

CHANGE ORIENTATED LEARNING AND WATER MANAGEMENT PRACTICES: KNOWLEDGE FLOWS AND MEDIATION TOOLS (K5/2074/1)

Reference Group meeting

24th May 2012

During this reference group meeting we will report back on our progress to date as well as discuss our work plan for the next year. Nina Rivers is the new masters student on the project and she will also share with us her progress and intentions for the rest of the year.

Please find below:

- Progress report
- A work plan for 2012/2013
- Masters research proposal.

We have also included the Deliverables 1, 2 and 3 for your interest.

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ABBREVIATIONS

ADM	Amatole District Municipality
BRC	Border Rural Committee
CBNRM	Community based natural resource management
CBO	Community based organisation
CF	Catchment Forum
CHAT	Cultural Historical Activity Theory
COP	Community of Practice
CPA	Communal Property Association
DWA	Department of Water Affairs
ELRC	Environmental Learning and Research Centre
IK	Indigenous Knowledge
IWRM	Integrated Water Resource Management
NGO	Non-Governmental Organisation
PhD	Doctor of Philosophy
PRA	Participatory Rural Appraisal
RSA	Republic of South Africa
SLIM	Social Learning for Integrated Management
U.S.	United States
WfF	Working for Food
WFW	Working for Water
WM	Water Management
WRC	Water Research Commission
WRM	Water Resource Management
WUA	Water User Association
ZCBNRMF	Zambia Community based natural resource management forum

LIST OF DELIVERABLES

Deliverable	Description	Status
1. Review Document	Literature review and aligning of fieldwork planning and resource design with review.	Completed
2. Start up Document	Project design and identification of site for research.	Completed
3. Fieldwork report	Report on fieldwork and development of the resource	Completed
4. Development of question driven resource publications based on case activity systems	Question-driven resource publication and report on its development	Due 31st May 2012
5. Design of community directed catalogue	Document setting out an approach to designing a community directed resource and a WRC catalogue for mediating processes and expanding learning in WRM practice contexts.	Due 31 st May 2012
6. Curriculum framework for mediator training programme	Mediator training programme.	Due 30 th April 2013
7. Report on mediator training and activity systems	Report on mediator training programme, which will include the piloting of the question-driven resource.	Due 30 th October 2013
8. Final report & masters studies	Final report and Masters studies.	Due 30 th October 2013

Introduction

In the Project start up document (Del 2), we explain how we see the project unfolding over the three years as well as the different focuses for each year.

The focus of the Phase one (year one) is developing a question-driven resource. The process of developing the question –driven resource consists of four tasks.

- Understanding community based water resource management practices and questions related to these practices (Masters studies)
- Compiling literature reviews covering change orientated learning, knowledge flow and the chosen management practice.
- Developing a catalogue of knowledge resources
- Developing a question-driven resource

This progress report will briefly discuss these tasks and our progress thus far.

1. Understanding community based water resource management practices and questions related to these practices

As indicated in the project proposal and in a report on a previous review on water communication (Burt & Berold, 2011), it is important to understand the sociology of community-based water management practices, particularly how communities learn these practices.

This first phase of the project aimed at producing an in-depth understanding of how communities learn in the context of existing water management practices. This took the form of a Masters project by Charles Phiri. The masters has been completed and submitted for examination.

The study site of Cata near Keiskammahoek was chosen for this phase of the research project for the following reasons:

- The community has requested Rhodes University to support various aspects of their development plan, including water resource management
- The site is relatively close to Grahamstown and matches the Environmental Learning and Research Centre's interest in supporting change-orientated learning in rural areas in the Eastern Cape
- The community has an established leadership structure.

Phiri chose three water management practices as the focus of his study. These are described in Phiri's Masters thesis (2011) and Deliverable 3 as the following:

a) *Rainwater Harvesting for Domestic Use (Water for Food community of practice)*

Water for Food is a network of people who wish to capitalize experience, share and create new knowledge and innovations on the sustainable use of water resources for food production within IWRM. A local organization, the Border Rural committee, introduced home-gardening approaches such as trench gardening and run-off rain water harvesting in Cata in 2004. Currently 21 Cata families are farming 'water for food' gardens

b) *Rainwater Harvesting for Irrigation (Cata Agricultural Project)*

This is a smallholder irrigation scheme in which land-rights holders have grouped their plots together with full-time, commercial farming in mind. It functions through a strong informal partnership between a support NGO, Border Rural Committee (BRC), and a local cooperative.

The irrigation scheme covers 22.75 hectares, made up of 20 individual plots whose owners are members. Its management committee includes the project members, BRC, and the Cata Community Property

Association (CPA), with the intention of improving local participation in decision making and management processes (Umhlaba, 2008).

c) *Eradication of Alien invasive vegetation (Working for Water)*

In Cata, the programme has been labour-intensive, with community members being hired by contractors. The contractors direct the clearing process with the collaboration and support of the Cata CPA, a community-owned association which holds, manages, develops and administers land within Cata on behalf of the community (Phiri, 2011a).

The WFW programme has achieved good results, evidenced in the increased water flow in the Cata River, which had nearly dried up as a result of black wattle infestation.

The question-driven resource will be developed based on two of these water management practices, namely rain water harvesting for domestic use and rain water harvesting for irrigation.

Deliverable 3 (Fieldwork report) provides an overview of Phiri's study including the main findings of his research. Included below is a draft review undertaken by Nina Waters, the second Masters student on the project which highlights Phiri's research approach and main findings. For the review Ms Rivers, drew on Phiri's Masters thesis as well as Deliverable 3 of this research project. Ms Rivers conducted the review as a way of understanding how her research would build on Mr Phiri's study and to identify some gaps in his study, which she will be following up. Her review both summarises Phiri's research as well as situates her own research which will both further explore learning in the context of community based water resource practices as well as pilot the question-driven resource.

Critical review: Charles Phiri MED thesis

By Nina Rivers

Introduction

This is a review of Charles Phiri's MED thesis, "Social Learning and Communities of practice". The overall aim of his study was to explore how social learning takes place as communities participate in IWRM practices. His study looks at how people learn the practices, the challenges and tensions of the learning process, and the learning that has taken place. Phiri conducted an analysis of three water management practices at a community level (*listed above*).

Phiri's main findings were:

- Participation in communities of practice creates a platform for learning for community members

- Participatory structures for local communities have developed around a WRM practice
- A range of contextual factors and structural mechanisms influence participation and learning in communities of practice
- Most learning has been achieved through social interactions amongst communities of practice rather than through outside influences

“Phiri’s research also shows that most learning happens through sharing, simple conversations, and storytelling, rather than through generic resource material. He concludes that if resource material is to contribute to this shared space of learning, it would have to be woven into the story or stories already being told around this practice, to ensure that it becomes part of the ongoing conversation of learning”(Burt *et al* 2012: 7).

“Phiri’s study builds on WRC consultancy K8/813 which explored knowledge flow and learning in communities, from the perspective of experienced water communicators. One of the findings of this research was that learning is more likely to occur when people are engaged in expanding or changing practices that they are already involved in (Burt and Berold, 2011). Another finding was that learning is context specific. Those who develop resources have to consider both the way people learn and their current practice” (Burt *et al* 2012: 8).

Charles’ Data analysis

Charles Phiri conducted an empirical analysis and identified categories and sub-categories. One of his sub-categories is ‘mechanisms and influences’. This is the level that I see myself working at. He separates this category further into sub-categories: inadequate quality education, language, power relations, poverty, policy and legislation, employment and tensions and contradictions (Burt *et al* 2012: 13). I propose to explore in more depth how these inform people’s learning of their rainwater harvesting practices.

The three water management practices selected for research

Water for Food (WfF) Community of Practice (COP)

Cata Agricultural Project COP

Working for Water (WfW) COP

The second phase of research requires that there be a focus on at least two water management practices so I will focus on the WfF programme and the Cata Irrigation project as well as identify a second site where rain is harvested for both domestic and irrigation purposes.

I am also in the process of conducting a contextual profile of Cata, as Charles did, but I will aim to probe my research participants further for what life was like in Cata pre-apartheid and during the Betterment scheme so as to gain a fuller picture of how the past may be influencing present practices.

Research findings that I will explore further.

- *Traditional institutions and structures mediate water resource management:* Burt *et al* (2006) argue that traditional institutions and structures that usually regulate natural resource management are often not considered in formal models for participatory water resource management practices (Burt *et al* 2012: 20). It is thus my aim to identify and explore these traditional institutions and structures with the aim of finding out how they mediate water management practices.
- *The importance of context:* Phiri's findings also support the WRC consultancy K8/813 that argues that context is key. Learning resources are more effective "when they engage learners with water issues that they experience in their local context" It is thus my aim to engage people through their stories on their water practices to establish the problems they experience, how they solve these and with whose help in order to contribute towards knowledge to help develop a resource that is context specific.
- *Testing the claim that if the knowledge generated by research in a community is mediated through an existing practice, it will be more likely to be used by people* (Burt and Berold, 2011). My research will investigate this claim made by water communicators in South Africa. Obviously a context specific resource will be more helpful than generic training material but will the resource be enough to initiate action or will further facilitation be needed?
- *Learning occurs both formally and informally.*

Mechanisms identified by Charles' study that influences participation and learning:

- **Language as a mediator:** English is used in most training workshops and most resource materials are written in English. It was found that this hampers participation and learning. Lupele (2003) argues that "in order to enable participants to generate information based on their experiences, it is important that they use the language they are familiar and comfortable with" (Phiri 2011: 97). I need to foster this when I listen to people's stories and when piloting the resource.
- **Power relations:** Phiri identifies that power relations in the form of gender bias, age bias, culture and race exist within some communities of practice. Underlying factors such as fear (of being outdone/out shone, losing jobs), pride, greed and jealousy influence opportunities for learning. Does this mean that age bias and power relations may affect innovation and new ways of doing things? Irrelevant training is also a problem with beneficiaries of programmes not being consulted about what they need and thus not necessarily benefiting from the training (Phiri 2011: 77). These findings lead to further questions such as: Would they then become despondent and bored with the training

and then perhaps stop attending other workshops that could be helpful? How are the structures for participation developed? How are stakeholders valued? Are the necessary resources available to encourage participation? (Phiri 2011:79). Often people need to build their capacity to be able to participate on an equal footing with more educated or powerful stakeholders (Lotz-Sisitka, H & Burt, J. 2006). How is this supported?

