methods, the project manager said the participants' reactions were that "the farming method is difficult, it involves lots of work and the soil has got rocks". This statement shows the conflict of motive faced by the CWP group if they wanted to practise rainwater harvesting and conservation methods.

The project manager said the CWP group had a community garden that they would like to use as a demonstration site for the project, and maybe later take this to 2-3 people's community gardens. The garden project is currently being used to grow vegetables for household consumption and to give to the needy. Commenting on how the CWP farmers learn together and share farming knowledge, the project manager said the farmers are not keen to share their knowledge as they would rather keep it to themselves. This statement also shows conflict of motives faced by the CWP group which limited their abilities to learn from each other through sharing knowledge on farming as they were working towards improving their farming practices.

The project manager also mentioned that during the training, there is an experienced interpreter for translating from English to isiXhosa, as the lead facilitator is not able to speak isiXhosa. Most of the CWP members speak isiXhosa with very little understanding of English. Commenting on their use of an interpreter during the training, the project manager said:

> Although I do not understand anything he says in isiXhosa, we have built a relationship of mutual trust over the years and so I trust that his interpretations are a true reflection of what the participants would have said.

The project manager also indicated that working with an interpreter is good in that community members trust him as he has been working in the area for some time and they are comfortable talking to him and sharing any of their challenges.

Commenting on the duration of the training, the project manager said, "two days are usually problematic in that people will get distracted and not pay attention". Below is an outline of the three-day training workshop conducted by the Green Village project facilitators with the CWP members in March 2017.

4.3 Water harvesting and conservation methods workshop

On 27-29 March 2017, the Green Village research team facilitated a three-day water harvesting and conservation workshop with the CWP teams in Sinxaku village. The training was held in Lower Sinxaku village at the community church hall. The workshop took place during the teams' working hours starting at 10am and ending at 1pm. The dates were set by the Community Works Programme (CWP) supervisor for the Maxesibeni and Qulungashe teams located in Upper Sinxaku, Ntabelanga Catchment area. Both CWP teams from Maxesineni and Qulungashe attended the training. Light lunches were provided on completion of each day's programme. The entire team, 24 people in total, turned up on Day One. On Day Two, there was an apology from one of the team members and on Day Three, there was a slight decrease with attendance down to 20 people.

The workshop programme was designed in a way that the community food garden project's vision and challenges were defined and analysed in detail exploring available solutions such as water harvesting and conservation practices (WRC Green Village workshop report, 2017). The training programme's aim was two-fold:

1. Map out the collective food garden vision/aspirations and identify and analyse dissonances and constraints found in the attainment of the proposed aspirations.
2. Design and plan rain water harvesting solutions for improved food gardening productivity within the broader context or catchment area (micro-scale level). (WRC Green Village workshop report, 2017)

Commenting on the *object* or aim of the training, the lead facilitator said the training was aimed at introducing different methods of rainwater harvesting and conservation to the CWP group and also finding out if these methods were relevant in their context. Commenting on the aim of the training, the lead facilitator (GVF) said, "We want people to participate and to want to voluntarily explore if these methods work or not".

During the training the Green Village facilitators worked with research participants in identifying the challenges that they were facing in their food gardening practices and in developing solutions that are "culturally and historically contextualised with water harvesting and conservation approaches being one of the solutions (GVF, 2017).

4.4 Aims and objectives of the training programme

(Day 1)

The lead facilitator explained the aims and objectives of the training programme. She explained that the training programme would follow an expansive learning research and development process. She explained the relevance of the training to the participants' food gardening practices. The lead facilitator emphasised the voluntary nature of participating in the research process as well as ethical considerations during and after completion of the training programme. All participants gave their consent to participate in the training programme. The lead facilitator then mapped out the different activities of the three-day training programme, as presented in Table 4.1 below.

Table 4.1: CWP food garden – Water harvesting and conservation workshop programme

Programme Outline		Facilitators Notes:
Day 1	Introduction to Research Objectives, Methodology and Ethics	Voluntary participation Co-creation of new knowledge Change oriented approach
	Defining participants' collective vision, aspirations and envisaged outcomes in relation to their CWP Community Food Garden project	Social and biophysical impacts
	Description and analysis of the CWP Community Food Gardens activity system, being water security at the centre of the activity	Contextual profiling
Day 2	Mapping and prioritization of solutions to achieve participants' goals and aspirations	Broad solutions Assign responsibilities and reporting mechanisms
Day 3	Introduction to rainwater harvesting and conservation principles and methods as solutions situated in watershed management and sustainability	Hand-outs
	Design rainwater harvesting – food garden system	Mapping exercise
	Practical implementation of rainwater harvesting and conservation methods	Local tools, equipment and materials
	Way forward	Roles and responsibilities Reporting Follow up workshop

Participants were divided into three groups and were given a task of mapping out their vision for the CWP food garden and the challenges that they were facing. The task was explained by

the lead facilitator, with help from the translator. Participants were encouraged to ask questions where they did not understand. Flip charts where given to the participants to write down their visions. Thus, flip charts acted as technical mediation tools on Day One. The concepts of vision and challenges were the higher order thinking mediation tools.

The groups presented their vision for the CWP garden and the lead facilitator developed a summary of the vision: "the CWP Project should be a centre of excellence and work towards a self-sustaining income generating food garden with great produce diversity". Coming up with a common vision thus acted as a double stimulation tool during the training as it formed the basis for thinking about the difficulties faced by the CWP members in their food gardening practices and for possible solutions to the problems.

From the group presentations, I noted strong intentionality from the participants as they were committed to work hard and ensure productivity of their community food garden. The lead facilitator said the CWP vision would be the focal point for further discussions.

The challenges mentioned by the three groups that they were currently facing in their food gardening practices included lack of money to buy fertilisers, lack of equipment such as fence and fencing poles, problems with pests and lack of teamwork. These will be discussed in detail in Section 4.7 where I discuss the rules guiding the CWP activity system. These challenges can be viewed as double binds, as they hinder the CWP's wish to realise their vision.

The last session on Day One was in the form of a focus group discussion where the lead facilitator asked questions aimed at understanding the contextual factors impacting on the CWP group's farming practices. The group discussion was aimed at soliciting the CWP group's food gardening practices with water security being the centre of the activity. A detailed discussion of the CWP food gardening practices will be presented in Section 4.7 where I discuss the various elements of the CWP activity system.

Figure 4.2: Participants during the training programme discussions

The pictures above show the CWP group members who attended the training programme on Day One. The pictures were taken during a focus group discussion to map out the contextual factors impacting on the CWP group's food gardening practices. Mediation tools used during the training, in the form flip charts and concepts illustrated on the flip charts are shown in the pictures above. Group discussions were used as a mediation process during the training.

The session provided an opportunity to interrogate mediation tools in the form of concepts relating to agricultural inputs such as seedling supply, utensils, and natural fertiliser. Concepts relating to the project roles and responsibilities allocations (such as ploughing, sowing, watering, and selling production) were also discussed as well as access to markets (e.g. local, regional, national). The current agricultural support pertaining to the area (from government, NGOs, private) was also interrogated: local knowledge and skills in relation to sustainable food production and water management. Furthermore, farming resources available to the CWP food gardeners (such as water and land) were discussed in this session. The exercise allowed people to continue with the process of identifying the constraints and opportunities for the CWP team

to develop and expand their food production capability, as per project vision and how the different contextual aspects and capabilities have changed over time.

During the last focus group discussion, I noticed that participants were restless as they had been sitting inside the church hall the whole day. I also noted that towards the end of the last session some participants were talking amongst themselves while the lead facilitator was conducting the training. Some of the men were walking in and out, and some where taking smoke breaks. This may have been because they were tired, or they could have lost interest of what was being discussed. Another reason for the participants' loss of interest could have been as a result of the methodology used during the training. In facilitating training with a group of farmers, it may be most appropriate method to take participants out in the community garden and do some practical activities, having explained the aims and objectives of the training. At the end of Day One, the lead facilitator consolidated the contextual profiling responses and main challenges identified in the training in Table 4.2 below.

Table 4.2: Contextual responses and challenges identified

Group	**Challenges**	**Guiding Questions**
1. Water Management and Conservation	• Water infrastructure and services not delivered • Water management and conservation practices not traditionally applied nor learnt from others/support agencies/learning resources • Uncertainty in rainfall patterns yet food gardens mainly depend on rainfall or tanks • WH&C knowledge not available	*a) How it used to be?* *b) How is it now and why?* *c) How it should be?* *d) Solutions?*
2. Operational Support	• Suitable equipment/ implements/ water infrastructure not available nor accessible • Compost not available	
3. Land Access and Management	• Vegetable production can increase in land available if focus in on "kitchen" vegetables – land is not maximised • Crop production (e.g. potatoes, maize, etc.) needs bigger extension of land – fencing not available • Production dependency on rainfall or other scarce water sources • Land management/soil erosion is understood but appropriate practices not in place	

4. Team Work & Dynamic	• Project roles and responsibilities not assigned to maximise production and sales • Unreliability and unwillingness from some project members affecting production and distribution of revenue • Lack of stimulation and exposure • Lack of cohesion and purpose in defining/achieving a common goal/vision	
5. Agricultural Knowledge and Skills	• Lack of access to agricultural extension support and knowledge • Lack of access to knowledge networks and information resources • Sometimes access to new knowledge and training but not applied in project	

Activities conducted on Day One produced a first stimulus for the training programme as they were aimed at clarifying the challenges faced by the CWP food gardeners in their farming practices and mapping out strategies and solutions to address these.

4.5 Co-creating solutions and action plans

(Day Two)

The second day of the training was assigned to working out solutions to the challenges identified in Day One using the first stimulus. At the end of Day One, participants were given a manual as a take-home assignment. The manual acted as second stimulus as it explained ways of addressing the challenges faced in the CWP farming practises by introducing rainwater harvesting and conservation techniques as solutions to these challenges. The participants were divided into groups of five and tasked to go through the manual which was written in Xhosa. Thus, the manual was used as a double stimulation tool which will be discussed in more detail in Section 4.8.

The training manual was used as an explicit mediating tool and a double stimulation tool during the training, as participants were able to see the different methods of rainwater harvesting and conservation from the diagrams in the training manual. The pictures of the different rainwater harvesting and conservation techniques in the manual acted as visual guides in aiding the learning process during the training. Furthermore, the Xhosa translations of the different rainwater harvesting, and conservation practices assisted the CWP group to easily comprehend the knowledge shared in the manuals (see Appendix D).

The issue of the participants' literacy levels emerged during the follow-up discussions on Day Three, as some participants said they were not able to read the training manual having been so

long out of school. The participants' literacy levels acted as an implicit mediating tool in the CWP group's learning processes, constraining some participants' use of the double stimulation tool.

4.6 Introducing the rainwater harvesting and conservation principles and practices (Day Three)

The first half of Day Three was dedicated to introducing the different rainwater harvesting and conservation techniques and practices that were in the manuals, thus extending the use of the double stimulation tool. The lead facilitator was interested in finding out the participants' current knowledge on rainwater harvesting and conservation and whether they were already practising the rainwater harvesting and conservation techniques. The participants indicated that there were doing so and were currently harvesting rainwater using containers. The participants agreed that "it is common to catch water in containers and transfer for both domestic and irrigation purposes mainly". The participants' feedback thus became the ground from where the components and principles of rainwater harvesting, and conservation were introduced and presented by the lead facilitator creating a baseline for the Zone of Proximal Development (ZPD). The development of the ZPD is illustrated in Figure 4.3 below.

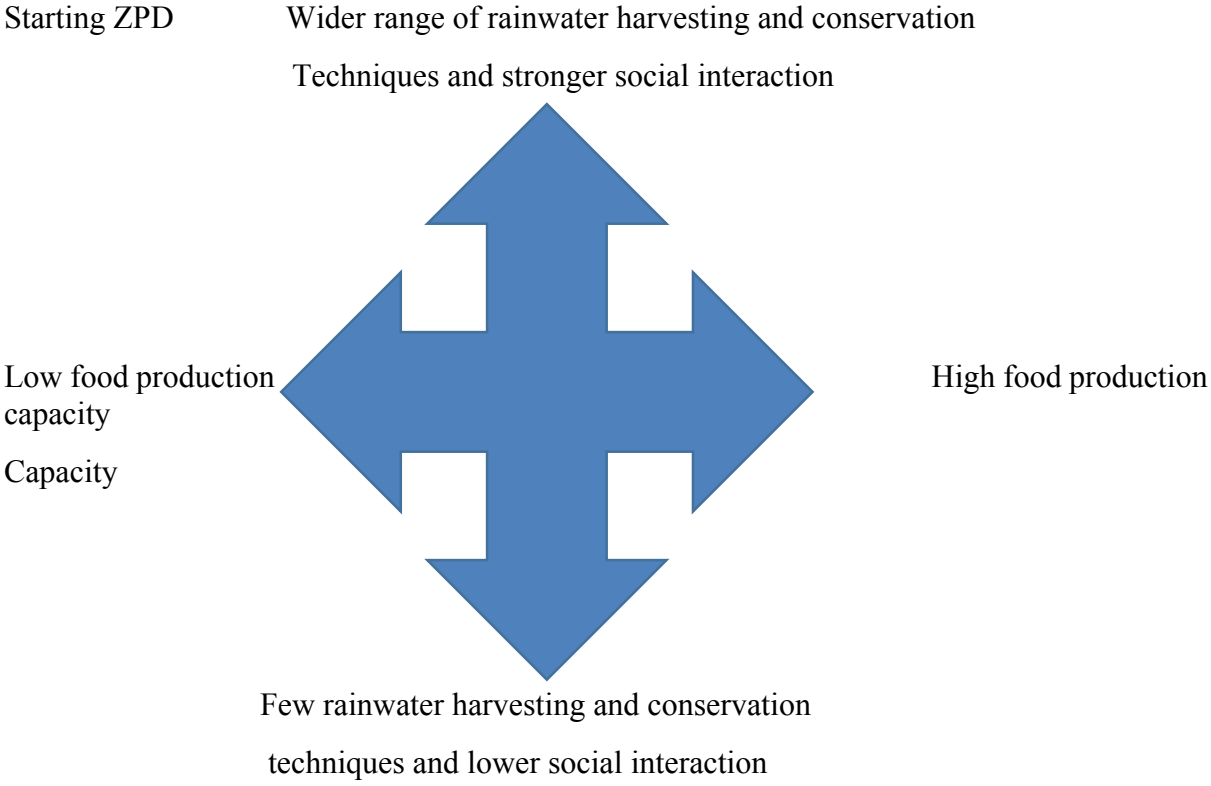


Figure 4.3: Development of ZPD for CWP food gardeners

As shown in the diagram, at the beginning of the training, the CWP food gardeners had a low food production capacity as they were using few rainwater harvesting methods and there were fewer social interactions. The aim of the training was to move the CWP food gardeners to a higher food production capacity through introducing a wider range of rainwater harvesting techniques and stronger social interactions among the CWP members.

Figure 4.3 below shows rooftop rainwater harvesting as one of the techniques that the CWP group were introduced to during the training. As seen in the illustration, flip charts were used to draw the rainwater harvesting techniques. Drawing an illustration of rainwater harvesting and conservation techniques on the flip chart assisted the CWP group to understand the rainwater harvesting practices and how they could use these methods to harvest rainwater in their own homes.

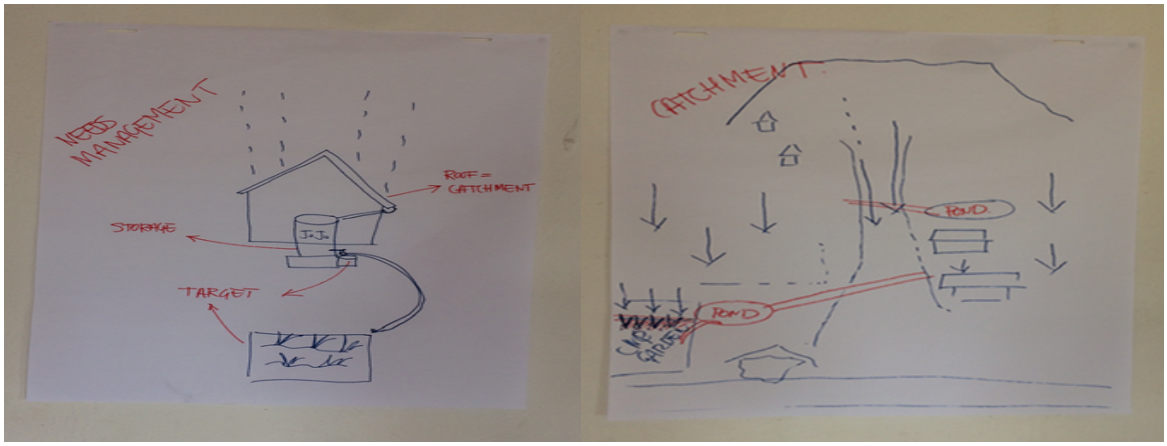


Figure 4.4: Illustration of rooftop rainwater harvesting and how to harvest rainwater on a catchment area

As illustrated in Figure 4.4 above, diagrams on the different ways of harvesting rainwater in a catchment area were used as another double stimulation tool to facilitate knowledge sharing during the training. Participants were able to visualise what the rainwater harvesting methods were by looking at diagrams.

