TOWARDS DEVELOPING A COMMUNICATION STRATEGY FOR WATER RE-USE IN SOUTH AFRICA

by

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[redacted]

DISSERTATION

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DEDICATION

I dedicate my efforts to my late father, Nakeng Ezekiel Mamabolo, my mother Mokgadi Minah Mamabolo, my adorable sisters and nephews, Tebogo, Puseletso, Koketso and Ofentse Mamabolo, to my sons Nakeng and Mphileng and lastly, to the most adorable and supportive individuals, Mphileng Lekinah (Morwedi wa ngaka) and my partner Tlou Meso.

DECLARATION

I Mamabolo Mamogobo Rosinah, declare that the research report entitled **'Towards Developing a Communication Strategy for Water Re-use in South Africa',** hereby presented to the University of Limpopo, for the qualification Master of Arts in Communication Studies, is my own work. All sources referenced and quoted in the text have been indicated and accordingly acknowledged by means of comprehensive references. This study has not been submitted for any qualification at any other institution.

…… ……

Signature Date

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ABSTRACT

This study aimed to develop a communication strategy for water re-use in Basic Education, which included illustrative learning materials which were suitable for online learning. To attain the intended aim, the study focussed on the subsequent objectives: to review and analyse learners' and educators' perceptions and understanding (knowledge) of water re-use; to examine strategies that could be employed to gain learners' and educators' understanding and acceptance of water re-use; to develop information or learning materials that would educate and enhance their understanding and informed decision making related to water re-use; and to discuss approaches to communicate water re-use in Basic Education. A qualitative orientation utilising participatory action research was employed as a research design for this study. A sample size of 80 participants, from four primary and four secondary schools in Mankweng Township was selected. 40 learners and 40 educators were selected. Convenience sampling was used to select the participants for this study. Data was collected by means of interviews, focus group discussions, workshops, teaching and participant observation. Thereafter, thematic analysis and NVivo software were employed to analyse data.

This study employed Geertz's notion of culture, Vygotsky's social constructivism and the behaviour ecological model as theoretical frameworks to guide the research. Geertz's interpretation of cultures was employed to understand culture and its effects on human behaviour, Vygotsky's social constructivism was employed to understand the process of effective learning in educational contexts and the behaviour ecological model was employed to understand individuals' behaviours and the background of the given behaviour. Understanding an individual's behaviour and experiences towards water re-use assisted in developing water re-use illustrative learning materials. It also assisted with a communication strategy, which integrated Steyn and Puth's steps, in the formulation of a communication strategy, joint approach model and a step by step content of a communication strategy and action plan model.

The study revealed that the majority of individuals have negative perceptions and attitudes towards water re-use, due to a lack of awareness, knowledge and education. The "yuck" factor and health apprehensions were revealed to be major causes of such perceptions and attitudes. Education, campaigns and programmes, traditional and

new media, community meetings, rules, policies and regulation were reported as strategies which might be employed to promote water re-use. The study revealed that individuals' home language must be made use of in all the water re-use promotional strategies. Communication approaches which promoted a platform for community participation, were revealed as appropriate for development programmes. As a result, participatory and development approaches to communication were considered suitable for communicating water re-use in Basic Education. The study further indicated that posters and storyboards were effective illustrative learning materials which could be employed to educate learners and raise their cognition regarding water re-use as a water conservation method. This would increase acceptability, awareness and practice and reduce negative perceptions, attitudes and concerns. The study indicated that water re-use communication should consider an individuals' environmental, religious and cultural backgrounds, which would affect water re-use projects. The study also indicated that there was a relationship between an individuals' perceptions, attitudes, education and culture.

KEYWORDS

Water re-use; greywater; water; communication; communication strategy; illustrative learning materials.

LIST OF ACRONYMS

ABET	Adult Basic Education and Training
ANC	African National Congress
BHI	Bunker Hills Investments
BLM	Baswa le Meeste
CMA	Catchment Management Agency
CSIR	Council for Scientific and Industrial Research
DPR	Direct Potable Re-use
DSCS	Development Support Communication Service
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
EC	European Commission
FAO	Food and Agriculture Organisation
FET	Further Education and Training
IPDC	International Programme for Development Communication
IT	Information Technology
MKO	More Knowledgeable Other
MWRMD	Ministry of Water Resource Management and Development
NGOs	Non-Governmental Organisations
NRC	National Research Council
NUL	National University of Lesotho
NWRS	National Water Resource Strategy
PUB	Public Utility Board
RDDA	Research Design Disseminate Adopt
SA	South Africa
SADC	South Africa Development Community
SALGA	South African Local Government Affairs
TCTA	Trans Caledon Tunnel Authority

TREC	Turfloop Research Ethics Committee
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
USA	United States of America
WHO	World Health Organisation
WRC	Water Research Commission
WRP	Water Resource Professionals
WRPL	Water Re-use Project Leaders
WSP	Water Service Provider
WUA	Water User Associations
ZPD	Zone of Proximal Development

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CHAPTER ONE

CONTEXTUAL STUDY OVERVIEW

1.1. INTRODUCTION, BACKGROUND AND MOTIVATION

The aim of the study was to develop a water re-use communication strategy for Basic Education, which included illustrative learning materials suitable for online learning. Given the importance of water re-use as a water conservation strategy in South Africa, the Water Research Commission (WRC) appointed a company, Bunker Hills Investments (BHI) 32 to undertake a study on water re-use and develop a communication strategy for water re-use. BHI 32, in association with the University of Limpopo, appointed the researcher (amongst other actions), a Master of Arts student from the School of Languages and Communication, to embark on this study.

Arid and semi-arid countries such as South Africa, Namibia and Tunisia, present challenges for human habitation as they increasingly face increasing water scarcity problems. These regions are characterised by lower average rainfall and high temperatures, which impose great challenges to human activities such as agriculture, and also to animal and plant populations (Council for Scientific and Industrial Research (CSIR), 2012; Ribot, Magalhaes & Panagides, 2005; John, Pannell & Kingwell, 2005). Such countries are experiencing insufficient water provision in order to meet their current and future water demands, due to the decrease of available fresh water and increased water requirements. South Africa is entering an era where plentiful clean water is no longer guaranteed due to accelerating industrialisation and urbanisation, rapid population growth, poor water management practices, and higher cultivation intensities (Keremane & Mckay 2009; Keremane, 2017). Many communities around the country face difficulties in accessing adequate and reliable quantities of clean water (Adewumi, Ilemobade & van Zyl, 2010).

South Africa is also considered to be a water scarce country and it is anticipated that a “water supply and demand gap of 17% will emerge by 2030” as the need for water continues to increase (National Water Resource Strategy 2 (NWRS2), 2013:7). Water demand is likely to exceed water provision in the future. South Africa does not have enough supply of water which is also inconsistently distributed (Department of Water Affairs (DWA), 2012; NWRS2, 2013; Van Koppen, Schreiner, & Fakir, 2011). “With a

population growth of 2.4% per annum, it is expected that South Africa's water demand will likely exceed available water resources in selected areas within the short to medium term" (Van Niekerk & Schneider, 2013:2). The water demand does not correspond with the water distribution (DWA, 2012; Ilemobade, Olanrewaju & Griffioen, 2013). The enhancement of water conservation strategies, water quality and water-use efficiency in South Africa is a key national priority. When compared against a global rainfall average of 870 mm per year, the country receives only 450mm. This rates South Africa as the thirtieth driest country in the world and it has significantly less water when compared with countries widely considered being much drier, such as Tunisia, Namibia and Botswana (NWRS2, 2013).

South Africa is a semi-arid country which experiences excessive water insecurity due to the low volumes of precipitation (rainfall) and high evaporation (Eberhard & Robinson, 2003). The high variable and spatial distribution of rainfall contribute to a freshwater deficiency across the country. South Africa relies mainly on surface water for most of its industrial, agricultural and urban necessities (NWRS2, 2013). Groundwater plays an essential role in most rural water supply schemes, while only a few groundwater aquifers can be utilised on a considerable scale, due to ground water salinity, especially in the coastal areas of the country (Mukheirbir, 2005). South Africa highly depends on surface water (NWRS2, 2013). Due to the ever-growing population, growing industrial developments, the connection of previously unserved households to municipal water supply, urban immigration and other factors, both ground and surface water are not sufficient to meet the intensifying water demand in South Africa (Department of Water Affairs (DWA), (2010). It is for this reason, within the context of freshwater constraints, that the DWA of the Republic of South African Government is faced with the challenge of implementing sustainable alternatives for potable and non-potable water requirements to meet the growing demand for water. Water is essential to sustain human life, the life or other living organisms and all human activities.

The DWA has adopted water re-use as a long-term strategy for conserving and extending available potable and non-potable water supplies in South Africa. Other benefits of water re-use will include the reduction of traditional sources reliance (NWRS2, 2013).

The NWRS1 (2011:1) defines water re-use as the:

> "Utilisation of treated or untreated wastewater for a process other than the one that generated it, i.e. it involves a change of user such as re-use of municipal wastewater for agricultural irrigation. Water re-use can be direct or indirect, intentional or unintentional, planned or unplanned, local, regional or national in terms of location, scale and significance. It may involve different kinds of treatment (or not) and the reclaimed water may be used for a variety of purposes".

The definition of water re-use is broad, and it is not limited to the direct potable use of treated wastewater. The definition indicates that water re-use can be direct or indirect and it can be used for both potable (drinking) and non-potable purposes. To clearly comprehend and differentiate between the terms, each term must be defined. The terms are defined below by the NWRS1 (2011:1) and van Niekerk and Schneider (2013:4):

> "Direct water re-use is defined as the use of treated or untreated wastewater by directly transferring it from the site where it is produced to a different facility for the next cycle or application. The water can be used for domestic or non-domestic purposes such as agricultural or industrial purposes. Direct water re-use is always treated, and the quality is cautiously monitored to ensure safety for potable or domestic purposes - water used in households for drinking, cooking etc".

> "Indirect re-use refers to treated or untreated wastewater discharged from ground water or a natural surface water which is used for various purposes (potable and non-potable purposes)".

Water re-use involves various types of wastewater or waste management which have different implications for a strategy of re-use. This study is founded on the re-use of greywater. The NWRS1 (2011:1) defines greywater as:

> "Wastewater derived from the domestic and household use of water for washing, laundry, cleaning, food preparation etc. It is wastewater that does not contain faecal matter".

Regardless of the strength of scientific evidence, public obstruction can cause water re-use projects to fail at any phase of their execution (Friedler & Lahav, 2006; Uhlmann & Head, 2011). Positive public perceptions and acceptance of water re-use are now recognised as vital factors for the successful introduction of wastewater re-use projects (Dolnicar, Hurlimann & Grun, 2011; Friedler & Lahav, 2006; Nancarrow, Leviston, Po, Porter & Tucker, 2008). Public opinion is a key challenge affecting the

successful execution of water re-use projects. Opinion influences the intention to accept, and the intention influences behaviour. It is for this reason that community opinions towards water re-use, specifically greywater, have been identified as a key component to successful water re-use projects (Okun, 2002; Po, Juliane & Nancarrow, 2004). Given the significance of public opinion on water re-use projects, it is crucial to ensure that the public has a holistic understanding and acceptance of the water scarcity problem.

To implement the notion of water re-use (greywater), a focused and continual public education program is required to develop and entrench awareness of the various facets of water use and more particularly, water re-use. In order to close the identified gap, the WRC, in association with the National Department of Water Affairs, set out a communication strategy for water re-use as a requirement in the National Strategy for water re-use. A comprehensive, well organised communication program, with identified stakeholders is necessary to any modern water re-use projects (Khan & Gerrard, 2006). Communication is a multifaceted process that takes place between two or more individuals, whereby information is delivered, received, understood, interpreted and responded to. This study attempted to review and analyse relevant approaches to communicate water re-use, public perceptions and the understanding of water re-use and establish a greywater re-use communication strategy, which included illustrative learning materials, suitable for online learning in South African Basic Education. This would aid in the fulfilment of the aims and objectives of water re-use projects so that they could be effectively communicated and ultimately more successful.

1.2. RESEARCH PROBLEM

As outlined above, South Africa is counted among water scarce countries and is faced with challenges of mining, industries, urban development, population growth, water wastage or insufficient uses of water by the public, municipalities (municipal supply schemes) and farmers. Numerous areas of the country are closer to the point where obtainable, freshwater resources are entirely utilised (NWRS2, 2013). The DWA recommends that water re-use must be used to combat this problem. Water re-use, as a water conservation strategy has been identified as a potential additional source of water. Nevertheless, the public lacks cognition and is not conscious of water

conservation methods (Nancarrow *et al*., 2008; Dolnicar & Hurilimann, 2009). Public perceptions and attitudes of water re-use have been shown to play a major role in the success or failure of water re-use projects. Water re-use success depends on the public's willingness to accept water re-use as a water conservation method (Dishman, Sherrard & Rebhun, 2009; Nancarrow *et al*., 2008). It is crucial that the public recognise this situation and adopt water re-use as a water preservation method. Water re-use must be communicated and adjusted to each local context so that it can be amendable, practical, advantageous and sustainable in a given situation (NWRS1, 2011; NWRS2; 2013). This study aims to develop a communication strategy on water re-use for Basic Education, which includes illustrative learning materials suitable for online learning. It aims to communicate and educate the public about the vital nature of water re-use. Communication and education will be used to raise awareness, educate and change negative perceptions and attitudes in order to lead to an acceptance of water re-use.

1.3. ROLE OF THEORY IN THE STUDY

Water re-use's potentiality to be utilised as a supplementary source of water conservation has been acknowledged (Bruvold, 1988) and the "importance of understanding public reactions to, and acceptance of water re-use technology has long been recognised" (Smith, Rutter & Jeffrey, 2015:1). The public's awareness and acceptance of the safety and appropriateness of re-used water is a vital factor to the success of any water re-use programme (Lazarova *et al*., 2013; Po, Nancarrow, Leviston, Syme & Kaercher, 2005). Alhumoud and Madzikanda (2010); Dishman *et al*. (2009); Lazarova *et al*. (2013) and Ross, Fielding and Louis (2014) confirmed that cultural and social aspects, as well as public attitudes and perceptions on water re-use, play a significant role in the success of any water re-use programme. The public's cognition of water re-use is of critical importance for successful water conservation projects and campaigns. It is the responsibility of the government – as 'More Knowledgeable Other' (Vygotsky, 1978) - to ensure that the public – as the 'less knowledgeable' - are informed and educated about the importance of water re-use. Scholars have indicated that people oppose water re-use for various reasons, which include cultural and religious beliefs, lack of knowledge, fear, attitudes and general

distrust (Po *et al*., 2005; Dolnicar & Schafer, 2009; Hurlimann, Dolnicar, & Meyer 2009).

Geertz (1973:89) is of a view that culture is a:

> "Historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate and develop their knowledge about their attitudes towards life".

Culture is generally viewed as the attitudes and beliefs as well as the norms and values, of a common element, shared among a particular group of people residing in a given geographical location. Hofstede (1994) argued that culture influences human behaviour. Culture governs social behaviour of a particular society or people. Culture and language "directly influence the way information is processed, interpreted and judged by the receiver" (Acar, Taura, Yamamoto & Yusof, nd:6). Similarly, Meso (2016:9) mentioned that "culture is naturally educative and creative". It is for this reason(s) this study adopted Vygotsky's Social Constructivists Theory of learning. The researcher is of the view that culture influences not only human behaviour but also catalyses learning in social interactions. Vygotsky (1978) argued that one learns effectively through social interactions.

Vygotsky's Social Constructivist Theory of Learning mentions that learning arises not through interaction, but during interaction(s). To perform a new or unfamiliar task successfully, learners need the assistance of others to internalise the task so that they could be able to perform it later without the help of others (educators). In this way, social interaction(s) is encouraged to facilitate learning. Vygotsky (1978) emphasises that 'what a child can do today with assistance, she will be able to do by herself tomorrow'. The child (learner) at this stage, depends entirely on other people, as the sociocultural environment keeps on presenting the child with a range of tasks and demands, engaging the learner in his/her world (Turuk, 2008). The learner learns by means of contact and interactions with others. Later, he/she integrates and internalises this knowledge and add their own personal norms and values. Vygotsky emphasises that both children and adults are active agents in the learning process. When applied to the process of teaching and learning, this means that both the teacher and the learner are considered active agents in learning. The teacher's intervention in children's learning is essential, but it is the quality of the interaction between the

teacher-learner, which is of critical importance in the learning process. It is for this reason that the researcher is of the view that, both public participation and collaboration are of critical importance to the success of water re-use projects.

1.3.1. Vygotsky's Social Construction Theory in context

Thinking processes and knowledge growth are perceived as the result of personal interaction in a social context and of appropriation of socially constructed knowledge (Vygotsky, 1978). Vygotsky stresses that interaction in the social setting plays a key role in the development of every child's comprehensive cognition. The cognitive development of Vygotsky's social interaction theory is centred on two main principles: The Zone of Proximal Development (ZPD) and the More Knowledgeable Other (MKO).

1.3.1.1. The Zone of Proximal Development (ZPD)

Vygotsky (1978) defined the ZPD as the gap between the "actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers". In the ZPD, The Water Resource Professionals or Water Re-use Project Leaders (WRPL) and the community members work together during water re-use project (campaign) where the WRPL illustrates the importance of water re-use as a water conservation strategy. This approach reflects the idea of collective activity, where those who know more or are more skilled (WRPL) share the knowledge and skills, in order to accomplish a task, with those assumed to have less knowledge (community). A good deal of guided participation is required in the ZPD. Community members share their own understanding and perceptions of water re-use during social interactions and construct meanings by integrating their understanding with their experiences in context. Both WRPL and community members are active agents of water re-use campaigns and the WRPL interventions in campaigns are essential. It is both the quality of the WRPL and the community interaction which are of vital importance. Vygotsky explains that the notion that the process of constructing meaning is strongly determined by the community's comprehension and perceptions.

Vygotsky (1978) also stated that in situated cognition, the learner is dependent on the environment; and the community's understanding and opinion on water re-use will be determined by their background knowledge (experience) and the environment created

by WRPL. The WRPL need to create sustainable learning environments that will establish, shape and maintain public confidence in water resource management and water re-use decision-making; promote communication and public participation; and build and maintain public trust.

1.3.1.2. The More Knowledgeable Other (MKO)

The learning process needs to be facilitated and guided; as is the case in water conservation projects. This could be realised by assigning the role of an MKO, to a person with an advanced ability level or better understanding of a particular task and/or a process than that of the learner. In this context, the Water Resource Professionals (WRP) as leaders of water re-use campaigns, assume the role of MKO, while community members become the learners. The WRP are expected to have a comprehensive knowledge of water conservation strategies in order to undertake the identified task. The success of the task in hand, as Vygotsky stipulated in his social learning theory, will be determined by the community's ability to conserve water on their own as they have learned, through collaboration with WRP during campaigns, at a given time. Vygotsky theorises that guidance and support by WRP (MKO) come in the form of modelling and corrective feedback (Byrnes, 2001). Vygotsky's Social Constructivists Theory - in context – is community oriented. In this study, it was attempted to establish a water re-use communication strategy that provided guidance for water resource professionals and methods to assess the community situation and develop a principle-based approach to public outreach, education and participation for water re-use.

1.3.2. Geertz's (1973) interpretation of cultures

Culture is a "context, something within which - social events, behaviours, institutions, or processes - can be comprehensibly described" (Geertz, 1973). It offers meaning to individual behaviour, a yardstick against which it can be interpreted and judged. Culture analysis is an interpretive attempt in search of symbolic cultural meaning. According to Geertz (1973), meanings of symbols are entrenched in social interaction structures. Cultural and socially established aspects of human life are equally interdependent factors. Given that the attempt to analyse culture is the art of interpreting the meaning attached to symbols and the social acceptance of such meaning, which is learned and shared by a society. Since water re-use campaigns

and education will all take place in a social setting, where the WRP will socially interact with the public in their own location, it is for this reason that this study adopted both Vygotsky (1978) and Geertz (1973)'s theories.

1.4. PRELIMINARY LITERATURE REVIEW

This section discusses the obtainable literature on both local and international public perceptions of water re-use, communication approaches and illustrative education materials. The process of developing a communication strategy is also outlined.

1.4.1. PUBLIC PERCEPTIONS OF WATER RE-USE

Water re-use is a key strategy for the conservation of limited water resources. It is perceived as a vital, potential strategy to address the growing pressures on global water resources and as part of a more integrated approach to handling the whole water circle and supporting the spherical environment (Michell, 2016; Van der Bruggen, 2010; Wang, 2016; Wester, Timpano, Çek, Lieberman, Fieldstone & Broad, 2015).
The public understanding and perception of the appropriateness and safety of water re-use is a key factor to their acceptance and the resultant success and/or failure of any water re-use programme. Positive public perception and acceptance of water re-use are recognised as vital factors for the success of water re-use schemes, while negative public opinion and perceptions are recognised as key challenges to the uptake of water re-use projects (Dolnicar, Hurilimann & Grun, 2011; Friedler & Lahav, 2006; Nancarrow, Leviston, Po, Porter & Tucker, 2008; Smith, Brouwer, Jeffrey & Frijns, 2018). Several studies documented instances where support for water re-use projects has been considerable as well as occasions where public resistances have stalled project advancement. Smith, Rutter and Jeffrey (2015: 189) indicated that "Individuals are less receptive to the idea of water re-use for uses that involve more personal contact such as drinking or bathing"; they can also be less receptive to re-use water within their households (Bruvold 1985; Hills, Birks & McKenzie, 2002; Robinson, Robinson & Hawkins, 2005; Marks, Martin & Zadoroznj, 2006). Po, Kaercher and Nancarrow (2003:13) state that "general disgust such as the 'yuck factor' and concerns over public health risks are cited as key factors in shaping individual's attitudes".

1.4.1.1. Perceptions on water re-use: An International perspective

Internationally, various studies have been conducted on the levels of public perceptions and acceptance of water re-use. Due to the global issue of water scarcity, these scholars have presented a description of various community views towards additional water sources (Dolnicar & Schafer, 2009; Alhmoud & Madzikanda, 2010). Water re-use studies have been implemented in numerous countries, such as Singapore, China, Australia, Israel and the United States of America (USA).

- Singapore

Po *et al*. (2003: 8) expressed the view that "Singapore is a small wealthy island that depends heavily on its neighbouring countries for their natural resources, including water". Seah (2002) stated that Singapore receives half of its water from Malaysia. Disagreements around high-water prizing received from Malaysia have aggressively threatened Singapore's future water supply. This led Singapore to seek alternative water supply methods (Kyodo News International, 2003). Singapore developed a water re-use project known as NEWater. NEWater was perceived as a strategic option, as it re-uses the available water and it was also cheaper, when compared to purified water (Po *et al*., 2003). An independent poll by Forbes Research indicated an overwhelming level of NEWater acceptance among Singaporeans. However, this finding was in contrast with those of two leading newspapers in Singapore, which mentioned that the majority of respondents did not feel comfortable drinking the (re-purposed/re-cycled) water. "Water re-use projects such as NEWater have often encountered strong community opposition, with few exceptions" (Seah, 2002 in Po *et al*., 2003:9).

- Australia

Australia is among the driest populated regions on earth (Po *et al*., 2003). Research on communication and public perceptions of water re-use was conducted as a result of a severe drought in 2000. This resulted in a focus on knowledgeable and policy attention on water re-use (National Research Council (NRC), 2012). Water re-use as a strategy was largely rejected due to the perceptions of individuals. Perception surveys were subsequently conducted in the country. Perceptions of the risk associated with water re-use, such as public health issues around unclean or dirty

water, and a lack of trust, were raised as main concerns (Hurlimann & Dolnicar, 2010). A water re-use study conducted by Hamiliton and Greenfield (1991) indicated that the psychological rejection of water re-use, which was viewed as filthy and unclean, accounted for the rejection of water re-use schemes by the majority of people. Although Australians have a general support for water re-use as they are aware of the idea; this support does not extend to potable re-use.

- China, Israel and the United States of America (USA)

Water re-use as a strategy for supplementing water resources has not been entirely acknowledged across China. During times of water scarcity, communities wanted to develop fresh water sources instead of re-using water (NWRS1, 2011). New government policies and various communities started to consider water re-use as a supplemental scheme, and little promotion, information and public awareness programmes were provided, which meant that deficient information was provided for the Chinese public (NWRS1, 2011). The study conducted by Yi, Jiao, Chen and Chen (2011) showed that individuals in China lacked knowledge about water re-use and that they viewed the benefits and safety of water re-use as untruthful.

Israel is also a country that relies on water re-use to supplement their natural water resources (NWRS2, 2013). Individuals are aware of the water re-use strategy as information during annual meetings held by Israel Ministry of Agriculture has been provided and support is given to ensure strict control measures and methods of efficient water use (Voss, 2013).

Similarly, individuals located in the USA have more knowledge and a greater awareness of water re-use schemes. The tendency of increasing acceptance has been prominent with 7% of households practising methods of water re-use, however a large number of individuals still adhere to the perception “use it or lose it”, this makes it difficult to bring rapidly advanced change towards U.S water resources (NWRS1, 2011; Rodda, Carden & Armnitage, 2010).

1.4.1.2. Perceptions on Water Re-use: A South African Perspective

Water re-use has been documented as one of the key strategies to supplement water resources in SA. It is predicted that up to 14% of water is re-used across the country (Adewumi *et al*., 2010; NWRS2, 2013). However, not all individuals accept water re-

use. According to Van Niekerk and Schneider (2013), South African opinions on wastewater re-use are different, especially in relation to direct or indirect water re-use for both potable and domestic applications.

Scholars such as Bungu (2014), Adewumi, Ilemobade and Van Zyl (2014), Stoakley (2013) and Wilson and Pfaff (2008) have conducted studies on public perceptions towards water re-use in South Africa. These research studies have indicated that public rejection and opposition can lead to negative attitudes towards water re-use. Factors such as occupation, gender, education, knowledge and information on water re-use, health concerns, trust in the service provider, perceptions of acceptable water quality and cultural factors such as race, religious beliefs and cultural norms are considered to be the influencers of consumers' perceptions on water re-use (Adewumi *et al*., 2014; Hurlimann & Dolnicar, 2010; van Niekerk & Schneider, 2013; Stoakley, 2013; Tayob, Deedat & Patel, 2015; Wilson & Pfaff, 2008). Adewumi *et al*. (2010:221) of the University of Witwatersrand, recommend that prior to implementation of water re-use the following parameters need to be addressed: "quality of re-use, source quality, public health, willingness, public trust and knowledge, and regulations and guidelines for re-use".

1.4.2. APPROACHES TO COMMUNICATING WATER RE-USE IN BASIC EDUCATION

This section reviews and discusses communication approaches which can be used to effectively communicate water re-use. Language, participatory and developmental approaches can be employed to effectively communicate water re-use in Basic Education. The approaches are discussed below.

1.4.2.1. The Language approach to communication

Language issues are perceived as constraints to various development programmes. "Language is a set of systems which interlinks with a range of social and psychological factors; the use and set of systems in combination provide meaningful communication" (Nyinondi, Mhandeni & Mohamed, 2017:96). It is the main medium through which individuals acquire meaning. Language limitations lead to challenges in meaning-making between the messenger and the recipient. For instance, the English language is used as the medium of education in Tanzanian institutions and the National

University of Lesotho. Since learners are not first language/mother tongue speakers of English, they face difficulties in comprehending concepts, asking questions and participating in various discussions. They spend most of their time struggling with language, which leads to a low performance rate in classrooms (Nyinondi *et al*, 2017; Janse van Rensburg & Lotz-Sisika, 2000). Language is perceived as a communication approach to communicate water re-use in Basic Education. Water re-use messages must initially be communicated using ones' mother tongue followed by ones' second language to clearly comprehend water re-use as a water conservation method.

1.4.2.2. Developmental and participatory communication approaches

Development and participatory approaches are intimately linked, participation is vital in the development paradigm. Development communication is viewed as a participatory process of material advancement and social change, for individuals who take control over themselves and their environment. Individuals are enabled to take charge and participate in development programmes by means of a two-way participatory communication. The approach aims to "increase participation of intended beneficiaries at grassroots level" (Moemeka, 1989:6). Development approaches prioritise the needs of the public and support communication tools which provide sufficient information and a platform for participatory, vertical communication between the public and the government. "The communication approach focuses on the premise that successful rural development requires conscious and active participation of the intended beneficiaries at every stage of the development" (Servaes, 2002:80). It is concerned with behaviour and attitudinal change among individuals involved in the development process. Development communication has been practiced and employed by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) - consistent agencies supporting development communication. The agency was developed in 1989 with the aim of "strengthening communication capacities in the developing countries so that they may participate more actively in the communication and development process" (Servaes, 2002:80; Hancock, 2000). The International Programme for the Development of Communication (IPDC) was also developed with the aim of promoting development participatory communication in developing nations.

1.4.3. ILLUSTRATIVE LEARNING MATERIALS

Education is considered a vital tool for sustainable development. Access to quality education assists in achieving sustainable development in a given environment. “To achieve quality education, the capacity of the education system must be improved through various learning materials designed to support the learning process” (United Nations, 2012; Li, Yamaguchi & Takada, 2018:1). Illustrative learning materials increase learners’ motivation to participate in classrooms and effectively acquire information. They enhance learning outcomes and promote sustainable knowledge development (Nyinondi, Mhandeni & Mohamed, 2017). Learning materials have been developed and incorporated into environmental lessons in order to educate learners about water issues, climate change, population growth, pollution and so forth. The materials include posters, fact sheets, flyers, computer-based materials or instructions, books, booklets, picture-based materials, games and packs combining different materials (South African Development Community (SADC), 2006).

1.4.4. DEVELOPING A COMMUNICATION STRATEGY

A communication strategy is viewed as an effort or attempt to discover a way to fill the gap between the communication effort and the identified goal (Maleki, 2007). Faerch and Kasper (1980:81) define communication strategies as "potentially conscious plans" which are used by organisations to solve problems in order to reach specific communication goals. Communication strategies are also defined as a conscious technique used to achieve a communicative goal (Dornyei & Scott, 1997); and attempts to enhance the effectiveness of communication (Canale, 1980). It is an action taken to better understand or be understood by others.

Communication strategies play a vital role during the development of strategic competence. It is a solution adopted to compensate communication breakdowns due to performance variables and/or to avoid insufficient competence (Tarone, 2005). Scholars give communication strategies the same aim, which is to solve a communication problem. Together, they identify problems, consciousness and intentionality as the main features of a communication strategy.