Overarching structures: How are rural people are constructed in the minds of department officials. The attitudes of department officials interviewed in Phiri's study show that rural people are seen as apathetic and careless (Phiri 2011: 79). The validity of this attitude will be important to explore. There may also be other causal mechanisms at play such as the connection between irrelevant workshops and attitudes of those in power about rural communities. The way people are grouped together may also effect opportunities for learning and attitudes. At the Cata irrigation scheme people are grouped together by gender and experienced and inexperienced workers were grouped together.

Power relations embedded in the production of resources and tools: It will be important to investigate the power relations embedded in different tools, for example the assumptions that learning resources embody about how things should be done and what people should know and learn.

Divergent views, expectations, backgrounds and experiences in COP: These mediate learning and how people manage their water (Phiri 2011: 99). Tensions may arise due to these different backgrounds. I will need to explore the differences amongst these groups and compare how their learning and practices differ.

- **Low education levels:**

Phiri found that low educational levels mediate what and how people learn. Low educational levels had a negative effect on "participation, performance and expected output" (Phiri 2011: 80). Phiri (80) equates low educational levels with causing people to be "stuck in their old ways of thinking and doing things". Tradition may hinder innovation and social change processes but tradition may also be harnessed/used/captured to become valuable indigenous knowledge. I will explore people's educational backgrounds in order to get a deeper understanding of how this mediates (hinders or facilitates) their learning.

Increased participation through capacity building: People need to be equipped with the skills and capacity to participate, including an understanding of why they are participating. One way of doing this may be to build on the capacity that already exists in the community (those already educated and equipped). Phiri suggests that further research be done into

the relationship between capacity building and participation in order to strengthen the practice (Phiri 2011: 100).

Phiri suggests that the biggest component of a training programme involves listening because many people are not sufficiently literate to rely on reading materials. Does this mean that we should appeal to an oral culture when designing resources? Most learners cannot read or write either so resources should not be text heavy.

One informant argues that “advancing the workers skill is a big challenge. There is therefore need for more resources to employ qualified workforce (S3). The point of most of these development/upliftment schemes is to counteract poverty and unemployment. If most of the unemployed and poor are uneducated then employing more qualified people would be missing the point.

- **Resource materials are not locally contextualised**

Resources need to be in isiXhosa and have lots of photographs to illustrate important learning points (Phiri 2011: 81). It is important to get communities’ own understanding of certain practices because the way we as scientists understand things may be very different.

The importance of making sure resources are accessible to people can be seen in the example of ‘playing broken telephone with a chainsaw manual’. The manual is the only resource that workers have to refer to when using a chain saw. “Most of the workers were relying on other workers who could read to help them understand what was being said...” and then sharing this with others (Phiri 2011: 81). The information being shared was interpreted in different ways.

- **Policy frameworks:**

Some policies can facilitate learning while others can have negative impacts on communities of practice.

When considering the practice of rainwater harvesting, the National Water Act does not encourage this practice. In fact, “by strict application of water related legislations, RWH is illegal” (Kahinda and Taigbenu: 17). Policies such as the National Water Act does not facilitate or encourage RWH but actually sets it out as illegal because it’s seen as interfering with ground water. Section 6 (1) requires users of rooftop RWH systems in urban and peri-urban areas to get the approval of their service provider (Kahinda and Taigbenu: 10).

Previous policy has also influenced practice, such as the Betterment policy under Apartheid. Charles Phiri observes that the change in space and the removal of fences means that people do not have space in their gardens for both vegetables and , livestock. Livestock then gets into garden patches and destroy or eat vegetables. The issue of fences came up in my initial fieldwork trip. People complain that they not have money for fences.

- **Poverty**

Phiri (2011: 83) finds that many people in Cata participate in the identified communities of practice as a response to poverty. They join WfF for example to grow vegetables and feed their families. Within a Cultural Historical Activity Theory framework (see below for description of what this is), participation, in order to counter poverty could be considered an object of an activity system. Charles does not offer a working definition of poverty or unpack what he means by this. He just refers to poverty in Cata as “pervasive, worsening poverty” (Phiri 2011: 83). As this is a contested term this statement will need further investigating.

One contradiction that has arisen in relation to poverty and food security. In the past the irrigation project was a source of cheap and sometimes free vegetables to the community. The manager of the scheme now says that the vegetables are not intended to be sold to the community as the scheme needs to make profits off of the vegetables in order to pay salaries. Does this mean that community members value a ‘salary’ more than they value cheap or/and free food.

There is also a question about the overall sustainability of these projects. Although Phiri’s research identifies that the projects are bringing in income for people, I wonder how sustainable this is in the long term.

In order to address the above points I will need to do a careful analyses of the interacting causal factors that influence learning and participation around water practices (Phiri 2011: 100). I will be looking at the structure of social context, social interactions, communication between people and opportunities for collaboration. (See diagram below). I will also be looking at examples of structures underlying and influencing learning such as poverty, history of betterment planning under apartheid, poor access to education and literacy, power relations, gender relations, rural context (Phiri, 2011, 102).

CAUSAL FACTORS

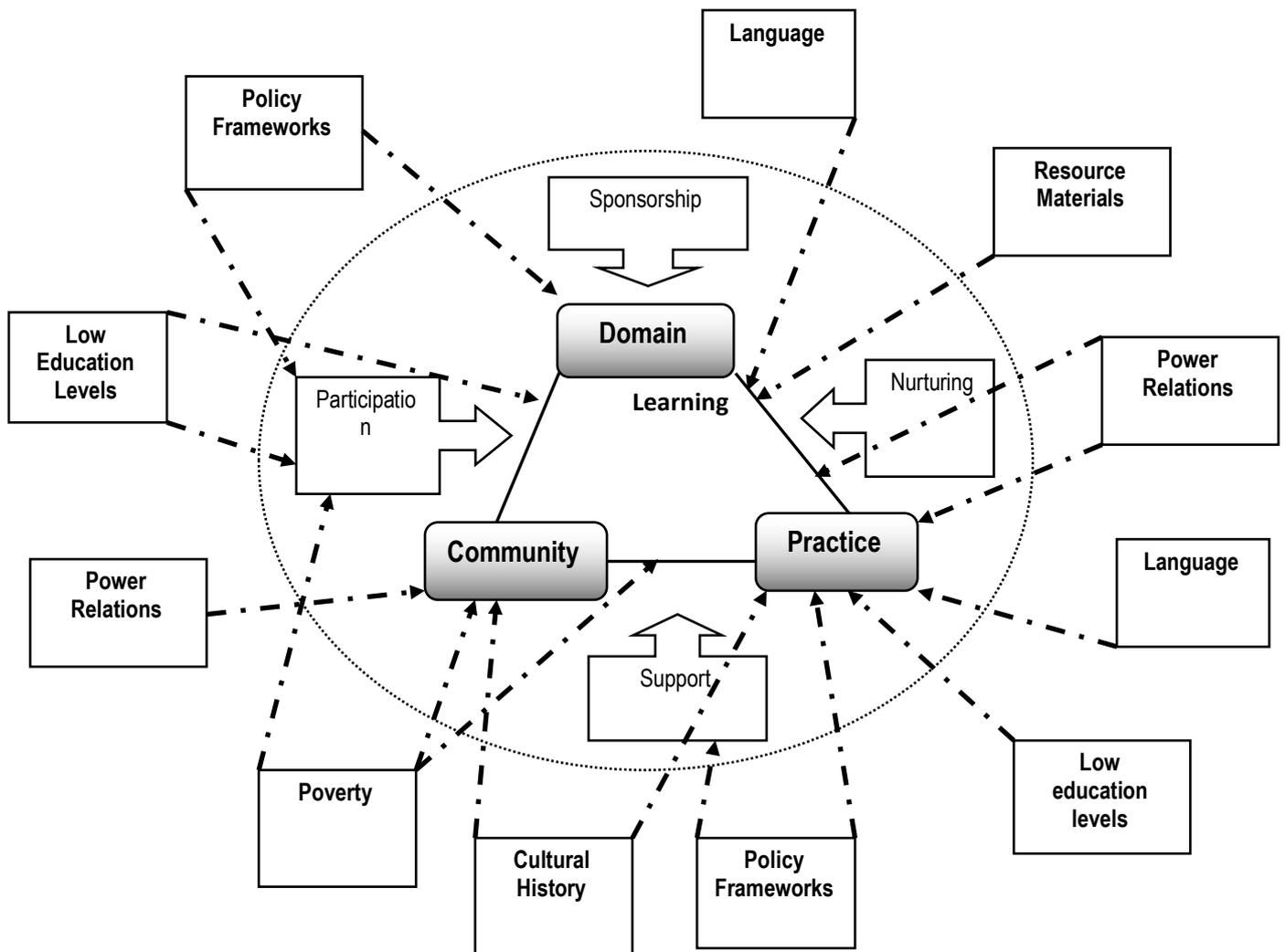


Figure 8: Underlying structures and causal mechanisms influencing learning in interactions in COP in Cata

Reasons for community participation:

Within Cultural Historical Activity Theory community participation would translate into the **object of the activity system**. Charles identifies several objects.

- *Source of livelihood:* people join COP in order to earn an income, grow their own food and buy cheap vegetables.
- *Skills development:* Men and women are trained in construction and chainsaw operation. This breaks down so gender biases and, potentially

power relations (Phiri 2011: 85). Some of these skills are transferable and can be used outside of the COP.