Additionally, flip charts were useful as mediation tools for learning in that participants could write down their views during the group discussions and share these with the rest of the participants (see Figure 4.5 below).

Figure 4.5: CWP farmers present their views as written on flip charts, during a focus group discussion

The lead facilitator recapped the discussions from the day before. The challenges identified on Day One were allocated solutions in terms of their feasibility by the lead facilitator and the CWP group. The CWP members allocated responsibility amongst themselves as to who would champion each of the solutions.

I observed that one of the members of the CWP group acted as the translator for Day Three, as the interpreter had to go to Matutine for a livestock auction which is another project under the Green Village project. Interpreter 2 could translate well what the lead facilitator was saying but as the workshop progressed, she seemed to face challenges with translating some of the technical terms. Translating and keeping people engaged was a skill of the previous interpreter, and it was therefore difficult for Interpreter 2 to fill those shoes.

In the second half of Day Three, the lead facilitator synthesised all responses and consolidated them into ten key actions that support the solutions collectively worked out during Day Two. These were presented as a preliminary action plan framework back to the group on Day Three as another double stimulation tool. The whole group carefully went through each "action" and decided the level of importance for each individual action to support the realisation of their project vision and the level of feasibility. Task leaders were appointed and finally the time frame by which they should accomplish and report on each task.

This activity generated a good discussion about the strategy by which each task was going to be accomplished. The conclusion was that if the group worked well and dynamics were sorted out, they would be able to achieve their vision. They suggested meeting again in July to follow up on progress and reflect on their processes. During the focus group discussion, I noticed that some people lost interest and responded to the solutions ranking the exercise with "high' on all the level of importance and level of feasibility (see Table 4.3 below).

Table 4.3: Participants rank feasibility of the identified solutions to the challenges

Actions		Level of Importance			Level of Feasibility			Task Leader	Time Frame
		High	Medium	Low	High	Medium	Low	Name	Month
Mobilize service delivery: 1.1 Supply water tanks 1.2 Deliver water		 x x					 x x	Leader 1 Leader 2	July 2017
2.Apply water harvesting methods for improved water access and irrigation		 X				 x		Leader 3 Leader 4	July 2017
3.Build water reservoirs and ponds for improved irrigation		X			X			Leader 4 Leader 5	
4.Hold CWP meeting to sort out group dynamics and foster better team work		X			X			Leader 1 Leader 5	
5. Set up exchange system for improved support with labour needs and other needs (equipment)		X			X			Leader 6 Leader 7	
6.Attract potential sponsors and outside support to access agricultural equipment		X			X			Leader 1	
7. Mobilise training from government for agricultural skills and knowledge		X			X			Leader 1	
8. Set up knowledge exchange visits with other food gardeners from Eastern Cape to learn new agricultural and food production skills		X			X			Green Village Facilitator	
9. Set up a project bank to enable the purchasing of agricultural equipment e.g. fencing		X			X			Leader 8	

The table above is based on the feasibility of the solutions; the ones directly related to rainwater harvesting and conservation practices could either be easier or difficult for the CWP group to

implement, thus impacting the CWP group's ability to implement what they would have been taught in the training. The importance of these action plans to the CWP group would also determine their willingness to implement the action plans.

The second half of Day Three focused on the various rainwater harvesting techniques that the CWP group could use to capture rainwater. Participants were instructed to sit in a semi-circle and the lead facilitator used a diagram to illustrate ways through which the CWP members could harvesting rainwater in a catchment area. These methods included harvesting rainwater in a pond or a tank.

The last session of Day Three was conducted at the demonstration site where the lead facilitator explained the main principles of capturing and storing water using a trench. The facilitator explained that trench beds help keep water intact in the soil. In explaining how the group could go about harvesting rainwater, the lead facilitator said,

> Water falls into your garden you can put a gutter or trench and the ground is your catchment. So you want to put a gutter to catch the water and channel it into a pond. You may also want to have water close to your garden, you can also put a gutter across your garden, so when the water falls into your garden, it runs down, and you can intercept it and channel it to your garden.

She also explained how one can make sure that the water stays in the soil longer, so it continues to water your plants. She said this can be done through using mulching. One of the participants demonstrated how you put mulch in the soil. The facilitator said, "It is important to make sure that the mulch is thick enough so that it stops water from evaporating when the sun comes out".

From my observations of the training workshop on Day Three, I felt that the CWP members were demotivated by the training programme. This could be as a result of a number of reasons namely fatigue: a three-day training workshop for farmers could be too long as they would rather be out working in their gardens instead of sitting in a training programme. Again, the use of more practical activities could have been used to ensure that the training activities did not become monotonous. Another reason why the CWP group could have been demotivated in Day Three, could have been as a result of the language barrier. Even though Interpreter 2 tried her best to translate for the lead facilitator, there were instances where she could not explain what the rainwater harvesting technique is in isiXhosa, or she would totally forget to translate some of the sessions. This could have caused some of the participants, particularly those with low literacy levels, to lose track of what was being discussed. Below is an outline of the activities conducted in the demonstration site on Day Three.

Activity 1: Different methods of harvesting rainwater

The lead facilitator summarised the different ways of capturing, storing and channelling water to either a storage place (e.g. pond in the garden) or directly to their gardens. The lead facilitator explained the different methods of harvesting rainwater namely, how to dig diversion furrows, mulching and swells. Interpreter 2 struggled to translate these terms as they were a bit technical. I noted that she would sometimes get distracted and forget to translate for the facilitator. The next exercise involved going to the garden and the lead facilitator explained ways of practising rainwater harvesting and soil conservation methods.

Activity 2: Intercropping

The lead facilitator took the participants through other ways of keeping the soil fertile for example how to make the most out of your land through intercropping, whereby you plant different crops in the same field, for example you can plant carrot, beetroot, onions, spinach and tomatoes together. The Green Village facilitator (GVF) explained that, "these vegetables have different root systems and so you can plant them in the same bed, also because they consume different nutrients thus you need to plant a leaf plant, a root and a fruit plant together".

Activity 3: Pest control

Practising pest control is another method of soil conservation that was introduced to the CWP group. The lead facilitator explained how one can use natural pest control methods to chase away pests from vegetables: "you can spray the chilli in your spinach, some people use sunlight soap". Participants asked if you spray the chilli sauce every day, and the lead facilitator responded, "You only spray after a while, for instance after the rains come you should spray again". She also explained the benefits of mulching and practically demonstrated this to the participants.

Activity 4: Trench beds

Finally, the group looked into preparing a trench bed. All groups had already prepared to facilitate one of the four methods the day before, so the discussions built from the information available on the handouts. By the end of this session, the group felt that some of these methods would be easy to apply and others would require more effort. I was able to follow up on the use of these rainwater harvesting and conservation methods in July 2017, during the follow-up visit to Sinxaku village.

From my observations on Day Three, I noted that participants were more engaged at the demonstration site, and they asked questions and engaged with the knowledge shared by the lead facilitator. The demonstration site thus acted as an important double stimulation mediating tool in facilitating knowledge sharing and learning.

Figure 4.6: The lead facilitator demonstrates to the CWP members how to practise intercropping and companion planting

Figure 4.6 above is a picture of the Green Village facilitator demonstrating to the CWP farmers how to practice intercropping and companion planting. The lead facilitator used a tray of seedlings for the demonstration. The CWP members are also trying the soil conservation methods as introduced by the lead facilitator.

The activity took place at the CWP garden in Lower Sinxaku, which was being used as a demonstration site. From my focus group discussion at the end of the training I gathered that the participants had a good grasp of what they had learnt and that they were eager to take the knowledge and practise it in both the community garden and their own homestead gardens indicating stage four of Sannino's and the Vygotskian model of double stimulation, where double stimulation connects in meaningful ways with participants influencing their intentionality.

The following section provides a contextual activity system analysis of the CWP group. In this section I explore the elements of each activity system and how they relate to the mediation tools. Developing an understanding of the activity systems in this study will shed light on the mediation tools that are being used to improve knowledge sharing and learning around rainwater harvesting and conservation. It will also reflect on how these mediation tools are being used to facilitate knowledge sharing and learning.

4.7 Contextual activity system analysis

From the training, water scarcity was mentioned as a problem affecting the CWP group's farming practices reflecting a double bind in their food producing activity. Water availability can thus be viewed as the first stimulus which necessitated the need for a training, such as the training on rainwater harvesting and conservation facilitated under the Green Village project as reflected in associated mediating tools developed on Day One of the training where the facilitator and the participants mapped out the vision and problem analyses. To strengthen the questioning and analysis around this, the participants were asked to map out, in groups, the history of water in their area and the following was the response from Group 1:

> There used to be lots of rain, so water was not a problem and we used to plant fields and garden relying on rain water and it did not disappoint us. The rain season has changed. We even stopped planting fields and our focus has shifted to gardening because of water.

As a solution to the problem, Group 1 members said:

> Government should provide each household with rainwater tanks. Government should monthly bring us water, so we can fill our tanks. We don't ask government for support. It would be better if households with tanks build a reservoir where if the tank is full it can then direct water to the reservoir, so you can sustain yourself.

As a way of addressing the water challenge, the lead facilitator said "rainwater harvesting methods are small solutions that could make a positive impact". During the group discussions, the lead facilitator was also interested in understanding the past food production knowledge and practices of the CWP group. The following were the responses she got from Group 2:

> Our parents were using oxen to plant, compost and manure. They were also using small ploughing equipment. They used to teach each other and support each other. This is how they used to do things.
>
> What has changed is the decrease in cattle numbers and there is also not finance to buy fertilizers. Our parents supported each other. If I had oxes and someone had seeds for example, we would work together. I will exchange seeds for someone to plough. If people can do the same thing we can support each other. People who are involved in garden project such as our one, they need agriculture skills.

From the statements above, the decrease in cattle can be viewed as an absence or loss to the CWP food gardeners' rainwater harvesting and conservation practice. Another double bind from the statements above, is the lack of agricultural skills. Both the decrease of cattle and shortage of agricultural skills are factors that limit the CWP group's ability to increase their farm produce.

As a solution to the challenge of cattle decreasing, Group 2 said:

> Government should provide. We talked about our cattle decreasing in numbers because of the drought. These were our assets for ploughing. Government could provide one tractor to share among our village and the communities can provide diesel.

Farmer 2 further mentioned that training such as this organised by the Green Village is one of the potential solutions to the problems they face in their farming practices: "This workshop is one of the potential solutions, so we can sit down and identify problem and actually address them".

The training overall acted as a second stimulus in mediating knowledge on rainwater harvesting and conservation using a number of double stimulation mediating tools. The training also informed the decision-making processes of the CWP group, as there were motivated to change some of their soil conservation practices following the training.

The lead facilitator offered to facilitate an exchange between the CWP food gardeners and people in Eastern Cape:

> We can share and access information from others. I work with other people in the Eastern Cape who are also food growers but at homestead level. I could set up a small exchange [introducing another double stimulation tool and mediation possibility] so you can learn from each other and share information.

Having outlined the socio-historical factors impacting on the CWP group's farming practices, the following section will discuss the various elements of the central activity system which is that of the CWP garden project.

4.8 The community works gardeners project activity system

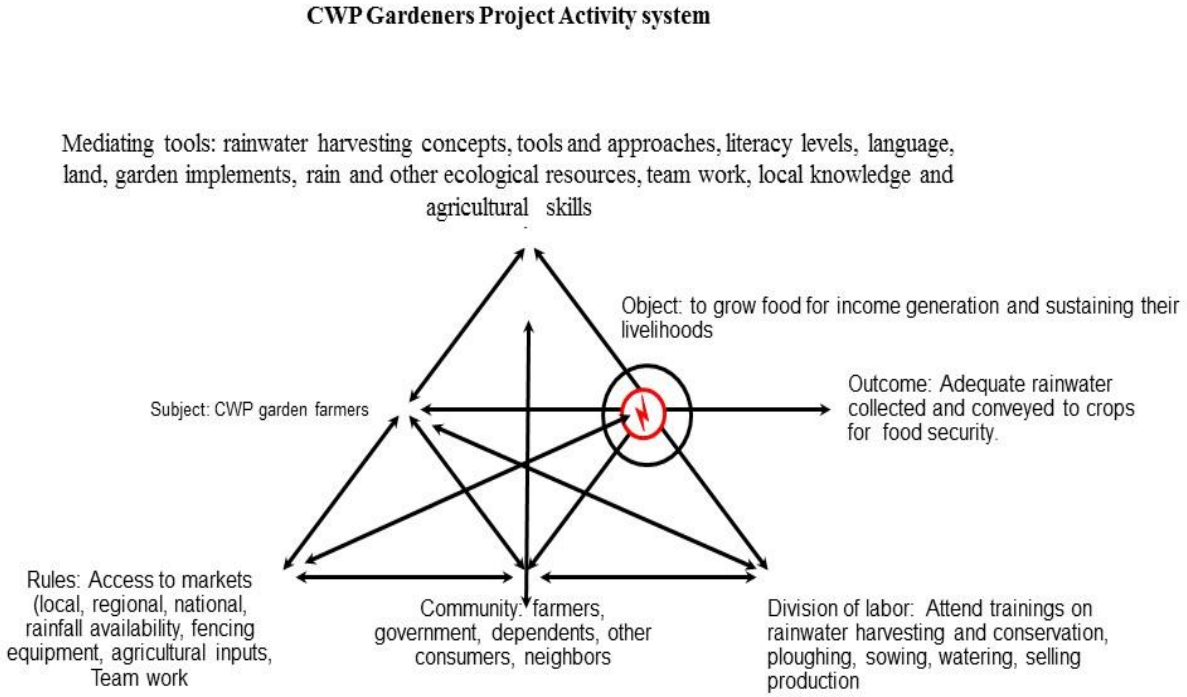


Figure 4.7: The structure of a human activity system showing the shared object (adapted from Engeström, 1987, p. 78)

The *object of activity* within the CWP activity system is to grow vegetables and sell the produce to generate income as indicated in the CWP vision below. As mentioned in Section 4.3 participants were divided into three groups and they defined their visions as follows:

> To produce vegetable and sell it locally to our neighbours and the nearby school which has a feeding scheme for the school children. To buy seeds and seedlings from the income generated in selling our produce. (CWP GRP1)
>
> We want to generate a good produce, so that we would be able to sell locally to generate funds to buy seeds. We want to plant tomatoes, green paper, lettuce etc. (CWP GRP 2)
>
> We want the garden to attract local members of the community so that when they think of buying vegetables they would come to us. We want every member of the garden group to get their share of the income generated from the garden. (CWP GRP 3)

Speaking on how the CWP food garden operates and how it is being used to support community members in Sinxaku village, the CWP supervisor said:

> The project is operating in Lower Sinxaku and in Qulungashe, however in Qulungashe the project is supporting six families to develop gardens for themselves, as well as looking after the gardens for them, unlike in Lower Sinxaku where the needy are given

> the produce from the vegetable garden. The projects also support bereaved people, that is, they go and assist with collecting firewood and give them their farm produce.

Commenting on their choice of vegetables, Farmer 1 said, "we chose to plant spinach and cabbages because these are the vegetables that are bought by community members in the village" (Interv CWP1).

From the individual interviews with some members of the CWP group as a follow-up to the training, Farmer 2 commented on their object of activity saying:

> We have recently harvested cabbages, and we have sold it to the schools for the nutrition scheme that they are running. We also sell the cabbage to the community. (Interv CWP 2)

Commenting on what they do with the produce, Farmer 3 said, "We eat them and the rest we sell. Even when we take from the garden we pay because we are trying to generate income" (Interv CWP 3).

The CWP supervisor said the garden project benefits the CWP members in that they get paid at the end of the month:

> They get paid, they can use the produce for household consumption or they can sell and get profit, or they sometimes give to people experiencing bereavement of a family member.

The CWP group noted the potential of the community garden as an income generating initiative, as highlighted by the following statement from Farmer 4:

> We want the garden to attract local members of the community so that when they think of buying vegetables they would come to us. We want every member of the garden group to get their share of the income generated from the garden project. (Interv CWP 4)

From the individual interviews that I conducted with some of the CWP group members following the training, I was informed that the CWP group sells the produce from the garden and generates income which they use to buy equipment, seeds and medicine to use in the garden. For example, commenting on the income generated from the sale of the garden produce, Farmer 2 said:

> We are paid by the Community Works Programme, and we use that money we don't give it to anyone. It's not much but it's enough for us to buy seeds and to buy some insect repellents here and there, otherwise we can use it to fence or anything for example we can use the money to buy seeds and medicine to use in the garden. (Interv CWP 2)

Farmer 3 added saying:

> We sell spinach, we get money and we use that money to buy seeds from town. We can get up to R700 per month from selling the produce. The vegetables are harvested and then sold, and we replant other vegetables. (Interv CWP 3)

Farmer 4 added:

> We would like to generate income to buy things such as fencing, and we would still need to have our own garden because this garden is not ours, it's someone else's, so we still need to have our own garden and to fence it. (Interv CWP 4)

The *subject* within the CWP activity system is the CWP members. The CWP members have a community garden where they plant different vegetables such as spinach, cabbages and beetroot. In a questionnaire administered to the lead facilitator, she said:

> The Community Works Programme (CWP) supervisor for Maxesibeni and Qulungashe teams is in Upper Sinxaku, Ntabelanga Catchment. Each team is constituted by 17 people and both teams have undertaken food gardening as their primary community project.