This study attempts to develop a communication strategy for stakeholders to agree on a common communication goal of water re-use, as a conservation strategy. The

foundation of the developed communication strategy is based on the findings of the study. All the steps in communication strategy development, from the analyses, identifying stakeholders to planning and monitoring activities and outcomes, were followed (Steyn & Puth, 2000). The communication strategy is an attempt to create a platform for communities to be heard when defining problems and solutions, deciding what behaviours are doable, organising campaigns and monitoring outcomes. This tool will be designed in an attempt to share and facilitate the programme objectives of water re-use by on-going stakeholder engagement and communication.

1.5. DEFINITION OF KEY CONCEPTS

For the purpose of this study, it is necessary that the following concepts be defined in order to clarify the context within which they are used.

1.5.1. Department of Basic Education (Basic Education)

Basic education was established when the Department of Education was separated into two, distinct departments. The department was divided into basic education and higher education and training. Basic education includes a focus on schools and learners from the foundation phase to further education and training (FET) phase. The department also focuses on adult literacy programmes such as Adult Basic Education and Training (ABET). As indicated above, this study aims to develop a communication strategy and illustrative learning materials for water re-use in basic education. Both the communication strategy and the learning materials were designed to target learners and educators within basic education.

1.5.2. Communication

Communication refers to the process of transmitting information and understanding, from one person to another. It is the process of sharing and receiving ideas, opinions and information which lead to understanding (Steinberg, 2007). It serves to provide knowledge, understanding and raise awareness about various phenomena.

1.5.3. Communication strategy

Strategy signifies a general plan of action intended for achieving one or organisational goals and objectives. Cook, Lally, McCarthy and Mischler, (nd:3) stated that communication strategy is “the selection of appropriate communication objectives and the identification of the specific brand awareness and brand attitude strategy”. It is the system of planning how to share information. Communication strategy is referred to as the mindful choice of the most useful objectives of communication, and recognition of a particular brand and its strategy in terms of attitude (Pearson, 2016). It is a general plan for communicating information related to a specific issue, event, situation, and/or target audience (Dörney & Scott, 1997). A communication strategy serves as organisational blueprint for communicating with stakeholders. If not treated carefully, it could create communication problems. It produces a profile that can be used to identify the right problems, to solve and to prioritise issues for which communication programmes are to be developed (Steyn & Puth, 2000; Pearson, 2016).

1.5.4. Water

Water is a natural resource which drives all aspects of life. It is vital for survival and expressed as “water is life”. “Water availability determines the nature of the natural environment in which human and animals live. Most economic activities depend on water for progression. The achievement of South Africa’s development vision will only be possible if water resources are managed effectively and support is given to various water conservation methods” (DWAF, 1997; NWRS2, 2013:22).

1.5.5. Water re-use

NWRS1 (2013:1) defines water re-use as the “utilisation of treated or untreated wastewater for a process other than the one that generated it”. It encompasses transformation by the user such as re-use of municipal wastewater for mining, industrial and agricultural purposes.

1.5.6. Greywater

Greywater is defined as water generated from household use such as bath, laundry, cleaning and rinsing. It is domestic water which has no faecal matter and contains less nitrogen (NWRS1, 2011).

1.5.7. Culture

Culture refers to a “historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate and develop their knowledge about their attitudes towards life” (Geertz, 1973:89). It offers meaning to individual behaviour, a yardstick against which behaviour can be interpreted and judged (Geertz, 1978). This study attempts to communicate, change behaviour, attitude and promote water re-use practices. Culture is an element which affects human behaviour, it needs to be considered in development studies and programmes.

1.5.8. Learning

Learning is a systematic process of acquiring new knowledge and modifying existing knowledge that affects human (learners) behaviour and their understanding of the environment they find themselves in. According to de Houwer, Barnes-Holmes and Moors (2013:3) functional learning refers to “learning as a change in behaviour that is due to experience. Learning is seen as a function that maps experience into behaviour. It is an effect of experience on behaviour”. Hamman, Berthelot and Saia (2000:17) define learning as “a reflective activity which enables the learner to draw upon previous experience to understand and evaluate the present, so as to shape future action and formulate new knowledge”. From the perspective of this study, every learner has the potential to learn, engage and participate in water re-use practices. Given that leaning affects behaviour, continuous learning should be considered as the substance of an effective school, an active community, and a fulfilled and meaningful life (Bransford, Brown & Cocking, 2000) as well as a potential solution to the South African water scarcity problem. This study assumes that as learning influences behaviour, every behaviour is the result of past learning and learning remains an activity undertaken during social context (Vygotsky, 1978).

1.5.9. Illustrative learning materials

Onuoha-Chidiebere (2011), Gauteng Department of Education (2011) and Manqele (2012) define illustrative learning materials as tools or resources used to assist and facilitate the learning process. They are employed to simplify the education process and disseminate information in an understandable manner. For instance, they can be in the form books or booklets such as textbooks used in most schools across the globe, posters, flyers, fact sheets and so forth.

1.6. PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

This study aims to develop a water re-use communication strategy for Basic Education, which includes illustrative learning materials suitable for online learning.

1.6.1. Objectives

- To review and analyse learners and educators' perceptions and understanding (knowledge) of water re-use;
- To examine strategies that need to be employed in order to gain learners and educators understanding and their acceptance of water re-use;
- To discuss approaches to communicate water re-use in Basic Education; and
- To develop information or learning materials that will educate and enhance Basic Education learners and educators' understanding and enable them to make informed decisions with regard to water re-use.

1.6.2. Research questions

- What are learners and educators' perceptions on water re-use in South Africa?
- To what extent do learners and educators understand the dynamics of water re-use?
- What is required to enhance learners and educators understanding and influence their decision making on water re-use?
- What information materials and strategies could be utilised to educate and influence learners and educator's acceptance of water re-use?

- Which communication approaches are appropriate to communicate water re-use in Basic Education?

1.7. RESEARCH METHODOLOGY

This section describes the research methodology and procedures employed in the study. It outlines the research design, sampling, target population, study area, data collection and data analysis methods employed in the study.

1.7.1. Research design

Participatory action research was adopted as a qualitative research design. Participatory action research is described as a flexible methodological design that allows people to assemble, interact and exchange knowledge (learn) among themselves. It is a form of research in which action and research complement each other; the researcher and the participant are involved in decisions regarding the entire research process (Mbongwe, 2012). Participatory action research is considered a methodology and a technique for attitude change that brings together a number of approaches to allow individuals to obtain, share, and analyse their knowledge and experiences (Chambers, 1994). Participatory action research provides a platform for participation and "helps the community to create informal social support networks in cooperation with professional helpers to prevent or cure a problem" (de Vos *et al*., 2011; Schurink, 1998:407). The design focuses on engagement and mobilisation of participants as active agents in the process of creating knowledge, reaching the desired objectives and finding solutions to identified problems (Rahman, 1993). In this design, participants retain the necessary knowledge and skills for the research process (Mbongwe, 2012). The researcher is not only considered as the expert who shares research skills, but also as the co-learner who recognises and benefits from the skills and knowledge of the community (McNicoll, 1999). The research design was employed in order to collaborate with participants and discover their experiences regarding water re-use, this assisted in achieving the intended aim and objectives of the study.

1.7.2. Sampling

A sample refers to “a subset of a population that is considered to be representative of the entire population” (du Plooy-Cilliers, Davis & Bezuidenhout, 2014:135). Participatory action research relies on convenience sampling to sample participants and elements, such as documents, for analysis. This type of sampling selects participants and elements based on ease of accessibility. Participants and elements are picked simply because they are easy to access, rather than on a specific strategy or rationale. For example, one may sample classmates, documents, co-workers, family members or neighbours simply because they are available. For the purpose of this study, convenience sampling was employed to sample schools, learners and educators in Basic Education. A total of eight schools which consisted of four primary and four secondary schools in Mankweng were selected due to their convenient accessibility and proximity. Learners and educators were selected due to their availability. A total number of 80 participants were selected. 15 participants (10 learners and 5 educators) were conveniently selected from each secondary school and 5 educators were selected from each primary school.

1.7.3. Target Population

Target population is defined as “established elements which the researcher emphasis on and from which data is acquired” (Creswell, 2003). The eligible target population for this study was all learners and educators in Basic Education, in Mankweng circuit, Polokwane, Limpopo Province.

1.7.4. Study area

This study was conducted in Mankweng Township within Mankweng circuit primary and secondary schools. The circuit is located within Capricorn District of Limpopo Province. The Mankweng Circuit consists of 16 primary schools and 12 high schools. The circuit was selected for the study due to its familiarity and accessibility to the researcher who grew up in the area and who is currently located in the area. The study sampled four primary and four secondary schools within the Mankweng circuit.

1.7.5. Data Collection

Data collection is defined as a systematic method which is applied by the researcher to collect relevant information for the study in order to achieve the intended aims and objectives of the proposed study (Burns & Grove, 2005). As an exercise in participatory action research, this study emphasised on the participation and involvement of all selected individuals involved in the project. One on one face to face interviews and various group formats, such as workshops and focus group interviews were used to collect relevant data for the study. Participants' observation processes were also used as data collection methods. Participants' behaviour and non-verbal cues were observed during interviews, workshops and focus group discussions. The identified data collection methods are discussed below.

1.7.5.1. Workshops

Workshops accommodate larger groups than the community. They specifically target groups of their interest and they focus on a two-way learning process between the researcher and the public (de Vos *et al*., 2011). A stakeholder consultation workshop was held on the 23rd of November 2018 (refer to appendix 11). The workshop was attended by the researcher; along with the partial funder; the supervisor and co-supervisor of the study. The workshop provided information which assisted in achieving the intended aim and objectives of the study.

1.7.5.2. Focus group discussions

A focus group is a small select group of 8 to 12 individuals, who are gathered together to apply their knowledge, opinions, perceptions, experiences, and expertise to a given problem (de Vos *et al*., 2011). Focus group discussions were used as a data collection method for this study. They provided the researcher and the community members a platform to interact, share opinions and experiences about a proposed issue. During focus group discussions selected learners and educators were placed in a specific context in order to discuss issues and exchange ideas on water re-use. Data received from focus groups assisted in developing a communication strategy and illustrative learning materials.

1.7.5.3. Interviews

Interviews were also used as data collection methods for the study. They provided the researcher with a platform to ask questions to selected individuals and vice versa. To attain the intended purpose of the research project, primary school educators were interviewed to reveal their attitudes, perceptions and knowledge on water re-use. Each educator was placed in particular context and the researcher interviewed him or her on various water re-use matters and their preferred illustrative learning materials suitable for various learners and online learning.

1.7.5.4. Data collection tools

An audio recorder, semi-structured interview guide, topic guide and observation sheet were employed as data collection tools. An audio recorder was used to record data collected from participants (learners and educators). A semi-structured interview guide was used to guide the interview questions and the topic guide was employed to guide the focus group discussions. An observation sheet was employed to note non-verbal cues presented by the participants (Attached as appendix 10). The topic and interview guide comprised of unstructured and open-ended questions which were asked and discussed (Attached as appendices 7 and 8).

1.7.6. Data Analysis

De Vos *et al*. (2011:397) expound that data analysis is concerned with "reducing the capacity of raw information, sifting significance from trivia, identifying key patterns and constructing a framework for communicating the essence of what data reveal. It is the process of bringing structure, order and meaning to the mass collected data". This study employed thematic analysis and NVivo software to analyse the collected data. Thematic analysis emphasises themes and patterns that the researcher can identify from participants' dynamic behaviour (Merton, 1967). Themes are units resulting from patterns such as topics of conversations, recurring activities, language, feelings and meanings (Taylor & Bogdan, 1989). *A priori* themes were employed to generate themes for the study. NVivo is a software that supports and assist in analysing practical social research (Godau, 2004). NVivo software assisted in categorising codes and participants' demographic information.

1.7.7. Quality Criteria

For quality criteria to be achieved, some level of trust needs to exist between the researcher and the participants. Trustworthiness refers to the process of constructing validity and reliability of qualitative research (Streubert-Speziale & Carpenter, 2003). Qualitative research is considered dependable when it correctly expresses participants' experiences. The "notion of trustworthiness evaluates the quality of qualitative research on the basis of credibility, dependability, transferability and confirmability" (Bless, Higson-Smith & Sithole, 201:236).

1.7.7.1. Credibility

Credibility is considered the most vital qualitative quality criteria (de Vos *et al*., 2011). It aims to assure that the study findings represent the truth and actuality of the study (Bless *et al*., 2013). Credibility establishes when participants identify the presented findings of the research as their personal experiences (Streubert-Spenziale & Carpenter, 2003). To ensure that the findings of the study portray the truth of the reality under study, the researcher demonstrated the appropriateness and overall internal logic of the research questions, the study design, data collection method and the approach of the data analyses used.

1.7.7.2. Dependability

Dependability is one of the qualitative research criteria used to gauge trustworthiness. It demands that the researcher should carefully define and follow a clear research plan which is "logical, well documented and audited" (de Vos *et al*., 2011:420). "Dependability is achieved through obtaining credibility of the findings" (Streubert-Speziale & Carpenter 2003:38). During this process "the researcher must show that each step has been thoroughly and carefully completed" (Bless *et al*., 2013: 237). Dependability is related to consistency of findings (Holloway, 2005). If the study is duplicated in a same situation with similar participants, the results would be constant. For the study to be dependable the researcher assured that data saturation point were reached, and many adequate verbatim quotations were used in the research report.

1.7.7.3. Transferability

Transferability can be related to external validity - it refers to the possibility that the study findings apply to other similar situations or have meaning to others in similar

situations (Bless *et al*., 2013). Transferability determines whether the research findings can be transferred from a particular situation to another (de Vos *et al*., 2011). This criterion requires the researcher to present detailed information about the location from which the data was collected, about the researcher as an individual and his or her relations with participants (Bless *et al*., 2013). In order to achieve transferability in this study, the researcher provided detailed information about the study location and the insider and outsider perspectives of the researcher along with the established relationship between the researcher and the participants. The researcher presented the methodology used in the report, in an attempt to be transparent, state clearly what, why and where it had been conducted.

1.7.7.4. Confirmability

Lincoln and Guba (1985) in Maree (2016: 125) define confirmability as "the degree of neutrality or the extent to which the findings of the study are shaped by the participants and not the researcher bias, motivation, or interest". The study achieved confirmability by quoting participants verbatim and the researcher ensured that no bias and personal sentiments where included during the study process. The researcher was neutral, and an attempt at fairness was maintained through all phases of the study.

1.7.8. Bias

During the data collection process, some answers from the participants may introduce bias into the study. In order to avoid this, various tools were used to collect data. The researcher did not only depend on the verbal responses from the participants; information was also gathered from observations of nonverbal behaviour. During data analysis, the researcher ensured neutrality and avoided personal sentiments which might have affected the data collection process.

1.8. SIGNIFICANCE OF THE STUDY

Information found from this study may be useful for creating an awareness, enhancing understanding and providing various South African communities with a more informed and well-structured water conservation plan. It also contributes to the body of knowledge on water re-use and may assist individuals in making informed decisions and developing positive attitudes towards water re-use.

1.9. ETHICAL CONSIDERATIONS

Ethics has to do with what is right or wrong as accepted by a particular cultural group of people. Louw (2014:264) state that “there are a number of important ethical issues that affect the participants in a research”. For the purpose of this study, the following ethical elements were considered.

1.9.1. Respect for participants’ rights and dignity

All participants have legal and human rights. The researcher ensured that human rights were not violated. Participants were treated with respect, regardless of their culture, age, gender or level of study. No individual was forced to participate against their free will.

1.9.2. Informed consent

The researcher ensured that participants clearly understood that the research was for academic purposes. All participants and respondents were asked to sign a consent form before any subjects were interviewed.

1.9.3. Confidentiality

Information gathered from participants was kept confidential and protected. No participants’ information was provided to anyone other than the researcher, who kept it secure at all times. The collected data was kept safe from non-purposive activities to the study.

1.9.4. Opting out

Participants were given assurance that they were free to discontinue (opt out) at any time without being required to offer any explanation. This can be important, as some participants may feel that their social benefits or beliefs are being affected. However, none of the participants opted out during the process of this study.

1.9.5 Permission to undertake the study

Considering the nature of the study (research) as participatory action research, which involves using humans as the source of information, permission was granted from the University of Limpopo and Basic Education. An ethical clearance letter (certificate) was obtained from the Turfloop Research Ethics Committee (TREC) of the University

of Limpopo and a permission letter was attained from the Mankweng circuit of Basic Education before the initiation of any data collection for the study (Attached as Appendices 1 and 2).

1.10. STRUCTURE OF THE STUDY

This study was divided into six chapters which sought to achieve the intended aim of the study- to develop a water re-use communication strategy for Basic Education, which included illustrative learning materials suitable for online learning- empirically and theoretically employing various sources, methods and analysis procedures. The study is structured into the following chapters:

Chapter one: Introduction and Motivation

This chapter provides the introduction, background and motivation for the study. It outlines the background and introduction to water scarcity and water re-use as a water conservation method to combat the problem. The study was motivated by water deficiency problems experienced in South Africa. The chapter discusses the problem statement of the study which notes that water scarcity is an environmental issue facing South Africa. Water re-use is perceived as an effective conservation method to combat the problem; however, the problem lies with the cognisance and awareness of affected individuals. It is indicted that individuals are not aware of water re-use and lack an understanding of the re-use methods. Preliminary literature on water re-use and the theoretical framework, which concentrates on Geertz's interpretation of cultures, Vygotsky's social constructivism and the behaviour ecological model, are outlined. The chapter further discusses the research objectives and questions employed to guide and achieve the intended aim of the study. Research methodology based on participatory action research, quality criterions, ethical considerations and significance of the study are further outlined.

Chapter two: Literature review

This chapter provides a literature review and theoretical framework of the study. It consists of an international and local literature review of water re-use public perceptions, strategies to enhance water re-use in Basic Education; which comprises of environmental education, programmes, campaigns and rules, policies and regulations. Communication approaches to Basic Education are further outlined. The

approaches involve participatory, development and language communication approaches. Illustrative learning materials and elements of communication strategies which indicate how the communication strategy was developed are further deliberated.

Chapter three: Research methodology

Research methodology used to guide the study is provided in this chapter. Participatory action research, as a research design employed in the study is defined and discussed. The philosophical underpinnings of participatory action research and qualitative and quantitative research designs are outlined. The population of the study which comprised learners and educators in Basic Education, sampling which discussed how individuals were sampled (convenience sampling was used to sample participants and their respective schools due to geographical proximity and intention to collect data at specific individuals) and insider and outsider perspectives, which position the researcher in the research study were discussed. The chapter outlines data collection and data collection methods which consisted of interviews, focus groups, workshops and participant observations and data collection tools which comprised of an interview guide, topic guide and audio recorder. Thematic analysis and NVivo software as data analysis methods are explained. Last, quality criterions and ethical considerations are outlined, and it was indicated how they were achieved throughout the study.

Chapter four: Data analysis and interpretations

This chapter outlines the analysis and interpretations of data collected from the interview sessions, focus groups, workshops and participant observations. As indicated above, thematic analysis and NVivo software were used to analyse data. The data is presented in the form of tables, pie charts, graphs and themes (pre-defined or a priori themes). The study findings regarding water re-use were generated in the chapter. The findings indicated that there was a relationship between perceptions and demographical, social, cultural, environmental and psychological factors. Each factor has had an impact on individuals' perceptions and behaviour towards the phenomenon.

Chapter five: A Communication strategy for water re-use in South Africa

A communication strategy for water re-use in South Africa is outlined in this chapter. The strategy was developed as a result of the findings and is comprised of various phases; including an introduction and background to a monitoring and evaluation phase. The strategy sought to communicate and raise water re-use awareness amongst the public (especially learners and educators).

Chapter six: Summary, recommendations and conclusions

This chapter concluded the study by presenting the summary of the findings with reference to the study findings and the interpretations presented in chapters four and five. Recommendations for water re-use promotion were made with reference to the findings. The chapter further presented the limitations of the study which included methodological, theoretical, sample size and geographical limitations which encourages further research. The chapter concluded by indicating that there was a key relationship that existed between perceptions and psychological, environmental, social, cultural, religious and demographic factors.

1.11. SUMMARY OF THE CHAPTER

This chapter outlined the introduction and background of the study. South Africa is a water scarce country faced with various challenges. High population growth, poor water management systems, agriculture, mining, industry and urban development create difficulties for adequate freshwater distribution across the country. The current water supply cannot meet current water needs. This led to water re-use as a water conservation strategy to address the water problems. However, the major problem lies within the cognition of individuals who are not aware of the conservation methods and some who are reluctant or apprehensive of the water re-use methods. This study aims to develop a water re-use communication strategy which could be used to communicate water re-use and illustrative learning materials which could be used to educate and enhance knowledge about water re-use. To achieve the intended aim of the study, participatory action research was employed as a research design. Geertz's theory of culture, Vygotsky's social constructivism and the behaviour ecological model were discussed as theoretical frameworks for this study. A brief literature review on perceptions, communication approaches, and illustrative learning materials was

presented. Steps in developing a communication strategy were further discussed. Various quality criteria methods and ethical considerations which were considered during the study were also deliberated in this chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1. INTRODUCTION

South Africa is a water scarce country which has a low average rate of rainfall and high evaporation. It is thus necessary to find water conservation methods which could be used to combat the water shortage problems. Water re-use has been identified as a suitable water conservation method which can assist to reduce water deficit challenges experienced in the country. This study aimed to develop a communication strategy for water re-use (greywater) for the Basic Education learners, which included illustrative learning materials suitable for online learning.

This chapter reviews literature regarding water re-use and examines the theoretical framework for this study. The chapter outlines the definition of greywater as a water conservation method which forms the focus of this study. The definition assisted the researcher with a clear comprehension of what was meant by greywater. The theoretical framework based on the behaviour ecological model and the work of Geertz and Vygotsky were also deliberated. Geertz's theory was used to understand and discuss the concept of culture and how it influences human behaviour regarding human perceptions, values and beliefs. Vygotsky's work was employed as a guide on how to teach learners in an effective manner. Vygotsky deliberates that effective learning can occur through social interactions. The behaviour ecological model looks at various levels and elements that might influence human behaviour, it provided the researcher with background on individuals' behaviours.

The next section of the chapter examines local and international perceptions on water re-use (greywater). The section is followed by a discussion on factors that can be used to change held perceptions and attitudes towards environmental issues such as environmental education, programs and campaigns, rules, policies and regulations. The following section elaborates on communication approaches to water management. Communication approaches that could be used to communicate effectively and to pass on knowledge and understanding towards water re-use were examined on the section. The participatory and developmental approaches which are in contract with Vygotsky's theory were discussed. Participatory and developmental

approaches indicated that for change to occur, individuals should be viewed as active agents throughout the process. They should be able to raise their thoughts and ideas on environmental issues. This can only occur in a particular social context and by means of social interactions. Language issues as an approach to communication and partnerships with private and water use sectors approach were also deliberated. Communication approaches provided information on how to communicate and to be better understood by the target audience.

Learning support materials which can be employed to simplify and strengthen the learning process on water re-use are discussed in section 2.8. The last section outlined stages for communication strategy development. Various stages needed to be employed to develop an effective communication strategy for water re-use. The stages commenced with an analysis of the internal environment, identification of strategic stakeholders and the publics in the internal and external environment, identification and prioritisation of key strategic issues, identification of implications of strategic issues for stakeholders, decisions on the corporate communication strategy, setting of communication goals around which communication plans were to be developed, development of a communication policy, conduction of a media analysis and development of a strategic communication plan. In conclusion, the identified sections indicate how various discussions were relevant to the study.

2.2. BACKGROUND TO THE PROBLEM

As highlighted in the introduction, continued demand for fresh water during a time of increased consumption and climate change is a challenge faced by governments across the globe. The demand for fresh water is higher than the supply; this leads to the decline of fresh water sources (Callaghan, Moloney & Blair, 2012; Dolnicar & Saunders, 2005, Po *et al*., 2004; Keremane & Mckay, 2009). Due to the decline in the availability of fresh water, it is important to find amendable, affordable and safe water conservation methods that can be used to reduce water problems (Mashabela, 2015). Experts in the water industry “espouse recycled water as a safe, cost effective, climate resistant, energy efficient and sustainable solution to combat future water shortages” (Callaghan *et al*., 2012; Dolnicar & Schäfer, 2009). The World Health Organisation’s (WHO) guidelines for safe use of wastewater and greywater emphasise the importance of greywater as an alternative water resource. Greywater can be used to

reduce the demand for the use of water as it makes up the largest volume of the waste flow from households (WHO, 2006; Mashabela, 2015). However, most individuals in various areas are unaware of the use of wastewater. Communication is an important tool that can be used to raise awareness, persuade, transform individuals' attitudes and promote understanding. It is viewed as a product and reinforcer of economic growth and development (Melkote & Steeves, 2001; O'Keefe, 2016).

Water re-use is an essential conservation method which can be used to reduce water scarcity problems in South Africa. Basic Education consists of learners and educators who appear to be unaware and have their own beliefs and attitudes towards water re-use (greywater); the context consists of an enormous group of learners who could benefit from being taught about water re-use at a young age. Teaching and communicating with pupils about water re-use at a young age will make it easier for the generation to grow and develop with this knowledge. Young learners can pass on the knowledge to their elders as well as to the upcoming younger generation. Communication is a vital element which can be used to communicate and generate knowledge to learners in Basic Education. It can be used as a source for awareness-raising required to transfer development and social change (Melkote & Steeves, 2001; Jenatsch, Bauer & Alarcón, 2016). There is no knowledge or development that occurs without communication. The primary aim of the study is to develop a suitable and sustainable communication strategy for water re-use in the Basic Education, which will include illustrative learning materials suitable for online learning. Additionally, the study intends to communicate knowledge and raise awareness about water re-use amongst learners and educators in Basic Education.

2.3. DEFINITION OF GREYWATER

Greywater refers to wastewater generated from household uses such as laundry, showers, bathtubs and hand wash basins. It is an immense resource with possible significant applications in areas which experience water scarcity problems. Greywater makes up to 60 to 70% of the domestic (day to day) wastewater volume in most developing and developed countries; "this is because the generation of greywater is directly related to the consumption of water in a household" (Mashabela, 2015:52). The use of greywater sustainability for irrigation in small scale agriculture and in gardens is also an effective method for alleviating water problems (Mashabela, 2015).

During periods of drought and water restriction, greywater may be used for irrigation purposes such as irrigating golf courses, food crops, parks, freeways, landscaping, school yards, playgrounds and pasture for animals (Friedler, 2004; Bakare, Mtsweni & Rathilal, 2016; Mashabela, 2015). Greywater can be used to reduce the amount of sewage discharged into ocean and rivers and the amount of potable water consumption, it can also decrease water bills (Mashabela, 2015).

2.4. THEORETICAL FRAMEWORK

2.4.1. Vygotsky's Social Constructivism Theory

Vygotsky's social construction theory describes how learning happens and suggests that learners make meaning out of their past experiences (Vygotsky, 1978; Amineh & Asl, 2015). This theory is often associated with teaching approaches that promote active learning. Social constructivism emphasises that each learner is unique and possesses exclusive traits with unique needs within a certain sociocultural background. The learner is also viewed as a complex and multidimensional social being. According to Wertsch (1997), Vygotsky accepts the natural uniqueness and complexity of each learner and encourages and rewards the learner as a central part of the learning process.

Culture as a way of life which governs one's intellectual behaviour and ways of doing things. Social constructivism encourages the learner to unleash their full potential, influenced by their cultural background. By virtue of being a member of a particular cultural group of people (society), the learner inherits, learns and exhibits cultural systems and symbols of such a society throughout his/her life. This emphasises the significance of the learner's active participation during interaction with senior members of the society (MKO). Geertz (1973) posits that "culture is a system of inherited conceptions expressed in symbolic forms by means of which society communicate, perpetuate and develop their knowledge about their attitudes towards life". Learners acquire social meanings of symbolic forms and learn how to apply them through social interaction with more knowledgeable individuals.

As mentioned earlier, Vygotsky holds that learning occurs through social interactions, learners improve their thinking competencies through interrelating with other learners, elders and the physical environment. From this theory's perspective, it is significant to

consider the learners' culture and background during the construction of knowledge or the learning process. The learner's background and nature help to explain the knowledge that she generates, discovers and attains through the process of learning (Wertsch, 1997; Bailey & Pransky, 2005 in Amineh & Asl, 2015).

2.4.1.1. The responsibility and motivation for learning

Von Glasersfeld (1989) maintains that the responsibility for learning should be vested in the learner. Teachers should consider their learners' knowledge first and then allow them to participate and put that knowledge into practice (Mvududu & Thiel-Burgess, 2012 in Amineh & Asl, 2015).

Vygotsky's theory emphasises the significance of learners' active involvement during the learning process, unlike previous educational standpoints where the responsibility of teaching and learning was firmly placed with the teacher while the learner played a receptive (passive) role. Learners should construct and illustrate their own meaningful understanding. They should not simply reflect and mirror what they have read or what was presented by the teacher (Von Glasersfeld, 1989). Learners should always be in search of meaning and attempt discovery, order and regularity, in the events of the world, even without comprehensive information.

Another critical notion regarding the nature of the learners' ability to learn on her own depends on learning level and motivation. According to Von Glasersfeld (1989), nurturing learning inspiration is largely dependent on the child's confidence in their learning potential. "Feelings of competency and belief in potential to solve new problems are derived from first-hand experience of mastery of problems in the past and are much more powerful than any external acknowledgment and motivation" (Prawat & Floden, 1994). This relates to Vygotsky's 'zone of proximal development' (Vygotsky,1978) where learners as active participants are "challenged within proximity to their current level of development" (Vygotsky, 1978:np). As a result of the successful completion of a challenging task, with or without the help of teachers, learners gain self-reliance and courage to take on more complex challenges on their own.

2.4.1.2. The MKO's role as facilitator

According to the social constructivist approach, MKO's should not adapt to the role of teachers but rather of facilitators to encourage maximum learner participation (Amineh

& Asl, 2015). The focus turns decidedly away from the MKO and the presentation of content to the leaner to put more emphasis towards the learner's ability to learn on his/her own (Gamoran, Secada, & Marrett, 2000). This change of role suggests that a facilitator should demonstrate a completely different set of skills compared to that of a teacher (Brownstein, 2001). A teacher instructs, while a facilitator enquires; a teacher teaches at the front; a facilitator provides assistance from the back. More importantly, Rhodes & Bellamy (1999:98) note that:

> "a teacher gives answers according to a set curriculum, a facilitator provides guidelines and creates the environment for the learner to arrive at his own conclusions; a teacher mostly gives a monologue, a facilitator is in continuous dialogue with the learners".