- *Employment opportunity*: Phiri writes that belonging to the WfF project you can own your own garden and make money from the produce. I did not meet anyone who was solely bringing money in through their gardens however.
- *Restoration of the reproductive potential of the land*: This is a result of the Working for Water programme.
- *Water availability and supply*: A result of the Working for Water Programme
- *Socio-ecological issues and risks*: A result of the Working for Water Programme
- *Incentives offered by Cata Irrigation Project*: Cheaper vegetables and communal grazing lands

Analytical statements identified in Charles' research:

1. Participating in a community of practice creates a platform for learning
2. Local structures for community participation and learning have developed around a practice
3. There are a diverse range of contextual factors that influence participation and learning
4. We learn by doing. Although learning has been shaped by external interventions, most learning has been achieved through social interactions amongst communities of practitioners through informal and formal meetings and conversations (Phiri 2011: 103). I will try further capture these points of learning through people's stories about their best practice, their problems and how they solve these in order to see how they influence learning and practice.
5. Cata community as a knowledge community: The Cata community, through being involved in various practices, have been equipped with skills and knowledge. How does this influence the sustainability of these programmes? How is this knowledge shared? In Charles' thesis he notes that a WfF practitioner mentioned that they do not share knowledge with those that are not members. This brings up questions around group exclusivity.
6. Learning as transactions: Through the apprenticeship programme at the irrigation scheme, older and younger/experienced and less experienced workers are paired together in order to engage in learning (Phiri 2011: 105).
7. Learning takes place through facilitated interventions. People are learning through formal training sessions, for example going to workshops in Pretoria run by Mama Matsepo.

Recommendations made by Charles Phiri.

1. Encourage communities to be actively involved in communities of practice as this creates a platform for social interactions and learning. To further investigate this recommendation I will ask the question investigate the question, can we claim that these practices have created a greater platform for interaction and learning than other social networks such as churches, for example (Phiri, 2011, 111)?
2. To develop strategies and resources that, not only take account of traditional structures and local knowledge, but feed into already existing practices (Phiri, 2011, 111).
3. There needs to be an analysis of the structural mechanisms that underlie these practices in order to understand how these influence learning. This will be the focus of my research.
4. To support and encourage learning that occurs within and between COP and also recognise the influence of external training programmes (Phiri, 2011, 111).
5. To develop participation structures that will address community needs and be contextually relevant (Phiri, 2011, 111).

Phiri suggests that there needs to be further research should focus on an in-depth analysis of interacting causal factors (Phiri, 2011, 112). He argues that the community of practice framework that he used as the basis of his analysis may be inadequate for this purpose as it does not take into account historical factors and cannot account for the broader structural influences (Phiri, 2011, 112). I will therefore use Cultural Historical Activity Theory and underlabour this with Critical Realism to. “further research on this dynamic between the social-cultural learning process are possible” (Phiri, 2011, 113).

Next phase of the WRC research project

My role will be to eliciting stories of people’s practices for the development of the resource and to understand:

- how people have made decisions about a particular practice.
- Motives behind these decisions decisions
- problems people have had and how they deal with these problems,
- understand the skills and knowledge they already have and how skills and knowledge has developed.

I like the metaphor the wheel of which current practices are the centre from which different learning opportunities can emerge (Del 3). As mentioned in Deliverable three, “the task for this research team is to find a way of mediating research knowledge within this wheel of practice”. For me this means learning to swim along with the stream of learning that is happening already, to better understand what factors mediate this learning and then to understand how research knowledge (that is generated from practice) can be used to improve how people learn and the sustainability of their practices.

2. Compiling literature reviews covering change orientated learning and knowledge flow

This review was compiled as a resource for the project researchers as well as other researchers, educators and water practitioners. It is hoped that by the end of the year aspects of the review will be written up as a paper for publication.

The literature consists of two parts:

- a review of social learning and,
- in-depth perspectives on mediation

Review of social learning in natural resource management

The literature review draws on a series of studies on social learning in the fields of natural resource management (Cundill, G. & Rodela, R. 2011, in press), Agricultural extension (Mukute, 2012), Participatory approaches (Kulundu, 2011) and Integrated Water resource management (Colvin *et al*, 2010). The main argument of the review is that the focus of learning in these practices has arisen out of a failure of previous managerial approaches to adequately deal with a growing understanding of the complexity of environmental issues.

Early approaches to management had a narrow focus of managing the natural environment in order to provide resources for human consumption. In the case of the water sector, this can be described as a supply-driven focus which included building large dams, irrigation infrastructures and the development of distribution and wastewater networks. As the pressure on resources has increased and the idea of an 'unlimited supply' has been replaced with a 'scarce resource', so have people started to shift their practice of resource management to be aligned with this new understanding of a planet under pressure.

Another shift in understanding has been that environmental systems cannot be managed separately from the human systems (political, social and economic) which rely on them and influence the way in which nature is used and perceived. What is noticeable in all reviews is an increased focus on learning and the importance of learning as practice shifts to deal with changing understandings of the environment and our place within the environment.

What the reviews highlight is that the way we understand learning has changed as our practices have changed. When the focus was purely on an engineering approach, learning was no more than what experts would get taught in institutions of learning in order to be able to engineer nature towards a pristine condition or towards fulfilling human needs. As our understanding shifted towards an understanding of the complexity of natural systems and the

impact human systems have on the environment, so did the processes of learning change as well as the focus of learning. This can be clearly seen in the history of water resource management and the emergence of an integrated approach to water resource management, which highlights the importance of participation, learning and dialogue as central to the management of water and to the promotion of concerted action.

In-depth perspectives on mediation

As the focus of this project is on mediation of knowledge, a review on the learning literature on mediation was done. This is in response to the changes in water management practice where researchers have observed that knowledge creation must emerge out of practices situated in their specific contexts (Jiggins, *et al*, 2007, 533).

Learning is always mediated. We often associated the idea of mediation with an individual who ‘re-interprets knowledge in a way that is relevant to a particular water practice and to those involved’ (Burt. J & Berold, R. 2011, 4). However, a mediator of knowledge, can be something other than an individual.

Knowledge can be mediated in implicit and explicit ways. A facilitator or individual as mediator would be an example of explicit knowledge mediation. Other examples are reports, learning resources and workshops. Implicit mediation is embedded in the discourses of everyday life and we are often not aware of how our knowledge is mediated by these discourses. Examples of implicit mediation would be our beliefs, traditions, norms, values and socio-economic, political and religious institutions that mediate how we learn. These forces will influence what we learn, how we learn and how we access different forms of knowledge.

Vygotsky, a Russian psychologist from the 1920’s, has influenced our understanding of learning and mediation. He researched the role of power and culture in child development and argued that human’s construct themselves using psychological tools which he called, artefacts. He explained that through human activity, meaning is ascribed to objects and things and it is this meaning that mediates our understanding of our world. An example would be a beer bowl. It is not just a bowl but a symbol of masculinity and friendship that is both understood collectively and individually (Daniels, 2008, 10). This understanding has two important consequences:

1. Humans are active agents in their own development. Understanding this shifts how we understand the learning process. It means that learning is an active, engaged process.
2. The socio-cultural is key in learning as artifacts are used at a particular time and place. This means that learning is that is contextually and culturally specific.

Artifacts are not only physical objects. Wartofsky describes three notions of artefacts.

1. Primary artefacts: artefacts that are used directly to make things such as tools, words, writing instruments, telecommunication networks. In our example of rain water harvesting, the primary artifact would be the physical tool used to collect water for example, a rain tank.
2. Secondary artefacts: Representations of the primary artifact. If traditions or beliefs or rules formed around a water tank and its use then a water tank would also become a secondary artifact.
3. Tertiary artifacts: Tertiary artifacts are the most abstract form of artifact and inform the imagination. An example of a tertiary artifact would be art. In our example of water harvesting, a ornamental pot that used to be used to collect water and becomes a symbol for a small group of food growers would be seen as a tertiary artifact.

This means that artifacts can be ideal or material and move between the inner and outer worlds where meaning is constantly being developed. This presents a challenge for researchers who are trying to understand how knowledge is formed and how best to support this process (Daniels, 2008, 11).

One way of doing this is by focusing on mediated processes. Mediated processes are the activities of humans taking place in a specific socio-cultural setting. In order to discover the essence and nature of mediated processes one must study them from their beginning to their end. In other words, to identify change, one has to know what came before it (Daniels, 2008, 13). It also highlights the importance of learning as it emerges out of actual contexts. This is what Nina Rivers will be doing in her Masters thesis using the framework of cultural historical activity theory (CHAT). CHAT has emerged from the work of Vygotsky and socio-cultural theory and identity which shows there are strong links between the context that individuals find themselves in, the practices they engage in, the social positions they take up, and their identity construction. It also acknowledges the role of power in the production of cultural tools or artefacts and the power relations that are embedded in the mediation context. These are things we need to take into consideration when developing a question-driven resource. We need to consider who was consulted when gathering questions from the community, what was left unsaid and, become aware of our own power in re-interpreting knowledge in a way that is relevant to a particular water practice.

What we are exploring in the development of this resource is how this reinterpretation of knowledge can be co-produced with communities in a way that is familiar to them.

Another feature of this approach to learning is acknowledging (rather than suppressing or ignoring) contradictions and inconsistencies and seeing them as potential spaces for learning. This is a crux of CHAT which considers how contradictions in activity systems can lead to learning. This idea fits with our new understanding of resource management as uncertain, unpredictable and complex.

Cultural Historical Activity Theory

Chat is both a theoretical framework and a methodology. It is based on two premises:

1. The context in which we find ourselves is central to how we develop
2. Learning is a social process which internalizes rules, values, norms and beliefs from the culture we find ourselves in.

In our study, the culture we find ourselves in is the practice of rain water harvesting which exists within both a rural community culture and a culture of a development organization. These cultures may be influenced by different pressures that may or may not be contradictory: political pressure, peer pressure, group norms and economic need.

What CHAT is interested in is how practice both changes and transforms the world. As we engage in a practice, so we change the world and so this changes the way we practice. The history of natural resource management and water resource management is a wonderful example of this. As we engaged in the practice of managing resources so our ideas of the world changed which then changed our practice. CHAT is particularly interested in what happens within our minds that leads to a modification in the way in which we interpret and act on our world. This understanding has implications for learning to move towards more sustainable livelihoods. In terms of developing a resource that supports this kind of learning we need to understand what kind of questions could encourage this kind of learning.

CHAT is also interested in how contradictory voices can be used to achieve learning based on an understanding of activity systems.

3. Developing a catalogue of knowledge resources

The focus for this task will be to identify and catalogue between 20 and 40 resources about rainwater harvesting. Instead of developing a catalogue according to themes or topics, this catalogue will be developed around practice. It will indicate how the resources address the questions asked by the community. We will draw on these knowledge resources for developing the question-driven resource. The catalogue will also be referenced in the resource according to how knowledge resources respond to questions addressed in the resource.