Speaking on the selection process for the CWP members, the supervisor of the CWP food garden group said, they are employed by the government which then identified a project for them to work on, but in the meantime, they are involved in other projects such as pothole filling, catchment management among others. Commenting on the selection of the CWP group members, the CWP supervisor said:

> We were approached by the government from a waiting list of people seeking employment to work for the garden group, each CWP group comprises of 12 men and five women and they work eight days a month.
>
> People who were chosen to work within the project were chosen in terms of those with greater need and who came from households where there wasn't anyone working.

4.8.1 Water scarcity as a mediating tool

Water scarcity was identified as a challenge impacting on the CWP group's food gardening practices (Section 4.2). The participants said a challenge they faced was to do with access to water sources as water sources were far and sometimes they had to buy the water. Speaking on the accessibility of water sources, Farmer 8 said:

> Water sources are far and people hire transport to go and fetch water which is costly. People live close by the water so they do not have to buy the water or pay for transport for the water. They are using Tsitsa water for their gardens, and the river never runs dry. Tanks run dry.

Farmer 9 added:

> In Qulungashe the taps run dry. Tsitsa river water quality is great because in summer the water is murky. Also tap water is good.

> Tributary water in Maxesibeni is poor, also tapped water is poor. Tank water is 100% good quality. Access to water has always been like this, there is no change.

Commenting on their water sources and the change in rainfall patterns and how this has impacted on their farming practices, Farmer 9 from Maxesibeni said:

> We used to receive the first rains in September through to January, but this has changed. The sources depends on the area and we only have two water sources, the river and the tank. In Maxesibeni we have springs, small tributaries, taps and tanks. Those are the main sources of water. There is a small tributary in Maxesibeni that people depend on for water.

Farmer 8 gave a historical perspective on the rainfall patterns in the past. He said as there used to be lots of rain, water was not a problem:

> We used to plant vegetables in our fields and gardens and we relied on rain water and the rains never disappointed us. The rain season has changed. We even stopped planting fields and our focus has shifted to gardening because of water.

Commenting on how farming was done in the past, Farmer 9 said:

> Our parents were using oxen to plough the field and compost and manure. They were also using small ploughing equipment. They used to teach each other and support each other. This is how they used to do things.

During the training, the CWP members used *artefacts* such as diagrams and illustrations to assist them in understanding some of the concepts used. For instance, in an interview, Farmer 8 said "I learnt the most from the diagrams. It was helpful because the facilitator was drawing so I could see what she was talking about".

4.8.2 Translations as mediation tools

The isiXhosa language was also used as a mediating tool, by the CWP group for easier comprehension of the concepts used during the training. For instance, the interpreter would translate from English to Xhosa, for the facilitator. Commenting on the language used during the training, the lead facilitator said, "I have used English but interpreted in Xhosa as it the main spoken language used by the participants, I am using the help of an interpreter for the translations".

I observed that most of the participants seemed to be able to follow and understand what the training facilitator was saying in English through listening to the Xhosa translations. Language therefore played a crucial role as a mediating tool in facilitating understanding and comprehension of the rainwater harvesting and conservation concepts and techniques.

During the training, the facilitator was also interested in understanding *the local knowledge* of the farmers on soil conservation practices. Upon enquiry of the CWP group's knowledge on soil conservation, the following were the responses to the facilitator:

> We understand what soil fertility is, in order for the soil to be fertile you put compost to keep the soil humid and you need to put some empty cans. (TCWP 10)
>
> I have no idea how to manage pests. Sometimes we sprinkle ashes over crops. We know that crop diversity involves planting different crops from time to time and planting different crops at the same time. (TCWP 11)
>
> We went to a workshop where we learnt some soil fertility techniques from school. We were taught to use grey water from the CWP training, and we are using some of the knowledge we got. We are doing our washing in Tsitsa River and buying seedlings from vendors. (TCWP 12)

From the statements above, *local knowledge* of the CWP group on soil conservation acted as a mediation tool during the training.

Figure 4.8: A demonstration garden in Qulungashe

One of the CWP members walked around the CWP garden pointing out how they were growing their vegetables in the community garden. The CWP members are growing cabbages, onions and beetroot in the vegetable bed.

In mapping out the contextual profile, the lead facilitator was also interested in ways in which the CWP members divided work amongst themselves. Commenting on the *division of labour* during Day One group discussions, a representative from Group 3 said:

> We used to have proper teamwork in the village. Different members of the community and household used to bring together their oxen and use those to plough.
>
> And the households who did not have cattle they used to provide manpower. Children used to get involved and assist to plough. So, households without cattle managed to plough their field.

> What has changed now is that there is a sense of individualism and selfishness. People only look for their own interest. People are now puffed up. They should go back to how things were. Things should be the way they used to be.
>
> We need to sit and discuss the challenge of disunity. We also need to ask government to intervene. Even within the CWP garden project. We have to discuss our challenges and even if we can identify a person who is slowing the group down. That person needs to be identified and address such behaviour. There is nothing better than working as a unit and pulling together in work situations. (Big applause from the group!!)

The statements above show that there is a double bind in the way the CWP members were working together in the community garden. There seems to be agreement from the group that some members of the CWP members have become selfish and do not want to share their farming resources with others. Whereas the general consensus is that there need to be better working relations where people pull together and work as a unit in their farming practices.

From the focus group discussion held during the training there seemed to be no clear *division of labour* among the CWP food gardeners. A question posed by the lead facilitator, was how they divide work amongst themselves and the response she got from Farmer 12 was that:

> Everyone is involved in watering the garden, selling the produce and working in the garden. If we allocate responsibilities to individuals nothing will happen.

A challenge highlighted by the CWP group, related to the division of labour, was the lack of good working relationships among the CWP members:

> They are free riders and some people miss work a lot. Water is another problem we are facing especially during non-rainy seasons. (CWP GRP 4)

Part of the *division of labour* within the CWP garden project is attending training workshops on rainwater harvesting and conservation and utilising the knowledge they would have gained to enhance their agricultural productivity. When I asked Farmer 2 during the follow-up interviews if she found the knowledge from the training useful and if she was using the information in her farming practices, she said, “Yes, we are using the knowledge from the training and we want more training”.

During the individual interviews when I asked how the CWP group divides work in the garden project, Farmer 11 said:

> It depends on the type of work. Sometimes it’s the men doing this and sometimes it’s the women doing that, and sometimes it’s all people working together.

Access to farm equipment was a *rule* identified by the CWP members as impacting on their farming practices. Commenting on this, a representative from Group 1 said;

> In order for a person to have access to land you would ask the chief or the headman for a piece of land. You would be given that piece of land. It would be fenced off and planted. This would be your field. So the land would be identified by the chief for a particular family and everyone in the village would know that that piece of land would be for that family.
>
> This is not a challenge now because even now you can access land easily. The problem is access to equipment to secure that land to fence. This is why we have secured the project small pieces of land because we don't have resources.

On solutions to the challenge of sourcing fencing poles, a representative from Group 2 said:

> We need to look at the kind of solutions that are there in terms of accessing fencing and fencing poles. One solution is that we can use the small profit we make from current gardens and save it and buy bit by bit some fencing.
>
> Another solution is that we need to be very serious about the small gardens that we have to make it very attractive, so this will demonstrate our commitment to outside help and potential sponsors.

Commenting on their past farming practices, Group 3 said,

> We use ploughs and cattle as implements for equipment. What has changed is that we are now using tractors.

During the group presentations, Group 4 outlined some of the challenges they are facing in their farming practices as follows:

> We should be planting our own vegetables. We should not be buying. We have land to plant our vegetables. We need to work together.

Lack of support from the government was another rule highlighted by the CWP food gardeners in their farming practices. Speaking on government support, Farmer 10 said:

> The government has never supported us, it's always been like this, and they only give us a monthly stipend that is the only money they give us.

Another rule identified by the CWP food gardeners was the lack of training on farming. Commenting on the training that they have been getting, Farmer 10 said:

> Since 2009, the CWP members have attended trainings on home-based care, HIV, brick laying and breeding pigs. But none of these skills have been put to use.

Other rules impacting on the CWP farming practices include lack of equipment and farming resources:

> We have no equipment, no wheelbarrows, no folk spades, we do not have gloves and hoes. People who are involved in garden project such as ours need agriculture skills and pesticides. And birds eat the seeds. (CWP GRP 1)

From the statements above, there seem to be a number of factors that impact on the CWP group's farming practices, namely, lack of training, lack of farm resources, lack of pest control and poor teamwork among the CWP members.

The community engaged in collective action within the CWP activity system are the CWP members who are working towards enhancing their food productivity through growing different types of vegetables.

Figure 4.9: CWP teams engaging in group discussions

Also forming the *community* within this activity system are the neighbours of the CWP group as they buy vegetables from the project to feed their families. Commenting on the community within the CWP activity system, the supervisor said, "We sometimes give the produce to neighbours experiencing bereavement of a family member".

Furthermore, the dependants of the CWP group also form part of the community within the activity system as they consume the food produced from the project.

The following section describes the various elements of the Green Village activity system, which is the second activity system in this study.

4.9 Green Village project activity system

Within this activity system, the subject of activity is the lead facilitator who conducted the training with assistance from the interpreter who was translating from English to isiXhosa. Below is an illustration of the Green Village Project rainwater harvesting and food gardening activity system.

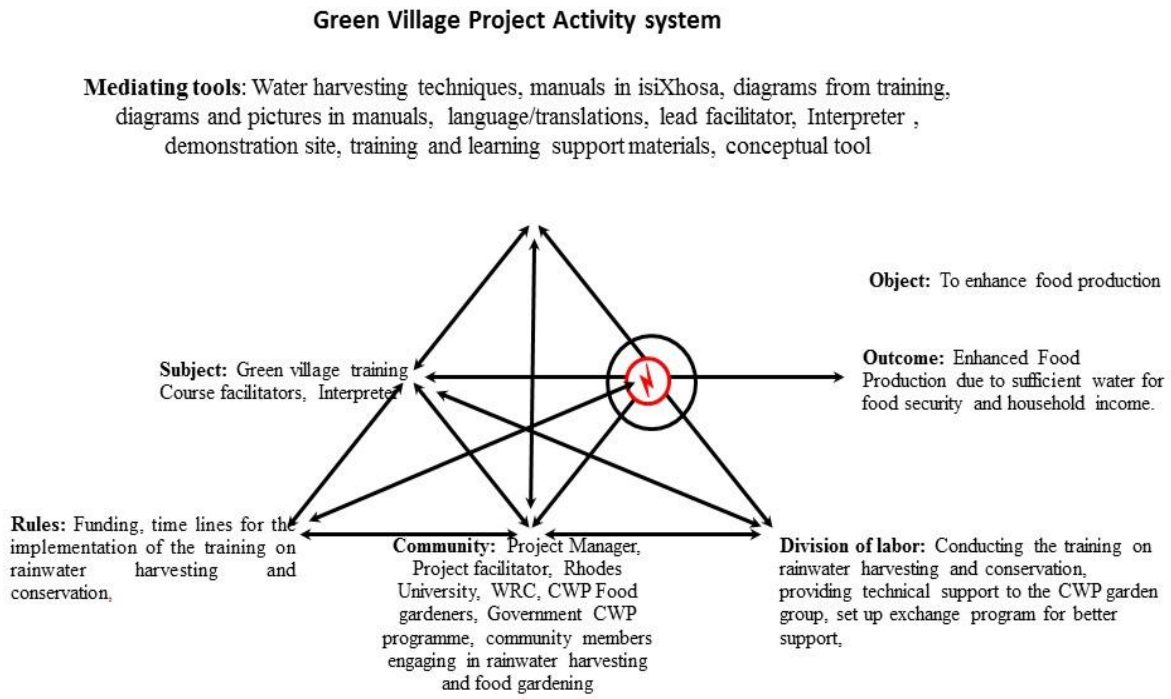


Figure 4.10: The structure of a human activity system showing the shared object (Engeström, 1987)

In seeking to understand the *object* of the training on rainwater harvesting and conservation, I asked the lead facilitator what she hoped to achieve by conducting the training. She said the training aims at:

> Mapping out the collective food garden vision/aspirations and identify and analyse dissonances and constraints found in the attainment of the proposed aspirations.

She went on to say that, the training was aimed at "designing and planning rain water harvesting solutions for improved food gardening productivity within the broader context of a catchment area (micro-scale level)".

Concepts of rainwater harvesting, and conservation methods introduced during the training include "diversion farrows, swales, mulching and trench beds" (GVF).

> I have done a scope of the CWP food garden and based on the topography as well as the existing garden design and aims of the project, together with do-ability, I decided to introduce only four basic methods to start with. (GVF)

From a questionnaire administered to the lead facilitator, she defined the ***objective*** of the training as follows:

> The aim of the Green Village water harvesting research component is to co-engage with multi-actors from the Ntabelanga Catchment area in order to co-produce locally

> relevant water harvesting knowledge and practices through a process of reflexive social learning towards a more water secured environment and sustainable productive area.
>
> Map out the collective food garden vision/aspirations, and identify and analyse dissonances and constraints found in the attainment of the proposed aspirations.
>
> Design and plan rain water harvesting solutions for improved food gardening productivity within the broader context or catchment area (micro-scale level).

During the training, the lead facilitator said the aim of the training was not only for her to share knowledge on rainwater harvesting and conservation but also for the participants to share their existing knowledge on rainwater harvesting and conservation. Commenting on the importance of conducting the training on rainwater harvesting and conservation, the lead facilitator said: "The training is important in supporting the participants' project vision" (GVF).

Within the Green Village activity system, the ***subject*** are the trainers for the rainwater harvesting and conservation methods namely; the Green Village facilitator and the interpreter.

Commenting on ***mediation tools*** that were used during the training the lead facilitator said, "she will be using flip-charts and handouts from the Amanzi for Food project … Thereafter four methods were introduced using the Amanzi for Food translated handouts. These were diversion farrows, swales, and mulching and trench beds."

Other ***mediation tools*** that the facilitator said she would be using during the training were flip charts, handouts and the CWP garden:

> I will be using flip charts and the Amanzi for Food handouts to mediate learning during the training. I also be using the CWP food garden as a demonstration site.
>
> I will use the demonstration site to follow up on implementation of the methods facilitated during the workshop and provide support as needed based on what has been or not done. I will try to address the challenges that people face during this process through a reflection exercise with the workshop participants and hands-on demonstrations.

4.9.1 IsiXhosa manual as a mediating tool

As indicated in Section 4.4 the manual in isiXhosa also acted as a mediating tool, as it had diagrams and pictures which explained the different methods of rainwater harvesting and conservation practices. See Figure 4.11 below.

Figure 4.11: Pictures from the training manual

Pictures of the different methods of harvesting rainwater can be found in the Xhosa manual. The manual was used to show the different methods of harvesting rainwater using a diversion furrow which directs rainwater runoff from gullies, grasslands or hard surfaces (such as paths or roads) to a cropped area or to a storage tank.

These methods were explained in isiXhosa language for easier comprehension by the CWP group. The isiXhosa manuals explained the different ways of practising rainwater harvesting. The manual also explained the various features of rainwater harvesting. The isiXhosa manual was therefore used as a second stimulus to encourage the CWP group to practise the different ways of rainwater harvesting and soil conservation as explained during the training.

Within the manual, rainwater harvesting was defined as:

> … the concentration, collection, storage and use of rainwater runoff. RWH can be developed for human consumption, environmental purposes and a number of productive activities such as agriculture.

The following components of rainwater harvesting were covered in the manuals:

- A catchment area where water is harvested. It can be a rooftop, path, road, communal land, etc.
- A storage facility or conveyance system where water harvested in the catchment area is stored. The storage can either be a reservoir (surface and subsurface water infrastructure), the soil profile, etc.
- A targeted area where the harvested water is used. The targeted area can be households, crops, plants, animals, enterprise, etc.
- Management of the RWH systems should be created.

Figure 4.12: The facilitator engaging with participants in the demonstration site

The lead facilitator used manuals to explain to the CWP group some of the soil conservation methods. The manuals where written in isiXhosa and had illustrations of the different rainwater harvesting and conservation techniques, as shown above.

During the training, diversion trenches and swales were methods of harvesting rainwater which were introduced to the CWP group by the lead facilitator. Explaining the rainwater harvesting practices, the lead facilitator said:

> This can be done by increasing infiltration through providing underground cover supported by mechanical means to harvest surface runoff. Diversion trenches, swales and micro-catchments are mechanical means to achieve this in non-dispersive soils.

Commenting on her selection of these learning materials the lead facilitator said:

> In the handouts, there are four methods that were introduced using the Amanzi for Food translated hand-outs and these were diversion farrows, swales, mulching and trench beds.