A facilitator should also be able to adapt to the learning experience 'in mid-air' by taking the initiative to steer the learning experience to where the learners want to create value. The learning environment should also be designed to support and challenge the learner's intelligence (Di Vesta, 1987). While it is advocated to give the learner ownership of the problem and solution process, it is not the case that any activity or any solution will be adequate. The primary purpose is to assist the learner towards becoming an effective, independent thinker. This can be attained by assuming several roles, such as that of a coach and consultant.

A few strategies for cooperative learning include (Woolfolk, 2010:11):

- Reciprocal Questioning: learners work together to ask and answer questions.
- Jigsaw Classroom: learners become "experts" on one part of a group project and teach it to the others in their group.
- Structured Controversies: learners work together to research a controversy.

Vygotsky's social constructivism theory is an effective theory that can be used to facilitate the learning process. The researcher in this study looked at Vygotsky's theory in order to understand how learning can be effective. In order to learn effectively about water re-use, the researcher provided participants (learners and educators) with a participatory environment which encouraged participants to participate and raise their thoughts by means of discussions and summative water re-use assessments. These were employed to gauge participant's understanding and ensure sustainable information retention (Hanna, 2004). This study strove to raise awareness,

communicate and enhance an understanding of water re-use for educators and learners in Basic Education. During the learning process, the researcher served as a facilitator, which allowed for active learning and interaction to take place.

2.4.1.3. Learning as a social process

Social constructivism, strongly influenced by Vygotsky's (1978) work, suggests that knowledge is created in a social setting and is then accepted by various cultural groups (Eggan & Kauchak, 2004; Amineh & Asl, 2015). According to social constructivists, the process of sharing individual perceptions is called collaborative elaboration (Van Meter & Stevens, 2000), which results in learners constructing and understanding together which would be impossible alone (Greeno, Collins & Resnick, 1996). Learners from various backgrounds possess different skills and should be encouraged to work together on tasks and in discussions to arrive at a shared understanding of a given phenomenon in a specific field (Jonassen & Duffy, 1992).

Social constructivist scholars view “learning as an active process where learners should learn to discover principles, concepts and facts for themselves” (Brown, Collins & Duguid, 1989; Amineh & Asl, 2015). Other constructivist scholars such as Ernest (1991); Prawat and Floden (1994) are of the same view and postulate that individuals make meanings during interactions with others, influenced by their experiences with their environment. Knowledge is continuously produced by people in social and cultural settings (Ernest, 1991; & Prawat & Floden, 1994; Amineh & Asl, 2015; Bada & Olusegun, 2015). McMahon (1997) adds that “learning is a social process because it is not a process that only takes place inside our minds, nor is it a passive development of our behaviours that is shaped by external forces and that meaningful learning occurs when individuals are engaged in social activities”.

Vygotsky (1978) emphasised the consideration of both the practical and social elements in the learning process. The theory indicates that through applied activity, a child makes meaning on their own representation of the world, while language connects this constructed meaning with the world shared by children and their culture (Christie, 2005 in Amineh & Asl, 2015).

2.4.1.4. Engaging and challenging the learner

Learners should continuously be presented with various challenging, creative tasks to develop their knowledge just further than their present level of mastery. This will motivate the learner to builds on previous experience and successes to improve their confidence (Brownstein, 2001). This is in line with Vygotsky's zone of proximal development, which could be referred to as the "gap between the actual developmental level (as determined by independent problem-solving) and the level of potential development (as determined through problem-solving) under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978 in Amineh & Asl, 2015). In this study, learners were given summative assessments (tasks) to challenge and evaluate their knowledge and cognition about water re-use.

Vygotsky (1978) further claimed that "instruction is good only when it proceeds ahead of development; it awakens and revives to live an entire set of functions in the stage of maturing, which lies in the zone of proximal development". It is in this manner that the lessons play an extremely significant part in child development. To fully engage and challenge the learner, the activity (task) and learning atmosphere should reflect the complexity of the atmosphere that the learner must be able to operate in at the end of learning. Learners' perception, understanding and acceptance of the suitability and safety of recycled water is an important factor to the success of any water re-use programme (Lazarova *et al*., 2013; Po *et al*., 2005). Their attitudes and perceptions on water re-use as well as cultural and social aspects are key determinants of the success of water re-use programmes (Ross, Fielding & Louis, 2014). It is evident that learners' knowledge, cultural experiences and understanding of water re-use will determine their attitudes and perceptions that will lead to acceptance or rejection of this conservation method.

Once they have been familiarised with current water scarcity problems and possible solutions, learners are expected to take ownership of water scarcity problems which will ultimately lead to their active involvement in the learning and/or problem-solving process (Derry, 1999). The problem of water scarcity should not be just the business of the South African Government or Water Resource Practitioners, but also important to the learners as members of South African communities. In order for learners to comprehend water re-use issues, they should be taught and actively contribute to

water conservation activities. Simultaneously they should also collaborate with their educators in a given social context suitable for learning.

Vygotsky's social constructivism theory is applied to the study because it provides researchers and educators with valid information to understand the learning process and to achieve educational goals. It provides scholars with essential knowledge on how to teach and engage with learners. Vygotsky's social constructivism theory serves as the educational framework for this study. The researcher will focus on this theory to raise awareness, educate and promote understanding about water re-use (greywater) to both learners and educators involved in Basic Education.

2.4.2. Geertz's (1973) Interpretation of Cultures

Culture is a context, "something" within which - social events, behaviours, institutions, or processes - can be comprehensibly described (Geertz, 1973). It offers meaning to individual behaviour, a yardstick against which they can be interpreted and judged. Culture analysis is an interpretive attempt in search of meaning. Geertz (1973) sustained that human thought is consummately social: social in its functions, social in its applications, social in its origins and social in its forms. Human thinking, as a subjective phenomenon, cannot be observed, but its forms and functions within the social arena can be closely observed. Cultural anthropology, as Geertz practiced it, begins inductively with the observation and description of social patterns. Human behaviour needs to be examined accurately, because it is this behaviour and social action that articulate cultural forms. According to Geertz (1973:89), the concept of culture as a system of symbols and meanings signifies:

> "… a historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate and develop their knowledge about their attitudes towards life".

Geertz (1973) referred to a symbol as an object, event, an act, quality, or relation which served as a principal vehicle for conception. The conception is the symbol's 'meaning'. "Symbols are tangible formulations of notions, abstractions from experiences fixed in perceptible forms, concrete embodiments of ideas, attitudes, judgements, longings or beliefs" (Geertz, 1973:91). Symbols are carriers of meaning, and meanings are

socially established. Culture consists of socially established structures of meaning (Geertz, 1973). (Geertz, 1973:91) points to several key elements of culture;

> "First, the concept culture is semiotic and instrumental to how people communicate amongst themselves about life. Culture is an ordered system of symbols and meaning in terms of which people define their world and express themselves. Second, meanings are rooted in social structure. Cultural and social aspects of human life are mutually interdependent factors. Third, the analysis of culture is art of interpreting the meaning of symbols".

Symbols are the central part component of culture and are culture specific. They refer to anything to which a society attaches meaning and which they use to communicate with one another. Geertz (1973:13) quoting Wittgenstein states that:

> "We … say of some people that they are transparent to us. It is, however, important as regards this observation that one human being can complete an enigma to another. We learn this when we come into a strange country with entirely strange traditions; and, what is more, even given a mastery of the country's language. We do not understand the people. (And not because of not knowing what they are saying to themselves). We cannot find our feet with them".

Culture comprises of socially customary structures of meaning, unique to a particular group of people. They (meanings) are not only culture-specific (unique within a society), they are also geographically limited (localised). Winch (1970:111) in Saunderson (2013:60) mentions that:

> "In any attempt to understand the life of another society, therefore, an investigation of the concept – their role in the life of society – must always take a central place and provide a basis on which understanding may be built".

All cultures are different. Understanding people's culture reveals their typical ways of life without reducing their particularity. It renders them accessible, setting them in the frame of their own banalities and dissolves their opacity (Geertz, 1973:14). This accessibility will permit the investigation into how a certain phenomenon is understood by the public. It investigates the publics' interpretative repertoires and how they make sense of the world (Campell & Williams, 1998 in Sauderson, 2013). Saunderson (2013:48) concurs that "effective programmes need to be based on an awareness of how relevant issues are understood by the target participants" as this study is concerned with their lived experiences and perceptions. In the context of this study,

participant-oriented investigation enabled the researcher to understand the public perceptions and knowledge of water re-use as a water conservation strategy.

Geertz (1973:12) states that “culture is public because meaning is” and it is evident in human behaviour. Culture is a collaboration of shared meanings amongst members of a society. It has a significant influence on learning as an integral part of the learning process. The root of a communities’ culture is viewed as the leading force behind how people learn to behave (Colbert, 2010). Geertz’s (1973) interpretative theory of culture shares the same sentiment of Vygotsky’s (1978) social constructivism, they both posit that learning occurs in a social interaction.

According to Geertz (1973) meanings of symbols are entrenched in social interactions and structure. Cultural and socially established aspects of human life are equally interdependent factors. An attempt to analyse culture is the art of interpreting the meaning attached to symbols and such meanings are socially accepted, learned and shared by society. The water re-use campaigns will all take place in a social setting where WRP will socially interact with the public in their own environment. It is for this reason that this study adopted both Vygotsky (1978) and Geertz’s (1973)’s theories. Both these theories increased the researcher’s awareness of interconnections and of the wider significance of data. It has allowed the researcher to create links between the theoretical and the empirical, the abstract and the concrete, thought statements and observational statements.

Perceptions, attention and visual illusion are often shared by individuals’ culture in a particular environment (Masuda, 2009; Geertz, 1973). According to Kastanakis and Voyer (2014), culture is a vital element that shapes the way individuals perceive a certain phenomenon. Human perceptions and attitude on environmental issues such as water re-use are often shaped by their cultural beliefs and behaviours. Learners’ perceptions of water re-use are mostly shaped by the older generations’ perceptions and beliefs. Similar to culture, human perceptions are passed on from one generation to the next. Geertz’s theory was relevant to the study because it helps the researcher to understand the importance of an individuals’ culture and subsequent behaviour. This theory outlines various elements of culture and its effects on various individuals. It provided the researcher with the knowledge of how to approach different individuals within a given culture. Geertz’s theory indicates that culture is an important element

which needs to be taken into consideration when conducting human related studies. Certain cultures may influence the reaction to ideas and information, which may become problematic to deal with and could impact negatively on the study.

2.4.3. The Behaviour Ecological Model

Effective social communication strategies and conceptual models are required for one to plan and maintain a desired level of societal change (Dresler-Hawke & Veer, 2006). The behaviour ecological model (also referred to as the social ecological model) provides a basis for understanding how communication methods can lead to behavioural or attitudinal change. The model focuses on behaviour; environmental change and public policy that make people behave in certain ways. As deliberated earlier on in the introduction, the ecological model assists users to comprehend factors affecting human behaviour and offers guidance for developing successful programmes through social environments (Glanz & Bishop, 2010; & Dresler-Hawke & Veer, 2006). The model holds that human behaviour shapes and is shaped by the social environments around them. Individuals behave in ways that reflect their respective communities. This is affected by an individuals' culture and beliefs which have been passed on from generation to generation (Dresler-Hawke & Veer, 2006).

The model emphasises multiple levels of influence. It emphasises that people behave in particular ways because of the influence they receive from individuals at various levels. The multiple levels of influence can be divided into an individual level, local level, community level and social or cultural level (Dresler-Hawke & Veer, 2006; & Glanz & Bishop, 2010). The individual level consists of close social groups around the individual. These social groups include people who can influence or disseminate an influential message to individuals such as counsellors, friends and family. At the local level, organisations such as schools, neighbourhood groups or work can be used to influence individuals' behaviour. "Power structures such as laws or policies play a crucial role in defining the community, they can provide a framework to limit risky behaviours and encourage safe behaviours" (Dresler-Hawke & Veer, 2006:321) on the community level. Lastly, at the social or cultural level, the "interlocking contingencies constrain the society's exhibit behaviour" (Dresler-Hawke & Veer, 2006:322).

The behaviour ecological model indicates that people behave in certain ways due to impact and influences received from certain individuals and organisations. The model

provides researchers with background information on people's behaviour. In this study, the model assisted the researcher in questioning why learners and educators behave in certain ways, towards water re-use. The model was employed as a framework to effectively communicate and influence change within Basic Education. It helped to understand and to discover communication methods that can be used by individuals to change their attitudes and behaviours regarding water re-use. The model is depicted in Figure 2.1.

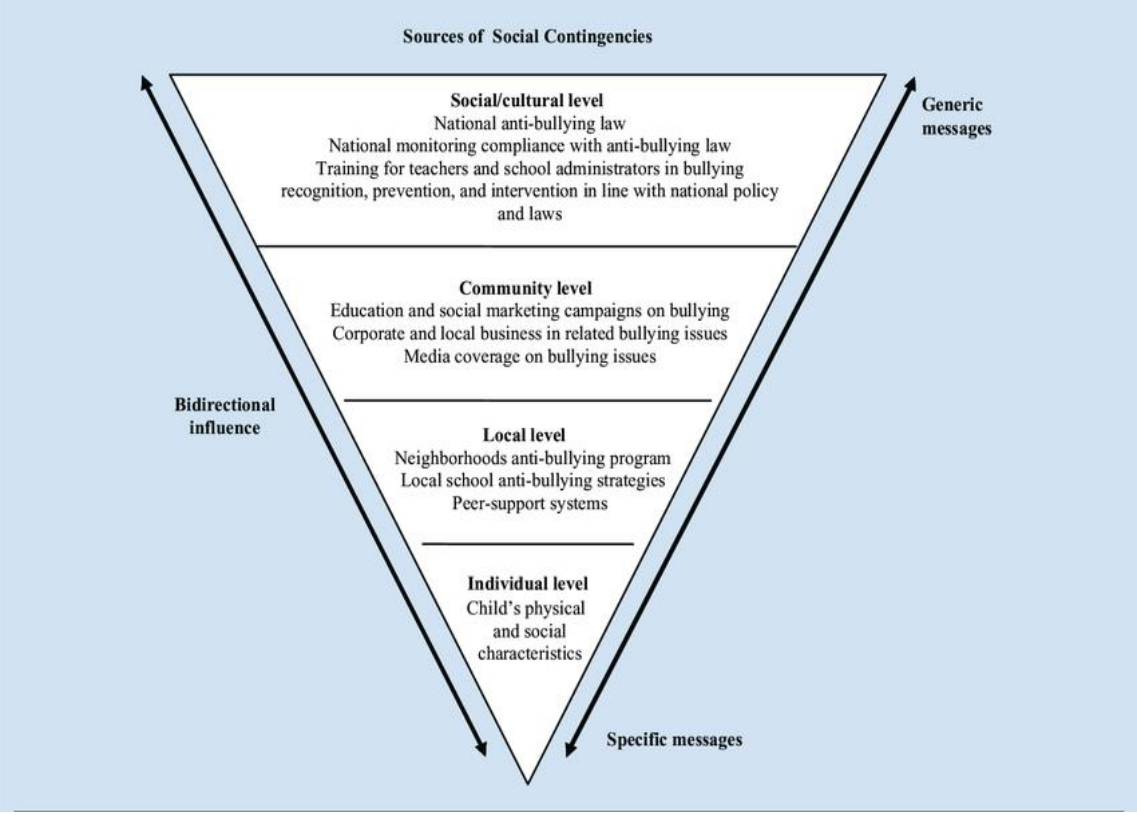

Figure 2.1: The behaviour ecological model (Dresler-Hawke & Whitehead, 2009: 197).

2.5. PUBLIC PERCEPTIONS OF WATER RE-USE

Since the early 1970s, community views of water re-use have been a topic of interest to scholars and researchers. Scholars began to focus on public perceptions and acceptance of water re-use. These scholars discovered that public rejection was the major obstacle to implementing successful water re-use programmes. They perceived public participation as essential for the successful implementation of any effective water re-use programs. Public perceptions and acceptance are regarded as the main ingredients to the success of any water re-use project. The successful implementation

of any re-use system depends not only on engineering and environmental feasibility; but also, on other factors such as economics and the support of the general public (Po *et al*, 2003; Chen, Bai, Zhang, Lyu & Jiao, 2015; & Adewumi, IIemobade & van Zyl, 2014; Muanda, Cousins, Legadien, Owen & Goldin, 2017a). Understanding the behaviour of local communities towards natural resources is essential before effective policies can be implemented. Increased involvement and participation of the public in water resources can raise awareness and aid in achieving the intended goals of the water programs. Perceptions about environmental resources such as water are shaped by several factors; such as historical information, personal experiences and visual imagery. Wastewater re-use programmes may face public opposition due to prejudicial and cultural beliefs, attitudes, yuck factor, general lack of distrust, lack of knowledge and fear (Wester, Çek, Timpano, Lieberman, Fieldstone & Broad, 2015).

2.5.1. International review on public perceptions and acceptance of water re-use

Various international studies have been conducted on public perception and acceptance of water re-use. The public attitudes towards wastewater re-use have been surveyed in the United States, Australia, China, Israel and India. These perceptions are briefly discussed below.

2.5.1.1. Israel

Israel is one of the countries that faces a high risk of water scarcity. It has faced several droughts and had low levels of water reserves between 1996 and 2002 (EPA, 2004 in NWRS1, 2011; Katz, 2016). This led to the implementation of water re-use projects which focused on the use of urban wastewater from major towns and cities to irrigate crops. Studies have been conducted about individuals' perceptions towards this wastewater re-use project. Outcomes from the survey indicated that among 21 water re-use options in Israel, 95% of the individuals supported the wastewater re-use options with a low and intermediate risk of human contact, such as wastewater (greywater) used for landscape, fire protection and irrigation purposes. Projects that involved high risk of human contact, such as recharging potable water aquifers processing food were supported by 15 % of the public (NWRS1, 2011; & Chen *et al*., 2015). Outcomes from the studies conducted in Israel showed that most individuals were comfortable using wastewater for irrigation purposes. The critical water

shortages in Israel are well known and often publicised. Annual meetings aimed at sharing water experiences are held in this country and this has contributed towards a high level of public acceptance of water re-use (NWRS1, 2011).

2.5.1.2. The United States of America (USA)

"Water scarcity is a rising issue in the southern and south-western parts of the U.S. Water re-use is presented as one solution to this problem; a solution which supports many of the stringent environmental regulations in the U.S" (NWRS1, 2011:23). Studies conducted in the U.S indicated a trend of increasing acceptance of water re-use (greywater) by the public. The studies indicated high levels of public acceptance for non-potable water re-use in irrigating golf courses, public parks, school grounds and industrial processing in five surveyed U.S cities. In the U.S, the considerable number of re-use projects indicate that a large number of the population are aware of and support the re-use and recycling of water (Chen *et al*., 2015; NWRS1, 2011).

2.5.1.3. Australia

Population growth and its associated effects, together with a decreasing reliability on traditional rainfall-dependent water supply sources, are the basic driving factors for water re-use and recycling in Australia. A report in 2006 revealed that Australia had been faced with a drought which had lasted for 10 years and affected nearly all of the country. Due to these effects, most urban water planners began to implement and include alternative water supply sources into urban planning policies. Wastewater re-use was perceived as an effective approach to traditional water supply. As a concept for water management, studies indicated that water re-use is widely accepted in the Australian community. A preceding focus group held by the Water Corporation of Western Australia (2003) designated that individuals had rated the idea of re-using wastewater positively. Similar findings were made in Melbourne (1998) and Sydney (1999), where studies were conducted on community perception of water re-use. However, on many occasions, the general society reported that there was a psychological barrier when it came to re-using water. This barrier included emotions of disgust derived from the thought of re-using used water. Some people believed that they might fall ill as a result of using re-used water such as greywater for toilet flushing purposes. Individuals reported that they were willing to use their own greywater (Melborne Water, 1998; Jefferey & Jefferson, 2002). This outcome was supported by

the study of Mashabela (2015) which was conducted in the Limpopo province, South Africa. The study revealed that people prefer using their own greywater rather than that of other people. In Australia there are also high levels of public acceptance for non-potable water re-use in irrigating golf courses, public parks, school grounds and industrial processing (Chen *et al*., 2015).

2.5.1.4. China

"The main driver to water re-use in China is due to the water crisis in the North East of China" (NWRS1, 2011:37). Water scarcity in China poses great challenges to its farmers, social stability and impacts on food stability. Water scarcity affects individual's health and threatens the investment of foreign and domestic companies in the country (NWRS1, 2011). As a developing country associated with a unique culture, the public viewpoints on water re-use in China are difficult to comprehend. The attitudes of the Chinese publics and professionals on reclaimed water re-use are vague. Chen *et al*. (2015) conducted a survey in Beijing, China, which revealed that "Beijing's population of over 20 million consumed more water and generated a greater volume of wastewater than any other socio-economic sectors" *(ibid)*. The public across the area lacked knowledge and information about water resources, people were not well informed about water re-use and their perceptions about water re-use systems revealed to be biased. The government here had not focused sufficiently on public outreach until recent years. With the increasing cost of water bills in recent years, Beijing residents began to pay attention to water conservation and managers of parks and companies showed a higher level of interest in using reclaimed water. Over recent years, Beijing has made efforts to disseminate information about water re-use to its public. Public awareness of water re-use started to increase. Individuals in Beijing began to accept non-body contact and non-potable re-use of reclaimed water. Over 90% of the respondents now strongly endorse reclaimed water such as greywater for fire protection, toilet flushing, street cleaning, ornamental lakes, car washing, industrial cooling and landscape irrigation. Meanwhile, 82% of the respondents accept re-used water for crop irrigation and domestic uses, except for food preparation and drinking purposes. Individuals in this region are overwhelmingly positive about greywater and they are aware of the risks associated with water re-use such as the public health and environmental pollution (Chen *et al.,* 2015). Studies conducted by Yi, Jiao, Chen & Chen (2011) indicated that in the greater countryside of China, there is a lack of

knowledge about the benefits and safety of reclaimed water use, which has limited the drive for water re-use in these areas.

2.5.1.5. India

India is a country where water scarcity is escalated by severe economic and geographical constraints, as well as high population growth, which increases the pressure on existing water resources. It is regarded as one of the most vulnerable drought-prone countries in the world. As a result, water re-use was elected as a highly desirable conservation method for water management across the country (NWRS1, 2011; Udmale, Chikawa, Nakamura, Shaowei, Ishidaira & Kazama, 2016). In 2011, Mandal, Labhasetwar, Dhone, Dubey, Shinde and Wate conducted a study in India. The study revealed that due to water scarcity in India, greywater re-use and treatment was perceived as a feasible option to solve their water shortage problems. With the solution mentioned, Penchal (2012) indicated that people in India are regarded as the major barrier to wastewater and they are resistant to water re-use. They do not prefer to use wastewater in their households.

2.5.2. A review on African countries public perceptions' and acceptance of water re-use

Water scarcity is a major environmental problem faced on various continents worldwide. It is a vital concern faced in the North and Middle East of Africa. With this problem presented, water re-use is considered as a conservation method that can be used to ease the water crisis in countries that rely mostly on agriculture for their livelihood (Jury & Vaux, 2007; Florida Environmental Protection, 2006; Mashabela, 2015). In countries such as Ghana, Uganda and Tanzania, wastewater (greywater) can be used for various purposes. How and what wastewater is used and how successfully depends to a large extent on individuals' attitudes and perceptions.

In 2013 a study on greywater was conducted in Ghana by Hyde. The study revealed that people in Ghana preferred to use wastewater (greywater) for various domestic purposes, such as flushing of toilets, cleaning, irrigation purposes and washing of cars.

In Tanzania, a study on greywater reuse was conducted by Chaggu in 2011. The study found that individuals located in Tanzania (Mwanza) perceived greywater as water which could be used for irrigation purposes only. Residents of Tanzania preferred to

use wastewater such as greywater for watering their gardens and not for any other purposes. These findings were similar to the research findings of Mashabela (2015) and Recourse Oriented Sanitation (2010) which revealed that people located in African countries (such as Uganda) preferred to use wastewater for non-domestic purposes such as washing cars, irrigating golf courses and so forth.

The above-mentioned studies indicated that people preferred to re-use water when it was applied for non-human contact purposes such as irrigation, car washing and so forth. This is due to their perception of factors such as the health issues, the “yuck” factor, risks associated with wastewater and the lack of trust of wastewater (Po *et al*., 2005; Wester, Timpano, Çek Lieberman, Fieldstone & Broad, 2016).

2.5.3. Local (South African) review on public perceptions and acceptance of water re-use

South Africa, like many other countries in the world, has growing pressure on its water resources. The availability of water is reaching crisis level; there is difficulty to maintain equilibrium between freshwater provision and freshwater demand (NWRS1, 2011). This has been driven by low rainfalls and high evaporation rates faced in most parts of the country. Additional water provision is required if SA is to meet the ever-increasing water demand identified, as it is in many parts of the globe. Water re-use has been identified as an effective conservation method which can be used as an alternative source to fresh water. However, “public acceptance towards establishing water re-use projects has been a major challenge and it is as a result of this view that recent studies consider public acceptance and perceptions of water re-use as one of key successes for any water re-use projects” (NWRS1, 2011; Po *et al*., 2005; Mashabela, 2015). Bakare *et al*. (2016) conducted a study on public attitudes and perceptions of water re-use (greywater) in Durban, South Africa. The study “revealed that there was a higher percentage of respondents that were willing to re-use greywater for toilet flushing or for garden purposes” (Bakare *et al*., 2016: 78). The findings also revealed that people living in Durban did not have any problem with regard to re-use of wastewater such as greywater. Individuals generally exhibited positive perceptions towards greywater re-use. A total of 71% of the community were eager to use greywater from other buildings for garden purposes or flushing of toilets, even to the extent that 80% of the respondents were willing to have a dual water

distribution system installed in their households. Factors such as age and gender were identified as the major factors associated with acceptance of greywater. Respondents between 20-29 years displayed a high level of acceptance towards the re-use of greywater compared to those of older age groups (Bakare *et al*., 2016). In most cases, young people were more receptive to these ideas compared to older people. This may be a challenge for behaviour change attitude studies.

Another study on greywater was conducted at the University of Witwatersrand, Gauteng. This revealed that the lower the possibility of human contact with wastewater, the more acceptable it was to potential beneficiaries. The study showed that individuals preferred to use greywater for flushing of toilets instead of irrigation purposes. A higher percentage of respondents preferred to use greywater for toilet flushing at the university academic building rather than at the university residential building (Ilemobade *et al*., 2013).

Stoakley (2013) conducted a study on perceptions of water re-use at both the University of Cape Town and the University of Pretoria. The study revealed that there was a higher level of acceptability when wastewater was to be used for toilet flushing and irrigation purposes. The study further revealed that acceptance increased when there was a guarantee that the water re-use system would be beneficial to the environment. Consumers had positive perceptions when they were told that they would be faced with water scarcities without water re-use (Stoakley, 2013). This showed that individuals were most likely to accept water re-use when they knew the risks and dangers associated with water scarcity.

Bungu (2014) also conducted a study on public perception in the Vaal Triangle. This study revealed that individuals were of the opinion that wastewater should be used for Industrial purposes, washing clothes, firefighting and for washing of cars. This indicated that these individuals had negative perceptions towards wastewater that might be used for human contact such as bathing, cooking and so forth.

Adewumi *et al*. (2014) also conducted a study on public perceptions towards greywater re-use in South Africa. The results of the study revealed that there was a relatively high level of support for treated greywater usage. Despite the strong support for this scheme, respondents appeared to be extremely concerned about the health implications of the re-use system. Contrary to these findings, the NWRS1 (2011: 54)

indicated that “due to previous cases of wastewater treatment plant failures, many South Africans rejected the idea of re-using water due to the “yuck” factor. This is a result of their distrust of the service provider, even if the quality of the water was assured by the local authority. This statement agrees with the findings of Wilson and Pfaff’s (2008) whose study was also conducted in Durban. This research aimed to assess perceptions of the Durban community towards wastewater and revealed that public anxieties concerning wastewater re-use were based on emotional factors such as the “yuck” factor. This study revealed that individuals were not happy with wastewater use and felt that water re-use should begin with industrial rather than domestic use (Wilson & Pfaff, 2008).

2.5.4. Learner’s perceptions on water re-use

Environmental issues are considered vital across the globe. They have become central to social, political and economic issues and policies in various parts of the globe. The world is faced with and affected by environmental problems on a daily basis. Climate change, water shortages, acid rain and pollution are regarded as the major environmental issues affecting the entire globe (Chan, 1996; Eroğlu, Bektaș & Tarkin, 2016). In different parts of the world, people perceive environmental issues differently due to factors such as gender, culture, age, motivation, social pressure and number of environmental related activities (Niaura, 2013; Vicente-Molina, Fernández-Sáinz & Izagirre-Olaizola, 2013). These problems may be either negative or positive. For instance, Eroğlu *et al*. (2016) conducted a study on high school students’ perceptions towards environmental issues in Turkey. The study revealed that learners in Turkey have negative attitudes and misconceptions of environmental issues. They had a lack of knowledge about problems such as global warming, acid rain, air pollution and so forth. These misconceptions were the result of poor scientific literacy among learners and the influences received from family members and social contexts (Eroğlu *et al*., 2016). This was supported by the behaviour ecological model which holds that individuals behave in certain ways due to the influence received from various social levels (Dresler-Hawke & Veer, 2006).

A study conducted by Abdullahi and Tuna (2014) on environmental issues indicated that a lack of awareness and low level of environmental regulations contributed to the poor perception of environmental quality in most developing countries such as Nigeria,

South Africa, China, India and others. Positive attitudes and behaviour towards the environment play a crucial role in providing solutions and support of environmental problems. On the other hand, negative attitudes and behaviour may jeopardise environmental issues and solutions. For instance, a study on learners' perceptions towards environmental issues was conducted by Yilmaz, Boone and Anderson (2004) (in Eroğlu *et al*., 2016). The study revealed that gender was a significant factor in determining learners' perceptions towards environmental issues. Generally, the research revealed that learners supported and had positive attitudes towards environmental issues. However, female learners appeared to have more positive perceptions than males. It also indicated that context and income had an impact on learners' perceptions and attitudes. For instance, learners living in urban areas with a higher family income had more positive attitudes towards environmental issues when compared to learners who come from rural areas and lower family income (Yilmaz *et al*., 2004 in Eroğlu *et al*., 2016). This study revealed that increased awareness and positive perceptions of environmental issues could lead to decreased negative perceptions of environmental issues.