Each knowledge resource will be described by a short summary, and rated under various criteria such as language level, proven value and current use of the resource. We will also investigate the most appropriate form of internet presentation for the catalogue, and the most appropriate design and presentation in the printed form.

The draft catalogue will be completed by the 31st May 2012. Robert Berold and Nina Rivers are currently working on catalogue and will present their

progress on the 24th May. As more knowledge resources are found, these will be added to the catalogue for the duration of the project.

4. Developing a question-driven resource

Using the narratives collected from the Cata community and drawing on the knowledge resources that are in the catalogue, we will develop a question driven resource. This resource will be an example of how one can develop a resource based on questions emerging from the community context that can then incorporate research knowledge and encourage people to continue questioning their practice. As mentioned above, contradictions, tensions and difficulties become spaces for learning rather than issues to be avoided or feared.

Charles Phiri's research provided us with a clear understanding of how people learn in relation to a water management practice. His research points to how learning should be grounded in a practice and that a community practice becomes a fertile ground for learning about all sorts of related issues. Nina Rivers has followed up on Charles' research by providing us with rich narratives of how people have learnt, how they engage in the water management practice of rainwater harvesting and what are their difficulties and triumphs.

We decided to contract Tim Wiggly as a writer for the resource. Tim has a vast amount of technical and practical experience with working with communities in developing agriculture and home food gardens.

The team met in April to discuss the design of the resource as well as the questions that the resource will address. Each question will take up four pages. On the first page will be the question, an illustration or photograph and, what we currently call, the 'technical text'. This will be the answer to the question based on what is currently known. If there is no clear answer to the question this will be reflected in the answer and choices given to the reader. The second and third page will contain a story about the practice. The story will be told as a series of pictures when possible. The final page will contain contact details and references taken from the catalogue.

The resource will be developed so that it is easily reproducible and cheap to copy. We are hoping that we will be able to develop a template which could be used by other researchers, extension workers and NGO's to develop similar resources around a question. Our hope is that all WRC research projects will end up being able to produce a number of easy to access and use question-driven resources using the template we have designed. As all research is generated from practice, it seems vital that some thought is given to how the final product of the research can feed back into practice in a way that is accessible, user-friendly and, more importantly, informs practice.

Although all the questions will be presented in the format of a booklet, each question can be used as a four-page resource. (See Appendix B for list of questions)

Phase 2: Evaluating the effectiveness of the question-driven resource in two communities and developing a curriculum framework for the mediators course.

1. Nina's masters research and piloting the question-driven resource

The focus of the second masters project will be to pilot the resource in two communities. The first community will be Cata. As the questions for the resource are based on practices in Cata, this will give the community the opportunity to give us feedback on whether they find the resource useful.

The second study site will be in the Sunday's River Valley. This site has been chosen for similar reasons as the first site:

- Rhodes University is already involved in the Sunday's River doing research at the request of the local municipality on water security.
- The site is relatively close to Grahamstown and matches the Environmental Learning and Research Centre's interest in supporting change-orientated learning in rural areas in the Eastern Cape
- Nina's research in the area can add to a broader study on levels of water security in the area.
- There are a few rural villages in the area that are entirely rain water dependent
- The area is very dry which is a contrast to Cata where there is a much higher rainfall. It will be useful to explore whether the resource will be useful in this context and whether more and/or different questions will arise given the differences in context.

2. Developing training course materials and curriculum framework for Mediators course.

This will be the focus for the second half of the year and we will draw on the expertise and experience of staff in the Environmental Learning and Research Centre to develop the course. The course will be developed along the lines of the successful Environmental Education certificate course which consists of four contact sessions and away assignments.

Four mediation tools will be developed out of the research to guide the course. They are:

1. How to understand community based water resource practice and identify community questions. (Developed out of Masters research projects)

2. Challenges and opportunities for mediating learning in the context of community-based water resource management practices (Developed out of literature reviews)
3. How to access, identify, and catalogue the most useful water resources available and their relevance to water resource management practices (Developed out of the development of the catalogue)
4. How to develop a question-driven resource for mediating available knowledge resources (Developed out of developing the question driver resource).

Decisions that need to be discussed with regards the training programme:

1. Where will it be housed?
2. Who will be the main target audience?
3. Over what time frame should the course take place? A short course over six months, a year-long short course,
4. Should we investigate SETA certification or/and Rhodes certification?

WORKPLAN FOR APRIL 2012 TO APRIL 2013

MONTH	ACTIVITIES	RESEARCHERS
COMPLETED ACTIVITIES		
April 2012	<p>Meeting to discuss question driven resource and catalogue.</p> <p>Writing of 1st draft of question-driven resource & catalogue</p> <p>Masters Research</p> <ul style="list-style-type: none"> • Participated in one week masters session 	<p>Jane Burt Robert Berold Nina Rivers Robert Berold Tim Wiggly</p> <p>Tim Wiggly Jane Burt Nina Rivers</p> <p>Nina Rivers</p>
May	<p>First edit of question-driven resource & catalogue (1-4th May) & 2nd field visit to Cata</p> <p>Second edit of question-driven resource & catalogue (15 May – 18th May)</p> <p>Draft design of question-driven resource & catalogue</p> <p>Masters research</p> <ul style="list-style-type: none"> • 2nd field trip to Cata • 1st field trip to Sunday's River 	<p>Robert Berold</p> <p>Nina Rivers & Monde Ntshudu</p> <p>Robert Berold</p> <p>Nina Rivers</p>
June	<p>Translation of resource and catalogue into Xhosa</p> <p>Design of translated resource</p> <p>Preliminary discussions on design of mediator's course</p> <p>Masters research</p> <ul style="list-style-type: none"> • 	<p>Monde Ntshudu</p> <p>Robert Berold</p> <p>Jane Burt, Heila Lotz-Sisitka, WRC</p>
July	<p>Writing mediation tools for mediator's course</p> <p>Masters research</p>	<p>Jane Burt & Robert Berold</p>
August	<p>Writing mediation tools for</p>	<p>Jane Burt & Robert</p>

	mediator's course Masters research: •	Berold, Nina Rivers
September	Writing mediation tools for mediator's course Masters research: •	Robert Berold & Jane Burt Nina Rivers
October	Workshop on findings from Nina Rivers evaluation of the resource Begin advertising mediator's course Masters Research	All researchers Jane Burt to coordinate Nina Rivers
November	Rewriting/updating resource based on Nina Rivers findings Identify teachers on mediator's course Finalising mediation tools for mediators course based on findings of Nina Rivers evaluation Masters research •	Tim Wiggly, Jane Burt, Nina Rivers, Monde Ntshudu & Robert Berold Jane Burt to coordinate Jane Burt & Robert Berold Nina Rivers
December	Finalised products Masters research •	Jane Burt & Robert Berold Nina Rivers
January/February	Advertise & organize mediator's course Design evaluation for mediator's course	Jane Burt to coordinate Jane Burt & Heila Lotz-Sisitka
March	First module of mediator's course: Orientating to the context of practice	Research team and identified educators.

References:

Burt, J. and Berold, R. (2011). Investigating water knowledge flow to communities most at risk. In Press. WRC Project K8/813

Burt, J., Phiri, C. and Berold, R. (2012). Deliverable 2: Project Design and Identification of site for research: WRC project K5/2074/1. Change Oriented Learning and Water Management Practices.

Burt, J., Phiri, C. and Berold, R. (2012). Deliverable 3: Fieldwork Report. WRC project K5/2074/1. Change Oriented Learning and Water Management Practices.

Colvin, J., Chimbuya, S. and Everard, M. (2010). *Learning about institutional reform by doing: The case of the Mvoti Water User Association*. Khanya-African Institute for Community-Driven Development.

Cundill, G. and Rodela, R. (2011). *A review of social learning in natural resource management*. In press.

Daniels, H. (2008). *Vygotsky and Research*. New York: Routledge.

Jiggins, J., van Slobbe, E. and Roling, N. (2007). "Challenges to science and society in the sustainable management and use of water: investigating the role of social learning." *Environmental Science and Policy, Vol 10: 499-511*.

Kulundu, I. 2011. In Pursuit of Participation: A literature review on the influence of local action for sustainable development, from PRA to social learning. Unpublished report: Environmental Learning and Research Centre: Rhodes University: Grahamstown.

Kahinda, J. M. and Taigbenu, A. E. (date) Rainwater harvesting in South Africa: challenges and opportunities. Water Research Group. University of the Witwatersrand, School of Civil and Environmental Engineering, Pretoria.

Lotz-Sisitka, H. & Burt, J. (2006). A critical review of participatory practice in integrated water resource management. *WRC report No 1434/1/06*.

Lupele, J.K. (2004). *Contextual profiling as a methodology in Environmental Education Research*. Unpublished master of education paper. Rhodes University: Grahamstown.

Mukutu, M. *Exploring and expanding learning processes in sustainable agriculture workplace contexts*. Doctoral thesis: Rhodes University: Grahamstown.

Phiri, C. 2011.

Umhlaba Consulting (2008). *Strategies to Support South African Smallholders as a Contribution Government's Second Economy Strategy*. Cata Irrigation Scheme: A Case Study Report

Appendix A

Rhodes University
Education Department
Research Proposal

Provisional title: The Mediating Processes within Social Learning: Women's Food and Water Security Practices in the Rural Eastern Cape.

Candidate: Nina Rivers

Student no: G06R4063

Degree: Master of Education (Environmental Education)

Thesis type: Full thesis

Supervisors: Professor Heila Lotz-Sisitka
Professor Rob O'Donoghue

Estimated date of

submission: 15 December 2012

Field of research: Environmental Education

Interest Area: Mediation and Women Empowerment

Focus: Social learning

1.0 Context

1.1 Water scarcity and security in South Africa

"Water is always a metaphor of social, economic and political relationships-a barometer of the extent to which identity, power and resources are shared" (Strang 2004: 21).

Growing water scarcity threatens global food and environmental security and it is predicted that by 2025 2.7 billion people may face water shortages (Ison, Roling, and Watson 2007). South Africa is a water scarce country with a history of inequalities in land and water distribution (Kahinda *et al.* 2008: i). A large

portion of the population are poor or vulnerable to poverty and the historical affects of apartheid are still marked in terms of access to resources such as safe water (Kahinda *et al.* 2008: 1; Cleaver 2011). After apartheid the government focused its energies and financial capital on urban development. Rural populations are therefore poorer and more vulnerable due to inadequate infrastructure (Kahinda *et al.* 2008: 1).