Another method of rainwater harvesting that was introduced by the lead facilitator during the training was planting vetiver grass on the edge of a trench bed. According to the WRC report, hedgerows of vetiver grass can be planted as effective water and sediment barriers on hillslopes; it helps water infiltrate, improve soil condition and promote the establishment of other plant species (World Bank, 1993; Hailu, 2009; Are et al., 2012). It can be used to strengthen earth bunds downslope from swales and other areas of potentially unstable soil. (ibid.).

During the training, a demonstration site was used as a double stimulation mediating tool to show the CWP members how to implement the different methods of rainwater harvesting and conservation. The demonstration site was also used to illustrate ways of conserving the garden soil and maintaining soil fertility.

Figure 4.13: The facilitator explaining how to do mulching.

The facilitator used a demonstration site as a mediating tool to illustrate the different methods of soil conservation. Here she was explaining to the CWP members how one can use mulching to fertilise the soil.

Commenting on the use of isiXhosa language in designing the training manual, the lead facilitator said, “I wanted participants to be able to read the hand-outs in the mother tongue as most participants are not fluent in English” (see Appendix F).

The pictures (see Appendix G) in the manuals can also be viewed as ***mediating tools*** as they further assisted the food gardeners in comprehending the information contained in the manuals through seeing the illustrations.

Language was also used as a mediating ***tool*** in facilitating knowledge sharing on rainwater harvesting and conservation methods. Commenting on the use of language as a mediating tool, the lead facilitator said:

> I have used English but interpreted in Xhosa as it the main spoken language used by the participants. We facilitated through an interpreter.

The CWP community garden also acted as a double stimulation mediating tool in facilitating knowledge sharing and learning around rainwater harvesting and conservation methods. Commenting on how the community garden assisted her in designing the training programme, the lead facilitator said:

> It has helped to analyse the group's food gardening activity and figure out possible solutions. This solution embodied in the mind of people enable me to proceed with sharing RWH methods situated in their own context and engaged food gardening activity.

Commenting on the challenges that she faced during the training, the facilitator said:

> Some techniques/methods are difficult to showcase as they require quite hard labour. Also, we haven't tested the benefits from a water yield point of view in this context. At this stage I'd consider RWH in this area still as an experiment towards improving productivity.

The project guidelines can be viewed as *rules* governing the operations of the Green Village activity system, as they specified how the project will be implemented and the time frame for the implementation of the project. Commenting on the timelines for the implementation of the project, the facilitator said, "the training was held over a three-day period as a way of building momentum for the training".

Within this activity system part of the *division of labour* involves the facilitator supporting the CWP group with knowledge on rainwater harvesting and conservation. Also, part of the *division of labour* within this activity system is the setting up of an exchange programme that the lead facilitator promised to facilitate for some of the members of the CWP group to go and see what other farmers in Port St Johns are doing. Such an exchange programme, the Green Village facilitator said would better support the rainwater harvesting and conservation training as the CWP members will get to see what others are doing.

The *community* within the Green Village activity system comprised of various stakeholders who are involved or have a say in the implementation of the project. The community or external stakeholders who have an interest in the work that the CWP group is doing include the Water

Research Commission (WRC) and the Government Department of Environmental Affairs. According to the WRC report (2015),

> The Green Village research project in the Ntabelanga area is situated within a broader research framework that involves various actors from a number of different institutions. The main funders are the WRC and the DEA through the Ntabelanga and Lalani Ecological infrastructure programme.

Developing insight into the two activity systems assisted me in understanding the relationship between the Green Village project and the CWP food gardeners as they were working towards a shared objective of increasing food production. Using a CHAT Inquiry process assisted me in understanding the relations between the Green Village activity system and the CWP activity system which is the shared object of activity (see Figure 4.14 below).

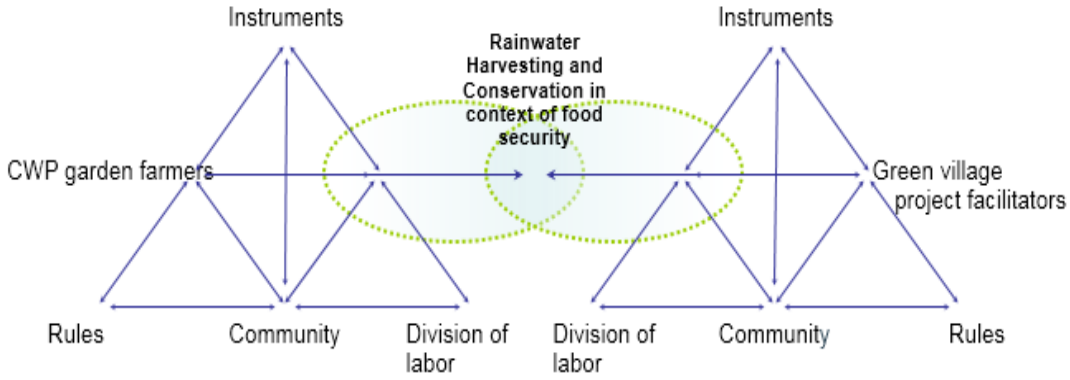


Figure 4.14: Two interacting systems with a shared object (Engeström, 1987, p. 78)

The section above outlined the two activity systems in this study. The language of the CHAT framework and the double stimulation analytical tool of Sannino (2015), was used to present the findings. The following section presents data aimed at illustrating how the mediation process occurred from the training, continuing this analyses.

4.10 Mediation processes and Rainwater Harvesting and Conservation practices

In tracking the mediation process during and after the training, I conducted semi-structured interviews with nine CWP farmers. These farmers were drawn from the two villages used in this study, namely Qulungashe and Maqasibeni. I interviewed five farmers from Qulungashe area and four farmers from Maxesibeni. These two villages have community gardens which were used as demonstration sites for the Green Village training held in March. The individual interviews were conducted in July, as a follow-up to the training. The interviews solicited

information on whether the CWP members were using the knowledge from the training and if so, how were they using this knowledge.

From the interviews, I gathered that the CWP food gardeners were implementing some of the methods of rainwater harvesting and soil conservation that they had been taught. Following the training, Farmer 1 from Qulungashe village said they had dug a trench bed in the community garden to direct rainwater and they went on to illustrate how they were planning to use the trench to capture and store rainwater:

> That's what we are doing, we are digging a trench 70cm deep which was being talked about so that when it rains the water comes and falls into the trench, filters through instead of runoff then its moist underneath the soil because the water is there, and it waters our vegetables so that they grow big. (CWP F1)

Farmer 2, also from Qulungashe village, added:

> This is the farrow we made, we wanted to go deeper but the soil was hard, so we couldn't dig deeper than this. (CWP F2)
>
> The land is dry and so it's very hard thus making it difficult to dig a trench. (CWP F2)

From observations in community garden in Qulungashe following the training, I noticed that they had planted cabbages, spinach, potatoes, onions and beetroot. In one of the vegetable beds they had mixed spinach (a leaf plant) and beetroot (a root plant) (see picture below).

Figure 4.15: CWP members are planting cabbages (leaf plant) together with beetroot (root plant)

A soil conservation method introduced during the training in March was intercropping (a root plant together with a leaf or vegetable plant). I noted that in growing their vegetables, the CWP members had mixed their vegetables, so I asked probing questions aimed at exploring why they were growing their vegetables that way.

Farmer 2 also from Qulungashe village said this was a way of saving land thus they were using knowledge from the training together with their own local knowledge of farming.

Commenting on why they were growing their vegetables this way, Farmer 2 said:

> When we plant our vegetables, we mix them. We plant a root plant (beetroot), and a leaf plant (spinach), and a fruit plant (tomatoes). It helps the plants not to be eaten by pests. There are some pests that eat spinach, so if you plant it together with cabbage, the pests will eat the spinach and leave the cabbages.

Farmer 7 from Maqasibeni, while showing how they were growing their vegetables in the garden in Qulungashe, said:

> We are planting cabbages and spinach so that it's a mix, if we do it like this. If the plot looks like it's not gonna have much we mix other things so that you see that they is a mix (illustrating in the garden). If we decided we want to plant cabbages, then we plant the cabbages and we see that the seeds run out but there is still space, then we place other things like the beetroot.
>
> We planted spinach and beetroot, the potatoes we didn't plant them this year, we planted them last year, so it just grew from last year. We have mixed, but before today we hadn't really known how important it is to mix, we had mixed because we were using the soil as much as we can. These were the seedlings we had and we have planted them and then today we have heard just how important and why it's important to mix.

This statement shows how the CWP group were willing to try out the soil conservation methods they had learnt from the training reflecting realisation of stages 4b and 5 of Sannino's (2015) double stimulation model where learning translates into agency. In response to whether this was something that the food gardener had learnt from the training in March, she said:

> Even before the training in March we were mixing because we were using the soil as much as we can, then to know how important it was to mix, we discovered during the March training. So, we were mixing even before March but for different reasons to what we discovered during the training in March. (Farmer 8)

Mulching is another method of soil conservation taken forward from the training in March that was highlighted by Farmer 9. Commenting on how there where using grass for mulching, Farmer 9 said:

> The grass for mulching is used to trap the water under the soil so that our plants grow well. The mulch helped in keeping the moisture in the ground for longer.

She went on to say that they were using tins underneath the garden to trap water and to retain soil fertility, a farming method they had learnt from other training, showing an earlier agency mobilisation from double stimulation in training.

During the training in March, the CWP food gardeners were taught two methods of conserving soil when planting vegetables, namely intercropping and companion planting. Thus, after observing that the farmers in Maqasibeni were mixing their vegetables when planting them, I wanted to find out if this was intercropping or companion planting.

Farmer 8 from Maqasibeni village responded that "it's dark, we don't understand". After Live (my translator) explained, the lady said,

> no we are planting not necessarily because this one is helping the other one but it's that ideas that we are planting root plant together with a leaf plant…. "Alright! yeah, you helped me my child, we now understand the difference between intercropping and companion planting, sure! What we are practising is intercropping.

She went on to say:

> During the training, these words are verbose, big words they are difficult to understand, you need a dictionary, but now that you have explained them we understand what is intercropping and companion planting, because it was dark to me.

Of interest to this study, is an understanding of how the CWP farmers engaged with the knowledge shared in the training and if they were practising any of the methods of rainwater harvesting and conservation that they were taught. In the interviews with Farmer 2, she said:

> We were taught about pest control…we learnt together with women, but we haven't been able to practise any of the methods. I am from the mines, so I understand a little of English.
>
> Also learnt that pepper is a repellent and that is something, you can use the pepper in your farming. Learnt about stuff that repel pests but we haven't started using that. What we have started doing is digging a trench bed and we are going to build a dam that will direct the water into the pond.

Commenting on what from the training they found helpful, Farmer 7 from Maqasibeni said:

> There are things that we learnt like the mulching with the grass that can help us. The ones that we have adapted are the easiest ones such as the mulching. But the other ones we haven't been able to do them yet but we discussed them. It's difficult to dig trench beds because the soil is dry and it hurts on the shoulders.

I then asked her if she got this information from the Green Village training in March and she said:

> Mulching and the trench were learnt from the Green Village training, and the dam we learnt from the training also, but the tins we learnt from another training.

Again this shows some transformation from 4b to 5 in Sannino's double stimulation model, showing that this can lead to agency but also that this is not always the case; farmers are able to do things that are easier immediately and without assistance.

In conducting the interviews with the food gardeners, I also wanted to find out which mediation tools or learning materials were easy or difficult to understand. This insight would assist me in answering my research question of how mediation was taking place during the training. When I posed the question to Farmer 1, the response was:

> We learnt most when we were doing practicals because then you can see what you are talking about. And when they are talking there and when we are reading there, I don't understand.
>
> So I learnt and I could really see and understand when we were doing the practical. Also, I wasn't always there at the training, so I learnt the most of all from practicals when they were doing the staff afterwards.

I also wanted to find out the challenges in comprehending the information from the training. Commenting on these challenges, Farmer 2 and Farmer 3 said they struggled with answering the questions because they were in English, and they couldn't understand what was being said:

> We didn't all go to school so here you understand, here you get lost there, you are captured there so it is not easy because of the language barrier. When the questions were being asked we found it difficult because there were being asked in English. Still the language barrier was there because it was difficult to answer the questions for example, the question on with what you farm. (Farmer 2)
>
> So even with the ladies there some can understand and others who do not, so there is always an interpreter to assist with the translations, so whenever we come together like this they should always be an interpreter so that we can all understand. (Farmer 3)

Framer 7 from Maqasibeni village said:

> The facilitator came and taught us we understood a little bit, but we are still learning and trying out what we were taught.

He went on to say that it was not easy to understand what they were taught during the training. I asked Farmer 8 from Maqasibeni village what he found difficult to understand and he said,

> The difficulty was that the questions were written in English, so answering the questions was difficult. I am from the mines and so understanding some of the concepts that were being said in English was difficult.
>
> I am from the mines, so I only hear a little bit of English, although I have been to Cape Town. In the training, what was difficult was the language. The difficult was in answering the questions because the questions were in English.

Another member of the CWP group said some of the concepts such as companion planting and intercropping were difficult to understand. The food gardeners also demonstrated their use of the local knowledge in their farming practices, Farmer 1 said:

> We are also using tins to trap water, we put tins under the soil to help hold the water and this helps to make the soil good. Additionally, the grass for mulching is used to trap the water under the soil so that our plants grow well.

Farmer 6 said:

> Underneath the soil, there are tins, from another workshop we learnt that we can use tins to hold the water and it also helps the soil to use those tins. On the top here, we are using mulching which also helps hold the moisture in the soil and it also helps the plants to sit nicely.
>
> Tins are put to keep the soil moist. That's what we were taught, that you dig the ground and put the tins underneath the soil and cover them with soil so that when the rains come the water stays in the soil for longer thus moistening the soil.

This shows the long-term impact of learner mediation processes that are helpful to farmers.

In July 2017, the Green Village project research team travelled to Ntabelanga Catchment area to follow up on the Community Works Programme (CWP) Food Garden project outcomes derived from the previous workshop in March. The interpreter explained the aim of the visit to the CWP members saying:

> We had said we will come back again in July, we want to find out if you used some of the knowledge you got in your food gardening practices, what are the challenges you faced in implementing the RWHC methods, which ones did you like, if you used them how did you use them and what is it that you are going to do.

The lead facilitator also added saying they want the CWP members to reflect on RWHC methods that they have applied, *"*what you have not applied, and the ones that you are thinking of applying".

I found the follow-up workshop conducted by the facilitator useful as it also provided insight into the mediation process that had occurred. Commenting on the question of whether they had implemented the RWH methods, Farmer 1 said, "We remember that you had said you will come back in July. We remember this month, but the problem is rain, because it's the dry season so the rains won't come".

Land ownership was also mentioned as a factor that was impacting on their practice of the rainwater harvesting and conservation methods. Commenting on the issue of land ownership, Farmer 2 said the garden was owned by one of the community members and "so if the CWP members want to dig a trench, the owner may refuse for them to dig the trench".

During the training, I also wanted to find out if the food gardeners were practising any of the RHWC methods at their homestead gardens as this could shed light on the extent to which the food gardeners were using the knowledge from the training in their farming. Farmer 3 said:

> We haven't done mulching in our homestead gardens. We only plant during the rainy season and so we do not have any vegetables in our gardens at the moment.

The shortage of farming resources such as fertilisers was also highlighted as a challenge that the CWP members were facing in their farming practices:

> So we also need fertilizer for the vegetables to flourish, the fertiliser is a need, we do not have enough money to buy the fertiliser as the money we get from selling the vegetables is only enough to buy the seeds and seedlings. (Farmer 3)

> Sometimes the money is not even enough to buy the seeds because sometimes people do not buy. Sometimes people buy the vegetables on credit and they never pay, so that's another challenge that we are facing. We do not do more with the money other than buy the seeds. (Farmer 3)

Thus, the lack of a viable market to sell their produce can be viewed as a limiting factor to the learning and practice of RWHC methods as it could demotivate the CWP members from working on the garden project.

From my observations in the two community food gardens I noted that the vegetables that were mulched were green and growing well. I then asked one of the participants if they saw a difference in the plants after using mulching and they said, "the spinach is greener, so this tells you that the mulching is working" (see Figure 4.16 below).

Figure 4.16: A garden bed where mulching was done following the training

In conducting the interviews, I was also interested to find out what from the training had helped the CWP members to change their farming practices. Farmer 5 said:

> Yes there is as we have shown you, we are able to use the mulching, and you can see we used to do the way you can see it on the side where we don't cover the soil, and we have realised that oh, if we water enough say on Monday, sometimes we come back say after two days, we see that oh, it's still moist, the water has been retained … the sun does not reach the water bed, so the grass helps retain the water.

Farmer 6 said:

> I learnt the most from the diagrams. It was helpful because she was drawing so I could see what she was talking about.