Regardless of the above review on learners' perceptions on environmental issues, research indicates that learners' perceptions of water and water re-use issues in South Africa appear to be under-researched. Vadachalam and Mancl (2010:43) quotes that "public perceptions can be shaped by a combination of prejudicial beliefs, cultural backgrounds and the elder generation". This implies that learners may have similar perceptions to the ones identified above, both in international and local communities. This might be a result of influential factors within their communities that influence their opinion and perceptions of water re-use.

2.6. STRATEGIES TO ENHANCE WATER RE-USE COGNITION IN BASIC EDUCATION

Environmental attitudes of young people (learners) are considered crucial for future developments and sustainability with regards to water problems and environmental issues in SA. Learners "play a direct role in providing knowledge-based solutions to incoming environmental problems" (Eagles & Demare, 1999 in Adeolu, Enesi & Adeolu, 2014:67). Therefore, learners' negative perceptions towards environmental issues need to be challenged and changed into more positive perceptions. Developing positive attitudes and behaviour towards environmental issues needs a high level of

environmental consciousness. Environmental consciousness and change can occur through environmental education, programmes, campaigns, policies, rules and regulations (Enesi & Adeolu, 2014; Asuamah Kumi, & Kwarteng, 2012; Eroğlu *et al*., 2016; United Nations Framework Convention on Climate Change (UNFCCC), 2014; Shobeiri, Omidvar & Prahallada, 2007).

2.6.1. Environmental Education

Educating learners and creating awareness about environmental issues is essential to eliminate and overcome environmental problems. Environmental education is considered a vital tool to increase awareness and adaptive capacity within a given society, it is perceived as a vital means of information dissemination and communication which can increase awareness of children and young adults about environmental issues. It can enhance people's understanding of environmental issues, mitigation and adaptations. Education is a continuous learning process in which individuals acquire knowledge, values, experiences and skills in order to improve their perceptions and beliefs about the environment and generate a clean and healthy environment for upcoming generations. Environmental education generates solutions to environmental problems and develops realistic and positive attitudes and perceptions about the environment. It is considered crucial for sustainable development and improves the capacity of individuals and their societies to adapt to environmental issues (UNFCCC, 2014; Shobeiri, Omidvar, & Prahallada, 2007; & Eroğlu *et al*., 2016). The primary aim of this study was to develop a communication strategy and illustrative learning materials on water re-use which could be used to raise water re-use awareness and knowledge among learners and educators in the basic education sector. Educating learners on water re-use is of crucial importance in order to achieve the intended aim of the study. Learners need to be taught about greywater to enhance their knowledge, change their attitudes, beliefs and behaviours towards this conservation method. It is for this reason that Vygotsky's theory was be employed as a guideline for educating, communicating (engaging), changing and enhancing understanding about greywater among learners in Basic Education.

2.6.2. Projects, programmes and campaigns

Strategic communication plays an integral role in any community related project or campaign; it can induce or encourage change in people's attitudes and perceptions

towards a certain phenomenon (Hovland, Janis & Kelley, 1953). The perceived expertise of an information source is considered to be a major determinant of the effect of communication (Selnes, 1998). Due to the rapid increase of freshwater scarcity around the globe, the re-use of wastewater needs to be communicated to the public. Educational and communication projects and campaigns are perceived as vital elements to advance sustainable water re-use and to overcome any negative perceptions towards water re-use (Freedman & Enssle, 2015). Most communities across the globe have developed public education programmes, communication projects and awareness raising campaigns as the main tools to overcome the social and cultural barriers of individuals (The United Nations World Water Assessment Programme, 2017).

Researchers, such as Asuamah Kumi and Kwarteng (2012) and Adeolu (2014) hold that sustainable development programmes, projects and campaigns can change an individuals' attitudes, beliefs and behaviour towards environmental issues. School environmental programmes, projects and campaigns addressed specifically to learners, can influence learner's environmental knowledge, attitudes and behaviour. Information disseminated during such projects, programmes and campaigns can be passed on to the older generations in a given society. The information and enhanced knowledge can also change the behaviour and perceptions of these generations through the process of intergenerational influence (Asuamah, 2012; Adeolu, 2014). For instance, this was done during Baswa le Meetsi- a competition transmitting water messages and Aqua Enduro drinking water quality competition (Slabbert, 2019). Furthermore, it is indicated that various water projects have been implemented both locally and internationally. The projects are discussed below:

2.6.2.1. Water projects: An International Perspective

- *The United States (U.S)*

A massive number of water re-use applications have been implemented in the United States (NWRS1, 2011). California is a pioneer water re-use state, where more than 230 water re-use projects were in operation in 2003 (Po *et al*., 2003). The Irvine Ranch Water Recycling Programme is one of the most successful water re-use projects in California. This project promoted water re-use to the society as a means of safeguarding the environment, saving money and energy and providing a drought

resistant supply (D' Angelo, 1998). Another successful project which emphasised public involvement was the Monterey Country Water recycling project found in California (Po *et al*., 2003). In the United State (U.S), successful water projects which were trusted by the community include Fred Harvey Water Reclamation Facility located in EL Paso, Texas and the Upper Occoquan Sewerage Authority Water recycling project in North Virginia (Po *et al*., 2003).

- *Australia*

Australian projects are often carried out on a small-scale basis and are commonly designed for non-potable purposes, such as irrigation and toilet flushing (Po *et al*., 2003). Water Reclamation and Management Scheme is one of the well-known water re-use projects found in Homebush Bay at the site of the Sydney 2000 Olympics. Another residential water re-use project includes New Haven and Mawson Lakes found in South Australia (Po *et al*., 2003). A further successful project in Australia (Queensland) is the Eli Creek Project which was launched in February 1998; this was created to reduce the need for an ocean outfall due to population growth (Heron, 1998), it provided consumers and farmers with recycled water which could be used for irrigation purposes (Po *et al*., 2003).

- *Singapore*

NEWater is a water re-use project found in Singapore. It has provided Singapore with a positive image on the world map for water re-use due to its specialised campaigns such as the "Clean and Green Week" (Po *et al*., 2003 & NWRS1, 2011) Singapore's public utility board (PUB) launched an intensive education campaign using documented feature film, media exposure, information briefings at community centres and schools for NEWater awareness (Po *et al*., 2003). Research has indicated an overwhelming level of NEWater acceptance among Singaporeans.

2.6.2.2**.** Water projects: A South African Perspective

Water Conservation programmes aim to prepare the society to actively participate in water related issues. Numerous water conservation programmes or projects have been implemented in South Africa (Mathipa, 2008). This section will provide a brief review of these projects.

- *Rainwater Harvesting Programme*

According to DWAF (2002) the “International Rainwater Harvesting Alliance was founded in 2002, after the World Summit for Sustainable Development held in Johannesburg, as a response to the continuing crisis of water management”. The project focused on raising awareness about the collection of “rainwater from the roofs of buildings through gutters where it is stored in tanks for later use” (DWAF, 2001: 68).

- *The 20/20 Vision for Water Education Programme*

The 20/20 Vision for Water Education Programme was established to provide water wastage strategies in rural areas. It was also aimed to assist in the awareness of young people to conserve natural resources, use water efficiently, actively contribute to water resource management activities and communicate their water re-use experience to their peers and elders (DWAF, 2001b and Enviro-Teach, 2001).

- *Drought Emergency Programmes*

Drought Emergency Programmes were introduced by DWAF. These projects focused on sustaining the water economy of South Africa and also aimed to meet the social needs of rural communities (DWAF, 2001).

2.6.3. Rules, Policies and Regulations

Attitudes, knowledge and perceptions of learners about the environment can influence environmental issues and programmes. Other factors that can be employed to change and develop learners’ perceptions towards environmental issues are rules, policies and regulations. Changing learners’ perceptions through rules and regulations can be used by various governments. Rules and regulations are also considered vital tools which can improve learners’ perceptions and the environment (Mashabela, 2015). For instance, during previous years in South Africa, individuals dumped waste materials anywhere in the environment. The South African government, along with the municipalities developed and designed notices and rules in various communities where people used to throw their waste. The signs were written “No Dumping, or you will be fined R1000”.

2.7. COMMUNICATION APPROACHES TO COMMUNICATING WATER RE-USE IN BASIC EDUCATION

A well-organised, comprehensive communication program with stakeholders (stakeholder engagement) is vital to any modern water re-use project. As indicated earlier, for water re-use programmes to be successful, water re-use organisations must engage and communicate effectively with their stakeholders (Khan & Gerrard, 2006; Megdal, Eden & Shamir, 2017). Communication is defined as "a dynamic process of exchanging meaningful messages" (Steinberg, 2007: 40); it is a two-way process where information is shared and transmitted among individuals. It is characterised by continuous evolution and change; individuals change one another during communication. Everything that people learn and every piece of information they acquire has the potential to change their behaviour to some extent. Communication may affect and change individuals' attitudes and beliefs in some way. Communication is not only regarded as an interactive process of exchanging meaningful messages, it is also regarded as a transaction between participants during which meaningful relationships are developed (Steinberg, 2007; van Staden, Marx & Erasmus-Kritzinger, 2007). Melkote and Steeves (2001:339) indicated that "Communication is a vehicle for liberation from mental and psychological shackles that bind individuals to structures and process of oppression". It is a vital element which assists in building commonality among the members of a group or community striving to change their existing situations. Communication helps people understand each other and identify their collective problems. It helps to discover and understand individual's problems and potential solutions to the identified problems. It can assist and simplify the development process in various parts of the world (Melkote & Steeves, 2001; van Hoof, 2016). Communication constitutes a crucial part of participatory approaches. In order for change to occur, people must perceive their real needs and identify their real problems (Melkote & Steeves, 2001). Communication can take various methods with many different ratios of input being part of the process. Various communication approaches can be used to foster change (Melkote & Steeves, 2001) towards water re-use in various societies.

In developing a strategy, South Africa has been required to align with new and innovative approaches to water management. In June 2012, a conference on Sustainable Development known as Rio+20 was held at the United Nations. This

conference provided a strong framework on which South Africa could approach integrated water resource management and sustainable development. At the Rio+20 Conference, various groups from 130 countries gathered together to shape and discuss how they could work to reduce and advance social equity, poverty and ensure environmental protection on a crowded planet. The conference provided a platform to move away from business-as-usual and to build a bridge to the sustainable future for all citizens across the world (NWRS2, 2013:14).

2.7.1. Communication approaches to water management

2.7.1.1. A Participatory approach

A participatory approach to communication increased in popularity in the 1980s and 1990s (Servaes, 2002) when the approach was supported by many academics and administrators. Scholars and academics argued that participation in change and development must be recognised as a basic human right. The participatory approach should be visualised along a continuum ranging from mobilisation of individuals to co-operation in development activities and to empowering people to be able to articulate and manage their own development. In the participatory approach, individuals are active in the development processes and programs, they take initiatives, assert their autonomy, contribute to ideas and articulate their needs and difficulties (Bamberger, 1988; Melkote & Steeves, 2001).

The participatory approach to communication has been employed by major institutions, such as Mexico's dominant Institutional Revolutionary Party and the World Bank (White, 1999). These institutions value grass-roots participation, cultural beliefs and local knowledge. They believe that participatory communication "leads to an awareness of differences that reveal inequalities and result in movements to address and transform them" (Servaes, 2002: 159). The approach directly leads to participation and social change.

Water management operates within an ecological, social and economic environment. For effective water management resources, a top-down approach to communication with stakeholders should be replaced by active participation (bottom-up approach) with citizens. This can be driven through civil society organisational structures and community forums with the aim of achieving equilibrium in the process of decision-

making in a developmental water management agenda (Melkote & Steeves, 2001; Ascroft & Masilela, 1989; NWRS2, 2013). In order for this study to develop a water re-use communication strategy and illustrative learning materials suitable for online learning, a bottom-up approach with learners and educators was employed. Participants were encouraged to participate with the aim of solving the problem and achieving the intended objectives of the study. The bottom-up approach is a new effective approach to education and development. It attempts to develop, maintain and increase the motivation needed for transformation among individuals (Maleki, 2010).

Community participation offers opportunities for the public to express their views in development projects such as those involving water re-use. It provides rich information, greater trust and transparency, shared responsibility and leads to healthier relationships. It in turn implies forming relationships, sharing in decision making and the dissemination and interpretation of information (Madzivhandila & Maloka, 2014).

2.7.1.2. Development approach to communication

The developmental approach to communication is dependent on the participatory approach. Development and participatory communication approaches take place concurrently. In the development communication approach, the environment is arranged to provide opportunities for communication and participation. Development communication is “the application of the processes of communication to make up the development process” (Moemeka, 1989:5). The communication developed from the Development Support Communication Service (DSCS) which operates under the United Nations Development Programme (UNDP). The DSCS formulated a new approach to communication (developmental approach) which form part of development interferences. Servaes (2002: 30) mentioned that:

> “If you want development to be rooted in the human beings who have to become the agents of it as well as the beneficiaries, who will alone decide on the kind of development they can sustain after the foreign aid has gone away, then you have to communicate with them, enable them to communicate with each other and back to the planners in the capital city. You must communicate the techniques that they need and let them decide on their own development. If you do not do that you will continue to have weak or failing development programmes”

Development communication has taken place in various parts of the world. For instance, in Ireland, a letter was written to the Royal Agricultural Improvement Society of Ireland by the Earl of Clarendon, to request the appointment of agricultural lecturers to travel to various communities which relied on potatoes as a source of food and educate them as well as communicating with them about improving their cultivation practices and varying their range of produce. Knowledge and skills were given to such communities, with the intention of changing and fostering new cultivation practices and adoption (Jones & Garforth, 1997). Cornell University, located in New York City, America, developed an extension programme based on various environmental issues. Individuals associated with the programme were involved in various subject discussions such as water quality, environmental and economic issues such as small business enterprise and training. India initiated developmental programmes based on agricultural development and technology transfer, individuals participated in these developmental programmes where they raised their concerns and perceptions (Servaes, 2002).

Development communicators spend most of the time in the field since face to face interaction and participation is crucial (Servaes, 2002). A further study, which focused on development communication was conducted at Stanford University. The study indicated that development communication is effective through human interactions but can also be effective by means of the use of mass media in the development of nations and development programmes (Schramm, 1964).

With reference to education, a development communication approach allows the child or learner to initiate the interaction or teaching event, while the teacher, researcher or communicative partner follows the child's (learner's) lead by being responsive to the child's (learner's) communicative intentions and expanding or reproducing the child's (Learner's) behaviour (Lewy & Dawson, 1992). For the learner to provide concrete information, he or she should be given a platform to communicate and express their feelings. For development and transformation to take place, individuals need to be able to interact and share meaning with one another. The developmental approach to communication is an approach that can be used to influence change and attitudes towards water re-use (greywater). The developmental and participatory approaches are similar to Vygotsky's social construction theory, since they hold that social interaction is an effective method to change, explain and comprehend various

concepts (Vygotsky, 1978; Lewy & Dawson, 1992; Amineh & Asl, 2015). Development and participatory approaches to communication are reflected by the transactional model of development communication. The transactional model of communication moves away from one-way communication and focuses on receiver-centric orientation where meaning and comprehension are stressed, rather than transmitted information (Slabbert, 2019). The model is illustrated in the figure below:

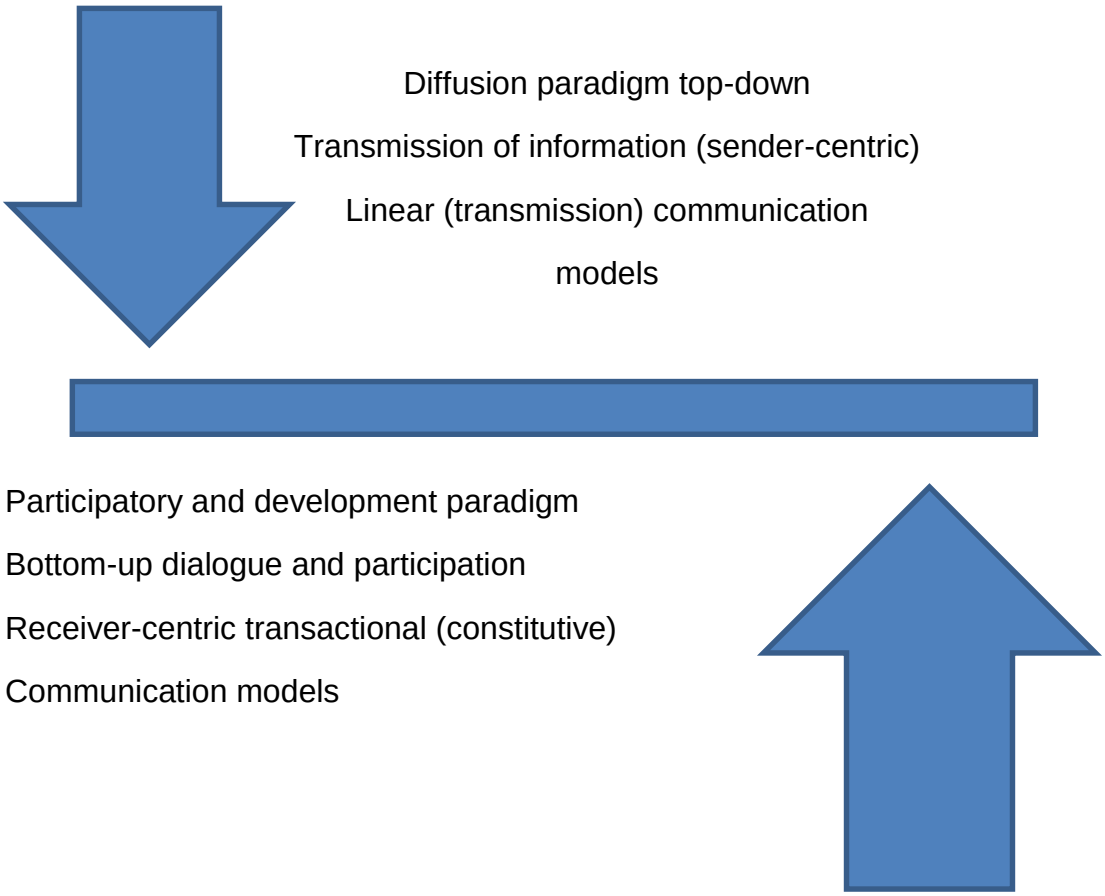

Figure 2.2: Transmission versus transactional Communication model (Slabbert, 2019: 31)

2.7.1.3. Language issues as an approach to communication (Natural language paradigms)

Language as a communication tool is a carrier of both linguistic and cultural aspects, it has become a fertile ground upon which collaboration and participation take place.

Language pervades social life as the principal vehicle for the transmission of cultural knowledge; it is the primary means by which one gains access to the contents of others' minds (Baker, 2011). It is the main medium through which learners acquire information for learning purposes. Language is central and crucial to the learning process because it is considered as the medium for meaning making. In most rural schools in South Africa, English is taught, but not really understood by most learners. The English language as a foreign or second language creates a great deal of difficulties and presents challenges for both learners and educators. In institutions such as the National University of Lesotho (NUL), many learners face difficulties in expressing their thoughts and ideas during English lessons. This results in a low performance rate. Therefore, environmental educators need to take this into consideration and use language in ways that support effective learning and meaning-making (Janse van Rensburg & Lotz-Sisitka, 2000; Ekanjume-Ilongo, 2015). Children (learners) understand better when taught in their mother tongue. When their mother tongue is used during the learning process, learners become motivated and can be able to interact with one another, communicate their thoughts and share their knowledge (Janse van Rensburg & Lotz-Sisitka, 2000; Ekanjume-Ilongo, 2015).

2.7.1.4. Partnerships with private and public water use sectors

Stakeholder engagement and partnerships within the water value chain are important. No government or business could resolve water issues such as climate change and water scarcity alone, which means that companies and government must develop new partnerships and relationships with the community as water consumers and with other stakeholders (NWRS2, 2013). An effective on-going relationship with both the internal and external stakeholders is crucial. "Meaning is derived from relationships and not from the party in isolation" (Ströh & Jaatinen, 2002). In this study, the researcher, as the water re-use practitioner developed relationships with learners, educators and all stakeholders associated with the construction of the intended communication strategy so that communication can take place effectively.

2.8. LEARNING SUPPORT MATERIALS (LSM)

Learning support materials are defined as diverse materials that teachers and learners use during the teaching and learning process. They refer to all resources or facilities required for effective teaching and learning, they are regarded as materials that aid

and simplify the teaching and learning. Learning support materials are tools that disseminate and transmit information to learners in simpler tasks. They aid in achieving the intended goals in education and help the learning process to be effective and productive (Onuoha-Chidiebere, 2011; Manqele, 2012; Gauteng Department of Education, 2011).

The quality of learning materials and experiences depends on the application of the pedagogical theories of learning and teaching. One of the principles of constructivist learning theories is that learning takes place in a particular context, appropriate to the learner. This indicates that the design and use of learning materials is influenced by the overall socio-cultural context including beliefs about and evidence of how children learn (Leach & Scott, 2002; Semple, 2000; Vygotsky, 1978; Amineh & Asl, 2015).

Early methods of developing learning support materials included expert driven, top-down, package centred approaches. These approaches emphasised the role of the expert in deciding what had to be included in various materials and how they had to be used. These materials affected the process of learning because learners were not involved in their development or their implementation. The Research Design Disseminate Adopt (RDDA) perceived the top down approach as passive and ineffective. The RDDA approach proposed that materials should be developed in a participatory manner. The RDDA mentioned that all stakeholders need to be involved in the development of the learning support materials. In the early 1990s, the participatory approach to the development of learning support materials began to be recognised in various International countries as well as in South African environmental education (Rahnema, 1992).

2.8.1. Learning support materials that have been researched, developed and implemented locally and internationally

This section provides an in-depth review of research findings on illustrative learning support materials for water re-use. In the exploration of literature on learning support materials, the researcher discovered that this subject appeared to be under-researched. However, some learning support materials used for environmental issues have been developed and implemented. The learning materials are discussed below.

2.8.1.1. Flyers, posters and fact sheets

Posters are developed and used to raise awareness and to disseminate information about environmental issues, days and activities. For instance, in Namibia, a poster about recycling was used to educate and to disseminate information to learners and the community about this topic. The poster included educational information which aimed to encourage recycling activities in schools. In Botswana, posters on recycling were also developed. These posters aimed to raise awareness and educate learners in Botswana about the importance of recycling. Other examples of posters which were developed in various countries include the Water Cycle, National Water Week and The World Environmental Day (South African Development Community (SADC), 2006).

Flyers are developed and used to provide brief and accessible information about environmental issues, problems, concerns, and projects. They are informative, educational and straight to the point. Fact sheets contain factual information; they clearly explain the nature of an issue and the main causes of the identified issue, its impact and possible solutions. The Ministry of Environment in Mauritius have made use of this method for their environmental education activities, the activities aimed at raising awareness about environmental issues. A massive public awareness campaign was organised in Mauritius. During the campaign, people received posters, factsheets and flyers which included educational information about environmental issues that affected Mauritius (SADC, 2006).

2.8.1.2. Computer-based Materials

Computer-based materials are online learning materials which learners and educators share information and findings while working on a computer (SADC, 2006). These materials enable interaction between the learner and the educator. They can enable learners to relate what they have viewed in practical activities to technical information, in order to network with other learners doing similar projects in various areas. Several studies have been conducted in China, the USA, South Africa, Australia and Japan. These studies revealed that computer-based materials were more effective and productive than traditional materials. Computer-based materials can also be used to raise awareness and to educate about environmental issues (SADC, 2006).

2.8.1.3. Books and booklets

"Books or booklets can be designed to be informative, practical or exploratory" (SADC, 2002; 2006:14). In Southern Africa, books and booklets are regarded as a common format for the provision of learning support materials. Books can be used to disseminate information about environmental issues such as water, health issues, and so forth. In various developed and developing countries, books and booklets can be used to disseminate vital information and educate about various issues. Phakathi (2015) indicated that books are the primary support learning materials; they disseminate information in an unlimited manner. Books have been used in various educational departments across the world. Most learners learn by means of books and then later on follow on to other supporting materials. Various books have been published with the aim of educating and informing learners about the processes and issues of water and water re-use (Taylor, 1997).

2.8.1.4. Competitions or Environmental games

Materials that engage individuals in ways that involve an element of competition or fun are known as games. Games or competitions can provide a vital introduction to environmental issues; they can raise arguments as a discussion topic and enable people to fully appreciate and understand environmental problems too. The Enviro Picture Building game, developed by Share-Net, is a well-known game used in South Africa and Namibia. It was developed to suit residents of both countries. This game aims to introduce learners to the language of environmental issues and its risks. It encourages learners to discover solutions to environmental problems. Enviro Picture Building game can also be used in multimedia format. It consists of pictures that allow both literate learners and illiterate individuals to participate (SADC, 2002). Another water competition which aims to raise awareness about water issues is *Baswa le Meetse* (BLM) which literally translates as 'Youth and Water'. BLM is a competition or programme aimed at raising awareness and providing water and sanitation information and management skills. It targets learners and educators who will be able to present hygiene and health messages by means of art and culture (Slabbert, 2019). Messages are conveyed in the form of poetry, drama, traditional music, posters and praise singing categories. "Learners from nine (9) various institutes in the Western Cape competed at the BLM competition which was held on the 11th of May 2019 at Brekenfell

[*sic*]Civic Centre" (Department of Water and Sanitation, 2019: n.p). Water and sanitation messages were presented in the form games and competitions. The North West, Free State and Eastern Cape provinces also held provincial BLM competitions with the purpose of increasing awareness about integrated water resource management, hygiene and water management skills. Various learners from various schools also competed and presented messages by means of arts mediums (Department of Water and Sanitation, 2019).

2.8.1.5. Packs combining different materials

Packs contain various materials that can be used separately or simultaneously. For instance, the Creative Solution to Waste pack of material group audit sheets and facts sheets. The School Environmental Policy pack included audit sheets, material for teachers and information resources (SADC, 2006).

2.8.1.6. Picture-based materials (Storyboards)

Picture-based learning support materials have mostly been used in campaign approaches to environmental education. Picture-based materials consist of clear pictures that transfer the intended message; they are easy to understand by learners, as well as literate and illiterate individuals. In Tanzania, environmental educators have used illustrated posters and storyboards to engage fishing communities in discussion about over-fishing and the size of fish that can be caught. Simple images were used to facilitate discussions among the fishing community. The images were designed in a way that reflected better ways for managing scarce fish resources (Taylor, 1997).

2.9. COMMUNICATION STRATEGIES

A discussion of the role of communication in South African case studies has indicated that the vital aspects of consultation, information-sharing, participatory communication and strategic planning phase are vital to any successful projects. The discussion contended that "if communication planning is not treated as a strategy on its own, it could result in severe communication problems" (Malan & Grossberg, 1998: 163). A communication strategy is defined as "potentially conscious plans" which are used by organisations to solve a problem in order to reach a specific communication goal. It is the framework for a strategic communication plan and operational communication

programmes. It is a written document designed to achieve its intended goals and objectives. The communication strategy produces a profile that can be used to identify the right problems to solve and to prioritise issues for which communication programmes are to be developed (Steyn & Puth, 2000; Pearson, 2016). It is a plan for communicating information related to a specific issue, situation, audience, or event; it serves as a blueprint for communicating with the public or stakeholders (Dörnyei & Scott, 1997).

2.9.1. Stages for communication strategy development

Various stages (as highlighted in the introduction) need to be followed in the process of developing a communication strategy. These stages include the following:

2.9.1.1. Situational analysis

Before developing a communication strategy, the researcher should be familiar with the environment or the context in which the strategy is developed (Steyn & Puth, 2000; Government Communication Service, 2014). The environment must be studied, examined and analysed. A situational analysis for a communication strategy requires a mandate or legislative framework, comprehension of water and water re-use, an understanding of attitudes and concerns, demography, a media agenda, knowledge of political issues, the public mood and forces at play. “This will assist in stakeholder mapping and identifying relevant stakeholders to be consulted in a communication strategy” (Slabbert, 2019: 15).

2.9.1.2. Stakeholder Identification

The environment consists of various groups of individuals who need to be identified and understood (Steyn & Puth, 2000). These individuals have various values, beliefs, views, needs, wants, goal and objectives. In order for an effective communication strategy to be developed, the public or strategic stakeholders should be identified (Steyn & Puth, 2000; Pearson, 2016). The strategy must clearly indicate who the strategic stakeholders are that the strategy is aimed at.

2.9.1.3. Identify and prioritise key strategic issues or communication challenges in the current environment

Strategic issues or communication challenges are defined as the events, trends and developments that are considered consequential for an organisation due to the potential impact they may have on the organisation's strategy. They could be anything from a new competitive strategy imposing vital changes in attitude and behaviour, the acquisition of new business or a shift in environment. They may also be challenges and obstacles which need to be overcome. Key issues need to be identified by senior communication practitioners (researchers) and at the same time they should be able to demonstrate how communication can provide solutions to the identified problems (Steyn & Puth, 2000; Government Communicators' Handbook, 2014-2017).

2.9.1.4. Identify implications of strategic issues for stakeholders

When developing a communication strategy, it is vital to identify the implications that key strategic issues already have or will have for the public. At this phase, a communication practitioner or researcher addresses the implications and the consequences strategic issues might have on the public. During this stage, the researcher or communication practitioner needs to understand the key issues faced by the environment and determine their implications on the public. This includes researching how the public feels and perceives a certain issue and its consequences (Steyn & Puth, 2000).

2.9.1.5. Decide on the key messages and themes of the communication strategy

Steyn and Puth (2000:70) claim that "a communication strategy should help an organisation compete more effectively by identifying what should be communicated". Strategic communication messages and themes focus on the key message that should be communicated to each target group in order to solve a given problem or issue (Steyn & Puth, 2000; Government Communication Service, 2014). Communicated information directed at a specific target audience can lead to change and development.

2.9.1.6. Set communication goals around which communication plans are developed

Strategising emphasises achieving certain communication objectives (goals). Communication goals or objectives refer to the destination that a communication

strategy needs to achieve (Steyn & Puth, 2000). Communication goals are developed to “indicate what the strategy wants to achieve with its communication regarding strategic issues and the implications for stakeholders”. An effective communication strategy has to clearly define the desired goals and objective of the strategy (Steyn & Puth, 2000: 71; Government Communication Service, 2014; Government Communicators’ Handbook, 2014-2017).