Water is a key resource for agriculture and food security. In 1996 South Africa passed the National Water Act which proclaimed water as a public good (Burt *et al.* 2011: 13). At the same time integrated water resource management (IWRM) and community based natural resource management (CBNRM) practices were being implemented internationally which encouraged participation and equity by multiple stakeholders (Lotz-Sisitka and Burt 2006: 9). Institutional reform has proved to be inadequate to achieve the goals of IWRM or CBNRM and focusing instead on how people learn seems to be a move toward solving water resource challenges (Burt and Berold 2011; Steyaert, 2007).

In order to understand not only the nature of environmental challenges but what drives human behaviour, environmental education (EE) explores how humans learn and what informs the way they affect and are affected by the world around them. One of the primary aims of EE is to open up a space for sustainable solutions to our environmental problems. It is the aim of this project then to explore the intersection between human behaviour, human understanding and the socio-cultural factors surrounding water resource management. This study also aligns with the UN Decade of Education for Sustainable Development and the Millennium Goals of integrating values, activities and principles linked to sustainable development into all forms of education and learning to help change attitudes and behaviour to ensure a more sustainable future (Lotz-Sistika and Lupele, 2012: 5).

1.2 Research and knowledge flows

In response to serious water shortages and the 1971 Water Research Act, the Water Research Commission (WRC) was established with a mandate to generate new knowledge of water and to promote purposeful research concerning South

Africa's water resources (www.wrc.org.za/2011). The WRC divides its areas of research into five Key Strategic Areas (KSA) which include Water Resource Management, Water-linked Ecosystems, Water Use and Waste Management, Water Utilisation in Agriculture and Water-centred Knowledge. This study is situated within the fifth KSA under Water-centred Knowledge and is the second phase of a larger project following on from a previous masters student. In their 2011 WRC consultancy Burt and Berold (2011:10) found that water research is not reaching the relevant groups, specifically those who use water, bringing into question the relevance and accessibility of water research. Reasons for this include that resources are not disseminated properly, are "inappropriately technicist" and potential readers are hampered by low educational levels (Burt and Berold 2011: 1). Many resources are available but little is known about which work best and why (Burt and Berold 2011: 1). In their 2006 critical review of participation in IWRM, Lotz-Sisitka and Burt (2006: 5) argue that in order for best practice to emerge in IWRM, contextual factors and social processes need to be carefully accounted for. Factors such as history, resources, knowledge, empowerment, experience, political enfranchisement, language, attitudes, individual agency and educational experience play out differently in different contexts and act as mediators of both learning and participation (Lotz-Sisitka and Burt 2006: 6). In other words, activities around water take place within a specific cultural landscape marked by its own social, economic, knowledge and material culture (Strang 2004: 5). One of the aims of this study then is to better understand the processes that mediate learning within a specific context, namely that of rural women's food and water security practices in the Eastern Cape.

1.3 Mediation

A recent review conducted by Burt and Berold (2011:17) focused on knowledge flows to rural communities within the water sector and highlighted the importance for learning to be mediated. They found that a learning resource, good or bad was not useful unless mediated by a local organisation or person sensitive to and having a good understanding of local practices and context (Burt and Berold 2011: 4). A mediator in this case is understood as a person who "re-

interpret[s] knowledge in a way that is relevant to a particular water practice and to those involved” (Burt and Berold 2011: 4). A mediator of knowledge, however, can be something other than an individual and can be defined as the means “by which the individual acts upon and is acted upon by social, cultural and historical factors” in human activity (Engeström in Daniels 2008: 4). Knowledge and learning are culturally shaped and mediated (Daniels 2008: 57; Smagorinsky 1995; Jiggins *et al.* 2007). The same applies to the learning and thinking of water knowledge and practices. Knowledge is mediated in implicit (invisible) and explicit (visible/clearly defined) ways. Examples of explicit mediation in water knowledge are the use of reports, learning resources, multimedia booklets and media advertisements and individuals who re-interpret knowledge in a specific way and aim to teach or inform through various forms of reasoning. Implicit mediation, on the other hand, is embedded in the discourses of every day life (Daniels 2008: 6). Examples include our beliefs, traditions, norms, values, and socio-economic, political and religious institutions, the way risk is socially constructed, the way environmental regulations are implemented, and the multiple voices and interests involved in water management, all implicitly mediate how people learn about and manage water (Ison *et al.* 2007: 508).

When seeking to explore the mediating processes surrounding rainwater harvesting practices one needs to consider **who** is mediating (NGO workers, extension officers, Water Affairs officials, teachers, ordinary community members, others who may be interpreting and explaining scientific information to communities), **what** is mediating i.e. what tools are being used to mediate (knowledge resources, learning materials, schemas, scripts, representations of scientific information, media and media formats, environmental policies) and **how** mediation is taking place (Burt *et al.* 2011: 18). Six conditions that lead to water dilemmas have been identified and can also be seen as factors that mediate learning around water practices (Blackmore 2007, 513). These factors are that: (1) water is a *common pool resource*, (2) there are *multiple stakeholders* making different claims on water resources, (3) there is also *interdependence* among stakeholders which influences how people learn about and use their water resources, (4) interdependence and multiple interests lead to *controversy*,

(5) there is always the *complexity* of multiple causality, which means problems cannot easily be resolved, and finally (6) there is the *uncertainty* inherent in complex situations (Blackmore 2007: 513). These are just some of the processes that mediate knowledge and learning in water resource management.

1.4 Community based natural resource management (CBNRM): Rain Water Harvesting (RWH)

The current South African government has the challenge of providing safe water to its citizens but conventional water supply methods seem to be reaching their limits with an ever increasing demand for water (Nare *et al.* 2011:1). The participation of community members in managing this scarce resource is essential as they are the primary stakeholders and have developed their own local knowledge and practices for using and managing water (Ong'or in Nare *et al.* 2011 :2). Community based natural resource management (CBNRM) is premised on the fact that ordinary men and women manage and use natural resources such as water in ways that enhance their livelihoods through local rules, taboos and belief systems (Fabricius *et al.* 2004; Elmhirst and Resurreccion 2008: 13). CBNRM is thus an educative framework (in the form of courses and the intervention of government departments and NGOs) that mediates particular practices within rural development.

The age old practice of rain water harvesting is proving to be a significant CBNRM method for a large portion of South Africa as it has the potential to contribute to food and water security for the rural poor and specifically women (Kahinda *et al.* 2008: i; Woyessa *et al.* 2006). Rain-water harvesting (RWH) technologies “are a range of techniques used for collecting, storing and conserving rainfall and surface runoff in arid and semi-arid regions (Boers and Ben-Asher in Mutekwa and Kusangaya 2006: 437). Water is collected from roof surfaces of homesteads during the rainy season, stored in above ground or underground tanks and used for domestic and outdoor use. Researchers argue that the potential for increasing the productivity and livelihoods of the rural poor in South Africa relies on RWH technologies in that sustainable and safe water supplies works toward improved sanitation and health conditions for many South Africans (Kahinda *et al.* 2008: ii; Rockström 2003). I will therefore investigate the learning that occurs around RWH

practices in rural communities. One of the aims of this project will also be to explore the extent to which RWH practices are sustainable, specifically using rainwater tanks.

1.5 Gender, food and water security

Africa and the rest of the developed nations are facing the world's largest food security challenges (Rockström 2003: 77). The regions of the world with the largest food deficits also have the largest water scarcity problems which is indicative of the link between water and food security (Rockström 2003: 77). Principle three of the 1992 Dublin International Conference on Water and Environment recognises that women play a pivotal role in the provision, management and safe guarding of water (Steele, Jeenes, Jacobs and Dyobiso 2005: 11). This is true in the rural South African context as set out in the 1997 Department of Water Affairs and Forestry (DWA) Gender Policy (Monyai 2002). The policy calls for visible representation of women in water projects. This study will also be informed by the critiques of gender based development (Elmhirst and Resurreccion 2008).

1.6 Rural communities: Cata and Port St. Johns

In order to explore the mediating processes within community based water research management practices this study will be carried out in two villages, namely Cata and Port St. Johns (PSJ). These sites were chosen as they are rural areas within the Eastern Cape thus the study remains local and research costs are kept relatively low. A relationship is also already established with the Cata community through the work of a previous masters student so for the sake of continuity, it is thought advisable to continue working in this village but with a different focus (Boarder Rural Community 2007). Researchers Burt and Berold (2011) will also develop a question-driven learning resource from the previous masters student's findings which I will work with in my research in these two sites. PSJ is suitable as a second research site as a number of similar studies are being conducted here and it would be advantageous to work alongside other researchers. I aim to explore the learning around RWH practices in different stages of their establishment in these two areas. Rainwater tanks have been used

in Cata for several years so it will be useful to compare a well established practice in a community with one that is not as established such as in PSJ.

2.0 Research aim, question and goals

The aim of this study is to investigate how the learning of rain water harvesting practices is mediated in two contexts of rural development practice.

2.1 Research question:

1. What are the mediating processes evident in and surrounding the learning of RWH in the context of women's water and food security in rural communities?
2. How can a question-driven learning resource be aligned with learning practices in this context?

The goals of this study are:

- To investigate **what** the mediating processes are within rain water harvesting practices and **how** these mediate learning
- To explore **how** a question-driven learning resource mediates learning

The wider question of food and water security for women and the issue of sustainability of RWH practices will be investigated within the contextual investigation of these practices.

2.2 Relevance and purpose of study

This study is relevant for several reasons. The first is that it is vitally important to understand how people learn to use and manage their water resources in the context of South Africa as a water scarce county as well as what the factors are that inhibit or facilitate this learning. The second is that this study is relevant for research in general as the broader project seeks to grapple with the relevance and accessibility of research in general. Those involved in the consultancy commented "how useful it was to be part of a broader conversation on the accessibility of research knowledge" (Burt and Berold 2011: 2). A third factor that makes this study relevant is that it focuses on food and water security issues. In the face of increasing global food and water security challenges a study that focuses on those most vulnerable, especially those living in arid and semi-arid regions such as the Eastern Cape, is most relevant (Tortajada, Rockström and Figueres 2003: 1). In terms of the study having a gendered focus, this aligns

well with not only South African policies concerned with gender mainstreaming but international commitments for integrating gender within the water sector (Steele *et al.* 2005).