Figure 4.17: CWP food gardeners pointing out how they are doing mulching

In tracking the learning process that had occurred following the training in March, I also wanted to find out from the food gardeners if there was anything they were now doing differently. Some of the responses included:

> We were not aware that mulching is important so that it retains the moisture, before that we used to do mulching to protect the seedlings.
>
> We also learnt companion planting; we haven't started but we got some space to experiment on now that we have harvested. The mulching we have tried as you can see, so we didn't know that it must be lots and lots of grass. The digging of trenches we haven't tried because the space is small, and because the garden is not ours, so we don't want to try something in a space that's doesn't belong to us. (Farmer 5)

I also wanted to find out which of the learning methods during the training were most helpful.

> Practical sessions in the garden is the one which was easy for us. Even the work that we were doing in the hall, it led to us being able to work easy and to understand quickly in the garden because when she was drawing it already gave us an idea of how that would look like in the garden. (Farmer 6)
>
> We didn't face any challenges, the difficult is that we have very small space, so there is not enough space to experiment with things like trenches because there is not enough land. (Farmer 7)
>
> We learnt about soil and water conservation and we have implemented some stuff (she shows us around the garden). Here as you can see we have planted root vegetables (onions) and fruit vegetable (tomatoes) and what we were also discussing today was part of the knowledge sharing today.

> You can see that we learnt to do mulching, we also learnt that the mulching must be thick, we had removed it, and removed some weeds but now we will implement the thickness. Mulching methods have been used since March after we learnt it from the facilitator (Farmer 7).

I then asked her how the vegetables were responding and she said, "It's growing very nicely as you can see". She went on to say:

> So we learnt about how to use kitchen waste to fertilise the soil and natural pest control methods without having to buy chemicals. There was not anything which was difficult because they were practicals which made it easy to understand.

A tension I noted from my interviews was on the division of labour, as there seemed to be disagreements as to who is supposed to do what. When I asked who does the mulching the garden, the men said it was the women while the women felt it was the men who should do it.

Figure 4.18: CWP farmers standing in their community food gardens

4.11 Conclusion

This chapter has presented data aimed at answering my research questions. The chapter presented the various elements of the two activity systems in this study. I then tracked the mediation process that occurred using the data collected in this study. The following chapter will draw on the data presented in this chapter to synthesise insights on how mediation occurred during the training.

CHAPTER 5

Synthesis and Recommendations

5.1 Introduction

Chapter Two presented a review of literature used in this study, Chapter Three presented the research methodology and theoretical framework guiding this study, and Chapter Four presented the evidence supporting learning and mediation processes within the rainwater harvesting and conservation training held by the Green Village project with the CWP farmers. In this chapter I provide a synthesis analysis of the data. I draw on evidence from my findings and my literature review to explain how learning occurred during the training and how the mediation tools used in knowledge sharing and learning during the training impacted on the CWP group's farming practices. This chapter will thus provide a discussion of the use of mediation tools during the training, how these mediation tools impacted on the CWP's learning and practice of rainwater harvesting and conservation practices, the challenges faced from the use of these mediation tools and how knowledge from the mediation tools and processes used during the training shaped the CWP's farming practices. The discussions are thus guided by my research questions, theoretical framework and my analytical framework. Analytical statements are used to consolidate data and initiate a discussion around my findings. This chapter will therefore seek to answer my research questions:

What mediation tools are being used to improve knowledge sharing and learning around rainwater harvesting and food security related to climate change?
How are these mediation tools being used to facilitate knowledge sharing and learning?
How is learning taking place as a result of the farmers' interaction with these mediation tools?

5.2. What mediation tools are being used to improve knowledge sharing and learning in relation to food and water security

5.2.1 Analytical statement 1: The training programme was used as a second stimulus mediation tool

The training programme was used as a second stimulus mediation tool. The training was used to stimulate the adoption of rainwater harvesting and conservation practices amongst the CWP farmers who participated in the Green Village training programme. As noted in the interview with the Green Village facilitator in Section 4.1, the aim of the training was to equip the CWP

farmers with knowledge on rainwater harvesting and conservation in the hope that they would practise what they had learnt from the training.

Thus the training was used as a second stimulus in mediating knowledge on rainwater harvesting and conservation, as it provided participants with an opportunity to sit down and identify problems in their food gardening practices and develop possible solutions to address the problems. The training programme used a number of double stimulation tools to mediate learning, namely training manuals, diagrams and practical activities in the demonstration site.

5.2.2 Analytical statement 2: Training materials were used as double stimulation mediation tools

Training manuals in isiXhosa where used as a second stimulus by the Green Village facilitator. The manual explained the different methods of rainwater harvesting. Some of the rainwater harvesting and conservation techniques covered in the manuals included diversion furrows, trench beds, swales, and mulching. The use of training manuals in isiXhosa was intended to make it easier for the CWP farmers to comprehend the knowledge being shared. The use of visuals in the form of diagrams and pictures aided learning in that the CWP farmers felt they could learn more easily from the illustrations in the manuals. Training manuals where thus used as an explicit mediating tool in facilitating knowledge sharing by the Green Village facilitator. The reading of the text in the manuals was a challenge to some of the CWP farmers who indicated that they were not able to read the manuals as they had been so long out of school (see Section 4.9). This can be viewed as a conflict of motive. As shown in Section 4.8.1, the lead facilitator used manuals written in isiXhosa with the intention of making it easier for the CWP members to be able to read and understand the various practices covered in the manuals. The training manuals in isiXhosa were therefore used as a second stimulus to encourage the CWP farmers to practise the different rainwater harvesting and conservation methods (see Section 4.8.1). Other material tools used in knowledge sharing during the training programme include posters and diagrams drawn on flip charts. As a recommendation to the WRC for future training, there is a need to make more use of visual materials such as posters and postcards with pictures and diagrams which can assist with comprehension of materials especially where the literacy levels of participants are low. The importance of using relevant training materials in training programmes involving rural farmers is noted in Lupele's (2010) study which focused on the process of materials development in a community context in Zambia (see Section 2.2). Dalvit, Murray and Terzoli in Masara (2012) also noted the importance of language used in training materials as a mediating tool for learning and teaching. They noted

that learning materials are more relevant to participants when they are written in the local language (see Section 2.5). Training manuals were thus used as explicit mediation tools during the training. Explicit mediation is defined by Daniels (2015) as involving another person or directing an individual by introducing a stimulus means into an ongoing activity (see Section 2.6).

As a recommendation to the Water Research Commission, an assessment of the participants' knowledge level before introducing training materials is important in ensuring relevance of these materials in training programmes.

5.2.3 Analytical statement 3: Facilitator's engagement with participants acted as a double stimulation mediation tool

The facilitator's engagement with participants during the training acted as a double stimulation mediation tool. As highlighted in the whole of Chapter 4, the lead facilitator and interpreter worked together in facilitating and engaging with participants during the training. The training facilitator worked with the CWP farmers in developing a shared vision for the CWP group, and in identifying the challenges faced by the CWP group in their farming practices. The facilitator together with the CWP farmers then came up with strategies and solutions to the challenges identified. Lastly, the facilitator took the CWP farmers through a practical exercise in the demonstration garden where the different concepts of rainwater harvesting and conservation where demonstrated. The facilitator's engagement with the CWP farmers throughout the training programme thus acted as a double stimulation tool in that it made the CWP farmers reflect on their farming practices and how they could use the knowledge shared by the Green Village facilitator to improve their farming practices. The use of a training programme as a double stimulation mediation tool is reflected in Mukute (2009) where he noted that knowledge mediators help learners to link everyday knowledge which is context-specific to scientific knowledge which is context-free in ways that enable internalisation and appropriation. This was also supported by Lotz-Sisitka et al. (2012) who noted that it is in the detailed mediation interactions that real participation occurs as people engage with each other and with more experienced others to form new knowledge and capabilities for action in relation to their existing contexts and practices (see Section 2.2).

5.2.4 Analytical statement 4: Sharing of experiences and prior knowledge acted as a double stimulation mediation tool

The sharing of experiences and prior knowledge of the CWP farmers also acted as a double stimulation mediating tool during the training. In the contextual profiling exercise, participants

were able to reflect on their prior knowledge on farming and to share this knowledge with each other and with the Green Village facilitator during the training. Some of the prior knowledge that the CWP members shared during the training included: ways of improving soil fertility, pest control measures, and rainfall patterns in the past (see Section 4.7). Additionally, in the follow-up interviews conducted with the CWP farmers, they indicated that the use of tins to hold moisture in the soil is a soil conservation method that they had learnt from previous training and they were using that knowledge together with mulching (see Section 4.5). The CWP farmers also shared prior knowledge of soil conservation methods such as soil fertility and greywater harvesting (see Section 4.7) which they learnt from other training programmes.

The sharing of experiences and prior knowledge facilitated learning and practice as the CWP were able to then link this knowledge to the knowledge shared in the training to improve their farming practices. This is in line with Phiri's (2011) observations: he noted that people learn from social interactions and conversations where they share knowledge, experiences and best practices (see Section 2.1). The sharing of experiences and prior knowledge by the CWP farmers during the training can be viewed as evidence of implicit mediation. According to Wertsch, implicit mediation is part of an ongoing stream of communication (Daniels, 2015). The sharing of experiences and prior knowledge is important in facilitating rural farmer learning and practice of rainwater harvesting and conservation practices. As a recommendation for future training by the Water Research Commission and Green Village, more sharing of participants' experiences and prior knowledge on farming would be useful.

5.2.5 Analytical statement 5: Language and translations were used as mediating tools

The interpreter's translations during the training programme acted as a second stimulus as this helped participants comprehend the new knowledge from the training. The use of English translations also acted as a double bind in the learning and practice of rainwater harvesting and conservation methods. Although the training made use of an isiXhosa translator who assisted the facilitator in conducting the training in English, there were concerns raised by some of the CWP farmers, who stated they found it challenging to understand what was being said in English. This could have been as a result of the fact that meaning of some of the rainwater harvesting and conservation methods were lost in translations during the training programme. For example in the follow-up interviews conducted with the CWP farmers, they mentioned that some of the words used during the training were difficult to understand. One of the farmers said he had not gone to school and so he struggled to understand some of the concepts that were being introduced in English (see CWP 9). The use of language applicable

to farmers' contexts was identified in the Water Research Commission, Amanzi for Food project mediation report, as a challenge facing training (Lotz-Sisitka at al., 2016). The report further noted that current training is often detached from people's experiences in socio-cultural contexts, so training should be holistic, carefully situated and change oriented (ibid.).

Another danger posed by translations is that where translations are too long, participants could lose focus as it becomes difficult to follow what is being translated. The use of English and isiXhosa translations thus provided both affordances and constraints to action (Wetsch in Daniels, 2008). Translations provided affordances as they aided the learning processes. They however also provided constraints in that some of the participants said they did not understand the English words used by the lead facilitator. Masara (2012) highlighted the importance of language as a mediating tool when he noted that materials are more relevant to participants when they are written in their local language.

Another challenge that relates to the use of translations in the training was the use of English during group discussions. From my observations I noted that during one of the group discussions (see Section 4.5), the participants of the group where not able to fully express themselves in noting down their responses on flip charts as they did not understand what the English questions required of them. In a follow-up interview with one of the CWP farmers, he mentioned that the questions asked in group discussions were written in English and so answering them was difficult (see Interv CWP7).

As a recommendation to the WRC, future training programmes could complement translations with more use of visuals such as posters and pictures in demonstrating the different methods of rainwater harvesting and conservation. A mix of knowledge sharing through translations and visuals could be useful in aiding learning and practice of rainwater harvesting and conservation practices.

5.2.6 Analytical statement 6: Training session time as a mediation tool

As shown in the observations conducted during the training, time allocated for training activities impacted on the learning process. The training was conducted over a three-day period of which the first two days and half of the third day was devoted to the workshop. I noted that participants were more focused and they participated more at the demonstration site compared to when they were in the workshop. In order to facilitate better learning, more time should be allocated to activities at the demonstration site. This was highlighted by Burt and Berold (2012)

who noted that individual and long-term interactions with stakeholders were important in influencing learning processes (see Section 2.1)

Thus a recommendation to WRC Green Village project future training is that there is need for interspersing sitting down with going out when planning training programmes.

5.2.7 Analytical statement 7: Training may be better started in a demonstration site where it is possible to analyse prior knowledge

As shown in all of Chapter 4, training on rainwater harvesting and conservation such as the programme offered by the Green Village programme may be better started in the demonstration site where the farmers can learn by practising what they are being taught and sharing the local knowledge they have with each other instead of having to sit in a workshop setting and listen to the facilitator explaining different methods of rainwater harvesting and conservation from the start. As highlighted in Section 4.5, the CWP farmers were more engaged in the demonstration site compared to when they were in the workshop setting. The demonstration site thus acted as an important double stimulation tool in facilitating knowledge sharing and learning during the training programme. As noted by Mukute (2009), much of farmers' learning has a practical orientation and includes learning by doing, observing, trying and innovating, thus pointing to the importance of using more hands-on and practical activities as mediation tools (see Section 2.1). Future training involving farmers could thus be started in a demonstration site and move to a workshop setting as a way of facilitating better learning and practice.

5.3 How are mediation tools being used to facilitate learning and practice?

5.3.1 Analytical statement 8: Demonstration site was used to achieve learning in the zone of proximal development

The demonstration site was used by the training facilitator and the CWP members to achieve learning in the zone of proximal development. The facilitator used the demonstration site to show participants how to implement rainwater harvesting and conservation techniques, and thereafter the participants were able to practice what they were taught from the training. In the follow-up observations in the CWP garden, I noted that the CWP farmers were practising soil conservation methods such as mulching, intercropping and companion planting. Through the use of these soil conservation methods, the CWP members achieved independent problem solving (Daniels, 2008), as they were able to increase their farm produce and provide food for their families from the community garden (see Section 2.3)

The demonstration site was therefore used as a double stimulation tool to foster learning and practice and as repeated in Chapter 4 following the training, the CWP food gardeners were able to practise what they had learnt in the CWP community gardens.

This supports Phiri's (2010) views that people learn from social interactions and conversations where they share knowledge, experiences and best practices. Phiri viewed learning as an ongoing process that happens in people's everyday lives. Lee and Krasny (2015) supported this view stating that learning occurs in people's interactions and cultural practices. Language was highlighted by Phiri (2010) as one of the challenges that exists in community learning contexts. He noted that language among other contextual factors brings insight into how communities learn as well as the challenges they face in learning processes.

Mukute (2009) also noted that much of farmers' learning has a practical component, as farmers learn by doing, observing, trying and innovating. Thus practical activities in the demonstration site facilitated better learning as participants were able to practise what they learnt from the training programme.

5.3.2 Analytical statement 9: The first stimulus was produced on Day One

Activities conducted on Day One produced the first stimulus within the Green Village training programme. Firstly, the exercise of developing a vision for the CWP food garden motivated the CWP members to think about the changes in their farming practices they would like to see and what steps they should take to achieve their goal. Secondly, identifying the challenges they were facing in their farming practices acted as double stimulation mediation tool as it made the CWP members think about the challenges they were currently facing in their food gardening practices and ways of addressing these challenges. These challenges include lack of training on water management and conservation practices, uncertainties in rainfall patterns, water harvesting and conservation knowledge not being available, lack of suitable food gardening equipment, among others (see Section 4.3)

5.3.3 Analytical statement 10: Diagrams were successfully used as a second stimulus

Diagrams of the different rainwater harvesting and conservation practices also acted as a second stimulus as there were used by the Green Village facilitators to aid learning and memory retention of rainwater harvesting and conservation techniques. The Green Village facilitator drew diagrams of rooftop rainwater harvesting (see Section 4.5). In the follow-up interviews, some of the CWP farmers said diagrams and illustrations of the rainwater harvesting and conservation practices assisted them to learn by seeing the illustrations. Using diagrams and

illustrations is important, especially in community contexts where some participants have low literacy levels. As a recommendation to the Green Village facilitators and the Water Research Commission, future community based training programmes should use many diagrams and illustrations as these facilitate better learning amongst participants.

5.3.4 Analytical statement 11: Prior knowledge of rainwater harvesting and conservation practices was also used as a second stimulus

During the training sessions in the demonstration site, the CWP farmers' prior knowledge on rainwater harvesting and conservation were used as a second stimulus by the Green Village facilitator. The CWP food gardeners mentioned that they were practising mulching and intercropping before the training and they were able to demonstrate how they used these soil conservation methods. The CWP farmers' prior knowledge of farming was therefore useful in that they were able to relate better to more information shared on these practices and to also practice what they learnt in the CWP food garden following the completion of the training. Sharing of prior knowledge on farming practices is therefore important in shaping learning processes in community based training. This is in line with Wertsch where he noted that mediated action is historically situated (Daniels, 2008). Thus evidence of mediated action being historically situated is noted in the CWP members' sharing of prior knowledge on farming during the training programme. Phiri (2011) also noted that learning happens all the time. He noted that people learn by engaging with other community members in their everyday water and food practices. They also learn from social interactions and conversations where they share knowledge, experiences and best practices (Phiri, 2011) (see Section 2.1).

As a recommendation to the Water Research Commission, training facilitators should encourage the sharing of prior knowledge when developing a contextual profile for their research sites. This would assist in developing more comprehensive training programmes.