2.9.1.7. Communication policy

An effective communication strategy clearly defines the communication policy. A clear policy statement on who is allowed to communicate with whom should be indicated in a communication strategy. “What must be communicated to stakeholders, what should be communicated, what the organisation is prepared to communicate, what the organisation is not prepared to communicate and what is to be communicated in special situations, such as a crisis, are vital to the development of a communication policy” (Steyn & Puth, 2000:72; Government Communication Service, 2014).

2.9.1.8. Submit a draft of the communication strategy to supervisors

Supervisors should be updated on the various stages during the development of a communication strategy. They should be able to know the results of the research and the strategic problems being faced by the target group or public. Updating supervisors on the strategy will make it easier to amend the strategy and to obtain funds for implementing the strategy (Steyn & Puth, 2000).

2.9.1.9. Conducting a media analysis

The aim of a media analysis is to examine the different communication media that might be suitable for particular target groups. It outlines on communication media and channels that will be employed for a given communication strategy (Steyn & Puth, 2000; Government Communication Service, 2014). The communication media might include interpersonal media, group or organisational media, public media such as radio and television and so forth.

2.9.1.10. Develop a strategic communication plan or action plan

This is the last stage involved in the development of a communication strategy. According to Steyn and Puth (2000), the strategic communication plan refers to “the

framework within which communication programmes, campaigns and plans are developed". The ideas resulting from strategising need an action plan that explains what is to be done at each event in the programme (Government Communicators' Handbook, 2014-2017).

The above-discussed stages for developing a communication strategy were employed when developing a communication strategy on water re-use for Basic Education. All elements were addressed with regard to the research findings. The strategy was submitted to the research supervisors and the project holders.

2.10. SUMMARY OF THE CHAPTER

In conclusion, this chapter discussed the concept of greywater as a water conservation method derived from households such as bathtubs, showers, dish washing and so forth. The chapter reviewed the theoretical framework of the study. This included an examination of the behaviour ecological model, Geertz and Vygotsky's theories. The literature revealed that many wastewater re-use programmes have faced public opposition because of prejudicial and cultural beliefs. It revealed that human perceptions towards water re-use are affected and shaped by culture. A concept of culture was outlined with the aim of providing a deeper understanding of the notion. Scholars such as Geertz (1973), Saunderson (2013), Kastanakis and Voyer (2014) and Masuda (2009) were examined to explain their understanding of the concept of 'culture'. The literature revealed that some individuals (learners) are reluctant to water re-use due to their lack of knowledge and understanding. People (learners) must be taught about water re-use in order to be knowledgeable and have an understanding of the subject. Vygotsky examined the notion of social context and social interaction as key elements of effective learning. The chapter also deliberated on factors which could be employed for changing learner's perceptions towards environmental issues. This chapter explained various communication approaches which need to be considered to promote transformation of the subject of water re-use. The approaches indicated that development studies need to take individuals into account as they are essential for any successful change and development. Learning support materials (LSM) which could be employed during the learning process of water re-use were also reviewed. The chapter finally examined various stages that should be considered in the implementation of a communication strategy on water re-use for Basic Education.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter outlines the research methodology utilised for this study. As deliberated in chapter one and two, the aim of this study was to develop a communication strategy on water re-use for Basic Education, which includes illustrative learning materials suitable for online learning. For the purpose of this study, participatory action research as a qualitative research method was employed to achieve the intended aim and objectives of the study. Participatory action research is a research method that combines research and participation. It is a systematic approach that seeks to generate knowledge for social action and change within a particular social context. Participatory action research, as a method can assist in changing individual's perceptions about water re-use. It can further assist in persuading, raising awareness and developing a particular community (Melkote & Steeves, 2001; MacDonald, 2012).

The chapter discusses qualitative versus quantitative research, where the researcher argues in support of a qualitative research approach. The philosophical underpinnings of participatory action research are outlined. Participatory action research focusses on convenience sampling. Therefore, convenience sampling as a non-probability sampling technique is discussed as this was employed during the population sampling process of the research. Convenience sampling refers to a sampling technique where subjects are selected due to their convenience, accessibility and geographical proximity (Etikan, Musa & Alkassim, 2016). A discussion on the population which outlines the target population for this study has been included. Learners and educators in Basic Education have been regarded as the target population for this study. The next section examines the researcher's position throughout the research process, particularly, with regard to data capturing. The section examines the insider and outsider perspectives which are considered to have an impact on the research findings.

For the research objectives to be achieved, data was collected using face-to-face interviews, participant observations, workshops and focus groups. An audio recorder, topic guide and interview guide were used as data collection tools. This chapter also

discusses thematic analysis and NVivo software as methods which were employed during the data analysis process. Several thematic analysis phases which were followed during the data analysis, are outlined. A discussion on quality criteria (trustworthiness) of the study has been included. Ethical considerations which consist of respect for participants' rights and their dignity, informed consent, confidentiality, opting out and the permission to undertake the study are deliberated and indicated how they were used throughout the study.

3.2. RESEARCH DESIGN

A research design refers to a tactical framework for action that serves as a link between the research execution and research questions. It is the procedure that guides the researcher in the process of verifying a particular research question. It "provides the glue that holds the research project together" and assists in answering the research questions. "The research design provides the components and the plan for successfully carrying out the study" (Blanche, Durrheim & Painter, 2014; Bless *et al*., 2013; Nengovhela, 2017:73).

This study involves human beings (learners and educators) as sources of information. As a result, a participatory action research - a qualitative research paradigm - was adopted to gather information for the study. Participatory action research is viewed as a suitable method which involves inquiry based on the existential concepts of human experience (Mbongwe, 2012). "It emphasises the connection of research with action in real world settings which results in co-generation of knowledge between the researcher and the participants" (Fletcher, MacPhee, Dickson, 2015:1). It is a systematic approach which seeks to generate knowledge for social action or change. It also aims to achieve change and development among individuals (participants) and their communities through education and action (Ozanne & Saatcioglu, 2008).

Participatory action research aims to produce social change, beneficial knowledge and action to individuals through research, socio-political action and education (MacDonald, 2012; Morales, 2016). It is collaborative research, where education and action are used to gather information which can be used for social and environmental change through employment of multiple data collection methods. Participatory action research combines action and reflection, theory and practice with stakeholder participation with the aim of finding solutions to concerns and issues (Pain, Whiteman

& Milledge, 2011; Jacobs, 2016). It exemplifies a democratic approach to research where participants work collaboratively in the co-generation of new knowledge to address specific issues or problems (Koch & Kralik, 2006; Reason & Bradbury, 2001; Jacobs, 2016). This indicates that "participatory action research is not conducted on another but with another" (Ozanne & Saatcioglu, 2008: 51).

The participatory action research design assisted in achieving the aims and objectives of this study. It provided the researcher with an opportunity to interact with participants and to collaboratively discuss water and water re-use issues in South Africa as well as to discover the participants' attitudes and perceptions towards water re-use (greywater). A discussion on effective learning support materials or information activities between the researcher and the participants took place. The researcher gained an understanding of the participants' likes and dislikes, preferences and which learning support materials were considered as user friendly and accessible through this participatory paradigm. Interview sessions and focus group discussions took place in a participatory manner which allowed for in-depth information about water re-use. Effective learning took place where the researcher and the participants learnt from each other through discussions and participation.

3.2.1. Qualitative versus quantitative research designs

When conducting or planning a study, a researcher chooses to employ qualitative or quantitative research designs. For the purpose of this study, a qualitative research orientation, with a participatory action research as a method, was chosen, due to its ability to explain and understand societal issues and find amendable solutions through collaboration with the affected individuals.

A qualitative research design was chosen to investigate water re-use issues with the aim of understanding, interpreting and explaining water re-use issues. Qualitative designs are concerned with understanding rather than explanation, they attempt to describe and interpret an individual's feelings and experiences in human terms rather than in measurements and quantification (de Vos *et al*., 2011; Blanche *et al*., 2014). Qualitative research provides researchers with "rich contextual data promoting an in-depth understanding of the phenomena" (Power, 1988 in Saunderson, 2013: 80).

Quantitative research designs are scientific methods for conducting research as they are applied in situations where vital variables are known and are able be controlled and measured. They are more interested in measuring variables rather than "asking people about their opinions and experiences regarding a phenomenon" (Blanche *et al*., 2014: 142). This study aimed to examine individual's perceptions, behaviours, knowledge and attitudes about water re-use and discuss approaches to communicating information about water re-use in Basic Education. The researcher was of the opinion that quantitative orientation was an unsuitable method to achieve the intended aim of this research, since this approach does not focus on interaction nor listening to what people have to say about a subject. For an effective water re-use communication strategy and illustrative learning materials to be developed, the researcher needed to know people's preferences, likes and dislikes and what they considered as user friendly. This could only be achieved by means of qualitative research, where one interacted and collaborated with the target population.

3.2.2. Philosophical underpinnings of participatory action research

The root of participatory action research is the ideas of Paulo Freire. Freire was a very influential scholar who applied liberation theology to education and communication practice in development settings (Freire, 1970 in Melkote & Steeves, 2001; MacDonald, 2012). He assumed that during development, people should not be oppressed, instead, they should become fully engaged in the process and should be free from internal and external oppression. Paulo Freire introduced participatory action research as a method used to oppose "banking education" where knowledge was considered a gift by those who considered themselves knowledgeable upon those considered by them to be unknowledgeable. The system regarded individuals as passive rather than active agents (Freire, 1970 in Melkote & Steeves, 2001). In response, Freire built an argument of a dialogic process of liberation. He argued that for social change and development to occur, individuals need to be active participants throughout the process. They should be able to raise their voices, ideas and thoughts. According to Paulo Freire, "development communication should be regarded as emancipatory dialogue rather than message communication" (Melkote & Steeves, 2001: 299). Learning is not a one-way process but a two-way process where collaboration and interaction take place between the facilitator and the learner (Melkote & Steeves, 2001). This viewpoint gave rise to participatory action research.

As deliberated earlier, this study employed participatory action research as a qualitative research paradigm which was used to gather information on water re-use from both learners and educators. The philosophical underpinnings of participatory action research are similar to postmodern interpretivism where “objectivity is impossible” and “multiple or shared realities exist” (Kelly, 2005: 66 in MacDonald, 2012:36). Participatory action research concentrates on historical-hermeneutic sciences, its intent is to understand individuals’ experiences and “establish harmony among people and between humanity and its environment” (Du Plooy-Cilliers *et al*., 2014:22). It focuses on the premise that people have the right to develop themselves and to participate in their development process in order to analyse their own solutions which can lead to sustainable development (MacDonald, 2012). This study intended to understand individuals’ attitudes and perceptions towards water re-use as well as to educate and raise awareness about this topic. Individuals (learners and educators) participated in the study in order to develop, make informed decisions and find concrete solutions regarding water and water re-use issues.

Participatory action research tries to combine participation and action. It is “concerned with an agenda for social change that embodies the belief of pooling knowledge to define a problem in order for it to be resolved”, it values participation and aims to promote positive social change and awareness (Juujärvi & Lund, 2015; MacDonald, 2012: 36). As such, the current research considered participants as co-researchers and agents of change through participation.

Contrary to non-participatory or traditional positivist research, participatory action research is a power shift from academic institutions to communities, where the participants become active agents in the study and the researcher embraces a partnership with the target population. It is an empowering process that creates a platform for participants’ sense of control, critical awareness, and involvement in the decision making. Participatory action research is democratic, equitable and liberating as it enables participation for all those involved and provides freedom from oppressive, debilitating conditions, instead it is life-enhancing which enables the expression of various individuals. It holds that individuals are social beings within economic, social and political contexts. Unlike traditional positivist research, this research holds that participants are not subjects of research but are active contributors to the research

(Blair & Minkler, 2009; MacDonald, 2012; McTaggart, 1991; Chandler & Torbet, 2003; Kelly, 2005 in MacDonald, 2012).

“Participatory action research involves the production of knowledge for action”. In contrast, non-participatory research is oriented to producing knowledge for understanding from which action may flow subsequently. It is framed by institutional, professional interest, agendas and focus on scientific expertise. Participatory action research is a co-learning process whereby individuals contribute their knowledge and expertise bidirectionally (Blair & Minkler, 2009; Amaya & Yeates, 2015: 8). In this study, learners, educators and the researcher learnt from each other by means of a two-way learning and communication process. Participants learnt about greywater while the researcher learnt more about the individuals’ cultural beliefs with regard to used water, effective learning materials and so on.

Participatory action research opens a communicative space between participants. It creates a platform for participants to communicate their own thoughts and ideas of a phenomenon. It reduces the traditional knowledge hierarchy by advocating that all participants should communicate and participate to bring knowledge and experience to the research process, “It ensures that everyone’s voice is heard” (Kemmis, McTaggart & Nixon, 2014; Jacobs, 2016: 52). Participatory action research is considered mutual inquiry aimed at reaching intersubjective agreement, unforced consensus and mutual understanding through communication (Kemmis *et al*., 2014). It is a research paradigm which combines action with participatory and communication approaches. Due to the nature of the study (participatory research), participants were able to open up and share their experiences without fear, they were able to participate and raise their thoughts and ideas about water re-use. Participants were not oppressed in any way; they were encouraged to actively participate throughout the data collection process.

As outlined above, the study aims to develop a communication strategy for Basic Education, which includes illustrative learning materials suitable for online learning. The developed illustrative learning materials were piloted. Education programmes which are piloted are regarded as methods employed to educate the society and raise awareness on water re-use (Vedachalam & Mancl, 2010). Participatory action research assisted in the pre-testing process of the materials. Learners and educators

participated and a platform for bottom-up participatory communication was created. The developed material was used at selected primary and secondary schools and tests took place. First, the researcher asked the participants what they saw when they looked at the learning materials. Then the materials and their key messages were explained. A summative assessment was given to the participants to test their level of understanding regarding water re-use.

3.3. TARGET POPULATION

A target population can be defined as the entire set of elements, objects, data, events or group of people that are of interest to the proposed study and which the researcher wants to determine some characteristics and information regarding a phenomenon (Bless *et al*., 2013; Hammond & Wellington, 2013). In the case of this study, the target population entailed learners and educators in Basic Education as well as all elements associated with the construction of the communication strategy for water re-use such as participant workshops.

3.4. SAMPLING

“Sampling refers to a set of population considered for actual inclusion in the study, it is a small portion of the total population from which a representative selection is made” (Barker, 2003: 380; Unrau, Gabor & Grinnell, 2007: 279; de Vos *et al*., 2011: 224). As outlined in the introduction, this study employed convenience sampling as a non-probability sampling method. Learners and educators in Basic Education were selected with regard to their easy access and geographical proximity. Four secondary and four primary schools in Mankweng were selected and visited. Selected schools were chosen as they were close to the researcher, this made it convenient for the researcher to travel to and access the institutions. Learners who major in various subjects and educators who teach different age groups and subjects were selected. This variety allowed the researcher to discover diverse views about water re-use from both learners and educators (with various subjects’ majors). As indicated in chapter one, a total number of 80 participants took part in the study. In each secondary school, a total number of ten learners (grade 10 and 11 learners) and five educators were selected for focus groups discussions. Five educators from each selected primary school were involved in the interview sessions. Fifteen participants from each secondary school and five participants from each primary school were selected

because a group which consists of a small number of individuals is considered a small group, which has the potential for effective useful data to be produced (de Vos *et al*, 2011; MacDonald, 2012). The small group made it easier for the researcher and the participants to collaborate and raise their thoughts during focus group discussions and interview sessions. Both male and female participants (learners and educators) were selected. The participants spoke Sepedi as their home language and English as the medium of instruction. Known elements associated with the construction of the intended water re-use communication strategy such as stakeholder consultation workshop were also visited.

3.5. INSIDER AND OUTSIDER PERSPECTIVES

As outlined in the introduction, this study employed participatory action research - a qualitative research paradigm which combines action and research. It holds that researchers should collaborate with research participants to develop and change a particular behaviour, attitude or situation. Throughout the research process, the researcher had to demonstrate emic and etic (insider and outsider) perspectives. Emic perspectives (insider perspectives) are perspectives derived from the researcher, considered to be a member of the community being studied. Etic perspectives are the opposite, they are taken by the researcher who is an outsider to the community being studied (Naaeke, Kurylo, Grabowski, Linton & Radford, 2012). During the data collection process, the researcher found it difficult to position herself as an insider or an outsider. Data was collected from four selected primary and secondary schools in Mankweng. The researcher noticed that the majority of the research participants in all the schools were black Sepedi speaking learners, aged between 15 and 18 and the educators aged 20 and above (refer to table 1, 2 and 3). In relation to the researcher's position, she was an insider as she is also a black, Sepedi speaking individual, aged between 20 and 25. This made her an insider to some educators aged between 20 and 25 and an outsider to all learners and educators aged between 26 and above. She also shares a similar culture with the participants, and this shared language and culture made it easier for the participants to open up and trust the researcher. Individuals were able to provide information about their cultural beliefs on water re-use without fear. With regard to the educational and occupational level, the researcher noticed that she was an outsider, as she was at a different level from the participants. The majority of participants were at their secondary level of education and employed,

while she was at a tertiary level of education and unemployed. However, the researcher felt that outsider status was never reached. Educational and occupational differences did not have an impact on the study as participants were comfortable to express themselves freely since they shared a similar culture with the researcher. Educational and occupational status were never seen as barriers to the study. The researcher felt that she was an insider during all phases of the data gathering exercise.

3.6. DATA COLLECTION

According to Burns and Grove (2005), data collection refers to a systematic method which is applied by the researcher to collect relevant information for the study in order to achieve the intended aims and objectives of the proposed study. As outlined above, participatory action research is participatory in nature and it facilitates collaborative and equitable partnership with individuals (participants) involved in the study. “It focusses on voice and everyday experiences” (Blair & Minkler, 2009; MacDonald, 2012:41). Participatory action research is a ‘soft’ method of research which considers any elements as data and employs various data collection methods such as focus groups, interviews, workshops, diary, personal logs, participant observation, field notes, visuals and so forth (MacDonald, 2012). The following section outlines data collection methods employed in this study.

3.6.1. Data collection methods

Highlighting a data crystallisation process allows for a variety of data collection methods and provides the researcher with a complex and deeper understanding of the topic (Richardson, 1994). Various data collection methods were employed in order to deeply understand individual’s perceptions, experiences and knowledge about water re-use. These methods included focus groups, interviews, workshops and observation of participants.

3.6.1.1. Focus group discussions

In order to obtain an in-depth understanding of participants’ experiences, attitudes, knowledge and perceptions on water re-use, focus group discussions were held at various sites. “Focus groups are considered a socially oriented process and a form of group discussion that capitalises on communication between the researcher and the

research participants in order to generate data" (Kitzinger, 1995: 299 in MacDonald, 2012: 41).

Focus groups were held in the four selected secondary schools with ten learners and five educators from each school. Each group discussion lasted ninety (90) minutes. The focus group discussions took place in a comfortable and non-threatening environment (school classrooms) where participants were free to express their opinions and share their beliefs, views and experiences without any fear. Focus groups were conducted in two languages, which was Sepedi - the participants' home language - and English - a second language used as the medium of education. Discussions and responses were made in either of the two languages. This made it easy for open dialogue and discussions to take place. During such discussions, in-depth information about water re-use was obtained. Participants were free to raise their opinions and interpretations about water re-use (Kamberelis & Dimitriadis, 2005 in Mbongwe, 2012). Focus groups provided the researcher with an opportunity to conduct participant observations and discussions simultaneously. The researcher was able to observe how participants interacted with one another and note non-verbal cues which were displayed.

During the focus group discussions conducted in three of the selected secondary schools, the researcher noted that some participants dominated the group. She brought this to the attention of the participants and ensured that all those involved had a chance to raise their thoughts. An open, trusting relationship between the researcher and the participants was built during such groups, which made it easier for the participants to reveal their experiences and beliefs on water re-use. Cultural issues can be regarded as a sensitive matter. Once a relationship had been built participants were able to raise their voice and explain their experiences on water, water re-use and their cultural issues.

Focus group discussions helped in answering the research questions of the study. They helped the researcher to understand the individuals' perceptions, attitudes, information activities, water re-use promotional strategies and preferred illustrative water re-use learning materials. The discussions helped to clearly comprehend the reasoning behind each response.

3.6.1.2. Interviews

Conducting interviews in a participatory action research “enable participants to describe their situations, experiences and opinions regarding a specific issue” (Stinger, 1999: 68 in MacDonald, 2012: 42). This study conducted semi-structured interviews as one of the data collection methods, which helped to gain an in-depth knowledge about the primary educators’ views and opinions on water re-use. Interviews were held at four selected primary schools in Mankweng. Five interviews with five educators were held at each primary school. This was done on nine random working days. During the initial visit (the first days of data collection process) at all the selected primary schools, the researcher was introduced to the participants by the school principal. Interviews were held individually with each participant. The interview sessions took place in the educator’s staff rooms. At all the selected primary schools, educators were placed in a staff room where each educator had his or her own table and space. During the interview process, the researcher sat with each participant at his or her table and initiated the interview. During the interviews, the researcher asked questions which were followed with further questions initiated from the participants responses.

An interview is a face-to-face verbal interaction in which the researcher tries to elicit information from the participants through direct questioning (MacDonald, 2012; du Plooy-Cilliers *et al*., 2014). The researcher directly interacted with the participants, asked questions and simultaneously conducted observations. During the face-to-face interviews, the researcher allowed the participants to open up and voice their views, cultural beliefs, experiences, knowledge and opinions about water re-use. Holstein and Gubrium (2004) in Mbongwe (2012) mention that during interview sessions, the interviewer (researcher) must employ creative strategies in order to interact with the participants based on intimacy and friendly feelings. In order for the participants to open up and provide rich information, the researcher used the participant’s home language, whilst also codeswitching it with English as their second language. This made it easier for the participants to comprehend some of the questions which might have been considered difficult to comprehend in English. The researcher also developed relationships with the participants. She was open and friendly with the participants; this created a platform for further questions and answers about water and

water re-use issues in South Africa. An ongoing, participatory, open dialogue and learning environment was created and maintained.

3.6.1.3. Workshops

Workshops are regarded as effective data collection methods which can aid in comprehending a phenomenon. As explained in chapter one, workshops accommodate larger groups, they specifically target groups they are interested in and they focus on a two-way learning process between the researcher and the public (de Vos *et al*., 2011). During workshops, various individuals raise their thoughts about a particular subject. This study also used workshops as a data collection method. A stakeholder consultation workshop was held on the 23rd of November 2018 and was attended by the researcher along with partial funders, her supervisor and co-supervisor. The workshop aimed to engage with various stakeholders and gain their input on a public awareness and education programme for water re-use in South Africa. During the workshop, all the participants were placed in an open boardroom which provided a platform for a participative, on-going learning process. Various presentations and discussions on water and water re-use issues were made. Participants (including the researcher) participated throughout the workshop. They were provided with feedback sheets where questions were asked and answered, this assisted them to clearly comprehend the subject of water re-use. The researcher received vital feedback information on water re-use issues, it challenges and benefits.

3.6.1.4. Participant observation

Participant observation is an effective data collection method that is mostly used in participatory action research (MacDonald, 2012). In this study, the researcher employed participant observation as a data collection method, to support other data collection methods. During the observations of participants, the researcher noted observations and what had been communicated and what was implicit in the situation (Marshall & Rossman, 2006; MacDonald, 2012). Throughout the focus groups, workshops and interview sessions, the researcher became both the participant and the observer (participant-observer) simultaneously. Participants' interactions, behaviours and physical settings were observed and described during the discussions about water re-use. According to Mbongwe (2012:102), "observations are perceived as a measure of trustworthiness". This statement is supported by the researcher

because through observations she was able to link what she heard with what she observed. This increased the level of trustworthiness between herself and the participants.

3.6.2. Data collection tools

The following data collection tools were used to collect information from all the participants of the study:

3.6.2.1. Interview guide

An interview guide is needed before conducting interviews; it helps the researcher direct the conversation or discussion towards the topics and issues of interest. Interview guides assist and guide the researcher by means of identified questions. They act as a guide about what to do or say next after your interviewee has answered the previous question (Boyce & Neale, 2006). The study used a semi-structured interview guide to guide the researcher's questions during the interview sessions. Unstructured and open-ended questions which allowed participants to respond in an open and unlimited manner were asked. An interview guide was employed because it provided the researcher with assistance as to which question needed to be asked after the previous one had been answered. It ensured that the researcher did not become muddled nor mix questions. The interview guide was divided into four sections. The first section elicited answers about the demographic information of participants, this section focused on the participants' gender, age, race, home language and occupational level. The second section concentrated on water re-use. This section focused on questions about water re-use, it aimed to understand individual perceptions, knowledge, attitudes, beliefs and strategies which could be employed to enhance water re-use as a water conservation method. The third section focused on information activities. The section was intended to discover participants' preferred information activities. Details on learning support materials were provided in the last section of the guide (refer to appendix 7).

3.6.2.2. Topic guide

A topic guide highlights the topics that need to be discussed during focus group discussions. The study employed a topic guide to assist the focus group discussions held at the selected secondary schools and help the researcher to cover

comprehensively the necessary topics. The guide provided a platform for participants to intensely explain their experiences regarding various water re-use issues. Similar to the interview guide, the topic guide was divided into four sections. The first section included demographic information which consisted of gender, age, home language, race and occupation. This section was followed by a section of guideline questions which aimed to understand individuals' experiences, perceptions, attitudes and beliefs regarding water re-use, influencers of these perceptions and strategies to promote water reuse methods. The third section provided guiding questions which related to information activities and the last section of the guide probed questions on suitable illustrative learning materials for various learners (refer to appendix 8).

3.6.2.4. Audio Recorder

Discussions made during interview sessions and focus groups were recorded by means of an audio recorder. An audio recorder is regarded as a reliable tool for data collection because the researcher could not rely on memory alone to remember the contributions from the discussions. It serves as a reminder as to what was said during group discussions (Fawole, 2014). The study employed an audio recorder as the researcher found it vital to have a recorder that could be replayed to assure the truthfulness of the findings. The voices of the participants were recorded during interview sessions and the focus groups. The audio recorded information was then transcribed.

3.6.2.5. Observation Sheet

The study used an observation sheet as a data collection tool. The sheet was used to note the non-verbal cues of the participants. The researcher observed the participant's and noted each cue or action on the observation sheet. The sheet provided the researcher with reflections of the participants emotions regarding water re-use.

3.6.3. Participants demographic information

Name of school	Designation	Race	Age	Gender
Mountainview High School	Maths and science educator	Black	26-30	Female
Mountainview high school	Geography educator	Black	31-35	Female
Mountainview high school	Life sciences educator	Black	36+	Female
Mountainview high school	Life sciences educator	Black	26-30	Male
Mountainview high school	Agricultural sciences educator	Black	20-25	Female

Ditlalemeso high school	Geography educator	Black	36+	Female
Ditlalemeso high school	Geography educator	Black	36+	Female
Ditlalemeso high school	Maths and science educator	Black	31-35	Female
Ditlalemeso high school	Geography educator	Black	31-35	Female
Ditlalemeso high school	Maths and science educator	Black	20-25	Male
Hwiti high school	Economics and accounting educator	Black	31-35	Female
Hwiti high school	Maths and science educator	Black	31-35	Male
Hwiti high school	Maths and science educator	Black	36+	Male
Hwiti high school	Life sciences educator	Black	31-35	Male
Hwiti high school	Languages educator	Black	31-35	Female
Marobathotha high school	Languages educator	Black	31-35	Female
Marobathota high school	Life orientation educator	Black	26-30	Male
Marobathotha high school	Accounting educator	Black	26-30	Female
Marobathota high school	Languages educator	Black	26-30	Male
Marobathotha high school	Life orientation educator	Black	31-35	Male

Table 3.1: List of secondary school educators and their demographics

Name of School	**Designation**	**Race**	**Age**	**Gender**
Moriting primary school	Foundation phase educator	Black	36+	Female
Moriting primary school	Intermediate phase educator	Black	20-25	Male
Moriting primary school	Intermediate phase educator	Black	31-35	Female
Moriting primary school	Intermediate phase educator	Black	31-35	Female
Moriting primary school	Foundation phase educator	Black	36+	Female
Dikolobe primary school	Foundation phase educator	Black	26-30	Female
Dikolobe primary school	Foundation phase educator	Black	26-30	Female
Dikolobe primary school	Intermediate phase educator	Black	36+	Male
Dikolobe primary school	Intermediate phase educator	Black	31-35	Male
Dikolobe primary school	Intermediate phase educator	Black	26-30	Female
Toronto primary school	Intermediate phase educator	Black	31-35	Male
Toronto primary school	Foundation phase educator	Black	31-35	Female
Toronto primary school	Intermediate phase educator	Black	36+	Female
Toronto primary school	Intermediate phase educator	Black	26-30	Male
Toronto primary school	Intermediate phase educator	Black	31-35	Male
Pula-Madibogo primary school	Intermediate phase educator	Black	31-35	Male
Pula-Madibogo primary school	Intermediate phase educator	Black	31-35	Female
Pula-Madibogo primary school	Intermediate educator	Black	26-30	Female
Pula-Madibogo primary school	Intermediate educator	Black	31-35	Male
Pula-Madibogo primary school	Intermediate educator	Black	31-35	Female

Table 3.2: List of primary educators and their demographics

Name of school	**Designation**	**Race**	**Age**	**Gender**	**Frequency**
Mountainview high school	Learners	Black	15	Females	2
Mountainview high school	Learners	Black	16	Females	2
Mountainview high school	Learners	Black	16	Males	3
Mountainview high school	Learners	Black	17	Males	2
Mountainview high school	Learner	Black	17	Female	1
Ditlalemeso high school	Learners	Black	16	Females	2
Ditlalemeso high school	Learners	Black	17	Females	2

Ditlalemeso high school	Learners	Black	18	Males	2
Ditlalemeso high school	Learners	Black	16	Males	3
Ditlalemeso high school	Learner	Black	17	Female	1
Hwiti high school	Learners	Black	15	Females	2
Hwiti high school	Learners	Black	16	Males	2
Hwiti high school	Learners	Black	16	Females	2
Hwiti high school	Learners	Black	17	Females	2
Hwiti high school	Learners	Black	17	Males	2
Marobathota high school	Learners	Black	16	Males	3
Marobathota high school	Learners	Black	16	Females	3
Marobathota high school	Learners	Black	17	Females	2
Marobathota high school	Learners	Black	17	Males	2
Total					40

Table 3.3: List of learners and their demographics

3.7. DATA ANALYSIS

Data analysis refers to “a mechanism for reducing and organising data to produce findings that require interpretation by the researcher”. It involves the specific processes of data organisation and management, immersive engagement with data, writing and representation (Burns & Grove, 2003: 479; Nengovhela, 2017:83; Ravitch & Carl, 2016). Once data on individual’s perceptions, attitudes, beliefs and knowledge on water re-use was collected, it was analysed, interpreted and synthesised into findings and conclusions (Kubayi, 2013). This study employed thematic analysis and NVivo software to analyse and interpret the data collected from both the learners and educators in selected Mankweng primary and secondary schools. Thematic analysis is “a method for identifying, analysing and reporting themes or patterns within the data” (Liamputtong, 2009:284 in Nengovhela, 2017: 84). It is an “elastic method for identifying, analysing and reporting themes within data” (Nengovhela, 2017:84). NVivo is a qualitative data analysis software, used to categorise and organise data collected from participants. Thematic analysis and NVivo were both employed because they provided the researcher with an opportunity to comprehend the potential of any issue or problem more extensively. They also permit for organisation and description of data in rich details (Braun & Clarke, 2006; Nengovhela, 2017; Saunderson, 2013).