3.0 Theoretical Framework

3.1 Research orientation: Critical Realism

I will use a critical realist depth ontology in order to track to what extent female water harvesting practitioners understand their practices. The point of departure in critical realism is that the world is “structured, differentiated, stratified and changing” (Danermark *et al.* 2002: 5). Bhaskar (2008) argues that the world consists of the real (mechanisms), the actual (events) and the empirical (experiences). In the real world there are also generative mechanisms (with casual powers) that instantiate actual events (and non-events) (Danermark *et al.* 2002: 198). When an event takes place there are generative mechanisms causing this event; events do not happen by themselves. In relation to this study these casual factors could be poverty, power relations and historical events that influence the mediation of learning within RWH practices. One can then perform a casual analysis in order to understand the various mechanisms and events that influence the mediation of learning within RWH practices.

3.2 Vygotsky’s theory of socially mediated learning

Lev Vygotsky was a Russian psychologist interested in the mediating processes within learning (Daniels 2005). One of the overarching themes in Vygotsky’s theoretical framework is that mental processes such as thinking and acting are mediated by signs and tools (Smagorinsky 1995: 193). These tools are cultural artefacts constructed by humans (artificial) and inscribed with meaning and are thus “used to control behaviour from the outside” (Daniels 2008: 8-9). The socio-cultural context is important in that these tools are being used at a particular time and place (Daniels 2008: 9).

Vygotsky (Daniels 2008: 13) asserts that cultural artefacts are produced by humans and that in order to study how these mediate one must focus on the “mediated processes”. Mediated processes are the activities of humans or “the actions or events “that take place in specific socio-cultural settings (Daniels 2008: 53). The aim of this study is to take this theory of mediation into the field and to understand the learning and change processes as they emerge out of the

actual context by observing the actions and events (mediated processes) in RWH practices that take place in a specific socio-cultural setting such as Cata and PSJ among women.

3.3 Cultural Historical Activity Theory (CHAT)

Cultural Historical Activity Theory (CHAT) is both a theoretical framework as well as a methodology used to explore social phenomena. CHAT argues that human activity is the foundation of human development (Stetsenko and Arievitch 2010: 237). CHAT evolved out of three generations of research beginning with Vygotsky's theory of mediation in the 1920s and 30s which describes the relation between subject, object and the mediation artefacts or tools (Engeström 2001: 133). Vygotsky bridged the gap between the individual and the social by arguing that cultural tools (explicit and implicit) mediate learning (Stetsenko and Arievitch 2010: 243). In the context of RWH practices the mediation artefacts/tools are the use of rain water tanks to achieve the object of collecting and storing water. Second generation CHAT was developed by Leont'ev in the 1970s where he explicated the difference between individual action and collective activity (Engeström 2001: 133). The elements of second generation CHAT include the subjects (individual rain water harvesters), the community (neighbours, individuals from government organisations etc.), the rules of the community (taboos, cultural rules, legislation etc.), division of labour (how labour is divided between collectivities and individuals), objects (motives for harvesting rain water) **Mediating tools/artefacts** (using water for domestic use or agriculture potentially) (Daniels 2001).

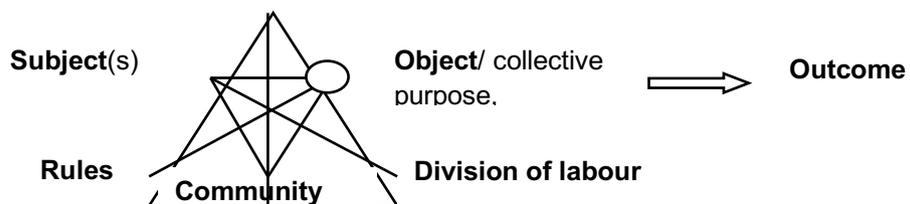


Figure 1. Second generation mediational triangle of a cultural and historically constituted activity system (adapted from Engeström, 2001).

In the 1990s third generation CHAT emerged when Ritva Engeström and others introduced the concept of multiple activity systems interacting with each other

(Engeström 2001: 135). This helps to understand the central activity system of RWH practices and the neighbouring activity systems such as government trainers, NGOs and funding agents. Individuals and their environment are thus understood through the activities that they practice. These practices and thus the mind are situated in a specific socio-cultural and historical context which offers agency to the individual (Stetsenko and Arievidt 2010: 237). This theoretical perspective will inform my conceptual, methodological, explanatory and analytical tools in phase 1 and 2 of this research project. People essentially learn through activity so second generation CHAT will help me understand the relationship between the different elements in a central activity system and the mediation that occurs within.

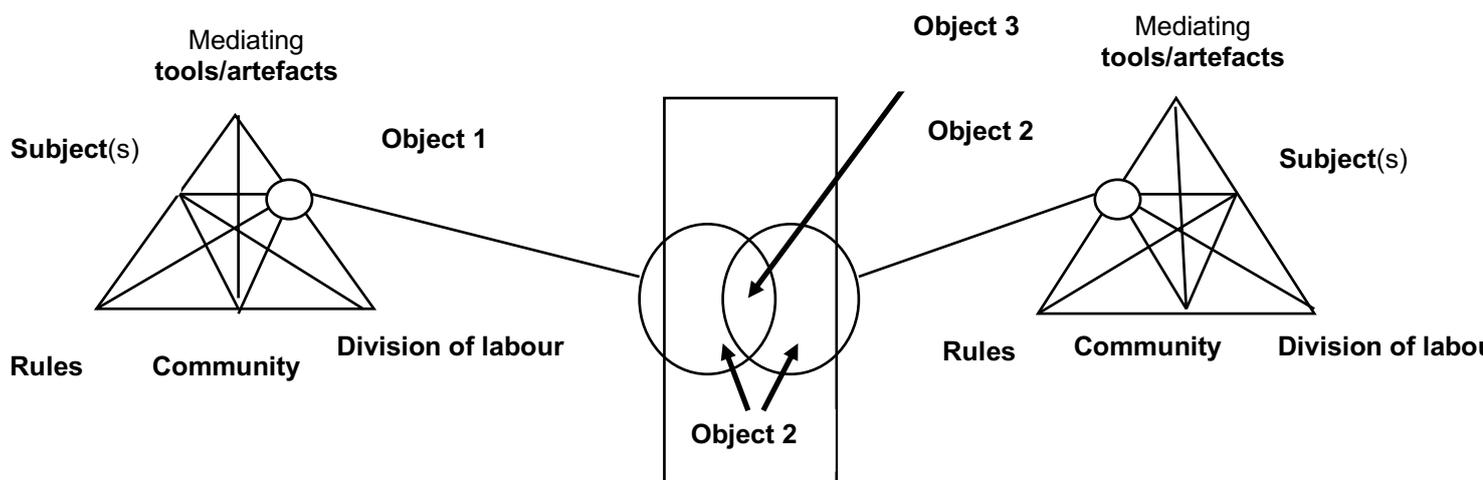


Figure 2. Third generation activity theory (Engeström, 2001: 136).

A major principle in activity theory is the central role contradictions play as a source of change and development within an activity system (Engeström 2001: 137). Contradictions are understood as “historically accumulating structural tensions within and between activity systems” (Engeström 2001: 137). Contradictions produce disturbances which can aggravate subjects enough for them to find innovative attempts for change and the potential for expansive learning to occur (Engeström 2001: 137). Expansive learning involves new knowledge and new practices for an activity. For this study I will use third generation CHAT to merely describe the interconnections between different activity systems and to surface contradictions. I will however not enter into the expansive learning stage by carrying out change laboratory workshops.

4.0 Methodology

A qualitative approach using the methodological tool of Cultural Historical Activity Theory will be employed to investigate the mediating processes at work within the context of social learning in RWH practices.

4.1 Case study and narrative inquiry

For this study I propose to use a case study approach which seeks to engage with the complexity of social and educational activity (Chadderton and Torrance 2011; Yin 2009). A case study investigates contemporary phenomenon in depth and within its real-life context especially when the boundaries between phenomenon and context are not clearly defined (Yin 2009: 18). Case study argues that 'social reality' is created through social interaction situated in particular histories and contexts which is why coupling this approach with CHAT is consistent. I will use a multiple case study approach comparing mediated learning across two case studies (Cata and PSJ) to understand the patterns of mediation at play (Chadderton and Torrance 2011). I also intend to use a **narrative inquiry approach** as part of a creative weaving of methods where respondents' stories are analysed in order to understand certain phenomena (O'Leary 2004: 199; Clandinin and Connelly 1999). Dewey in Craig and Huber (2007: 255) argues that "narrative inquiry is the study of experience, and experience...is a matter of people in relation contextually and temporally". In narrative inquiry the power of the relationship between the researcher and the researched is recognised as well as the power of words as data to identify the nuances of experience and relationship in a particular context of human experience (Craig and Huber 2007: 9-20). Narrative inquiry focuses on the particular as opposed to the general and argues that there are multiple ways of understanding human experience (Craig and Huber 2007: 9-25). Narrative analysis is relevant for this study in that I aim to identify the mediating processes within my research participants' learning as they emerge out of their own stories of their RWH practices (O'Leary 2004: 199).

4.2 Data collection techniques

Multiple data collection techniques will be used such as document analysis, observation, interviewing and focus group discussions. This multiple approach

strengthens a study as well as offers validity to the research because it produces rich data (Maxwell 2008: 244).

4.2.1 Document analysis

Document analysis will constitute **Phase One** of the data collection process in order to carry out a **contextual profile** of each case study. A systematic review of relevant documents is important as a contextual profile will provide historical depth and perspectives of the two cases (Yin 2009: 103). I will analyse training materials, formal study reports, newspaper articles and any policy documents concerned with the learning of RWH practices. These documents have the potential to provide information on how learning around RWH practices has been and is mediated. I will also analyse the thesis of the masters student that my work follows on from so as to use it as a point of departure and to identify the mediatory processes that emerge out of his findings. I will use the CHAT framework to trace the history of RWH in these two cases.