5.3.5 Analytical statement 12: Concepts of rainwater harvesting and conservation were used as mediation tools during the training

Rainwater harvesting and conservation concepts acted as ideal mediation tools during the training. Rainwater harvesting and conservation concepts discussed during the training included diversion farrows, intercropping, companion planting and trench beds. The facilitator explained how to practise these rainwater harvesting and conservation practices, and demonstrated to participants how to use each of these methods in their food gardens. During the training programme, I noted that some participants faced challenges in understanding these concepts particularly on Day Three when Interpreter 2 struggled to translate these concepts to

participants from English to isiXhosa (see Section 4.5). As a way of facilitating easier understanding of these concepts, the facilitator demonstrated how to practise these techniques, during a practical exercise in the CWP food garden. Evidence of the CWP farmers' comprehension of these concepts is shown in their farming practices following the training. From the observations that I conducted in the CWP community food gardens, I noted that the CWP farmers were practising intercropping and companion planting. I gathered that they were mixing their crops before the training, but they only came to understand the importance of mixing different vegetables in their gardens (intercropping) from the Green Village training. The willingness to try out some of the rainwater harvesting and conservation practices from the training indicates stage four of Sannino's (2015) double stimulation model where learning translates into agency.

5.4 How is learning taking place as a result of the farmers interaction with the mediation tools?

5.4.1 Analytical statement 13: Farmers learn together by focusing on the object of activity

During the training participants mapped out their vision for the community food garden on flip charts. The vision for the CWP group as shown in Section 4.3 was to develop a self-sustaining income-generating food garden with great diversity in produce. The exercise of mapping out their vision as part of the workshop activities and coming up with possible solutions to the challenges identified indicates that farmers learn together by focusing on the object of activity.

This view is supported by CHAT bridging theory which states that people learn through cultural interpretation of knowledge (Daniels, 2008). This is where a group of people with different experiences and perspectives work together on the same object and seek to jointly develop new knowledge or tools to address the problem (ibid.).

5.4.2 Analytical statement 14: Farmers learn by practising rainwater harvesting and conservation methods

During the training activities in the demonstration site, I noted that the CWP members learnt from practical activities where the facilitator demonstrated a rainwater harvesting or soil conservation technique. For example, in one instance, the facilitator used a tray of seedlings to illustrate ways of practising intercropping and companion planting (see Section 4.5). I also noted evidence of learning in my follow-up observations in the CWP community garden. For example, I noted that the CWP farmers were practising some of the rainwater harvesting and conservation practices that they learnt from the training, namely mulching, intercropping, companion planting and digging a trench. The practice of some of the rainwater harvesting and

conservation methods learnt from the training programme could be evidence of higher learning (Lee & Krasny, 2015) that occurred among the CWP members.

As a recommendation to the WRC and Green Village project, there is need for more follow-up on similar training to see if people are able to practise what they would have learnt from the training, and if there were any challenges, the facilitators would then be able to address these in future training.

5.4.3 Analytical statement 15: After the first stimulus, participants are able to clarify issues and challenges in more depth

Observations made of the training revealed that farmers learn by clarifying issues. One of the focus group discussions held on Day One involved the CWP members coming together and discussing challenges they were facing in their farming practices and developing possible solutions to these challenges. Some of the challenges mentioned included: lack of equipment, lack of knowledge, difficulties in sourcing government funding and a sense of individualism amongst the CWP farmers, lack of fertilisers and money to buy fences and farm equipment (see Section 4.3)

5.4.4 Analytical statement 16: Farmers learn by coming up with visions, strategies and plans

During the training programme, I also noted that the CWP farmers learnt from coming together and discussing their vision for the CWP garden and developing strategies and plans to achieve their objectives. The exercise of mapping out their vision acted as a double stimulation tool as it encouraged the CWP members to think about the challenges and opportunities that exist in their current food gardening practices and the changes that they would like to see in the future. Challenges faced in the CWP food gardening practices, such as water shortages, lack of fences and other farming resources, acted as a first stimulus mediating tool within the CWP activity system. The CWP members worked together in mapping out strategies and action plans to address the challenges they were facing in their community food garden. These strategies and plans acted as second stimulus mediating tools as they facilitated a change in practice in the CWP farming practices.

5.5 Disruption of the potential of learning as a result of mediating tools

5.5.1 Ecological factors

As highlighted in Section 4.6, water scarcity in Sinxaku village acted as a first stimulus within the CWP activity system, as it necessitated the need for training on rainwater harvesting and

conservation, such as what was offered by the Green Village project (see Section 4.6). A key challenge faced by the CWP farmers which acted as a conflict to their implementing the rainwater harvesting and conservation methods they learnt from the training, relates to ecological factors. In the follow-up interviews conducted with the CWP farmers, they mentioned that due to rainfall scarcity, they were not able to practise the rainwater harvesting techniques that they had learnt from the Green Village training (see Section 4.9). The CWP members said some of the methods of rainwater harvesting such as digging a trench were difficult to implement as the ground was hard and rocky (see Section 4.7). Water scarcity thus formed a double bind in the CWP farmers food producing activity (see Section 4.6). Changes in rainfall patterns as a result of climate change were mentioned by participants as a challenge impacting on their farming practices. During individual interviews I conducted with the CWP farmers, they mentioned having used to plant vegetables in their fields and gardens and relying on rainwater. Things have however changed with the change in the rainfall season and the CWP farmers have even stopped planting fields and shifted to growing vegetables in their gardens (TCWP 9). The CWP farmers mentioned that they used to receive the first rains in September to January but this has changed (see Section 4.6). As highlighted in Chapters 1 and 2, it is important to understand the context and challenges faced by the target group before introducing a training intervention.

As a recommendation to the Green Village facilitators for future training, they should implement training programmes on rainwater harvesting before the rainy season, as this would give farmers enough time to implement what they had learnt from the training during the rainy season. There is therefore a need for strategic implementation of future training on rainwater harvesting by the Green Village project facilitators.

5.5.2 Lack of farm equipment

A challenge identified by the CWP farmers during the training was their lack of farming equipment. This challenge could have impacted on the CWP farmers' ability to practise the rainwater harvesting and conservation techniques that they had learnt from the Green Village training. The CWP members mentioned that they lacked equipment and farm resources such as wheelbarrows, forks spades, gloves, hoes and fencing to secure their land. They also mentioned that they did not have agricultural skills. The lack of farm equipment and agricultural skills could have negatively impacted on the CWP farmers practising the rainwater harvesting and conservation methods they had learnt from the Green Village training.

5.5.3 Team work

Poor working relations among the CWP members acted as a double bind in the way the CWP members worked together in the community food garden (see Section 4.7). During the training programme, the CWP members expressed their wish that things should go back to the way they used to be in the 'old days', when farmers used to share their farm resources with each other and had good working relations. The CWP members mentioned that things have changed as people now have a sense of individualism and selfishness. The challenge of disunity was thus mentioned as one of the major challenges faced by the CWP members in their farming practices. Another challenge related to poor working relations, highlighted by the CWP farmers in the follow-up interviews, was the unwillingness by the farmers to share farming resources. Thus the lack of unity, and unwillingness to share farm resources could have impacted on the learning and practice of rainwater harvesting and conservation techniques by the CWP members.

Also linked to poor working relations is the lack of clear roles and responsibilities in the CWP food gardening practices. The CWP farmers mentioned that they did not assign tasks to individual members within the CWP group, but that everyone was responsible for watering, selling and working in the CWP community food garden. Lack of clear roles and responsibilities could have had a negative impact on the CWP farmers' learning and practice of rainwater harvesting and conservation techniques introduced by the Green Village facilitator.

As a recommendation to the Green Village project, there is a need to address challenges of disunity among farmers in future training interventions. Furthermore, the Green Village facilitators should facilitate the equal sharing of duties amongst the farmers, as a way of improving their working relations. Addressing these challenges can positively impact on future learning and practice of rainwater harvesting and conservation practices.

5.5.4 Time allocated to the training programme

The time allocated to training the CWP members was short considering the amount of content covered within the three-day period. The training was compressed to half a day for each of the three days that it was held. This was because the CWP members wanted to use the afternoons to fetch their children from school and to also do other household duties. From my observations it appeared that the content of the training was relatively dense and there wasn't enough time for the facilitator to go carefully through all the content and allow participants to fully engage

with the knowledge shared. This could have impacted on the learning process as I noted that in the contextual profiling exercise on Day Two, for example, some of the participants were distracted as the session was quite long. This could have been as a result of the participants losing focus of what was being said as a result of mental exhaustion. During my observations of Day Three, I also noted that the CWP farmers were distracted and this could have been as a result of the training workshop session being too long. As a recommendation to the WRC and the Green Village project facilitators, similar training could be done over a longer period of time, so as to give more time for discussions and participant engagement with the training materials. As noted by Burt and Berold (2012), individual and long-term interactions with stakeholders are important in influencing learning processes. There is therefore a need for sustained interactions between the facilitators and participants in future training interventions.

5.6 Summary of the study

A summary of how I used the Vygotskian (adapted from Sannino, 2015c) double stimulation framework is provided in analysing data is provided below.

Table 5.1: Summary of how Vygotskian double stimulation framework was used to analyse data

Phase	Detail
1. Decision forming process	Defining participants' collective vision, aspirations, outcomes in relation to the CWP garden Description and analyses of the CWP activity system being water and food security at the centre of the activity
2. Conflinct of stimuli	Water scarcity as a result of rainfall variability, language barrier, lack of fencing, poor team work, time allocated to the training
3. Auxilary motive	Demonstration site, diagrams, flip charts, pictures
4. Real conflict of stimuli	No rainfall to practise rainwater harvesting methods. Lack of manpower to dig the soil which was hard thus hindering the practice of rainwater harvesting
4a. Closure of conditioned connection	CWP farmers choosing to dig a trench, practice mulching, intercropping and companion planting following the training
4b. Decision implementing	Rainwater harvesting and conservation practices implemented such as digging of a trench, mulching, intercropping, and companion planting

5.7 Reflections on the study

5.7.1 Limitations and delimitations of the study

Time constraints were one of the major limitation of this study. I conducted a follow-up to the training programme four months after it took place. This could have given the CWP farmers inadequate time to implement the rainwater harvesting and conservation practices they had learnt from the Green Village training programme. In the event that the CWP farmers were still to implement the rainwater harvesting and conservation practices. Going back after a year to do follow-up interviews and observation could have been more appropriate as it would have given the CWP farmers enough time to put into practise what they had learnt. One of the major challenges faced by the CWP farmers in implementing the rainwater harvesting and conservation practices, was that they did not receive rainfall following the implementation of the Green Village training programme. Making follow-up observations after a year could have helped in this instance as it would have rained by then.

Another limitation of this study was the distance to the study site. Sinxaku Village, where this study was located, is five hours' drive from Grahamstown, where I was staying. I was thus not able to go to the research site as often as I would have liked to enrich my data collection. Having a research site which was far from where I stayed could have limited my time to collect contextual profile data, conduct observations and interviews. I had to rely on transport from the Green Village team, and thus the time for the visits was already pre-determined. More visits to the research site could have produced richer data for this study.

A delimitation of the study was that the study made use of one case study in rural Eastern Cape. A more rigorous and comprehensive study could have focused on two or three case studies in different parts of South Africa. The study focus was on one case study, and this was mainly due to funding constraints and time limitations.

5.7.2 Lessons learnt

Despite the limitations listed above I learnt a considerable amount from this study. I have learnt how to conduct a rigorous qualitative research study, how to design data generation tools and conduct interviews that produce rich data. I learnt about factors impacting on the designing of training programmes involving rural farmers. I also learnt about some of the pitfalls one can encounter if appropriate learning materials for a training programme are not carefully chosen. From the Green Village training facilitators, I learnt various methods and ways of facilitating a training programme. I also learned about the object of study, namely mediation, especially

how double stimulation tools used in mediation processes can support learning of farmers in response to challenges associated with water scarcity, food insecurity and climate change.

5.8 Conclusion

This chapter has provided a discussion of the key findings. In my discussion I was guided by my research questions and how data from the study assisted in answering my main research question which sought to investigate **"How mediation tools were being used in a project setting to mediate farmer learning in relation to food and water security"**. Mediation tools and processes impacting on learning and practice of rainwater harvesting and conservation practices were discussed in this chapter, and recommendations for future training were provided. I also provided reflections on the research journey and on the lessons learnt from this study.

REFERENCES

Ajiboye, J. O., & Silo, N. (2008). *Enhancing Botswana children's environmental knowledge, attitudes and practices through the school civic clubs*.University of Botswana, Botswana, International Journal of Environmental & Science Education Vol. 3, 105-114

Altman, T. G. B., & Jacobs P. T., (2009). Household food security status in South Africa. *Agrekon*, *48*(4) 345-361

Atkinson, P., & Silverman, D. (1997). Kundera's immortality: The interview society and the invention of the self. *Qualitative inquiry*, *3*(3), 304-325.

Backeberg, G. R., & Sanewe, A. J. (2006). The research and development strategy for water utilisation in agriculture – Responding to diverse needs of farmers in South Africa. *Irrigation and drainage*, *55*(3), 281-290.

Backeberg, G. R., & Sanewe, A. J. (2013*). Systems approach to water use for food production and energy generation.* Paper for ICID First World Irrigation Forum, Turkey.

Bäckstrand, K. (2003). Civic science for sustainability: Reframing the role of experts, policy-makers and citizens in environmental governance. *Global Environmental Politics, 3*(4), 24-41.

Bandura, A. (1977). *Social Learning* Wals, A., van der Hoeven, N., & Blanken, H. (2009). The acoustics of social learning: Designing learning processes that contribute to a more sustainable world. *Theory*. Englewood Cliffs, NJ: Prentice Hall.

Bassey, M. (1999). *Case Study Research in Educational Settings.* Buckingham: Open University Press.

Bassey, M. (2001). *A Solution to the Problem of Generalisation in Educational Research.*

Bateson, G. (1979). *Mind and Nature*. Glasgow: Fontana/Collins.

Bertram, C., Christiansen, I., & Mukeredzi, T. (2015). Exploring the complexities of describing foundation phase teachers' professional knowledge base. *South African Journal of Childhood Education*, *5*(1), 169-190.

Bickman, L., & Rog, D. (1998). *Handbook of applied social research methods*.Thousand Oaks, USA: Sage British *Journal of Education Studies*, *46*, 351-351.

Bless, C., Higson-Smith, C., & Sithole, S. L. (2013). *Fundamentals of social research methods: An African perspective*.Juta and Company Ltd.

Botha, M. E. (2009). *Application of the guide for farmer trainers and facilitators on the revitalisation of smallholder rain fed and irrigated agriculture*. Water Research Commission Report No. KV 221/09.

Botha, M. E., & de Lange, M. (2006*). Revitalisation of smallholder rainfed and irrigated agriculture: A guide for farmer trainers and facilitators*. Water Research Commission Report No. TT 254/1/05.

Boyd, C., Turton, C., Hatibu, N., Mahoo, H. F., Lazaro, E., Rwehumbiza, F. B., ... & Makumbi, M. (2000). *The contribution of soil and water conservation to sustainable livelihoods in semi-arid areas of sub-Saharan Africa. The contribution of soil and water conservation to sustainable livelihoods in semi-arid areas of sub-Saharan Africa*. Overseas Development Institute (ODI), 102.

Boko, M., Niang, C., Vogel, A., Githeko, A., Mdany, M., Elasha, B., & Yanda.P. (2007). *Africa. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, (pp. 433-467). Cambridge, UK: Cambridge University Press.

Bryman, A. (2016). *Social Research Methods* (5th ed.). London: Oxford University Press.

Bryman, A. (2017). Quantitative and qualitative research: further reflections on their integration. In *Mixing methods: Qualitative and quantitative research* (pp. 57-78). United Kingdom, Routledge

Barab, S. A., Barnett, M., Yamagata-Lynch, L., Squire, K., & Keating, T. (2002). Using activity theory to understand the systemic tensions characterizing a technology-rich introductory astronomy course. *Mind, Culture, and Activity*, *9*(2), Accessed 10 January 2018 from 76-107.https://www.tandfonline.com/doi/pdf/10.1207/S15327884MCA0902_02

Burnard, P., Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Analysing and presenting qualitative data. *British Dental Journal, 204*, 429-432.

Burt, J., & Berold, R. (2012). *Investigating Water Knowledge Flow to Communities.* Water Research Commission Report No. KV 288/11.

Burt, J., Lotz-Sisitka, H., Rivers, N., Berold, R., Ntshudu, M., Wigley, T., ..., & Kruger, E. (2014). *The role of knowledge in a democratic society: Investigations into mediation and change-oriented learning in water management practices*. Water Research Commission Report No. 2074/1/13.

Capper, P., & Williams, B. (2004). Cultural Historical Activity Theory. Qualitative Castells M. 2007. Communication, power, and counter-power in the network society. *International Journal of Communication, 1*, 238-266.

Castells, M. (2007). Communication, power and counter-power in the network society. *International Journal of Communication, 1*, 238-266

Corbin, J., & Strauss, A. (2008). Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory (3rd ed.). Thousand Oaks, CA: Sage

Cohen, N., & Arieli, T. (2011). Field research in conflict environments: Methodological challenges and snowball sampling. *Journal of Peace Research*, *48*(4), 423-435.