During data analysis and interpretation, the researcher followed a step-by-step thematic analysis guide recommended by Braun and Clarke (2006). The analysis guide consisted of the following elements:

- *Data familiarisation*

Firstly, the researcher familiarised herself with the collected data. To be familiar with the data, she immersed herself with it (data), in order to understand the depth and breadth of the information. Through the immersion process, the data from the audio recorder was frequently listened to by the researcher (Braun & Clarke, 2006).

- *Transcription of verbal data*

This study examined verbal data collected during interview sessions, workshops and focus group discussions. As outlined before, an audio recorder was used as a data collection tool to record the verbal information. During data interpretations, the researcher transcribed the recorded information (data) into a written form. Transcribing the verbal data aided the researcher to familiarise herself with the information and produce and understand meaning (Braun & Clarke, 2006).

- *Generating initial codes*

This stage included the production of initial codes. Coding refers to "the labelling, systemisation and organisation of data by making connections between major and sub-categories" (Liamputtong, 2009; Tracy, 2013; Nengovhela, 2017:87). It is the process of organising the material into segments of text before conveying meaning to information (Creswell, 2009; Nengovhela, 2017). At this stage, the researcher identified vital codes from the written data on water re-use issues which needed to be interpreted and analysed. Coded data assisted the researcher in categorising information or data which belonged to the given research objectives. NVivo software was used to assist in sorting and identifying the codes. NVivo makes it easier to manage, access and control data (Saunderson, 2013). However, during the initial sorting of the data, the researcher found it difficult to use the software, as she was unfamiliar with the software. Consequently, she consulted the information technology (IT) specialists and people who understand the software and have experience in its application. A student enrolled for a Master of Science in Environmental Studies was able to assist the researcher with the practical application of the software. An IT specialist helped to install the software into the researcher's computer. The researcher went through the entire data set, paid attention to each data item and was assisted by NVivo to identify vital aspects in the data items that might form the basis of themes

across the data set (Braun & Clarke, 2006). This process helped the researcher to understand the data.

- *Construction of themes*

As outlined in chapter one, this study employed *a priori* themes which allowed the researcher to define themes in advance of the data analysis process (Brooks, McCluskey, Turley & King, 2015). Themes were pre-defined and generated from the research objectives of the study. A priori themes were employed because the study project holders required the research to focus on specific aspects (objectives) which could assist in developing a water re-use communication strategy for Basic Education, such as water re-use communication approaches, illustrative learning materials, individuals' perceptions and knowledge of water re-use. These aspects were used as *a priori* themes and coded information was placed under each aspect.

- *Data interpretation*

During the data interpretation process, the researcher went through the data in order to analyse and interpret it effectively. The researcher examined the data patterns to ensure that the correct interpretation of the data was recorded (Nengovhela, 2017). During this stage, the researcher scrutinised the written data and listened to the audio recorder again to ensure that clear and true interpretations of the findings were made. Notes from participant observations were also read and re-read to ensure correct interpretation of the non-verbal cues.

- *Producing or writing the report*

Writing the report involves the understanding and interpretation of data. It involves the final analysis of the collected data. This is where the researcher records the responses and findings of the proposed study with regard to its objectives. In order to produce findings for the report, the researcher requires a comprehensive understanding of the data, considering the researcher's and the participants' culture, experiences and history (Nengovhela, 2017). At this stage, the researcher began writing and clearly interpreting the findings of the study. Themes were identified and relevant information was interpreted and explained. After reporting and interpreting the information, the researcher compared the findings of the study with the data gathered from the literature review and the theories underlying the study (refer to chapter five).

3.8. QUALITY CRITERIA

Participatory action research deals with individuals' subjective experiences and meaning associated with a particular phenomenon (du Plooy-Cilliers et el., 2014; MacDonald, 2012). For an effective data collection process to occur in participatory action research, some level of trust is required between the researcher and the participants. This study was conducted with honesty and integrity with the aim of achieving trustworthiness. The researcher strived to achieve trustworthiness and quality of data by looking at quality criterions established by Bless *et al*. (2013), as discussed below.

3.8.1. Credibility

Credibility aims to ensure that the study findings represent the truth and actuality of the study. It seeks to convince that the findings of the study depict the truth (Streubert-Spenziale & Carpenter, 2003). "Credibility establishes when respondents identify the research findings as their own responses and experiences" (Bless *et al*., 2013: 236). Integrity "is obtained by aligning the study to ethical procedures" (Guba, 1981 in Saunderson, 2013: 94). This study was truthful in presenting the data received from participants. Participants' observations and explanations of data from focus group discussions, workshops and interview sessions are a true reflection of the participants information. The researcher tried to present participants' attitudes, experiences and views holistically. The research process of the study and information observed and recorded were correctly described. Credibility was also achieved through debriefing and review. The supervisor and the co-supervisor commented and reviewed the research report. During the data analysis process, the researcher continued to replay the audio recorder in order to present clear and accurate findings.

3.8.2. Dependability

"Dependability is a quality criterion which is achieved through obtaining credibility of the findings" (Streubert-Spenziale & Carpenter, 2003: 38). It is concerned with the following questions: "Are the results consistent with the data collected? Can the same study be replicated and yield the same results?" (Merriam 2002: 125 in Mbongwe, 2012: 113). The researcher assured dependability by presenting truthful results generated from the data collection. For others to replicate the study, the research

process followed during the conduction of the study is clearly elaborated and discussed, the researcher presented the data collection methods and analysis employed. Furthermore, an evaluation of this chapter (methodology) could assist in replicating the study. Through detailed methodology, other researchers could understand what was done, why was it done and at which location. The researcher also assured dependability by attaching an interview guide, topic guide and an observation sheet which could be used in order to replicate the study.

3.8.3. Transferability

Transferability refers to the degree to which the study results could be transferred to other contexts with other respondents. It refers to the possibility that the findings of the study apply to other comparable situations or have meaning to others in comparable situations (Streubert-Spenziale & Carpenter, 2003; Bless *et al*., 2013; Nengovhela, 2017). Transferability necessitates the researcher to deliver a detailed description of the environment in which data was collected, about the researcher as an individual and about the researcher's relationship with the contributors (Bless *et al*., 2013). In this study, the researcher achieved transferability through thick description of the research process. The study context along with the participants were described in detail. With the research process described, readers could explore the research documents and decide if the findings could be transferred to their own surroundings (Nieuwenhuis, n.d in Maree, 2016).

3.8.4. Confirmability

As indicated in section 1.6.7.4., "confirmability refers to the degree of neutrality or the extent to which the findings of the study are shaped by the participants and not the researcher bias, motivation, or interest" (Lincoln & Guba, 1985 in Maree, 2016: 125). The researcher employed crystallisation to reduce researcher's bias and improve confirmability. Various data collection methods were used in order to obtain in-depth information about water re-use and decrease the potential of bias. Nieuwenhuis (n.d) in Maree (2016: 125) posits that "to reduce researcher bias, researchers need to admit their own predispositions". In this study, the researcher acknowledged the possibility of her bias, noting that her values, expectations and beliefs might affect the way in which data was interpreted. During data interpretations, the researcher used quotes

to illustrate the participants' exact words thus increasing confirmability. The researcher also involved her supervisor and co-supervisor to check and ensure that the interpretation of the data and conclusions reached were obtained from the collected data.

3.9. ETHICAL CONSIDERATIONS

Ethics refers to a matter of integrity on a personal level; they are individual's moral or professional code of conduct that sets a standard for an individuals' attitudes and behaviour. They refer to a code of professional conduct that distinguishes between what is acceptable and unacceptable behaviour (du Plooy-Cilliers *et al.*, 2014; Nengovhela, 2017). Ethics are crucial in research, they potentially affect all the stakeholders involved in the process (du Plooy-Cilliers *et al.*, 2014). The researcher needs to have a moral obligation to take into consideration the rights of the participants as providers of knowledge for the study (Streubert-Speziale & Carpenter, 2003).

This study employed participatory action research. Participatory action research deals with the underlying lived experiences of individuals. It focuses on interaction and collaboration with participants, in order to understand their experiences towards a phenomenon. Spencer, Ritchie, Lewis and Dillion (2003) posit that quality research which consists of human beings or any elements, should include ethical considerations. Throughout this study, the researcher abided by the University of Limpopo's ethical guidelines. Several ethical issues were considered during and after the research conduction.

3.9.1. Respect for participants' rights and dignity

All participants have legal and human rights. No research project should violate these rights. During the data collection process, the researcher ensured that human rights were not violated. Participants were treated with respect, regardless of their culture, age, gender, occupational status or level of study. No individual was forced to participate against their will.

3.9.2. Informed consent

Participants must know that they are taking part in a research study. They must be informed formally and give their consent. They should understand what is required of

them during their participation, whether and how their identities will be protected, and how results will be used (du Plooy-Cilliers *et al*., 2014). For this study, the researcher used a consent form to ensure that participants willingly took part in in the study, and that they allowed the researcher to use the information obtained. This study focussed on individuals (learners) under the age of 18, therefore, parents and school principals were provided with consent letters, along with consent forms which needed to be signed by them to show that they permitted their children and learners to partake in the project. Both school principals and parents were provided with these documents (consent letters and forms) before the initiation of the data collection process. Educators who participated in the project were also provided with consent letters and forms as they were above the age of 18. On the consent form learners also had to give their own consent (Annexure 5). A Consent letter assisted the participants to understand the nature of the study. Before the initiation of interview sessions and focus group discussions, the researcher mentioned that primary consent was permitted from the principal and the parents of the learners, but if they felt uncomfortable about the project, they were free to opt out. She also provided participants (learners and educators) with a brief description of the study. Clear, complete, and precise information about the study, its methods, and benefits, along with the voluntary nature of participation were provided to participants.

3.9.3. Confidentiality and anonymity

To assure confidentiality and anonymity, the researcher stored data safely and did not expose any participants' identities. No participants' information was provided to anyone other than the researchers (supervisor and co-supervisor), data was kept safe from non-purposive activities to the study. Information was always kept under secure conditions. The researcher assured participants about the issues of anonymity and confidentiality. Participants were told not to reveal their names, the names of others or the information provided by other participants.

3.9.4. Opting out

In this study, no participant was forced to take part and/or to stay in the focus group discussion or interview session. The researcher understood that some discussions such as cultural issues might be sensitive to some participants, thus, she explained

that participants who felt uncomfortable about questions under discussion could opt out without providing any explanation. During the data collection process, all participants from all four selected secondary and primary schools remained in the study. No one opted out in any discussions.

3.9.5. Permission to undertake the study

Permission to undertake the study was granted from the University of Limpopo, Turfloop Research Ethics Committee (TREC) and the Department of Education. The researcher applied for ethical clearance from the University. Permission request letter to collect data in Mankweng secondary and primary schools was submitted to Mankweng circuit. A permission letter from the Department of Education (Mankweng Circuit) and ethical clearance letter (certificate) which allowed for data collection were then obtained before the initiation of any data collection. The researcher formerly travelled to selected secondary and primary schools in Mankweng and submitted the identified letters along with the consent forms in order to ask for the parents and principals' permissions to conduct interviews and focus groups on water re-use at their respective schools with their respective learners.

3.10. SUMMARY OF THE CHAPTER

This chapter deliberated on the research methodology of this study. Participatory action research as a research method for this study was outlined. A discussion on its philosophical underpinnings and a qualitative and quantitative debate were outlined. Participatory action research deals with the underlying experiences of individuals. It focuses on collaboration, interaction and relationship building between the researcher and the participants. Participatory action research focuses on face-to-face interactions between the researcher and the participants. Focus groups, workshops and interviews provide a platform for face-to-face interaction with participants. As a result, they were discussed as data gathering (collection) methods for this study. As the researcher could not rely solely on memory for questions and answers, an interview guide, topic guide and audio recorder were also discussed as data collection tools. Throughout the data collection process, an examination on the insider and outsider perspective of the researcher were made and discussed. Convenience sampling as a non-probability sampling method was discussed as the chosen sampling method employed in the study. Thematic analysis and NVivo software as data analysis methods were also

discussed. Steps which were followed during the thematic data analysis were deliberated. Data integrity was addressed under ethical considerations and quality criteria. The data integrity issues involved transferability, dependability, credibility and confirmability. Throughout the study, this chapter indicated that participants were respected, regardless of their age or gender, consent was given before the initiation of data collection, confidentiality was respected and protected and lastly, participants were provided with an opportunity to opt out at any time they feel uncomfortable about some of the issues. The next chapter discusses an analysis of the data and interpretations of the findings.

CHAPTER FOUR

DATA ANAYLSIS AND INTERPRETATIONS OF FINDINGS

4.1. INTRODUCTION

This chapter outlines the analysis and interpretations of the research findings. The chapter is structured into four main themes. First, it addresses the demographic information of participants. This information enabled the researcher to comprehend various experiences of the different individuals. The demographic section consists of participants' gender, age, race, home language and occupational level. Second, a discussion on a priori themes is embarked upon. A priori themes that were pre-defined consist of perceived causes of water scarcity in South Africa, formal education or training on water conservation methods, perceptions and attitudes towards water re-use, drivers or influencers of perceptions towards water re-use, strategies to promote water conservation methods in South Africa, information materials or activities used to access information on environmental issues and last, water re-use illustrative learning materials. The themes are further analysed, interpreted and supported by participants' verbatim quotes. The third section addresses the research questions of the study. The study focused on the following research questions: (1) What are learners and educators' perceptions and attitudes on water re-use in South Africa? (2) To what extent do learners and educators understand the dynamics of water re-use? (3) What is required to enhance the learners and educators understanding and influence their decision making related to water re-use? (4) Which information material should be utilised to influence learners and educators' acceptance on water re-use? (5) Which illustrative learning material is suitable for learners and educators to enhance understanding on water re-use? (6) And which communication approaches are appropriate to communicate water re-use in Basic Education? The fourth section concludes the chapter.

4.2. DEMOGRAPHIC INFORMATION

This section examines the demographic information of participants as outlined in chapter 3. The demographic information consists of individuals' gender, age, home language, race and occupation. The information was compiled from data collected

from the focus groups discussions and interview sessions held at the following Mankweng primary and secondary schools:

Primary schools	Secondary schools
Moriting primary school	Ditlalemeso high school
Dikolobe primary school	Marobathota high school
Pula-Madibogo primary school	Mountainview high school
Toronto primary school	Hwiti high school

Table 4.1: Targeted primary and secondary (high) schools at Mankweng

As outlined earlier, the target population for this study comprises of learners and educators in Basic Education, therefore, the demographic information included is that of the sampled participants.

4.2.1. Participant's Gender

Gender plays a crucial role in comprehending various levels of perception and attitudes between male and females. This section outlines the gender of participants who contributed to the study. The chart below illustrates the percentage composition of both male and female participants:

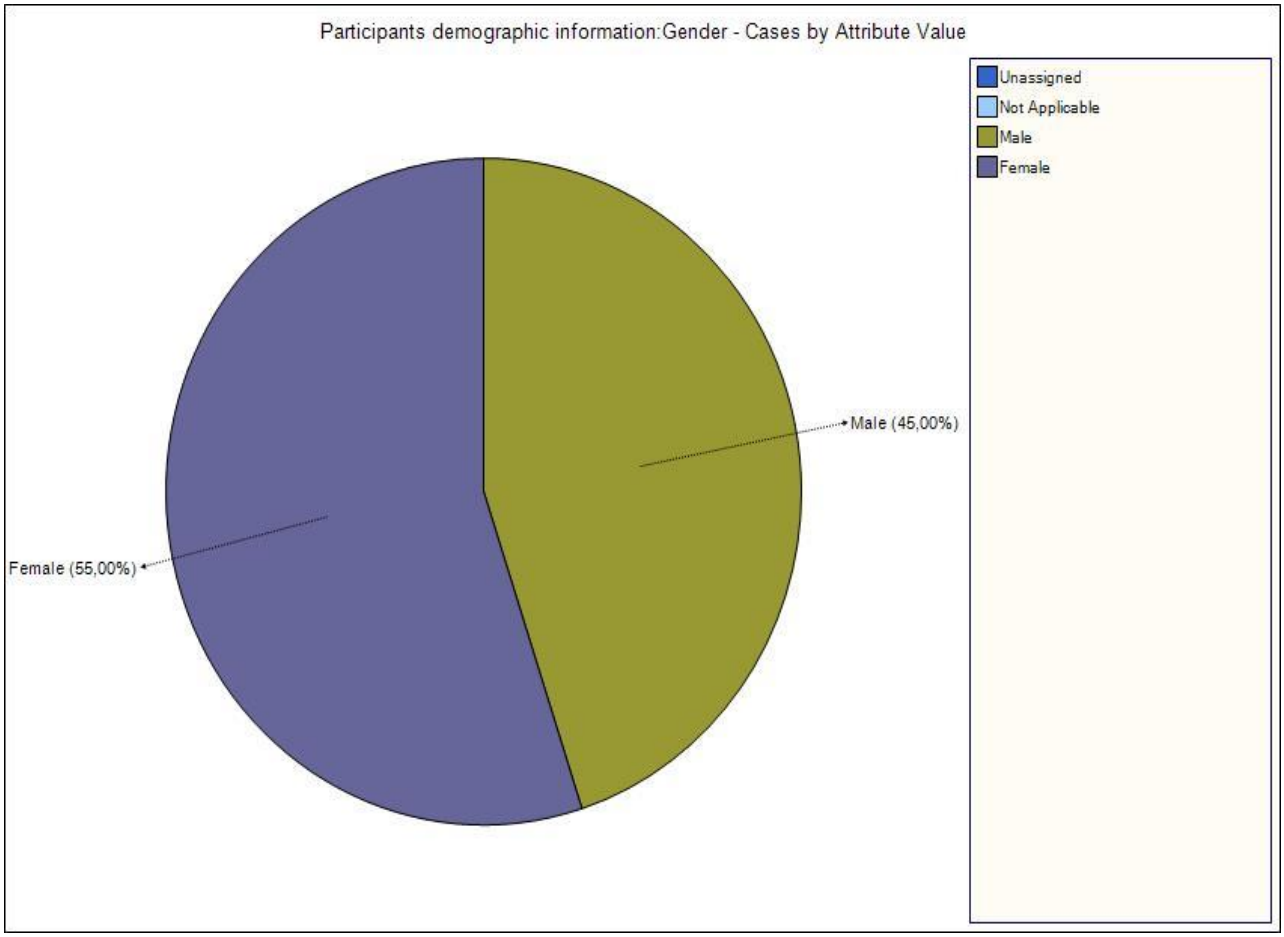

Figure 4.1: Participant's gender distribution

The pie chart illustrates that from a total number of individuals (80) who contributed to this study, the majority (55,00%) were females while the minority (45,00%) were males. The majority of females were able to participate in the study because in most cases, females were more willing to participate in research studies than males. For instance, in this study, most female educators were more interested in partaking in the study than their male colleagues.

4.2.2. Participant's Age

Age plays an important role in identifying suitable individuals who will absorb and apply new practices and ideas such as water re-use and conservation methods. The figure below illustrates the age of individuals who participated in this study.

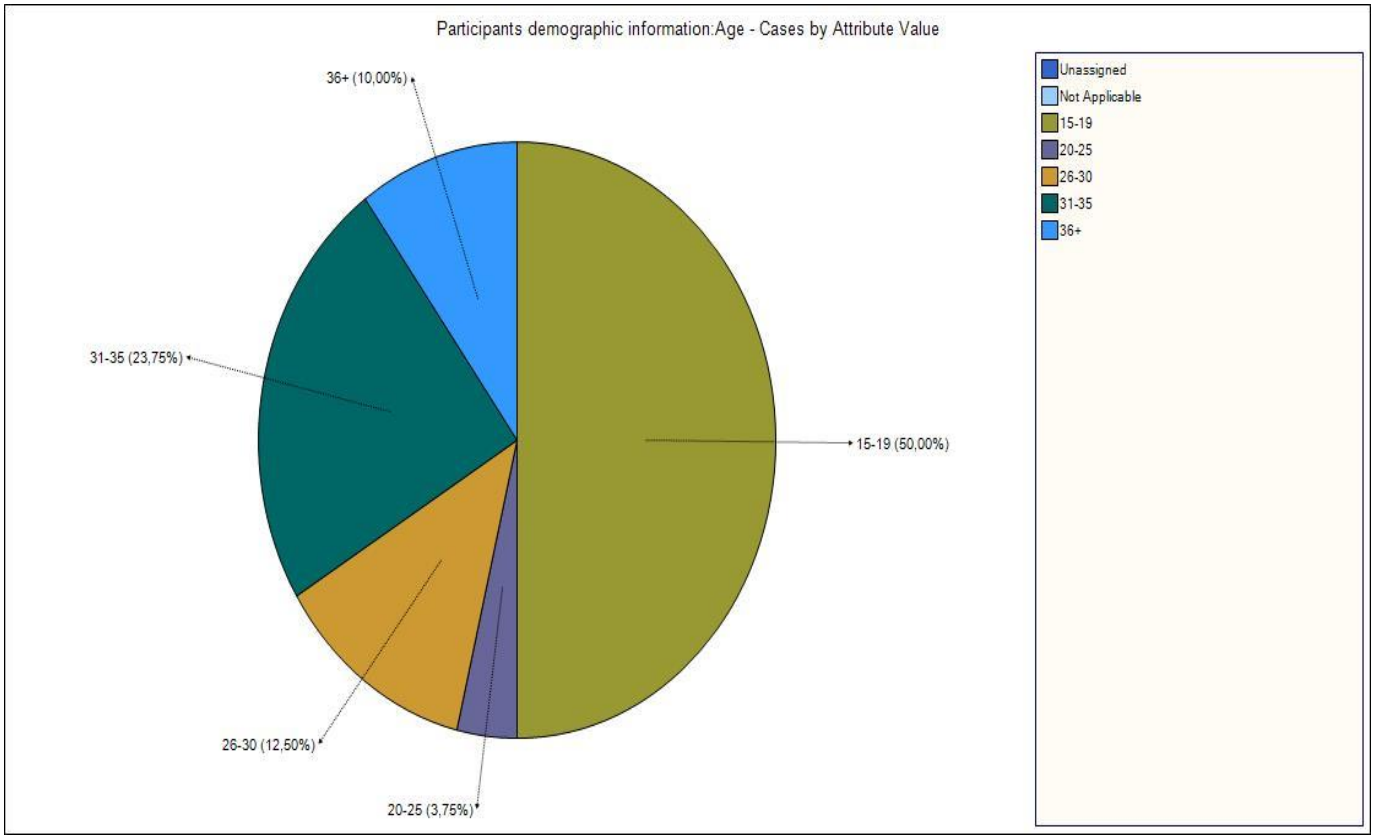

Figure 4.2: Participant's age

Participants' age was grouped into five categories. The majority of the participants were learners aged between 15-19 (50, 00%). Most educators who participated in the study were aged between 31-35 (23, 75%). The percentage was followed by educators aged 26-30 with a percentage rate of 12, 50%. Older educators who were older than 36 years constituted 10, 00%, while young educators aged 20-25 constituted 3.75%. Age differences of the participants provided the researcher with diverse experiences, attitudes and viewpoints on water re-use.

4.2.3. Participant's Race and Home Language

Since culture has multiple implications for various issues, race and home language play an important role in identifying one's culture. The participant's race and home language help in comprehending people's perceptions and experiences on a particular phenomenon. Figure 3 shows both race and home language of participants who contributed to the study.

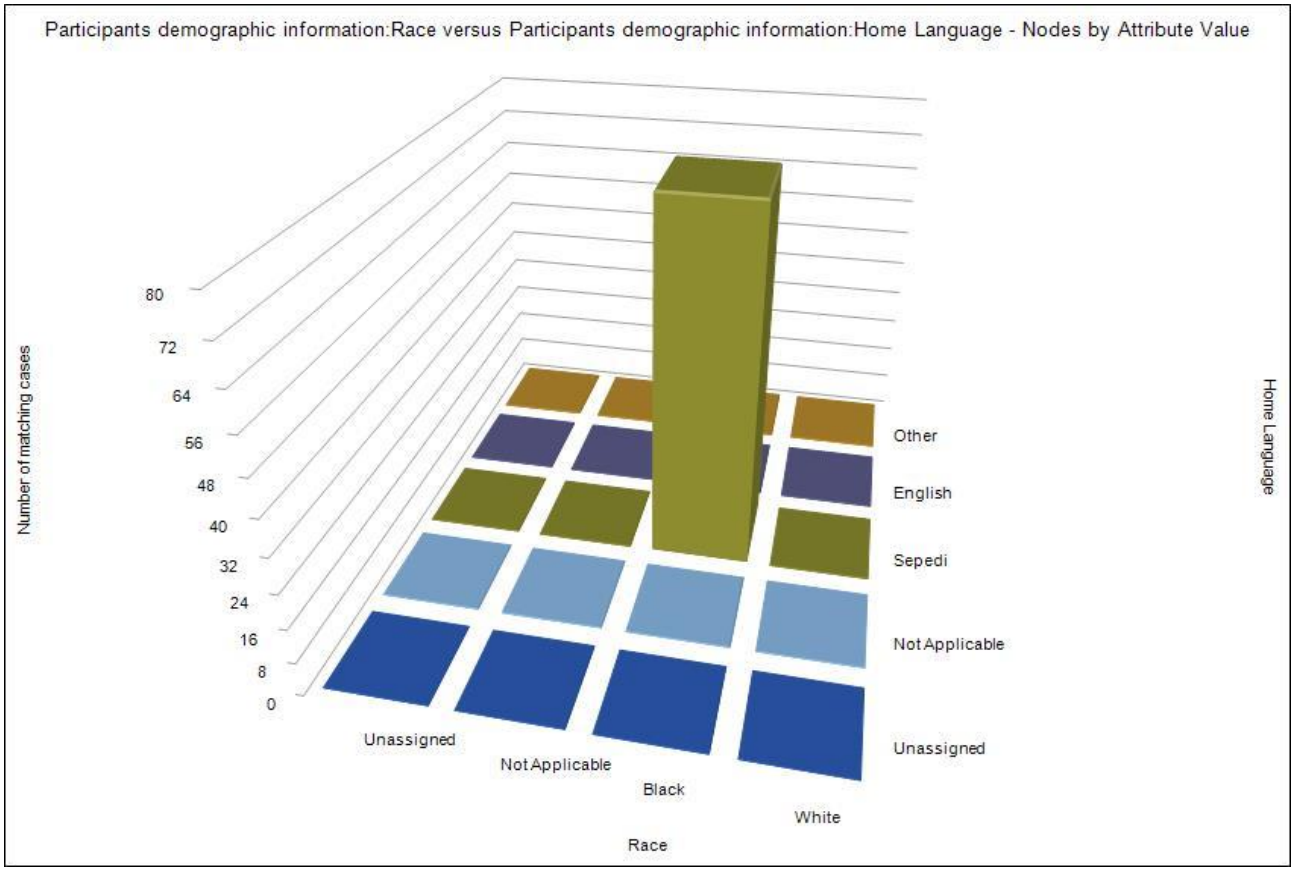

Figure 4.3: Participant's race and home language

Participant's race was grouped into two categories (black and white) and home language was categorised into two languages (Sepedi and English). Figure 3 shows that all (100%) participants who contributed in the study were black, Sepedi speaking individuals. Mankweng is a small township where the majority of black Sepedi speaking individuals live. Schools located in the area are attended by children (majority) who live in the surrounding area. These children, as well as their educators (majority) are black, Sepedi speaking individuals.

4.2.4. Participant's Occupation

This section discusses participants' occupational status. The section aims to understand the attitudes, opinions and perceptions of individuals who are employed and unemployed. It provides a percentage rate of the occupational status of the participants as demonstrated in the pie chart below.