4.2.2 Participant Observation

Participant observation and interviews will constitute **Phase Two** of the data collection process. Participant observation is an appropriate method to use in order to identify how people interact with each other, the division of labour, rules that govern certain communities and the implicit and explicit mediating artefacts and tools that influence learning within these water practices. One of the main aims of participant observation is to understand and look into the social world from an insider's perspective (Foster 1996: 6). Social situations are also approached with a wide-angle lens where the participant observer takes in a broader spectrum of information and becomes more introspective about what is observed (Spradley 1980: 56).

I aim to spend time with women in Cata and PSJ so as to observe their RWH practices and the learning surrounding these activities. I plan to observe the way learning is mediated explicitly through, for example, learning resources they may use, through the training by NGO workers or government officers or through knowledge that is passed on from generations. Observation gives direct access to social interactions and insight into those events that are so familiar to members

of an activity system that they are never commented on, questioned or made explicit (Simpson and Tuson 2003: 16). This is particularly helpful for these case studies as I will need to look for both the explicit and implicit mediating processes influencing learning. I will use a camera to document instances of learning around RWH practices as well as keep a detailed field journal to document my observations.

4.2.3 Interviews

As part of **Phase Two** I will conduct **semi-structured interviews** with rain water harvesting practitioners so as to gain a better understanding of participants' own understanding of how they learn. Semi-structured interviews are understood as those that contain open and closed questions and if conducted with skill can deliver rich data (Gillham 2000: 65). Interviews will be conducted with female water harvesting practitioners as well as facilitators such as NGO workers and extension officers as they share their knowledge and skills with RWH practitioners. Interviews will compliment the intended narrative inquiry approach.

I plan to interview 8-10 RWH practitioners in each village concerning their water practices and the mediatory processes surrounding these. Depending on who is involved in these practices, I may interview both men and women but will focus on women. I will identify a group of women in Port St Johns to work with. I already have contact with another researcher doing work in a similar field of interest who said she would introduce me to the communities there. While working in Cata, I am following on from a previous masters student so will link up with the women he worked with if they agree.

A major constraint to this study is that the majority of my research participants will be Xhosa speakers while I only speak English. Not only will this effect rapport with individuals but it will also be challenging for me to identify nuanced elements such as linguistic devices (metaphors and proverbs) that mediate learning. This is why socio-cultural phenomena at the linguistic level will not be my primary focus but will support other data. I will enlist the help of a Xhosa interpreter who has worked with other researchers in the same area of study and therefore will know how and when to probe deeper for answers. I appreciate that interviewing is a delicate process and a researcher must establish credibility

and earn the trust of communities first (Gillham 2000: 62). I will make use of a voice recorder during my interviews in order to give my full attention to my respondents as well as being able to transcribe these sessions verbatim.

4.2.4 Focus groups/report back sessions

A focus group discussion in the form of a report back session will be held as the **third phase** of research in each site. The aim of these sessions will be to acquire interaction data from discussions among participants as well as to observe how they use the question-driven learning resource (Lambert and Loiselle 2007). I will analyse the contextual profiles (Phase 1) of the case studies as well as the stories (Phase 2) of RWH practitioners in order to code for the different mediatory processes and then construct an activity system for each case study using the CHAT framework (Engeström 2001). I will also aim to surface any tensions and contradictions in their practices. I will then critically analyse the question-driven learning resource (the language used, the way it is set out and any potential graphics and images which may influence the way people use and learn from the resource) and in a report back session I will mirror back the tensions and contradictions as well as introduce the question-based learning resource to those involved in the study to see how they work with it. I aim to approach NGO or community facilitators to run these report back sessions in order to be able to observe better how people work with the learning resource and to link my research to some form of local agency concerned with water practices.

5. 0 Data management and analysis

I aim to adopt a reflexive analysis approach where the researcher stays as close to the data as possible, moving between the raw data and research questions and aims (O'Leary 2004:184). In terms of managing my data I aim to *log* and *systematically organize* my data, keeping records of collection dates, data collection procedures, conducting preliminary coding and culling notes for relevance (O'Leary 2004:187). I appreciate that in practice, data management is not always such a tidy process but I will endeavour to be as organised as possible for the sake of the integrity of the research.

My data will be qualitative in the form of people's stories, interviews and my observations regarding how they learn their water practices. My analysis will take on a retroductive or interim analysis approach in that collection of data and analysis will take place simultaneously and calls for different modes of inquiry at different stages in the study (Huberman and Miles 1994: 431). I will perform cumulative data generation through the interplay between contextual profiles, interviews and observation work. I will interview research participants on-site and then transcribe and analyse each interview straight away, coding for different themes and subthemes and then linking these to theoretical models using the CHAT heuristic (identifying objects of RWH such as healthy drinking water or gardening for example) (Pepper and Wildy 2009: 23). Cumulative analysis of interviews and observations will point to key areas that I need to revisit in order to build on. I will then hopefully be able to gauge when I have enough data to construct an activity system when no new information is being generated.

After analysing the contextual profiles, observations and interviews (phase 1 and 2) by exploring the interconnections between various themes by looking for correlations between concepts, I will construct a picture of each activity system (O'Leary 2004: 197; Engeström 2001). I will then pull out contradictions and tensions (differences in social controls or different tools for example) and then mirror these back in a report back session in phase three with the help of NGO or development workers. I will not engage in the expansive learning phase of CHAT as the aim of this project is not development based. It is my hope however that in report back sessions I can raise the outcomes of my research with the support of a local agency, thereby adding value to the communities and concluding the research in a responsible manner.

6.0 Data verification and trustworthiness

Validity and trustworthiness is important to the integrity of one's research participants and study. Maxwell (2008: 243) asserts that there are two broad categories of threats to validity; researcher bias and reactivity. Researcher bias refers to the way in which data collection or analysis may be distorted by the researcher's own theory, values or preconceptions (Maxwell 2008: 243). I will endeavour to be self-reflexive about my position as a researcher and keep in

mind that the aim in qualitative research is not to eliminate the influence of the researcher but to understand and use it productively (Maxwell 2008: 243). I will employ several measures to increase the credibility of my research. Generating “rich” data counters the danger of respondents producing data that supports a mistaken conclusion as well as makes it difficult for myself as the researcher to only focus on what supports my prejudices and preconceptions (Maxwell 2008: 244). Member-checking or respondent validation is another validity tool in which I will present transcripts, photos and other data to my research participants in order to solicit their feedback as well as hold discussions in the report back sessions (Maxwell 2008: 244). I will also be using multiple data collection techniques in order to test the integrity of inferences drawn from data against each other (Maxwell 2008: 245). Searching for discrepant evidence and negative cases is also a useful strategy for ensuring validity in research. Due to the fact that this is a multi-cited study my analysis will then be open to comparison which strengthens the validity of findings and conclusions (Maxwell 2008: 245). I will also strive to be open and invite critique from my colleagues and supervisors at the Environmental Learning Research Centre (ELRC) which nurtures an atmosphere of peer support and critical reflection.

7.0 Ethical considerations

Ethical practice will be one of my main concerns throughout this study. Three basic ethical principles have been identified as critical when conducting qualitative research (Sieber 1992). The first is beneficence, respect for others and upholding justice (Sieber 1992: 18). These main ethical principles can also be understood in terms of respect for democracy, truth and for persons (Bassey 1999: 74). Ensuring the relevance of the theory and methods I employ is one way of making sure my research design is valid, reasonable and achievable. I will aim to be transparent and realistic with my participants as to the benefits and risks of a study of this nature. Although the benefits of a study of this nature may be long term I will aim to add as much value to the communities I study in as possible. Voluntary informed consent is another ethical norm to be followed when conducting research (Sieber 1992: 19). I will negotiate access responsibly with written letters if required, clearly communicating in nontechnical jargon the expectations of the research, that it is voluntary and will assure my research

participants of their right to withdraw from the study at any point. Another ethical norm is that no harm should be done to a research participant due to a study (Sieber 1992: 19). Harm in this context could mean divulging individuals' identities. As a result I will take the necessary precautions to maintain the anonymity of research participants as well as any organisations and institutions I work with. I will also ask permission to take photographs of research participants and their activities. Another important ethical consideration is the respect for truth (Bassey 1999: 74). I will make sure that I am truthful in my data collection, analysis and reporting of findings and that I do not manipulate any raw data.

Research schedule

Table 1: Proposed time frame of activities

MEd Requirements/activities	Date
Submission of proposal	2 February
Work on literature review Phase 1: Contextual Analysis Visit research site, introduce study and set up field work including consent, collect contextual data 2 sites (Cata+ Port St Johns)- one week per site	February 20-24 February (PSJ) 28 February-2 March (Cata)
Analysis of phase 1 data Construct contextual profile Phase 2: Interviews and Observations Two sites (Cata+ Port St Johns)- one week per site	3-11 March 12-20 March (PSJ) 22-31 March (Cata)
Submit draft 2 Literature Review Submit draft 1 Methodology Chapter	April 16-20 April
Analysis of phase 2 data Tensions and contradictions Construct activity systems Analyse question-driven learning resource	20 April-5 May
Phase 3: Report back sessions Mirror tensions and contradictions Introduce question-driven learning resource	7 May-12 May (PSJ) 16-19 May (Cata)

Analyse phase 3 data Begin to write up Findings Chapter 4 Literature review Chapter 2 completed	June
Submit draft 2 Methodology Chapter Submit Analytical Memos Prepare research poster (EEASA)	July (23-27 July)
Final analysis of data (chapter 4), findings (chapter 5) and recommendations (chapter 6) Submit draft 1 Chapter 1 (context and introduction) EEASA Conference-present research poster Submit completed Chapter 4 Submit draft 1 Chapter 1 Submit draft 1 of full thesis	September (10-14 September) (15-19 September) 30 September
Write up conclusion (chapter 6) and abstract	October 1
First draft of thesis submitted	October 15
Submit draft 2 of thesis Open writing workshop to complete write up Submit final thesis to supervisors	1 November 5-18 November 18 November
Submission of thesis for examination	December 15

References:

Bassegy, M. (1999). *Case study research in educational settings*. Buckingham: Open University Press.

Bhaskar, R. (2008). *A Critical Theory of Science*. London: Verso.

Blackmore, C. (2007). What kinds of knowledge, knowing and learning are required for addressing resource dilemmas?: A theoretical overview.

Environmental Science and Policy, Vol. 10: 512-525.

Boarder Rural Community (2007). *The Cata Story*. East London.