Cohen, L. M., & Manion, L. (1998). L. (1989) *Research Methods in Education*. New York: Routledge.

Cohen, L., Manion, L., & Morrison, K. (2000). *Research Methods in Education* (5th ed.). London: Routledge/Falmer.

Cole, M., & Engeström, Y. (1993). A cultural-historical approach to distributed cognition. In G. Salomon (Ed.), *Distributed Cognitions* (pp. 1-46). Cambridge, England: Cambridge University Press.

Cundill, G., & Rodela, R. (2012). A review of assertions about the processes and outcomes of social learning in natural resource management. *Journal of Environmental Management, 113*, 7-14.

Daniels, H. (1996). *An Introduction to Vygotsky*. London: Routledge.

Daniels, H. (2002). *Vygotsky and Pedagogy*. London: Routledge.

Daniels, H. (2008). Vygotsky and Research. *Research Papers in Education* (Vol. 24). New York: Routledge.

Daniels, H. (2015). Mediation: An expansion of the socio-cultural gaze. *History of the Human Sciences*, *28*(2), 34-50.

Daniels, H., Leadbetter, J., Warmington, P., Edwards, A., Martin, D., Popova, A.,... & Brown, S. (2007). Learning in and for multi- agency working. *Oxford Review of Education*, *33*(4), 521-538.

Davydov, V. V. (1999). The content and unsolved problems of activity theory. In Y. Engeström, R. Miettinen, & R.-L. Punamäki (Eds.), *Perspectives on Activity Theory* (pp. 39-52). Cambridge, England: Cambridge University Press.

Dendrinos, B. (2006). Mediation in communication, language teaching and testing. *Journal of Applied Linguistics*, *22*, 9-35.

Denison, J., Smulders, H., Kruger, E., Ndingi, H., & Botha, M. (2011). *Water Harvesting and Conservation. ,WRC Report No. TT 495/11*

Denison, J., & Wotshela, L. (2009). *Indigenous water harvesting and conservation practices: historical context, cases and implications.* Water Research Commission Report No. TT 392/09, (April).

Denzin, N. K. (2017). *The research act: A theoretical introduction to sociological methods*. New York: Routledge..

Department of Agriculture, Forestry and Fisheries, South Africa (2015/2016). *Annual report*.

Department of Agriculture Forestry and Fisheries (2011). The Integrated Food Security Strategy for South Africa. [online] Accessed from www.daff.gov.za on July 5, 2017

Department of Environmental Affairs. (2011). National climate change response white paper., Department of Environmental Affairs, Pretoria, Republic of South Africa (pp 1-56)

Department of Environmental Affairs. (2011). National Climate Change Response White Paper. Accessed February 5, 2018 from https://www.environment.gov.za/sites/default/files/legislations/national_climatechange_response_whitepaper.pdf.

Domjan, M. (2014). *The principles of learning and behavior*. Nelson Education.

South African Department of Environmental Affairs (DEA). (2010). South Africa's second national communication under the United Nations Framework Convention on climate change.

Department of Environmental Affairs (DEA) (2013). Long-term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. *Climate change implications for agriculture and forestry*, Pretoria: Government Printers.

Domjan, M. (2014). The principles of learning and behavior. Nelson Education.

Engeström, Y. (1987). Learning by expanding: *An activity-theoretical approach to developmental research.* Helsinki, Finland: Orienta-Konsultit.

Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research.* Helsinki: Orienta-Konsultit.Engeström, Y. (1993). Developmental studies of work as a testbench of activity theory: The case of primary care medical practice.

In S. Chaiklin & J. Lave (Eds.), *Understanding practice: Perspectives on activity and context* (pp. 64–103). Cambridge, England: Cambridge University Press.

Engeström, Y. (1995). Objects, contradictions and collaboration in medical cognition: an activity-theoretical perspective. *Artificial Intelligence in Medicine*, *7*(5), 395-412.

Engeström, Y. (1999). Activity theory and individual and social transformation. *Perspectives on Activity Theory*, *19*(p.38).

Engestrom, Y. (2001*).* Expansive Learning at Work: toward an activity theoretical reconceptualization. *Journal of Education and Work, 14*(1), 133-156.

Engeström, Y. (2014). *Learning by Expanding*. Cambridge: Cambridge University Press.

Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review, 5*(1), 1-24.

Engeström, Y., & Sannino, A. (2011). Discursive manifestations of contradictions in organizational change efforts: A methodological framework. *Journal of Organizational Change Management*, *24*(3), 368-387.

FAO (2008). Food & Agriculture Organization of the United Nations. *The state of agricultural commodity markets: High food prices and the food crisis—experiences and lessons learned*. United Nations.

Flick, U. (2004). Triangulation in qualitative research. *A companion to qualitative research*, *3*, 178-183.

Fisher, C., & Kunaratnam Y. (2007). *Between Ourselves: The New Generation of Information and Knowledge Intermediaries*. Brighton: Institute of Development Studies.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, *12*(2), 219-245.

Gbetibouo, G. A., Ringler, C., & Hassan, R. (2010). Vulnerability of the South African farming sector to climate change and variability: an indicator approach. In *Natural Resources Forum, 34*(3), 175-187. Oxford, UK: Blackwell.

Jamshed, S. (2014). Qualitative research method-interviewing and observation. *Journal of basic and clinical pharmacy*, *5*(4), 87.Journal of basic and clinical pharmacy.

Kim, H. S. (2012). Climate change, science and community. *Public Understanding of Science*, *21*(3), 268-285.

Flick, U. (2004). Triangulation in qualitative research. *A Companion to Qualitative Research*, *3*, 178-183.

Garrick, J. (1999). Doubting the philosophical assumptions of interpretive research. *International Journal of Qualitative Studies in Education*, *12*(2), 147-156.

Hamilton, L., & Corbett-Whittier, C. (2012). *Using Case study in Education Research*. United Kingdom; Sage.

Hammersley, M., & Atkinson. P. (1983). *Ethnography: Principles in practice*. England: Routledge.

Igira, F. T., & Gregory, J. (2009). Cultural historical activity theory. In *Handbook of research on contemporary theoretical models in information systems* (pp. 434-454). IGI Global. Com (pp. 434-454) Accessed 15 November 2017 from https://www.igi-global.com/chapter/cultural-historical-activity-theory/35845

IPCC (Intergovernmental Panel on Climate Change) (2007). *Climate Change 2007: Impacts, Adaptation and Vulnerability.* Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson. (Eds.). Cambridge, UK: Cambridge University Press.

IPCC (Intergovernmental Panel on Climate Change) (2014). *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects.* Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change. Field, C. B., Barros, V. R., Dokken, D. J., Mach, K. J., Mastrandrea, M. D., Bilir, T. E., ... & Girma, B. (Eds.) Cambridge University Press.

Jacobs, P., & Hart, T. (2014*). Pro-poor rural development in South Africa. State of the nation,* 1994-2014 (pp 1-13)

Lee, E., & Krasny, M. E. (2015). The role of social learning for social-ecological systems in Korean village groves restoration. *Ecology and Society*, *20*(1) (pp. 1-12)

Lotz-Sisitka, H. (Ed.). (2012). *(Re) views on Social Learning Literature: A Monograph for Social Learning Researchers in natural resources management and environmental education*. Grahamstown: Environmental Learning Research Centre, Rhodes University.

Lotz-Sisitka, H. B., Belay, M., & Mukute, M. (2012). The 'social and 'learning in social learning research: avoiding ontological collapse with antecedent literatures as starting points for research. In H. Lotz-Sisitka (Ed.), *(Re) Views on social learning: A monograph for social learning researchers in natural resource management and environmental education*, pp. 56-88. Grahamstown: Environmental Learning Research Centre, Rhodes University.

Lotz-Sisitka, H., & Burt, J. (2006*). A Critical Review of Participatory Practice in Integrated Water Resource Management.* Water Research Commission Report No. 1434/1/06.

Lotz-Sisitka, H., Burt, J., Berold, R., Rivers, N., Ntshudu, M., Jenkin, T., Stanford, M., & Buzani, M. (2014). Paper 3: *'Changing practice': Designing and testing a professional development course for water knowledge mediators who support community learning and practice.* Environmental Learning Research Centre, Rhodes University, Grahamstown.

Lotz-Sisitka, H., O'Donoghue, R., Phillips, K., Pesanayi, T. & Sisitka, L. (2013). Deliverable: No.2 (WRC project K5/2277); *Policy Analysis and the consultation process report on initial consultations with key National Government Departments, NGOs and other stakeholders (Component B).* Unpublished report, Environmental Learning Research Centre, Rhodes University, Grahamstown.

Lotz-Sisitka, H., O'Donoghue, R., Phillips, K., Pesanayi, T. & Sisitka, L. (2014). Deliverable: No. 6 (WRC project K5/2277); *Report on the design of knowledge mediation processes with Agricultural colleges (Component A*). Unpublished report, Environmental Learning Research Centre, Rhodes University, Grahamstown.

Lotz-Sisitka, H., Mukute, M., Chikunda, C., Baloi, A., & Pesanayi, T. (2017). Transgressing the norm: Transformative agency in community-based learning for sustainability in southern African contexts. *International Review of Education*, *63*(6), 897-914.

Lupele, J. (2003). Participatory materials development in rural Zambia. *Southern African Journal of Environmental Education*, *20*, 85-96.

Mandleni, B., & Anim, F. D. K. (2011). Perceptions of cattle and sheep farmers on climate change and adaptation in the Eastern Cape Province of South Africa. *Journal of Human Ecology*, 34(2), 107-112.

Masara, C. (2010). *Learning Commercial Beekeeping: Two Cases of Social Learning in Southern African Community Natural Resources Management Contexts.* Unpublished PhD thesis, Rhodes University, Grahamstown.

Maxwell, J. (1998). Designing a qualitative study. In L. Bickman & D.J. Rog (Eds.), *Handbook of Applied Social Research Methods* (pp. 214-253). London: Sage.

Maxwell, J. (1992*). Understanding validity in qualitative research*. . In L. Bickman & D.J. Rog (Eds.), *Handbook of Applied Social Research Methods* (pp. 243-253). London: Sage.

MacDonald, B., & Walker, R. (1975). Case- study and the social philosophy of educational research. *Cambridge Journal of Education*, *5*(1), 2-11.

Mukute, M. (2009). Cultural historical activity theory, expansive learning and agency in permaculture workplaces. *Southern African Journal of Environmental Education*, *26*, 150-166.

Mukute, M. (2010). *Exploring and expanding learning processes in sustainable agriculture workplace contexts.* Unpublished PhD thesis, Rhodes University, Grahamstown.

Mukute, M. (2015). *Developmental Work Research: A tool for enabling collective agricultural innovation*. Wageningen: Wageningen Academic Publishers.

Mukute, M., & Lotz-Sisitka, H. (2012). Working with Cultural-Historical Activity Theory and Critical Realism to investigate and expand farmer earning in Southern Africa. *Mind, Culture, and Activity,* 19(4), 342-367.

National Water Resource Strategy (NWRS). (2013). Water for an equitable and sustainable future. Accessed August 26, 2018 from https://www.dwa.gov.za/nwrs/LinkClick.aspx?fileticket=CIwWyptzLRk%3D&tabid=91&mid=496 Netherlands: Wageningen Academic Publishers.

Nerlich, B., Koteyko, N., & Brown, B. (2010). Theory and language of climate change communication. *Wiley Interdisciplinary Reviews: Climate Change*, *1*(1), 97-110.

Neumann, W.L. (2006). *Social Research Methods: Qualitative and Quantitative Approaches*. Toronto: Pearson.

Naumann,k, G., Barbosa, P., Garrote, L., Iglesias, A., & Vogt, J. (2014). Exploring drought vulnerability in Africa: an indicator based analysis to be used in early warning systems. *Hydrology and Earth System Sciences*, *18*(5), 1591-1604.

Ockwell, D., Whitmarsh, L, & O'Neill, S. (2009). Reorienting climate change communication for effective mitigation: Forcing people to be green or fostering grassroots engagement? *Science Communication, 30*, 305-327.

Pahl-Wostl, C., Tàbara, D., Bouwen, R., Craps, M., Dewulf, A., Mostert, E., ... & Taillieu, T. (2008). The importance of social learning and culture for sustainable water management. United Kingdom: *Ecological economics*, *64*(3), (pp 484-495).

Petrie, K. (2016). Coming unstuck as an interviewer. *Waikato Journal of Education*, *11*(1), 107-120.

Pepper, C., & Wildy, H. (2009). Using narratives as a research strategy. *Qualitative research journal*, *9*(2), 18-26.

Pesanayi, T. V., & Weaver, K. N. (2016). Collaborative learning of water conservation practices: Cultivation and expansion of a learning network around rainwater harvesting demonstration sites in the Eastern Cape, South Africa. *South African Journal of Agricultural Extension, 44*(1), 131-145.

Philip, K. (2009). *The Community Work Programme in South Africa*. Acessed on 18 February 2018 from http://www.levyinstitute.org/pubs/conf_june09/conf_june09_files/presentations/Session5b_Philip.pdf

Phiri, C. M. (2011). *An investigation of community learning through participation in integrated water resource management practices*. Unpublished master's thesis, Rhodes University, Grahamstown.

Rivers, N. (2014). *The mediating processes within social learning: women's food and water security practices in the rural Eastern Cape*. Unpublished doctoral thesis, Rhodes University, Grahamstown.

Rockström, J. (2003). Water for food and nature in drought–prone tropics: vapour shift in rain-fed agriculture. *Philosophical Transactions of the Royal Society B: Biological Sciences, 358(*1440), 1997-2009.

Roth, W. M. (2004). Activity Theory and Education: An Introduction. *Mind, Culture, and Activity,* 11(1), 1-8.

Rowntree (2016) Improving socio-economic conditions of Ntabelanga and Okhombe communities through integrated green innovations. Water Research Commission, Green village project, Project Number: K5/2423,

SANBI factsheet climate change and biodiversity sector (2013) Accessed on 20 March 2018 from https://www.sanbi.org/wp-content/uploads/2018/03/ltas-factsheetclimate-change-and-biodiversity-sector2013.pdf

Sannino, A. (2015). The principle of double stimulation: A path to volitional action. *Learning, Culture and Social Interaction*, *6*, 1-15.

Sayers, R. (2006). *Principles of awareness-raising: Information literacy, a case study.* Bangkok: UNESCO Bangkok.

Silverstone, R. (2005). The sociology of mediation and communication. In C Calhoun, Rojek, and Turner (Eds.) *The Sage Handbook of Sociology*. London: Sage.

Simons, P. R. J., & Laat, M. D. (2002). Collective learning: Theoretical perspectives and ways to support networked learning. *European Journal for Vocational Training, 27*, 13-24.

Siniscalco, M. T., & Auriat, N. (2005). Questionnaire design. *Quantitative research methods in educational planning*, (pp. 1-92).

South Africa's second national communication under the United Nations Framework Convention on Climate Change. Accessed June 8, 2017 from https://www.sanbi.org/documents/south-africas-second-national-communication-under-the-united-nations-framework-convention-on-climate-change/

Stake, R. E. (1995). *The art of case study research*. United Kingdom: Sage.

Stenhouse, L., Ruddick, J, & Hopkins, D. (1985). *Research as a Basis for Teaching: Readings from the Work of Lawrence Stenhouse.* Portsmouth NH: Heinemann.

Turton, C. (2000). *Enhancing livelihoods through participatory watershed development in India.* London: Overseas Development Institute (pp.7-21)

Trauth, E. M. (2001). The choice of qualitative methods in IS research. In *Qualitative research in IS: Issues and trends* (pp. 1-19). IGI Global.

Urquhart, P., Lotz-Sisitka, H. B., Kruger, B., & Naudé, J. (2014a). *SARUA climate change counts mapping study, Vol. 1 knowledge co-production framework*. SARUA.

Urquhart, P., Lotz-Sisitka, H. B., Kruger, B., & Naudé, J. (2014b). *SARUA climate change counts mapping study, Vol. 2*. SARUA.

UNDP. (2006a). *Human Development Report 2006: Beyond scarcity: power, poverty and the global water crisis.* New York: UNDP.

UNDP. (2006b) Fourth assessment report (FAR), *Climate change*, Cambridge, UK: Cambridge University Press.

Van der Spuy, D., & Rademeyer, P. F. (2010). *Flood frequency estimation methods as applied in the Department of Water Affairs.* Pretoria: Department of Water Affairs.

Van Tol, J., Akpan, W., Kanuka, G., Ngesi, S., & Lange, D. (2016). Soil erosion and dam dividends: science facts and rural 'fiction around the Ntabelanga dam, Eastern Cape, South Africa. *South African Geographical Journal*, *98*(1), 169-181.

Van Zyl, P. (2014). The impact of extension suite online on extension in South Africa. *Extension Suite Online Monthly Newsletter, 59* (October).