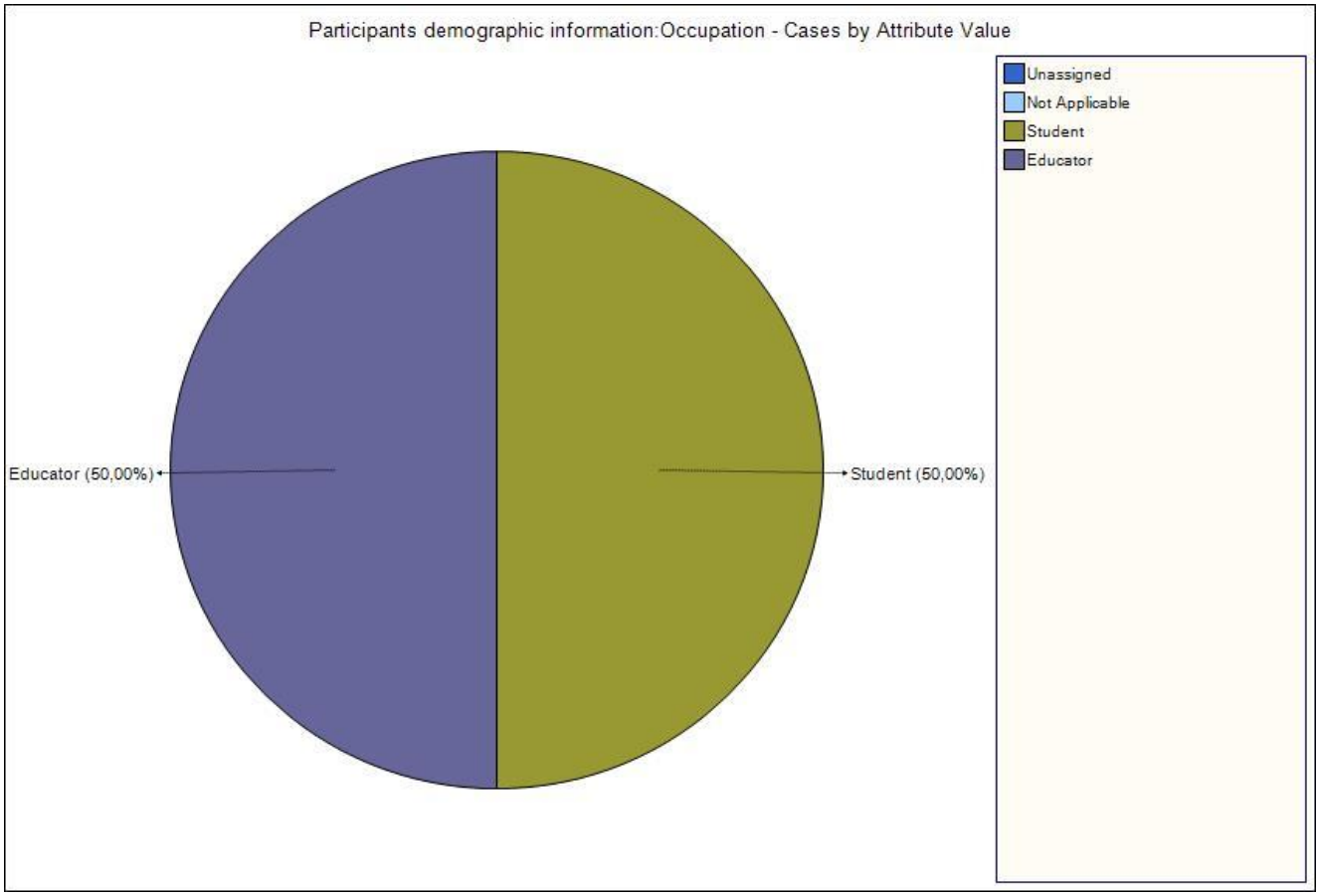

Figure 4.4: Occupational status of participants

The occupational status of participants shows that 50, 00% of the participants were educators and 50, 00% were learners. The participant's occupational level assisted the researcher in comprehending the experiences, knowledge and perceptions of the different individuals from different occupational (educational) levels.

4.3. DISCUSSION OF KEY A PRIORI THEMES

This section discusses key a priori themes which were pre-defined during the study process. As indicated in the introduction, themes were discussed and supported by the verbatim responses of some of the participants.

4.3.1. Perceived Causes of Water Scarcity in South Africa

This section examines the central understanding, views and comments of participants regarding the causes of water scarcity in South Africa. During the data collection process, participants reported that water scarcity was caused by multiple factors across the globe. Climate change, industries, communities, population growth, global warming, lack of water re-use information and the government were perceived as the

key causes of water scarcity in South Africa. The major reasons for these perceived causes of water scarcity have been reported by participants as indicated on the table below.

Perceived reasons for water scarcity in South Africa	**Selected quotes of participants**	**Participants details**
Inappropriate uses of water	(P15, P29, P58, P71, P79): Some factors which lead to water scarcity involve the inappropriate way people use fresh water. People waste fresh water across the country, for instance they do not use buckets when washing their cars, use glasses when brushing their teeth and tend to leave their taps open (tap leakages). (P56): "People inappropriately use fresh water due to the fact that they water their gardens with the water"	(P15): Focus group, Mountainview high school, grade 11 learner. (P29): Focus group Ditlalemeso high school, geography educator. (P58): Focus group, Marobathota high school, grade 10 learner. (P71): Interview session, Toronto primary school, foundation phase educator. (P79): Interview session, Moriting primary school, foundation phase educator. (P56): Focus group discussion, Marobathota high school, grade 10 learner.
Industrialisation and water pollution	(P23): "Massive industries across our country lead to water scarcity because they pollute nearby rivers which results in water pollution ". (P50): "With multiple industries across the country, high water pollution is experienced, this makes it difficult for South Africa to have a higher amount of clean and consumable water. These industries pollute nearby rivers which could be used to supply fresh water to nearby societies. The industries not only pollute nearby rivers, they also pollute the entire	(P23): Focus group, Ditlalemeso high school, grade 11 learner. (P50): Focus group, Marobathota high school, maths and science educator. (P47): Focus group Marobathota high school, grade 11 learner.

	environment which might result in acid rain". (P:47) "Due to the accelerating rate of water pollution, people no longer have access to clean fresh water, therefore water pollution lead to water scarcity in South Africa".	
Population growth	(P73): "factors such as high population growth gives rise to water scarcity in South Africa, the demand for water is high while the supply for fresh water is low. Over population strains present water resources and lead to water pollution escalation". (P44): "High population growth lead to water scarcity in South Africa. Birth rate in our country is high while we have fewer rivers which supply us with fresh reliable water".	(P73): Interview session, Toronto primary school, Intermediate phase educator. (P44): Focus group, Hwiti high school, grade 10 learner.
The South African Government	(P13): "The South African government lead to water scarcity across the country. The government does not take care of natural resources; thus, they prioritise poverty alleviation, social grants and other developments. For instance, construction sites use fresh water to damp certain sites where construction is going to take place.	(P13): Focus group, Mountainview high school, economics and accounting educator.
Lack of water re-use information programmes	(P35): "Lack of water re-use information and programmes on water re-use also lead to high water scarcity in South Africa. Information and programmes on water saving strategies are not prioritised by the government or any other department or organisation. We are aware of HIV and AIDS programmes, campaigns, posters, advert and so forth, but we not aware about water conservation methods because such programmes or initiative are not publicised".	(P35): Focus group, Hwiti high school, life orientation educator.

Table 4.2: Perceived causes of water scarcity in South Africa

With reference to the participants responses indicated on table 4.2, Ribot *et al*. (2005); Ludwig and Asseng (2006); John *et al*. (2005) and Mashabela (2015) support these responses by asserting that South Africa is characterised by a low average rainfall, accompanied by high temperatures and evaporation rates which results in water scarcity across the country. In South Africa, plentiful, clean water is no longer guaranteed due to accelerating industrialisation, urbanisation, poor water management practices and rapid population growth (Keremane & Mckay 2009; Keremane, 2017). Focus group discussions and interviews conducted with participants indicated that both environmental issues and human activities (such as agricultural activities and industrial use of water) lead to water scarcity in South Africa. Environmental issues such as globalisation and climate change also lead to water scarcity in South Africa. Over population and poor water management practices and strategies put pressure on the supply of fresh water across the country.

4.3.2. Formal education or training in water conservation methods

This theme examined the percentage of participants who have received or have not received any formal education or training on water conservation or water saving skills in their communities. The theme outlines the level of knowledge participants have about water re-use, as a water conservation method. The pie chart below illustrates the total percentages of responses.

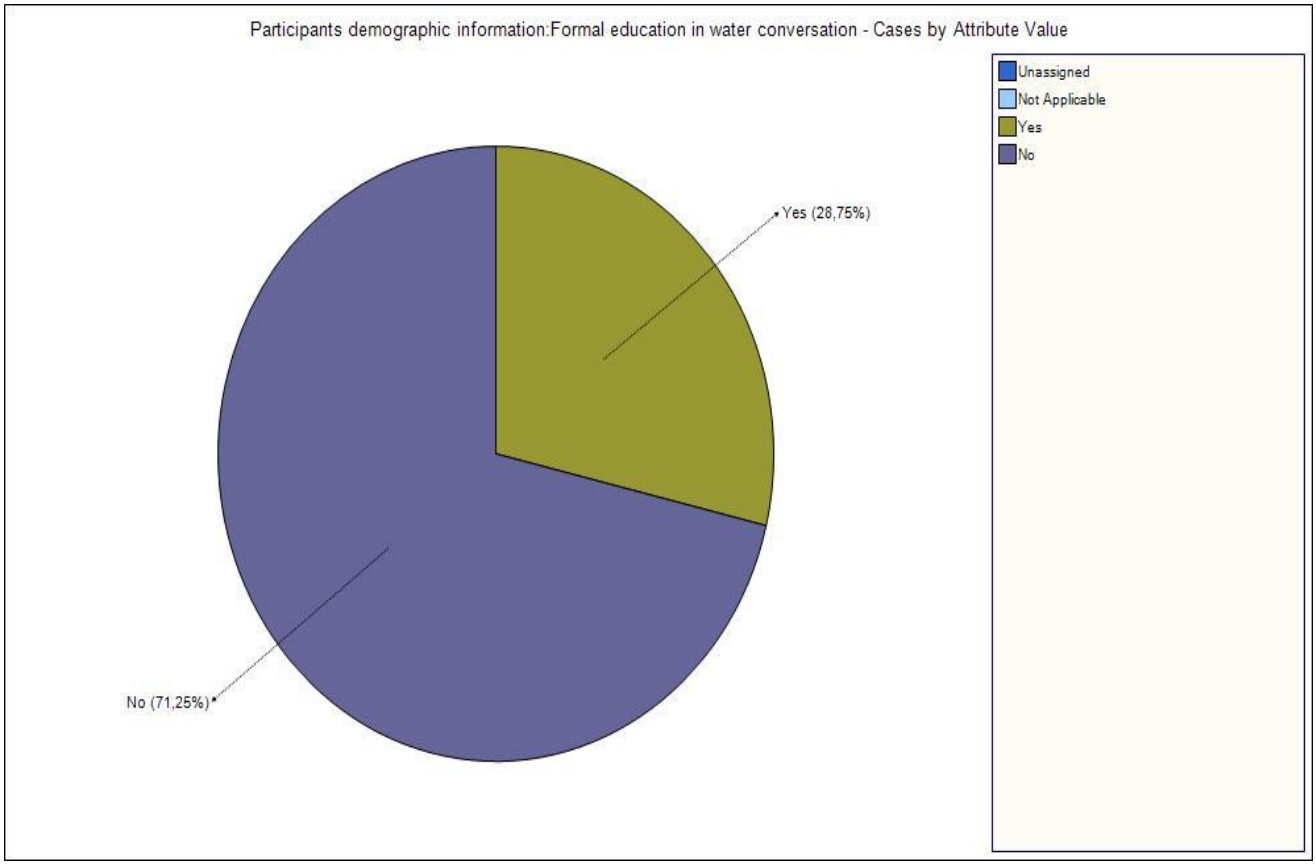

Figure 4.5: The status of formal education on water saving or conservation methods of participants.

The status of formal education on water saving or conservation methods of participants illustrates that the minority (28,75%) of participants had received formal education and had little knowledge of water conservation and water saving skills. The majority (71,25%) of participants had never received any formal education or training on water saving or water conservation methods. These participants lacked knowledge about water re-use. Out of a total number of 80 participants, 10 males and 13 females reported that they had been exposed to formal education on water re-use. 26 males and 31 females reported that they had never been educated or trained about water re-use. These results are supported by the responses below:

> *Oh Ya (head nodding), I have been educated about water saving skills and conservation methods before. Lepelle water officials once came to our community and launched a campaign on water issues. They taught us about water saving strategies and using water containers and tanks for storing water. They told us that we can also use greywater for watering our plants. However, I perceived that as something I should do occasionally. I never took*

> *that serious, I perceived it as entertaining and a way of bringing entertainment to local communities because the officials provided us with free t-shirts and bottles. They were playing music and we were dancing and competing for premiums.*

Focus group discussion, Marobathota high school, grade 11 learner

> *Yes (head nodding), I have been taught about water saving skills and conservation methods when I was in grade 10. It was around March when our geography teacher taught us about water issues. We were discussing about the hydrological cycle and the causes of water scarcity, storing (by using tanks and water containers) and saving skills (through water re-use).*

Focus group discussion, Hwiti high school, grade 11 learner

On the contrary, another participant reported that:

> *We as South Africans are not aware of the impact we pose to the environment and its natural resources. We are not aware of water saving and conservation methods because we have never been exposed to any formal education about water. Majority of South Africans are not taught about such issues. Therefore; we will continue to waste water as long as we are unknowledgeable.*

Interview session, Dikolobe primary school, foundation phase educator

People located in Israel, U.S and China (Beijing) are aware of the water scarcity experienced by their countries. They are knowledgeable about water conservation methods and they support the idea of re-using water for non-body contact purposes. People located in these countries support the idea of water re-use because their governments disseminate information and hold projects and annual meetings on water re-use and experiences and so raise awareness and create knowledge (NWRS1, 2011; Chen *et al*., 2015). Stoakley (2013) indicated that people at the University of Pretoria and the University of Cape Town had positive perceptions towards water re-use because they had been informed that not practising water re-use might result in water shortages in the coming years. The statement indicates that they have been exposed to water re-use education, information programmes or campaigns. They are knowledgeable about the consequences of water scarcity and the importance of water re-use as a conservation strategy.

The responses and statements above give the impression that through educational projects, meetings, programmes and campaigns, residents from various regions would be able to save water and apply water re-use as a water conservation strategy. With knowledge, they will be able to accept and support the idea. Environmental education and communication should be employed to increase awareness and adaptive capacity within a given community. It is perceived as a vital means of information dissemination and communication which can change and improve individuals' perceptions and attitudes towards various environmental issues, such as water re-use (UNFCCC, 2014; Shobeiri, *et al*., 2007; Eroğlu *et al*., 2016; Asuamah, Kumi & Kwarteng, 2012; Adeolu, Enesi & Adeolu, 2014).

4.3.3. Attitudes and Perceptions towards Water Re-Use

This section outlines the perceptions and attitudes of participants towards water re-use. Participants' views, beliefs, and attitudes towards water re-use practices are presented, analysed and discussed in the section.

4.3.3.1. Perceptions on water re-use

As indicated in chapter one and two, a community's perceptions and understanding of the safety and suitability of water re-use, is a key factor to the success or failure of any water re-use programme. Understanding the public's reaction and acceptance of water re-use is vital to the success of any water re-use programme (Nancarrow *et al*., 2008; Lazorova *et al*., 2013). In order for a sustainable water re-use communication strategy to be developed, the researcher interviewed participants on their views and thoughts about water re-use (greywater). Both negative and positive perceptions were raised. The minority (15) perceived water re-use as a positive, effective, user friendly method of saving water, while the majority (65) participants perceived it as a way of spreading diseases.

Out of a total number of 80 participants, 65 participants who resides in rural and peri-urban areas reported not being in favour of water re-use as a water saving method while the minority (15) who came from both areas (peri-urban and rural) (such as unit A, unit, B, unit C, unit D, unit E, unit F, unit G, Ga Molepo and Thabakgone) reported that water re-use could be an effective way to save water and cut down their water bills. For example, participants explained that:

> *We perceive water re-use as a method which can save a huge amount of fresh water per day. Some of us come from unit C, unit G, unit A, unit B, unit E and unit F, we use municipal water and we pay water bills every month. Therefore, we perceive water re-use as an effective and cheaper way of saving water.*

Focus group discussions at Ditlalemeso high school, Hwiti high school, Marobathota high school and Mountainview high school, maths and science educator, life science educator and accounting educator.

> *"We have gardens which need to be irrigated. Using municipal water to irrigate these gardens costs us an enormous amount of money (water bills) per month. Using greywater to irrigate gardens can aid in reducing water bills. Greywater seems to be user friendly and it is much cheaper compared to municipal water".*

Focus group discussion, Hwiti high school and Ditlalemeso high school, language educator and geography educator. Interview session, Toronto primary school and Pula-Madibogo primary school, foundation phase and intermediate phase educator

Another male participant reported that:

> *Water re-use is a way of saving water. In my area (Ga-Molepo Boshega) we rely on rain harvesting but due to the fact that our country is facing rain difficulties we rely on buying water. Water re-use might save a huge amount of fresh water and water bills (smiles).*

Focus group discussion, Marobathota high school, grade 11 learner

When the above responses were given, some participants responded with a smile to show that they were happy about the issue of water re-use and its advantages (a water saving and cheaper conservation method). In support of these responses, NWRS1 (2011); Chen *et al*. (2015); Hyde (2013); Chaggu (2011); Resource Oriented Sanitation concept for peri urban areas in Africa (2010); Mashabela (2015); Bakare *et al*. (2016); and Stoakley (2013) indicated that individuals in local and international spheres perceive water re-use as a conservation method which can be used for irrigation purposes, thus decreasing water costs. With the high cost of water supply in

various areas, water re-use represents cost saving opportunities for a vast number of individuals in various areas (European Commission (EC), 2016).

Out of 80 participants, 65 participants did not support the idea of water re-use. These participants gave reasons such as apprehension about the health implications that could be caused by water re-use. Such concerns are perceived as an example which lead to negative perceptions and public opposition by individuals towards water re-use (Po *et al*., 2005).

For instance, the following concerns were raised:

> *Water re-use can pose health issues towards individuals as it is contaminated and contains various chemicals. Watering plants and vegetations with greywater may cause sickness to individuals eating those floras. When irrigating plants or vegetations with such contaminated water, it might also affect the health and the growth of the plants.*
>
> Focus group discussion, Ditlalemeso high school, grade 11 learner

Participants explained that water re-use is a way of spreading diseases. Watering vegetation with greywater (contaminated water) and eating the produce later might result in diseases and infections. The Food and Agriculture Organisation (FAO) (2010) in EC (2016) reported that environmental and health concerns presented by water re-use pose greater difficulties in the uptake of water re-use practices. Water re-use is perceived as hazardous to individuals who are in contact or who eat food that has been irrigated with re-used water. Plants irrigated with greywater are perceived as flora which may contain viruses, pathogens, persistent organic and toxic contaminants (EC, 2016). Consequently, chemical contaminants from water re-use may also affect the environment negatively. The salinity of the water is risky for the environment and crops. Individuals are afraid to re-use water due to the health implications and emotional factors such as the “yuck factor” (Wilson & Pfaff, 2008; Adewumi *et al*., 2014; Bungu, 2014; Ilemobade *et al*., 2013; Chen *et al*., 2015). These feelings are caused by water re-use trust issues and safety concerns which were reported during water re-use stakeholder consultation workshop. People are afraid to re-use water due to their lack of trust and their safety concerns about possible health risks associated with water re-use.

Contrary to the above responses, one male participant reported that:

> *No (head nodding showing that he disagrees with the response outlined above), "I do not think irrigating plants and vegetations with greywater could have an impact on the health of individuals, I view water re-use as an effective water conservation method. The plants or the vegetation irrigated with re-used water will only consume what it needs and leave all unwanted chemicals behind. Greywater will not have an impact on the health or growth of the plants in any way".*

Focus group discussion, Ditlalemeso high school, grade 11 learner

Contradictory responses indicated that individuals have different perceptions regarding particular issues. Various individuals view a phenomenon from different angles due to discrepancies in their cognition and their own experiences. The above response indicates that water re-use is viewed as an effective water conservation method which might positively affect the economy to save considerable amounts of clean, fresh water and have less impact on the health of individuals or vegetation.

4.3.3.2. Attitudes on Water Re-use

Various factors such as disgust or the "yuck factor" about water re-use, risk perceptions, education and knowledge, emotions and attitudes towards water re-use play a crucial role in water re-use rejection or acceptance (Po *et al*., 2004; Wester *et al*., 2015). This section outlines and discusses participants' attitudes towards water re-use. The emotions of individuals lead to various patterns of attitudes, behaviour and perceptions (Wester *et al*., 2015). For an effective water re-use communication strategy to be implemented, the attitudes of individuals regarding water re-use should be understood. The pie chart below illustrates the participants' attitudes towards water re-use (greywater).

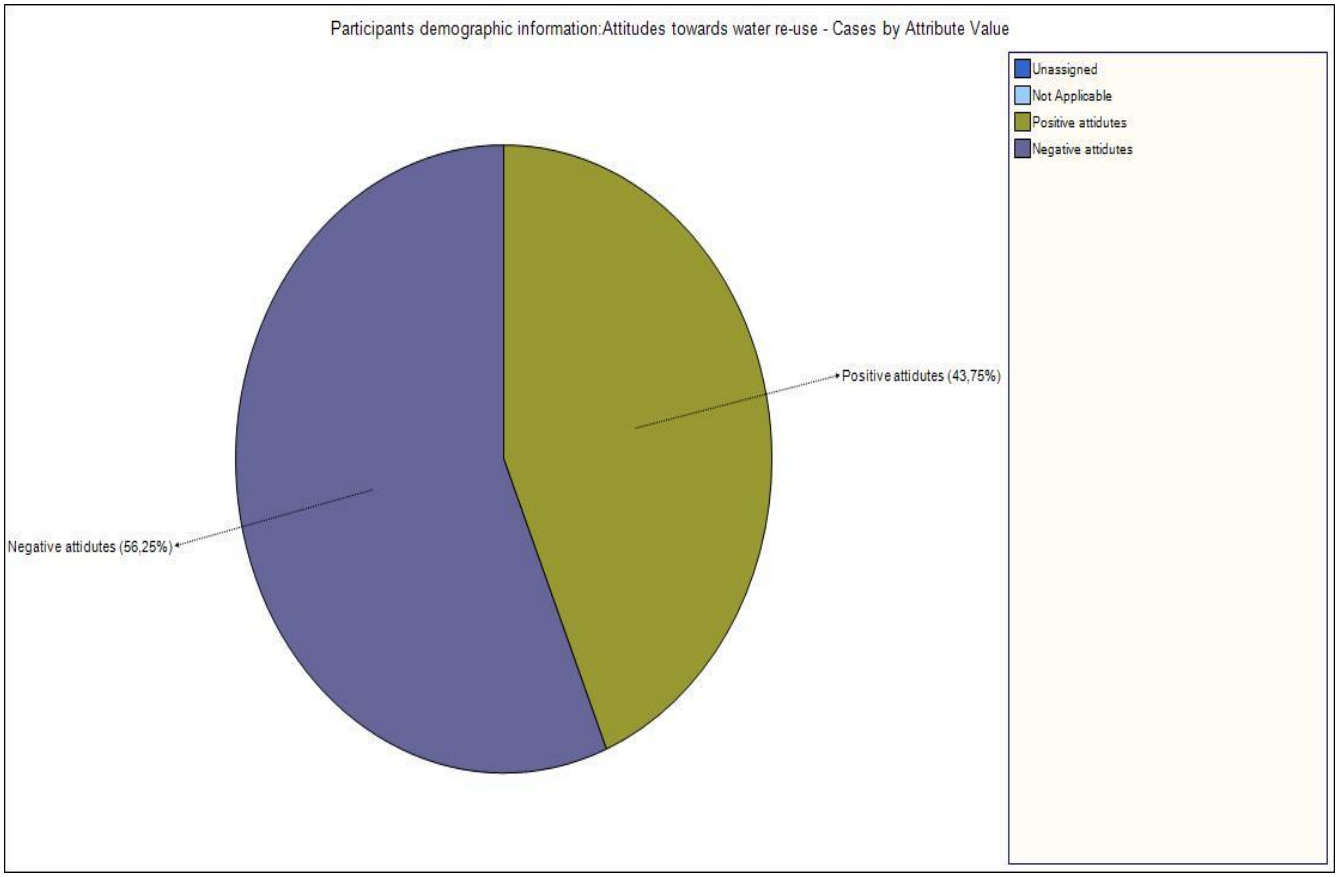

Figure 4.6: participants' attitudes towards water re-use

Attitudes towards water re-use were grouped into two categories - negative and positive. The results illustrated on the pie chart indicate that the majority (56,25%) of participants had a negative attitude towards water re-use, while the minority (43,75 %) were more positive. Male participants showed more interest in the issue of water re-use than females. A total number of 24 males and 11 females had positive perceptions on greywater re-use. 33 females and 12 males had negative attitudes towards water re-use as a water conservation method. Most female participants reacted more negatively to the water re-use discussions than males. The majority of them responded by shrinking their faces and turning away in disgust manner, this indicated that they were of the opinion that re-use of greywater might be disgusting (disgust or "yuck factor"). Gender is one of the factors which affects individuals' perceptions and attitudes towards water re-use. In most cases males are more favourable towards water re-use than females (Bungu, 2014). During the data collection processes, most female (both learners and educators) participants indicated that they had a negative attitude towards greywater re-use than males.

For Example:

> *Using greywater for irrigation purposes, toilet flushing, or car washing might be disgusting. Mistakenly, you might touch the water which have been used by the other person for specific purposes such as bathing. This might cause various diseases because of the bacteria found in the water. For instance, using such water for toilet flushing might be risky because some droplets might drop and unconsciously remain around the toilet seat.*

Focus group discussion, Mountainview high school, grade 11 learner

As outlined above, safety concerns and public health are perceived to be major barriers to the acceptance of water re-use (Bungu, 2014). Po *et al*. (2005) holds that general disgust and health apprehensions are main factors which shapes public responses towards water re-use. These findings are confirmed in this study as it indicates that the participants' responses disapproved water re-use due to health concerns and their disgust factor.

Some participants reported that:

> *Water re-use is a way of saving water. It might help in reducing drought across South Africa. Imagine re-using all the amount of water we consume daily in our households for toilet flushing, irrigation and domestic purposes. A vast amount of greywater will be produced and used for such purposes thus decreasing the issue of water scarcity across the country. Therefore, I have positive attitudes towards water re-use.*

Interview session, Moriting primary school, intermediate phase educator

> *I have been educated about water re-use previously. I do not have a problem re-using water because I have knowledge about the method. I have positive attitudes about water re-use and am willing to practice the method regularly. I am willing to re-use it for toilet flushing, irrigation and would advise contractors to re-use it for constructions.*

Focus group discussion, Hwiti high school, grade 11 learner

> *I really don't have a problem in re-using water. Just like the previous speaker, I have been taught about the water conservation method before. Therefore, I have positive attitudes towards water re-use due to the knowledge I have about it.*

Focus group, Marobathota high school, grade 11 learner

"Knowledge of water re-use has been reported to be one of the factors affecting perceptions and attitudes of individuals towards wastewater re-use" (Alhumoud & Madzikanda, 2010:147). Individuals with little or no knowledge of water re-use have more negative attitudes compared to individuals with more or adequate knowledge on the subject. Individuals with knowledge have positive opinions and are more supportive towards water re-use issues (Dolnicar *et al*., 2011; Hurlimann *et al*., 2006; Bungu, 2014). The responses indicated that education plays an important role in changing individuals' opinions, perceptions and attitude. It provides individuals with knowledge which could lead to more positive opinions, attitudes and decision making on a certain phenomenon.

4.3.4. Drivers or influencers of perceptions towards water re-use

This section discusses influencers or drivers of participants' perceptions and attitudes towards water re-use. Participants' perceptions, opinions and attitudes can be shaped by various factors. They are perceived to be caused by factors such as cultural, religious, environmental, social and political factors (Kastanakis & Voyer, 2014). During the interview sessions and focus group discussions, participants were asked about their perceptions and attitudes, along with the influencers or drivers of those attitudes and perceptions. Environmental, social, cultural and religious factors were reported to be influential factors that contributed to participants' perceptions, behaviours, opinions and attitudes towards a phenomenon.

4.3.4.1. Environmental Factors

This section discusses the environmental impact on individuals' perceptions and attitudes towards water re-use. The environment plays a critical role in shaping individuals' behaviours and attitudes. Attitudes, perceptions and behaviour of individuals develop through constant interaction with the environment (environmental factors) and biological inheritance (Uzoka & Njoku, 2015). During the data collection

process, several participants reported that they had positive or negative perceptions and attitudes towards environmental issues due to the environment they come from. Participants perceived the environment as a contributing factor to their perceptions and attitudes towards water re-use.

Examples of responses:

> *I positively perceive water re-use as a user friendly and effective water conservation method due to the environment I come from. I live at a small rural area named Mankgaile (Ga-Molepo). We do not have running water and we face serious difficulties in getting clean, pure and fresh water. We rely on rain harvesting whereby we store rainwater in large water containers and tanks. With higher temperatures and lack of rain across South Africa, we face water scarcity difficulties, during this time, we rely on purchasing water for domestic purposes. We also have vegetations in our yard and we use fresh purchased water to irrigate them and dump away all the greywater in a hole. Using greywater will help in saving water around Mankgaile village.*

Focus group discussion, Marobathota high school, grade 11 learner

> *I am also located in a rural area named Thabakgone (Ga-Mamabolo). We do not have running water. However, we have street taps, but the water does not run regularly, it can take two to three weeks or even months without running. We also have vegetations which are irrigated with greywater. Therefore, the environment I come from contributes to my positive perceptions and attitudes towards greywater re-use.*

Focus group discussion, Marobathota high school, grade 11 learner

> *I am from Mankweng Unit C, a small peri-urban area. We have municipal running water which runs almost every day. I negatively perceive water re-use as filthy and unclean. I do not imagine myself using water which consists of germs. We do not struggle getting clean water in my area, and we use it to irrigate our gardens and vegetations. I find it unworthy to use greywater while we have clean running water at home. I grew up in this environment where we do not struggle to consume clean fresh water, this is the reason why I have negative attitudes towards greywater as a water conservation method.*

Focus group discussion, Ditlalemeso high school, grade 10 learner

> *I am from Mankweng Unit G. At home, we have municipal running water and it runs almost every day. The environment taught me that water is not a scarce resource, therefore I have negative perceptions and attitudes towards water re-use.*

Focus group discussion, Mountainvew high school, grade 11 learner

The above responses indicated that the environment can contribute to people's attitudes and behaviours towards a phenomenon. These responses indicated that participants who come from rural areas had more positive perceptions and attitudes towards water re-use as opposed to those who come from urban and peri-urban areas. The findings indicated that people who come from an urban and/or peri-urban environment, and who had running water in their yards perceived water re-use as more impractical than those who come from a rural environment and who struggled to get fresh running water.

The idea that environmental factors affect individuals' behaviours is supported by the behaviour ecological model as it outlines that certain human behaviour shapes and is shaped by environments and social environments around them (Dresler-Hawke & Veer, 2006). People behave in certain ways due to the environment they come from and various social structures or socio demographic factors they are associated with. This was also emphasised during the stakeholder consultation water re-use workshop. The workshop reported that environmental factors (considerations) can affect individuals' perceptions, attitudes and water re-use programmes.