Burt, J. and Berold, R. (2011). Investigating Water Knowledge Flow to Communities Most at Risk. *WRC Project K8/813*.

Burt, J., Berold, R. and Rivers, N. (2011). Review of social learning literature relevant to knowledge flow in the water sector. Change Oriented Learning and Water Management Practices: Knowledge Flows and Mediation Tools. *WRC report K5/2074*.

Chadderton, C. and Torrance, H. (2011). Case Study in *Theory and Methods in Social Research*. (2nd ed.). Bridget, S. and Lewin, C. (Eds.). London: Sage.

Craig, C. J. and Huber, J. (2007). Relational Reverberations: Shaping and Reshaping Narrative Inquiries in the Midst of Storied Lives and Contexts in *Handbook of Narrative Inquiry: Mapping a Methodology*. Clandinin, D. J. (Ed.). London: Sage.

Danermark, B., Ekstrom, M., Jakobsen, L., and Karlsson, J. C. (2002). *Explaining Society: Critical realism in the social sciences*. London: Routledge.

Daniels, H. (2001). *Vygotsky and pedagogy*. London: Routledge.

Daniels, H. (2005). *An introduction to Vygotsky*. (2nd ed.). New York: Routledge.

Daniels, H. (2008). *Vygotsky and Research*. New York: Routledge.

Denzin, N. K. and Lincoln, Y. S. (1994). *Handbook of Qualitative Research*. London: Sage.

Elmhirst, R. and Resurreccion, B. P. (2008). Gender, Environment and Natural Resource Management: New Dimensions, New Debates in *Gender and Natural Resource Management: livelihoods, mobility and interventions*. Resurreccion, B. P. and Elmhirst, R. (Eds.). London: Earthscan.

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

Fabricius, C., Koch, E., Magome, H. and Turner, S. (2004). *Rights, Resources and Rural Development. Community-based Natural Resource Management in Southern Africa*. London: Earthscan.

Foster, P. (1996). *Observing Schools*. London: Paul Chapman Publishing.

Gillham, W. (2000). *Case study research methods*. London: Continuum.

Huberman, A. M. and Matthew, B. M. (1994). Data Management and Analysis Methods in *Handbook of Qualitative Research*. London: Sage.

Ison, R., Roling, N. and Watson, D. (2007). Challenges to science and society in the sustainable management and use of water: investigating the role of social learning. *Environmental Science and Policy*. Vol. 10: 499-511.

Jiggins, J., van Slobbe, E. and Roling, N. (2007). The organisation of social learning in response to perceptions of crisis in the water sector of The Netherlands. *Environmental Science and Policy*. Vol. 10: 526-536.

Kahinda, B. B. P., Sejamoholo, A. E. Taigbenu, J. R., Boroto, E. S. B. Lillie, M. Taute and T. Cousins. (2008). Water Resource Management in Rain Water Harvesting: An integrated systems approach. *WRC report No. 1563/1/08*.

Lambert, S. D. and Loiseau, C. G. (2007). Combining individual interviews and focus groups to enhance richness. *Journal of Advanced Nursing*. Vol. 62(2): 228-237.

Lotz-Sisitka, H. and Burt, J. (2006). A critical review of participatory practice in integrated water resource management. *WRC report No. 1434/1/06*.

Lotz-Sistika, H. and Lupele, J. (2012). Education for Sustainable Development Learning Processes in sub Saharan Africa. *A contribution to the Association of the Development of Education in Africa (ADEA) 2012 Triennial Conference*.

Mutekwa, V. and Kusangaya, S. (2006). Contribution of rainwater harvesting technologies to rural livelihoods in Zimbabwe: The case of Ngundu ward in Chivi District in *Water SA Vol. 32 (3)*.

Nare, L., Odiyo, J. O., Francis, J. and Potgieter, N. (2011). Framework for effective community participation in water quality management in Luvuhu Catchment of South Africa. *Physics and Chemistry of the Earth, Parts A/B/C, Vol. 36(14-15)*.

O'Leary, L. (2004). *The essential guide to doing research*. London: Sage.

Pepper, C. and Wildy, H. (2009). Using Narrative as a Research Strategy. *Qualitative Research Journal*. Vol. 2(2).

Rockström, J. (2003). Managing rain for the future in *Rethinking Water Management: Innovative approaches to contemporary issues*. Figuères, C. M., Tortajada, C. and Rockström, J. (Eds.). London: Earthscan.

Sieber, J. (1992). *Planning ethically responsible research. A guide for students and internal review boards*. Newbury Park: Sage.

Simpson, M. and Tuson, J. (2003). *Using Observations in Small-Scale Research: A beginner's guide*. Glasgow: University of Glasgow.

Smagorinsky, P. (1995). The social construction of data: methodological problems of investigating learning in the zone of proximal development. *Review of Educational Research*. Vol. 65(3): 191-212.

Spradley, J. P. (1980). *Participant Observation*. New York: Holy, Rinehart and Winston.

Stetsenko, A. and Arievitch, I.M. (2010). Cultural-Historical Activity Theory: Foundational Worldview, Major Principles, and the Relevance of Sociocultural Context in *The sociocultural turn in psychology: the contextual emergence of mind and self*. Kirschner, S. R. and Martin, J. (Eds.). New York: Columbia University Press.

Steyaert, P., Barzman, M., Billaud, J., Brives, H., Hubert, B., Ollivier, G. and Roche, B. (2007). The role of knowledge and research in facilitation social learning among stakeholders in natural resources management in the French Atlantic coastal wetlands. *Environmental Science and Policy* 10: 537-550.

Strang, V. (2004). *The Meaning of Water*. Oxford: Berg.

Tortajada, C. Rockström, J. and Figuères, C. (2003). Introduction in *Rethinking Water Management: Innovative approaches to contemporary issues*. Figuères, C. M., Tortajada, C. and Rockström, J. (Eds.). London: Earthscan.

WRC homepage. (2011, November 30) Retrieved November 30, 2011 from www.wrc.org.za WRC Mandate and Key Strategic Areas.

Yin, R. K. (2009). *Case Study Research: Design and Methods*. (4th ed.). London: Sage.

Indicative references:

Clandinin, D. J. And Connelly, F. M. (1999). *Narrative Inquiry: Experience and Story in Qualitative Research*. San Francisco: Jossey-Bass.

Cleaver, F. (2011). Does good local water governance elude design?

Understanding water access, poverty and institutions. 11th

WaterNet/WARFSA/GWP-SA symposium, Victoria Falls, Zimbabwe.

Monyai, P.B. (2002). *The Gender Dimension of the Water Policy and its Impact on Water and Sanitation Provision in the Eastern Cape: The Case of the Peddie District. WRC Report No. 1021/1/02.*

Riessman, C. K. (1993). *Narrative Analysis*. London: Sage.

Woyessa, Y. E., Pretorius, E., Hensley, M., van Rensburg L. D. and van Heerden, P. S. (2006). *Up-scaling of rain-water harvesting for crop production in the communal lands of the Modder River basin in South Africa: Comparing upstream and downstream scenarios.*

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APPENDIX B

RAIN WATER HARVESTING QUESTIONS

Rainwater Harvesting for Domestic use and home food gardens

4 sections

Section 1: Rainwater harvesting within a broader picture of sustainable livelihoods

How do land use practices, rain fall and the landscape influence our choices?

What has happened to the landscape?

What is a healthy landscape that is effective at harvesting rain?

Why doesn't our landscape harvest rain water like it used to?

How do we make our landscape a rain water harvesting landscape again?

Section 2: Rainwater harvesting choices

What questions do I need to ask myself when considering how to harvest rain water?

What is the best method in relation to what I want to do and the landscape I live in?

Choosing a rain water tank -

How do I know whether getting a rain tank is worthwhile?

How do we know how to install a rain water tank?

Where is the best place to put a rain water tank?

What size tank do we need?

Including other techniques –

How do I harvest ground water for my tank?

When is it a good idea to have a catch pit?

How do I build a catch pit?

How and when do I build trenches and swales?

How do I ensure water is retained in the soil? (blankets and cans – How does this work?)

How do I keep soil healthy to ensure efficient water use?

What methods did my grandparents use that I can use now?

Section 3: Maintaining and Managing rain water harvesting

Maintaining and managing the water in my rain water tank: -

What can go wrong with my tank?

What do I do when my tank is broken?

How do I maintain my tank?

How much does a tank cost?

What do we do when we can't afford tanks?

How do we manage the water in our tank?

How do we estimate the amount of water in our tanks in relation to rainfall?

Other methods:

How do I maintain catch pits?

How do I maintain reservoirs?

How do I maintain trenches and swales?

How do I continually maintain the soil in my garden?

How what I plant, influences the amount of water I will need and use?

Sharing rainwater:-

When we have a community tank, how do we develop rules and principles for sharing the water and looking after the tanks?

Section 4: Keeping the practice going

External assistance: -

What projects and programmes are there that I can contact to help me get a rain water tank?

What projects and programmes are there that can help me to improve my knowledge?

Internal support –

How do we support and learn from each other?

How do we start a support group so that we can learn from each other? (case study Cata water for food project)

How can we involve all generations in gardening?

How can we encourage people to value a sustainable, healthy livelihood?

How and why do I value growing my own food and harvesting water?
(traditional values, health, food security etc)

Harvesting rain for agriculture

For this resource we will be taking a different approach. Agricultural co-ops do not have a high success rate and often sustainable methods of harvesting rain are replaced by expensive irrigation systems. In a FAO report on water security, it is reported that rain fed agriculture would be vital for food security in Africa.

In Cata there the agricultural co-op is not working very well. It is underproductive and crops are not marketed successfully. This is due to both ecological, social and economic reasons. This resource will document the history of the Cata Agricultural co-op and another example (Blueberry farming) which seems to be working. It will focus on what farmers need to consider at an ecological level to engage in successful rain fed agriculture and briefly touch on some ideas of how projects can be organised socially in a way that reflect and respond to the environmental context that people live in. For example, how people living on slopes can develop rain water harvesting systems that allow them to share water.

Although there are many reasons why community co-ops don't work, this resource will focus on the ecological choices that people need to make and the techniques they can use to harvest rain water successfully. It will also draw on other case studies from other countries if necessary (eg example of Indian government providing transport to markets for community gardeners)