Vink, N., & Van Rooyen, C. (2009). *Agriculture and food security in South Africa*. Paper prepared for the Development Bank of Southern Africa Food Security Report, Midrand.

Vygotsky, L. (1978). *Interaction between learning and development: Mind and society*. Cambridge, M.A: Harvard University Press.

Wals, A. (2007). Learning in a changing world and changing in a learning world: Reflexively fumbling towards sustainability. *Southern African Journal of Environmental Education, 24*, 35-45.

Wals, A., van der Hoeven, N., & Blanken, H. (2009). *The acoustics of social learning: Designing learning processes that contribute to a more sustainable world*. Wageningen: Wageningen Academic Publishers.

Westaway, A. (2012). Rural poverty in the Eastern Cape Province: Legacy of apartheid or consequence of contemporary segregationism? *Development Southern Africa, 29*(1), 115-125.

Wenhold, F., & Faber, M. (2008). *Nutritional status of South Africans: Links to agriculture and water*. Pretoria: Water Research Commission.

Wertsch, J.V. (2007). Mediation. In H. Daniels, M. Cole and J.V. Wertsch (Eds.) *The Cambridge Companion to Vygotsky* (pp. 178-92). New York: Cambridge University Press.

Wigley, T.... & Kruger, E. (2014). *The role of knowledge in a democratic society: investigations into mediation and change-oriented learning in water management practices*. Water Research Commission Report No. 2074/1/13.

WWF South Africa (2015). *WWF Integrated annual report*. Stellenbosch: WWF.

Yin, R. (1984). *Case study research*. Beverly Hills: Sage.

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). London: Sage.

Yin, R. K. (1994). Discovering the future of the case study. Method in evaluation research. *Evaluation practice*, *15*(3), 283-290.

Yin, R. K. (2015). *Qualitative research from start to finish*. New York: Guilford Publications.

Ziervogel, G., Nyong, A., Osman, B., Conde, C., Cortés, S., & Downing, T. (2006). *Climate variability and change: implications for household food security. Assessment of Impacts and Adaptations to Climate Change (AIACC).* Washington, DC. Accessed September 3, 2017 from https://www.researchgate.net/profile/Gina_Ziervogel/publication/241137955_Climate_Variability_and_Change_Implications_for_Household_Food_Security/links/0f31752e77c108ee57000000.pdf

APPENDICES

Appendix A

List of documents analysed

Name of document	What the document provided	Index Code
WRC report Green Village workshop report 1	Purpose of the Green Village project on rainwater harvesting and conservation, reflections on being in the field, an analysis of the tensions, dissonances and challenges found in their project community garden outcomes from the field trip, actions of the field trip and findings. approach, content, process and outcomes of the three-day workshop	Doc 1
WRC report Green Village workshop report 2	Purpose of the field trip, reflections on being in the field, outcomes from the field trip, actions of the field trip, future, findings, Feedback and Reflection on Action Plan	Doc 2
Green Village deliverable Report 1 (K5 – 2423)	Background to the Ntabelanga Green Village project, water harvesting guidelines, soil conservation guidelines, Background to the Sinxaku Green Village project.	Doc 3
Green Village deliverable Report 2	Background to the Green Village project, Green Village concepts	Doc 4
WRC Green Village Questionnaire	WRC Green Village Rainwater Harvesting and Conservation Contextual Profiling	Doc 5
Amanzi for Food 2015 report	Gaps on the mediation processes in rainwater harvesting and conservation	Doc 6
Charles Phiri's Thesis: an investigation of community learning through participation in integrated water resource management practices	Findings on participation and community of practice around water. Gap in knowledge and practice. Recommendations for further study.	Doc 7
Dick Kachilonda's thesis Investigating and expanding learning in co-managent of fisheries resources to inform extension training.	Understanding and expanding learning through a CHAT framework.	Doc 8
Nina Rivers's thesis The Mediating Processes within Social Learning:	implicit and explicit mediating processes within a community context	Doc 9

Women's Food and Water Security Practices in the Rural Eastern Cape		
Burt and Berold (2012) programme on Investigations into mediation and change-oriented learning in water management practice	Mediation processes in water management practises. Gaps in mediation processes in community based water management practises.	Document 10
Kim Weaver's Thesis Exploring the course-led development of a learning network as a community of practice a shared interest of rainwater harvesting and conservation agricultural practices: A case study in the Amathole District in the Eastern Cape, South Africa	Findings on the availability of information on rainwater harvesting and conservation to rural farmers.	Document 11
Justin Lupele's Thesis Participatory Materials Development in Rural Zambia	Insights into participatory materials development processes in community contexts. The role of the existing social and political structures, ethnicity, language and literacy, local knowledge, the roles of different actors, and decision-making and power relationships in a community context.	Doc 12
Mutizwa Mukute and Heila Lotz-Sisitka study on working with Cultural-Historical Activity Theory and Critical Realism to Investigate and Expand Farmer Learning in Southern Africa	The learning environments necessary for sustainable agriculture. Why farmers learn and practise sustainable agriculture, how they learn and practise it, the contradictions they are facing.	Doc 13
Masara's Thesis how rural communities learn to commercialise natural resource products.	Learning processes in a community context.	Document 14

Appendix B

Summary of interviews conducted

Interviewee	Gender	Designation	Date of Interview
Interv GVF	F	Green Village facilitator	August 2016
Interv GVI	M	Green Village Interpreter	August 2016
Int. CWP 1	M	CWP member	July 2017
Int. CWP 2	M	CWP member	July 2017
Int. CWP 3	F	CWP member	July 2017
Int. CWP 4	F	CWP member	July 2017
Int. CWP 5	F	CWP member	July 2017
Int. CWP 6	F	CWP member	July 2017
Int. CWP 7	F	CWP member	July 2017
Int. CWP 8	F	CWP member	July 2017
Int. CWP 9	F	CWP member	July 2017

GVF – Green Village facilitator

GVI – Green Village interpreter

CWP – Community Works Project

F – Female

M – Male

Appendix C

List of observations conducted

Date of observation	**Place**	**Focus**
Phase 1		
27 March 2017: Session 1	Lower Sinxaku village hall.	Research Objectives, Methodology and Ethics.
27 March 2017: Session 2	Lower Sinxaku village hall	Defining participants' collective vision, aspirations and envisaged outcomes in relation to their CWP Community Food Garden project.
27 March 2017: Session 3	Lower Sinxaku village hall, focus group discussion.	Contextual profiling data: Description and analysis of the CWP Community Food Gardens activity system, being water security at the centre of the activity
28 March 2017	Lower Sinxaku village hall, focus group discussion	Mapping and prioritization of solutions to achieve participants' goals and aspirations. Assigning of roles and responsibilities for the mapping exercise.
28 March 2017	Lower Sinxaku village hall, focus group discussion	Introduction to rainwater harvesting and conservation principles and methods as solutions situated in watershed management and sustainability – information was represented in the form of handouts.
28 March 2017	Lower Sinxaku village hall, focus group discussion	Design rainwater harvesting food garden system-Mapping exercise
28 March 2017	Lower Sinxaku village community garden.	Practical implementation of rainwater harvesting and conservation methods
28 March 2017	Lower Sinxaku village hall, focus group discussion	Way forward: Roles and responsibilities for reporting Follow up workshop.
28 March 2017	Lower Sinxaku village community garden.	Observation of the CWP food gardeners farming practises.
Phase 2		
17 July 2017	Lower Sinxaku village hall, focus group discussion	Feedback and Reflection on Action Plan
17 July 2017	Lower Sinxaku village hall, focus group discussion	Future Food Garden/Water Harvesting and Conservation Plans
17 July 2017	Lower Sinxaku village community garden.	Field visits in the demonstration site, reflecting on how the CWP members were using the information from the training in their food gardening exercises.

Appendix D: Data generation tools

	Interviews	Observations	Focus Group Discussion
Question 1: What mediation t being used to improve knowledge sharin learning around RWH and FS related to clima change?	*GVP Facilitator:* -What Material or resources do you use in your trainings rainwater harvesting? why? -What materials or resources do you use in your trainings gardening? why? -Could you show me the material? -What do you hope to achieve by training farmers on rainwater harvesting and food gardening? -When conducting, these training workshops do you use learning material such as posters? -How do you use those learning materials? -Do you also use books or diagrams? Why?	*Food gardening/ RWH Training* -What materials/resources are being used in rainwater harvesting and food gardening trainings? -Observe for how other mediating tools are being used in the trainings such as RWH and FG gutters, meshes, catch pit, fences. -what is the role of the mediation tool in supporting learning? -Observe how the mediation tools are being used together with learning activities in facilitating learning? -Is the facilitator using 2 or more tools together. -Are different tools being used with different people? -Are the mediation tools being used in any practical activities? -Observe how the mediation tools are being used and how this is linked to learning… -In what language are the materials written? -Who is attending the training on rainwater harvesting and food gardening?	*Focus group 1- Interview with 6-8 farmers* - Do you feel that you get the chance to share what you know about farming with each other during the trainin -In what ways, do you share what you know about farming with each other during the training? -Do you feel that the course provides useful information on: Rainwater harvesting: Food gardening: -Which information do you find useful? -Which information was not useful to you and why? -Which of the learning materials or resources do you use when you go home? -Why do you use those materials? -How do you use the learning materials? -Is drought a challenge that you are facing in this area? -Could you tell me how drought is affecting your farming practices over the past 5years? -How is drought affecting your crop yields? -What do you do when there is drought? -Who comes to help when there is drought and what sort of help do they provide? - When do the rains normally come? -What are the weather conditions in this area? - Are rainfall patterns consistent in this area? -Could you talk me through the Information you have on RWH? -Could you talk me through the information you have on food gardening?
Question 2: How are the med tools being used to facilitate knowl sharing and learning?	*Interview GVP Facilitator:* -Could you give me more information on how you are using those learning materials/ resources in sharing knowledge on rainwater harvesting a gardening?	*Food gardening/RWH Training* -how are the learning materials /resources being used in the trainings? - who is using the mediation	I am very interested in learning more about the training you did with the facilitators from the Green Village Project. I am especially wanting to To know things like handouts from the training, workshop resources such as flip

	-For example, how would you use this poster compared to this one? -could you tell me about this diagram? - Are there other ways that you use diagrams as well? - Could you share with me how you are using those materials? -Which language/ languages do you use in your trainings why? - Do you have to switch languages while you are teaching -What language do you use in designing learning materials such as booklets, manuals, posters? Why? -What do you aim to achieve by using these learning materials (i.e. posters, flip charts, demonstration handouts in your trainings.? -Do you have any other insights on the Materials or resources you use during the trainings that you would like to share with me? -What are some of the challenges you face when conducting trainings on RWH and food gardening? *Activity triangles diagrams.* -Are they any traditional beliefs around the use of RWH and food gardening farming resources such as RWH tanks, gutters and seeds? -Could you talk me through any cultural beliefs around th farmers have on Rainwater Harvesting Learning materials and tools? -Could you talk me through any cultural beliefs that the farmers have on food gardening? -Could you talk me through any historical beliefs that the farmers have on food gardening?	tools (i.e. who are the mediators of meaning)? -Are different tools being used with different people? -Are different people using the mediation tools in different ways? -In what language are the material written? -Observe how the participants are responding to the mediation tools. -How are participants responding in different ways to the mediation tools? -How did the facilitator respond if the farmers are confused? -How is the facilitator responding to the responses of the farmers? -Observe how learning resources such as posters, manuals Information booklets and concepts of RWH are being used to facilitate knowledge sharing and learning. -what role are the mediation tool being used in supporting learning. -Observe for the use of practical activities involving the use of mediation tools such as RWH demonstration sites, RWH tanks, gutters, seeds, garden fences) to Influence knowledge sharing and leaning (observe how these mediation tools are being used to enhance learning and practice). -Observe for words used to share knowledge on RWH and food garde concepts. -Take note of how scientific terms related to climate change and RWH are used in the posters, pamphlets and other learning materials used in the training.	charts, demonstration sites: I will then present the participants with a set of these learning materials/resources and ask them to identify by marking on the flip chart, which ones they liked the most. -Which learning material did you find useful during the training and why? -Which ones did you like? - which ones did you find confusing? -Why do you prefer xx material compared to xx? -In what ways, do you think you will use the knowledge you have gained from the training in your food gardening practices? *Focus Group 2: 6-8 farmers* Why do you practice rain water harvesting in your farming? -Why do you practice food gardening? -Why is it important to you to practice rainwater harvesting and food gardening practices? -Do you share knowledge on rainwater harvesting and food gardening with other each other during the training? -Do you share knowledge on rainwater? harvesting and food gardening with other community members? -In your households who is responsible for Watering the garden? *Activity triangles diagrams.* -Are they any traditional beliefs around the use of rainwater farming resources such as rainwater tanks, gutters? what are those? -Are there any traditional beliefs around the use of food gardening farming resources. -Are there any cultural beliefs around the use of rainwater harvesting farming resources? -Are there any cultural beliefs around the use of food gardening resources? What ae they? -Are they any historical beliefs around the use rainwater farming resources? What are they? -Are there any historical beliefs around the use of food gardening farming resources?

		- Observe farmers' engagement with the learning materials and resources during the training -Observe how farmers engage with the learning materials and resources at the demonstration Sites? -observe for RWH and food gardening learning materials or resources that the participants got from the training.	What are they?
Question 3: How is learning place as a result of the farmers' interaction wi mediation tools?	*Interview with the facilitator* -What are the outcomes of the trainings on rainwater harvesting and food gardening? -From your observations of the farming activities Is there evidence of the use of the knowledge yo shared with the farmers during the training in the farmers' food gardening and farming practices? -What were some of the challenges you faced In sharing knowledge on rainwater harvesting and food gardening? -What are the enablers when sharing knowledge On rainwater harvesting and food security?	*Observation of food gardening practices* -Field visits to the farmers homesteads and observe their food gardening practices. -Observe for evidence of the use of knowledge learnt from the training in their food gardening practices, (i.e. the use of permaculture methods to plant a food garden which was learnt in a past garden training workshop. -Observe what they are doing, Explore why they are doing why what they are doing? -Observe their rainwater harvesting a and food gardening practices. -Observe what happened in the course that they found useful and what there are using in their farming -Do the farmers feel that they have Space to challenge the information they are getting from the training? -What space is there for the farmers To give input? -Are there spaces for dialogue?	*Focus group 3 with 6-8 farmers* -Is there anything that you are now doing differently in your food gardening practices after having been exposed to the resources used during in the training on food gardening? -Is there anything that you are now doing differently in your food gardening practices after having been exposed to the resources used during in the training on rainwater harvesting? -Could you show me how you are now doing things differently – point out activities in their food gardens, or permaculture practices etc.? -What from the course helped you change your farming practices? -What do you think needs to be done to improve the training?

Appendix E

Questionnaire

Name: ……..

Role in the WRC Green Village project: ……..

My name is Patience Shawarira and I am studying towards my master's in environmental on Education at Rhodes University. There are some questions that I would like to ask you as part of my research project where I am investigating the mediation process taking place in a project setting to mediate farmer learning in relation to food security and climate change, could you please complete the questionnaire below. I specifically want to know what learning is taking place in trainings on Rainwater harvesting. I would also like to ask some questions related to the learning materials or resources you will be using in your trainings.

1. Could you share with me the aims and objectives of the training on Rainwater harvesting and Conservation methods workshop?

1. Who are you conducting the training with?

1. Could you share with me what you hope to achieve by training farmers on Rainwater Harvesting and Conservation?

1. What learning materials or resources are you planning to use in your training?

1. Could you share with me why you chose that set of material?

1. When conducting the training, are you going to use learning materials such as flip charts? If yes, how do you plan to use them in sharing knowledge during the training?

1. Are you also planning to use handouts? If yes, how do you plan to use them in sharing knowledge during the training?

1. Are you also planning to use diagrams? If yes, how do you plan to use them in sharing knowledge during the training?

9 (a) Are you planning to use demonstration sites as a learning tool for sharing knowledge on Rainwater Harvesting and Conservation.

(b) Could you share with me how you plan to use a demonstration site as a learning tool for sharing knowledge on Rainwater Harvesting and Conservation?

(b) What Conservation methods are you planning to introduce at the demonstration site?

(c) Could you share with me why you chose those conservation methods for this training?

1. Could you share with me why you will be using those materials?

1. Could you share with me how you are using these learning materials / resources in sharing knowledge on Rainwater harvesting and Conservation?

1. Which language/ languages do you use in your trainings and why?
1. Do you have to switch languages while you are teaching?

1. What languages do you use in designing learning materials such as handouts, booklets, manuals, posters?

1. What do you aim to achieve by using these materials?

1. Do you have any other insights on the materials or resources you will be using during the training that you would like to share with me?

1. Why is it important to conduct trainings on Rainwater harvesting methods?

18 (a) could you share with me the different methods of Rainwater Harvesting that you plan

to introduce to the CWP group during the training?

b. Why did you chose those specific methods of Rainwater Harvesting?

1. (a)Could you share with me the different methods of Soil Conservation you are planning to introduce to the CWP group?

b. Why did you chose those specific methods?

20. Could you share with me how you plan to monitor and evaluate the outcomes of the training workshop?