4.3.4.2. Social, Cultural and Religious factors

This section discusses social, cultural and religious factors as influencers of perceptions and attitudes towards water re-use. Social, cultural and religious factors are also considered as influencers or factors which affect individuals' attitudes, perceptions and behaviours towards various environmental issues. Participants reported that they behave in certain ways due to various social levels, cultural and religious beliefs. This was reinforced during the stakeholder consultation workshop. During the workshop, social and cultural factors were reported as key drivers or factors affecting water re-use rejection or acceptance.

For instance, participants reported that:

> *Participant: I am a black Sepedi speaking individual who belongs to a Pedi culture. I have negative attitudes towards water re-use because our cultural beliefs. Our culture taught us that used water (especially the one used for bathing) should not be re-used for any other purposes. In our culture we believe that someone's greywater should go straight to the dump because each and every person has his or her own sins and bad lucks, this means that if a person bathes, his or her sins will be left in the water. If you re-use such water for irrigation, car washing, constructions or any other purpose, the bad lucks will be transferred from the original user to the next.*
> *Researcher: How will greywater produced through bathing affect and transfer bad lucks to the plants, the washed car or construction sites?*
> *Participant: The vegetations irrigated with the water might not be reproductive or the people who are going to eat those vegetations might have bad lucks and even get sick, the car might be exposed to accidents, and the road made during constructions might cause a lot of accidents. This also applies in our religion. Someone's water should not be used for any other purposes due the sins and bad lucks washed off. Re-using such water can transfer all the sins and bad lucks to other things.*
> *Researcher: Oh, okay now I understand.*

Interview session, Dikolobe primary school, foundation phase educator

> *I do not believe in re-using water because our religion holds that when you bath or become baptised you remove all the sins and bad lucks attached to you. Therefore, greywater should not be used for any other purpose. This is the main reason I have negative attitudes and perceptions towards greywater re-use (especially the one from bathtubs).*

Focus group discussion, Ditlalemeso high school, grade 10 learner

> *At home we sometimes practice greywater re-use through irrigation. Personally, I do not have a problem with greywater re-use because we already practice it at home. My mother will even be furious if she sees me pouring greywater in a damp hole. In most cases we irrigate our vegetations with greywater.*

Focus group discussion, Marobathota high school, grade 11 learner

The above responses indicated that multiple levels of influence contribute to individuals' behaviour towards environmental issues. The behaviour ecological model posits that people behave in particular ways because of the influence they receive from individuals at various social levels (Dresler-Hawke & Veer, 2006). Individuals behave in a manner that is learned from their respective communities. This is due to their families, teachers, governments, cultures, religions, councillors, friends, neighbours and so forth. Culture and religion are also vital factors which shape the way individuals perceive a certain phenomenon. Human perceptions and attitudes on environmental issues are often shaped by their cultural beliefs, religion and behaviours (Kastanakis & Voyer, 2014; Muanda *et al*., 2017a). Geertz (1973:12) stated that "culture is public because meaning is" and it is evident in human behaviour. Culture is a collaboration of shared meanings amongst members of a society. The root of the culture of a community (social or cultural level) is considered the driving force behind how human beings learn to behave (Colbert, 2010; Dresler-Hawke & Veer, 2006).

4.3.5. Strategies to promote water conservation methods (greywater) in South Africa

As mentioned earlier, the purpose of this study is to develop a water re-use communication strategy for Basic Education, which include illustrative learning materials suitable for online learning. This section outlines the strategies that could be used to promote water re-use as a water conservation method. During the data collection process, the researcher interviewed and discussed strategies which participants think should be implemented to promote water re-use as a water conservation method. Education, campaigns and programmes, traditional and new media, community meetings and rules, policies and regulations on water re-use were reported as effective strategies to promote water re-use.

4.3.5.1. Education on Water Re-use Issues

As outlined in chapter two, education is a tool which can enhance individuals' understanding, mitigation and adaption of environmental issues. It is a continuous learning process in which individuals acquire knowledge, values, experiences and skills with the aim of improving their perceptions and attitudes about environmental issues (UNFCCC, 2014; Eroğu *et al*., 2016). This section discusses education as a water re-use promotional strategy. All 80 participants, who contributed to the study, reported that education might be an effective strategy to promote environmental issues such as water re-use. The statement was also raised during the stakeholder consultation water re-use workshop. During the workshop, education was reported as an important tool which could be used to promote and teach individuals about water re-use, its advantages and disadvantages, thus minimising the perceived safety concerns and trust issues towards water re-use.

For instance, participants reported that:

> *You know, education is a vital element which can be used to fix the world. Through education, we know and understand various issues along with their advantages and disadvantages. For example, we know about issues of HIV/AIDS because of education, we know that one should use protection in order to avoid unprotected sex which might results in various consequences such as teenage pregnancy, HIV/AIDS and STI's. We know that we should wash our* hands *after using the bathroom or before eating. We know and understand all these issues because we have been taught about them.*

Focus group discussion, Hwiti high school, Maths and Science educator

> *As learners, we believe that in order to be familiar with water re-use practices, water and water re-use issues should be emphasised and included in our curriculum.*

Focus group discussions, Mountainview, Hwiti, Ditlalemeso and Marobathota high school, grade 10 and 11 learners

Water re-use should be introduced and initiated as a subject and water academic resources must be available at schools. Through education we will be able to quickly adapt and practice water re-use.

Interview session, Toronto primary school, intermediate phase educator

If the government prioritises education on water re-use, a lot will change. People will be able to practice water re-use due to the knowledge they have about the method. This is the reason why education is called a key to change each and every situation.

Focus group discussion, Mountainview high school, grade 11 learner

Through education and communication, people will quickly adapt to water re-use. Education (along with communication) can change the way people think and perceive a certain phenomenon. Education is a key factor which can promote water re-use and lead to sustainable knowledge on water re-use.

Stakeholder consultation water re-use workshop

These examples indicated that education and communication was key to any successful water re-use programme. It is a powerful tool which can be used to make a difference. Participants emphasised that through education, awareness about water re-use would be raised and knowledge would be gained. With knowledge and understanding about water re-use, people would be able to change their beliefs, values, attitudes and perceptions towards water re-use issues. Through water re-use academic resources, learners and educators believe that individuals would be able to learn and better understand water related issues.

4.3.5.2. Water re-use campaigns and programmes

Although all 80 participants who contributed in the study reported that education was a key strategy to promote water re-use, some participants also reported that school and community environmental programmes and campaigns addressed to a specific target group could promote water re-use and influence environmental attitudes, knowledge, behaviour and perceptions. During the stakeholder consultation water re-use workshop, public awareness campaigns and programmes were also reported as key factors which could promote water re-use across the globe. The statements were

reinforced by Asuamah *et al*. (2012) and Adeolu *et al*. (2014) as they posited that sustainable programmes and campaigns can play a crucial role in promoting environmental issues. Asuamah *et al*. (2012) and Adeolu *et al*. (2014) maintained that campaigns and programmes could change individual's attitudes, beliefs and behaviours towards environmental issues. Out of a total number of 80 participants, 72 raised the issue that campaigns and programmes could be used to promote water re-use.

For instance:

> *Similar to education, people are aware about HIV/AIDS due to campaigns held in various schools and communities. HIV/AIDS campaigns and programmes taught us about HIV/AIDS, its causes and consequences. For example, programmes such as Soul City, Soul Buddies and Yesterday made us believe and see how people living with HIV/AIDS struggle. Some schools have HIV/AIDS dramas played by learners during school functions in order to expose them to the causes and consequences of HIV/AIDS. Today we are knowledgeable and aware about the risks associated with HIV/AIDS. This shows that through campaigns and programmes water re-use aims and objectives can effectively be achieved. Therefore, campaigns and programmes on water-use can play a vital role in promoting water re-use, raising knowledge and awareness as well as changing people's perceptions and attitudes. Campaigns and programmes can also motivate individuals to practice water re-use.*

Focus group discussion, Mountainview high school, grade 11 learner

> *In order to drive behavioural change and promote water re-use, water awareness campaigns need to be carried out to the community and Basic Education Department level. Various communities and schools should be exposed to water re-use practices.*

Interview session, Pula-Madibogo primary school, intermediate phase educator

The above responses indicated that programmes and campaigns were regarded as tools which could be used to promote water re-use and can achieve development and social change about water issues. In 2017, Rodney Mashele - acting deputy director

of Water Services Regulations - reinforced the statement by stating that for behavioural change to occur around the use of water, awareness campaigns need to be implemented and carried out at various social levels such as at schools, communities, organisations and so forth.

4.3.5.3. The Use of Traditional and New media

Traditional and new media are viewed as communication tools which can be used to encourage water re-use among individuals in various demographical levels and locations. Through traditional and new media, awareness and effective behavioural change can be achieved among individuals across the country. During the data collection, all (80) participants supported the idea that traditional and new media could be used as tools which could effectively promote water re-use practices to various target groups.

For instance:

> *Media is an effective communication tool which can be used to promote water re-use. I am sure that majority of us have televisions at our homes, some of us have personal laptops and android cell phones. Using these tools to raise awareness and to promote water re-use might positively encourage water re-use practices.*

Focus group discussion, Ditlalemeso high school, geography educator

> *Advertising and developing water re-use programmes on televisions and social media might lead to attitudinal change. If an attractive advert which is associated with a particular celebrity re-using water could be developed, a vast amount of people will be persuaded to do what the celebrity does, therefore majority of people will begin to practise water re-use. Attractive elements on adverts and programmes need to be considered to effectively promote water re-use.*

Focus group discussion, Mountainview high school, grade 11 learner

Contrary another participant reported that:

> *I think water re-use should start with the younger generation than the older one. Young individuals are considered as future developers and changers of societal problems. Yes (head nodding), I agree that both new and traditional media should be used to promote water related issues but using and advertising on traditional media will only grasp older individuals' attention. I think new media should be used to effectively target new generation and to promote water re-use issues. Developing an effective advert might be effective but majority of people, especially young people are no longer paying attention to adverts. New media (social media) provides a platform for a two-way communication where individuals can participate throughout water re-use programmes and raise out their concerns on water re-use. Learners spend most of their time on social media, therefore new media can be used to effectively promote water re-use practices.*

Focus group discussion, Mountainview high school, agricultural science educator

From examining the data, participants in the first example agreed that traditional and new media could be used to promote water re-use. Advertising and publicising on traditional and new media might promote water re-use and lead to behavioural and attitudinal changes. The second example emphasised specific media suitable for a particular target audience. The example supports the belief that both traditional and new media can be used to promote water re-use, however it emphasises that new or social media should be used to promote water related issues to the younger generation or learners who are perceived as future leaders and developers of the country and who spend most of their time on social media. Due to the nature of social media- a two-way communication media which provides a platform for participation - water re-use can effectively be understood, promoted and adapted by most individuals. The South African Development Community (2006) posited that two-way computer-based or new media materials were more effective and productive than other traditional materials. Computer-based or new media materials could be used to raise awareness and educate people about environmental issues such as water re-use. Slabbert (2019) postulated that today's campaigns are gaining more attention on

social media than traditional media due to its accelerating reach and targeting capacities.

4.3.5.4. Rules, Policies and Regulations on Water re-use

Rules, policies and regulations are effective legislative frameworks which might be used to promote water re-use. They can be implemented by the government to foster water re-use practices. Out of the total of 80 participants, 71 participants reported that rules, policies and regulations could be used to effectively promote water re-use practices in South Africa.

For example:

> *Rules, policies and regulations can be used as factors which promote water re-use legislative frameworks. Water scarcity is a serious challenge facing our country; therefore, people must be forced to adhere to water re-use rules and regulations.*

Focus group discussion, Ditlalemeso high school, geography educator

> *If rules, policies and regulations on water re-use can be implemented and emphasised, people will stop using water inefficiently and re-use water efficiently. Therefore, rules, policies and regulations can be used to effectively promote water re-use.*

Interview session, Dikolobe primary school, intermediate phase educator

> *People have safety concerns and lack of trust towards water re-use. Rules, policies and regulation can help in promoting water re-use and reduce perceived trust and safety concerns people have about water re-use. Rules, regulations and policies should be implemented explaining water re-use benefits. This will lead to massive water re-use practices across the country.*

Focus group, Ditlalemeso high school, geography educator

The examples above emphasise that rules, policies and regulations were perceived as factors that could promote water re-use and change individual's perceptions, attitudes and behaviours towards water re-use. Rules, policies and regulations are perceived as legislative frameworks, which can be employed to reduce risk and trust

concerns regarding water re-use. They are reported to be effective legislative frameworks which people should adhere to in order to promote change and development within a given country. In other words, the legislation that makes it safe to re-use water, should be communicated to the communities

4.3.5.5. The use of community meetings to promote Water re-use

Community meetings can also be used to promote water re-use in South Africa. Municipalities, counsellors and traditional role players should organise water re-use community meetings where individuals in given societies meet, communicate, raise awareness and share knowledge about water re-use. They play a crucial role in changing individuals' perceptions and attitudes towards a specific issue. With the total number of 80 participants, the majority (67) reported to have support for the use of community meetings as tools which could be used to promote water re-use, while the minority (13 participants) showed a lack of support for these activities.

For instance:

> *Community meetings provides individuals with a platform to communicate and interact with social structures and organisations. Through community meetings, people can participate, communicate and raise out their issues and concerns. Community meetings can be used to promote water re-use because people can be able to ask questions and understand the concept of water re-use broadly, with the knowledge, they will easily adapt to water re-use.*

Focus group discussion, Mountainview high school, life sciences educator

> *Community meetings can attract a wide number of individuals. Remember in most communities, if a counsellor, municipality or a king or queen announces a meeting which talks about various problems and remedies to the problems, people will attend, listen and in-turn practice the remedies at their households due to the fact that the problems and remedies were raised by the most respected and known person or organisation. So yeah, I think community meetings will assist in promoting water re-use.*

Focus group discussion, Mountainview high school, grade 11 learner

> *I agree with both the speakers (in the first and second example) as they report that community meetings can play a vital role in promoting water re-use. People believe in their municipalities, counsellors, kings or queens because they know and trust them, and they can talk to them about various issues and concerns and ask them questions about a particular issue on hand. Constant interaction will lead to change and adaption towards water re-use practices.*

Focus group discussion, Mountainview high school, grade 10 learner

From the above examples, it can be concluded that people believe in a two-way, bottom-up communication approach, which occurs through participatory and developmental communication. People report a higher level of acceptance when the issue is presented by a person or organisation who they are familiar with. They can quickly adapt to change if they have been consulted and included in any development programme, such as water re-use programmes, campaigns and meetings. This finding is in contrast to that of Van Niekerk and Schneider (2013) who posited that South African communities do not have confidence in local authorities due to poor maintenance, performance municipalities and operations.

Community meetings provide a platform for participation and offer opportunities for the public to express their views on development projects such as water re-use projects. They provide rich information, greater trust and transparency, shared responsibility and lead to healthier relationships (Madzivhandila & Maloka, 2014). Education, communication, new media, and community meetings lead to participation and developmental approaches. The above responses indicate that for water re-use to be actively practised, bottom-up participatory and developmental approaches to communication with citizens should be prioritised (Melkote & Steeves, 2001; Ascroft & Masilela, 1989; NWRS2, 2013).

Another male participant reported that:

> *I disagree with what the first speakers say about community meetings. Community meetings cannot play an effective role in promoting water re-use practices. During community meetings, people do not pay attention. The most respected person might talk, but not all people will listen to what is said. Through these activities, some people cannot participate and raise out their*

questions and thoughts. In many community meetings, people tend to make noise which might jeopardise the message. We spend most of the time standing in one place and end up losing interest. Therefore, I regard community meetings as ineffective tools which can be used to promote water re-use.

Focus group discussion, Mountainview high school, grade 11 learner

The first two examples indicate that community meetings could promote water re-use effectively. The last example indicates that even though community meetings are reported to have a positive impact on water re-use promotions, they can also have a negative impact towards the promotion of water re-use practices. First, the response indicates that community meetings are time consuming. Second, community meetings make it difficult for individuals to participate and ask questions. Third, during community meetings, many people tend to make noise and do not listen to the key message of the meeting. Most responses indicate that community meetings should not be employed as activities which could be used to effectively promote water re-use due to these disadvantages.

4.3.5.6. Use of individual's home language

During the data collection process, language was perceived as a strategy to promote water re-use. The researcher experienced that language is a central issue for development messages. She asked some questions in English and discovered that the majority of the participants had misunderstood the questions. The respondents (participants) will look away or down and kept quiet, which showed that they either did not understand the question or were not confident to attempt an answer. Some began arguing about the meaning of the question.

For instance:

Researcher: Let's talk about your perceptions regarding water re-use.
Participant: Yeeee? aowa wa kwa jwale le thoma go re thema (What? Now you are speaking a foreign language).

Focus group discussion, Ditlalemeso high school, grade 11 learner

Researcher: Tell me about your perceptions towards water re-use.
Participants: What?
Yeee?
Eng?

Focus group discussion, Mountainview high school and Hwiti high school, grade 10 and 11 learners

The researcher discovered that participants experience difficulties in comprehending some of the concepts presented in English. She realised that using their home language, when sending water re-use messages, was vital. This indicate that mother tongue or home language must be used to impart water re-use education and information materials. The language must then be supported by English as a second language.

4.3.6. Information materials or activities used to access information on environmental issues

This theme outlines the information materials or activities used by participants to access information on environmental issues such as climate change, pollution, water issues, population rate, global warming and so forth.

Out of a total number of 80 participants, the majority (63) reported that they relied on word of mouth and computer-based activities such as the internet and social media, to access information about environmental issues. The minority (17) of participants reported that they relied on traditional sources, such as television, radio and newspapers in addition to word of mouth.

For instance, participants reported that:

Social media is flexible, it is easy to use and access. Information presented on social media comes directly to you, can be read and re-read, responded and accessed anytime. This is the main reason why I rely on social media to access information about various environmental issues. I also rely on word of mouth through my friends and classmates.

Focus group discussion, Mountainview high school, grade 11 learner

Social media is easy to use. Information presented on social media grabs more attention than information presented on televisions, radios, magazines and newspapers. As a learner, I am an active user of social media, I spend most of my spare time on various social media platforms, therefore, I rely on social media to access information on different issues.

Focus group discussion, Ditlalemeso high school, grade 10 learner

I rely on the internet, social media platforms and word of mouth. Sometimes I do not have time to go through various social media platforms, therefore I rely on hearing information from my friends, colleagues and family.

Focus group discussion, Ditlalemeso high school, Maths and Science educator

I rely on television and word of mouth to access information about environmental issues. Unlike social media, television is the most reliable medium and it presents real information. With television, I can be able to view all the information presented about environmental issues.

Focus group discussion, Marobathota high school, Language educator

Participant: I only rely on television, radio, newspapers and word of mouth through my friends and colleagues to access information on environmental issues.
Researcher: Why do you rely on these information tools only?
Participant: These traditional mediums are mainly reliable and trustworthy. I only rely on word of mouth if I have missed some information, mainly on television.
Researcher: Okay.

Interview session, Toronto primary school, intermediate phase educator

As stipulated above, the results indicate that the majority of participants rely on computer-based (new media or social media) activities while the minority of participants rely on traditional media. Traditional media, particularly television and newspapers, still play a dominant role in disseminating information and designing communication and behavioural change campaigns. However, the use of communication technology has gained more popularity and attention, it accelerates the circulation of information which could reach massive audience and lead to knowledge and awareness (Khajeheian & Mirahmadi, 2015; South African

Development Community, 2006). The majority of these individuals perceive computer-based materials and activities as more effective than traditional materials. They are perceived as flexible tools of communication which provide a platform for bottom-up participatory communication to take place.

4.3.7. Water re-use illustrative learning materials

This theme discusses illustrative learning materials used to simplify and add support to the learning process. It outlines the preferred water re-use illustrative learning materials that could be used and understood by both learners and educators in a given social context. Individuals have their own preferred learning methods, some prefer to process information in visual or picture-based methods by means of posters, storyboards and so forth, while some prefer verbal and non-verbal methods such as books, computers and listening to educators (John, Shahzadi & Khan, 2016). During the data collection process, participants reported that they preferred water re-use illustrative learning materials. The majority (79) of the participants preferred to use picture-based materials, such as posters and storyboards which could be accessed through computer-based materials, while the minority (1) of participants preferred to use books or booklets.

For instance, participants said:

> *An illustrative learning water re-use material should be in a computer-based material. It can be in the form of a poster or storyboard. A computer-based material which can be accessed through the internet or any social media platform and which can be accessed anytime at any geographical area is more preferred than books which are geographically limited and consists of massive information which can be difficult to comprehend. Posters and storyboards are easy to comprehend by all age groups.*

Focus group discussion, Hwiti high school, Maths and Science educator

> *Hmm, I prefer to use posters as illustrative learning materials. Posters are easy to comprehend, and the information is presented in a clear, logic and understandable manner. Information presented on posters is not clumsy and it is easy to understand the key message presented.*

Focus group discussion, Mountainview high school, grade 11 learner

As a learner, I prefer to learn through posters and storyboards as illustrative learning materials. Posters and storyboards are easy to understand, they consist of pictures and cartoons which grabs attention, and which are easy to understand.

Focus group discussion, Marobathota high school, grade 11 learner

You know today we live in a digital society; people prefer to learn and to access information about various issues through the internet. I also prefer to learn and to access information through the internet. With illustrative learning material, I will prefer to use a poster or storyboard which can be accessible through the internet. It must also be able to be shared from one individual to another through various social media platforms.

Focus group discussion, Mountainview high school, grade 11 learner

Posters and storyboards which can be accessed through computer-based materials should be used to educate about water re-use issues. I highly prefer to use these materials because I perceive them as effective and easy to use and understand. They present information in a precise and comprehendible manner.

Focus group discussion, Hwiti high school, grade 11 learner

I prefer to use posters as illustrative water re-use learning materials. Posters do not consist of too much information, they are more accurate, simple and clear. Posters are convincing and they grab more attention due to the colours and pictures presented.

Interview session, Dikolobe primary school, intermediate phase educator

Storyboards are effective illustrative learning materials. They are easy to understand and are suitable for different age groups, from foundation phase to further education and training (FET) phase. Storyboards which can be taught through projectors and accessed online are preferred to be suitable and effective for water re-use education.

Interview session, Moriting and Toronto primary school, Foundation phase educators

The above responses indicate that participants prefer to use posters and storyboards which could be accessible through computer-based materials such as the internet and social media platforms. Participants reported that posters and storyboards played an important role in raising awareness and educating about various environmental issues. They are viewed as materials which are convincing, attractive and easy to comprehend. These communication tools consist of pictures with eye-catching colours that present information in an accurate and precise manner. Online computer-based tools are perceived as effective tools which can be used to improve the education sector. Illustrative learning materials (posters and storyboards) which can be accessed through computer-based materials can improve environmental education such as water-use issues, they play a critical role in information sharing, group work and team spirit (Maynard, 2018; South African Development Community, 2006).

Another female participant added that:

> *According to my knowledge, books provide us with full unlimited information. Therefore, I think books should be used as illustrative learning materials to water re-use. The government should provide us with books on water and water re-use issues. Books consist of more reliable information than any other illustrative learning materials. Therefore, I prefer to use books as illustrative learning materials for sustainable water re-use knowledge to be created.*

Interview session, Dikolobe primary school, intermediate phase educator

The above response indicate that the participant prefers to use books and booklets as illustrative learning materials. Books and booklets are perceived as effective materials which contain accurate and reliable information. They are perceived as support materials which provide readers with a wide range of unlimited information.

4.3.7.1. Pre-testing illustrative materials

As indicated above, the majority of the participants prefer to use picture-based materials such as storyboards and posters. The study designed and developed a water re-use poster and storyboard learning materials which were pre-tested. The findings reveal that majority of learners and educators easily comprehend picture-based materials and actively participate throughout the learning process.

For instance:

> *The researcher: What do you see on the two illustrative learning materials for water re-use?*
> *Participant: The materials show that clean water can be re-used. It shows how one can re-use water. Water for washing laundry and bathing can be re-used for other purposes such as toilet flushing, constructions, car wash and irrigating sport grounds while laundry, vegetable or fruit rinsing and hands washing water can be re-used for irrigating food crops.*
> *Researcher: Do you understand the message presented by the material?*
> *Participant: Yes, the material shows that we must save water by re-using water for other purposes.*

Focus group discussions, Hwiti high school, grade 11 learner

> *Researcher: What do you see on the two learning materials?*
> *Participant: I see people washing, bathing, rinsing fruits and vegies, later, the water is used again for car washing, irrigation, toilet flushing and constructions. The poster shares water messages that shows that South Africa is facing water scarcity issues, therefore we can save water by using it again.*
> *Researcher: Okay, so what do we call water which comes from laundry, dish washing, rinsing and bathtubs?*
> *Participant: It is shown on the learning materials, greywater.*

Focus group discussions, Ditlalemeso high school, grade 10 learner

> *Researcher: Educators what do you think about these learning materials?*
> *Educator: The materials are well designed and easy to comprehend by various demographic groups. It is understandable and easy to teach.*
> *Educator: Mmmmm these materials are wow (head nodding). They are easy to comprehend by individuals from different social, cultural and economic structures. They are just perfect for effective learning and are suitable for all grades.*

Focus group discussion, Marobathota high school, Language educator and Interview sessions, Toronto (foundation phase educator), Moriting (foundation phase educator), Pula-Madibogo (intermediate phase educator) and Dikolbe (intermediate phase educator) primary school.

During the pre-testing process of the learning materials, it was shown that participants easily understand information which was presented and integrated with pictures and colours. All participants understood the materials and message presented. No difficulties were experienced during the process. Learners and educators from both primary and secondary schools comprehended the materials and perceived them as effective to water re-use education. As indicated in section 2.4.1.2, participants were also tested by means of a summative assessment which posed questions on greywater re-use (refer to appendix 9). The questions were correctly answered. Both the discussions and assessments indicated that the participants had understood the various functions and uses of greywater. They understood that bathing and laundry washing water which contained soapy chemicals should not be re-used for food garden irrigation purposes, but instead for flushing of toilets, non-food garden irrigation and washing of cars, and rinsing water which contained no soap or chemicals could be used for food garden irrigation and construction purposes. The illustrative learning materials were comprehended by the participants and the information revealed to be well presented and easily understood.

4.4. ADDRESSING THE RESEARCH QUESTIONS, AIMS AND OBJECTIVES

This section addresses the research questions, aims and objectives of the study as outlined in chapter one. To give a wider understating of the study, research questions and objectives which aided in exploring reasons behind the selected preferred methods and information activities, promotional strategies, acceptability, attitudes and perceptions of water conservation methods, such as water re-use were employed.

4.4.1. What are learners and educators' perceptions and attitudes on water re-use in South Africa?

This research question aimed to understand participants' perceptions and attitudes towards water re-use. As deliberated above, for a successful water re-use communication strategy to be developed, individuals' perceptions and attitudes towards water re-use need be known and understood. The study findings indicate that participants have different perceptions and attitudes regarding water re-use. Some participants have positive perceptions and attitudes towards water re-use, while others have more negative perceptions and attitudes towards the method. The majority of participants who contributed to the study positively viewed water re-use as a water

conservation method which could save considerable amounts of fresh water across South Africa. It is perceived as a way to both save water and decrease water bills. The majority of participants who have running (municipal) tap water and who live in peri-urban and urban areas pay water bills monthly and greywater re-use is perceived as a way to decrease their water bills. On the contrary, the minority of participants (especially learners) living in peri-urban and urban areas who also have running (municipal) water in their households perceived water re-use as impractical and a way of spreading diseases. These individuals were concerned about possible health and safety concerns associated with water re-use. With regard to attitudes on water re-use, the majority of participants had negative attitudes towards water re-use due to the “yuck factor” and a lack of knowledge about the method. The minority of participants who have minor water re-use knowledge had more positive attitudes towards this water conservation method. The findings revealed that most female participants have more negative attitudes than the male participants and most learners have more negative attitudes towards water re-use than the educators.

4.4.2. To what extent do learners and educators understand the dynamics of water re-use?

This research question aimed to determine the level of cognisance participants have of the different facets and dynamics of water re-use. The majority (71,25%) of participants who were involved in the study indicated that they have no idea or knowledge of water re-use because they have never been exposed to any formal education or training on water re-use and its facets. The minority (28,75%) of participants indicated that they have been exposed to some water re-use education, however they appeared to lack knowledge about the dynamics and various aspects of this method of conservation. The findings reveal that the participants lack knowledge about water re-use as a water conservation method. They do not comprehend or understand the method clearly. Little is known about this water conservation method and much should be done to generate knowledge on the issue.

4.4.3. What is required to enhance learners and educators understanding and influence their decision making related to water re-use?

This research question helped the researcher to explore strategies which might be used to promote water re-use and enhance understanding and more positive decision making for learners and educators towards water re-use. Participants who contributed to the study reported that in order to enhance their knowledge and understanding of water re-use, various communication tools and activities on water re-use should be implemented and employed. Education was reported as one of the key tools which could be used to enhance knowledge and understanding of water re-use. Educating people on water re-use could help minimise health and safety concerns. Education was perceived as a tool which could influence change and development within a particular society. Participants reported that water re-use should form part of the curriculum. It should be included into the educational system and form part of environmental subjects.

Public awareness campaigns and programmes on water re-use were also reported as strategies which could enhance understanding and acceptance of water re-use by learners and educators. Water re-use public awareness campaigns and programmes could aid in raising awareness and increasing knowledge on water re-use. They could help to increase acceptance of water re-use practises by learners and educators in Basic Education. This key finding reveals that water re-use awareness campaigns and programmes could lead to water re-use behavioural change and acceptance.

Another key finding is that of the use of traditional and new media to enhance understanding and knowledge on water re-use. Traditional and new media are perceived as activities which could be used to promote water re-use, enhance knowledge and raise awareness of water re-use practices. All 80 participants are of the opinion that traditional and new media should be used to promote and publicise water re-use. They are of a view that media is an effective communication tool which could be used to promote water re-use practices. However, some participants support the choice of new media as effective for activities which could be used to promote water re-use and enhance understanding over the use of traditional media.

Legislative frameworks (rules, policies and regulations) were also reported as factors which could promote water re-use in South Africa. The findings revealed that

legislative frameworks on water re-use should be implemented and adhered to. Legislative frameworks could aid in minimising trust and safety issues individuals have about water re-use. They could play a vital role in assuring individuals that water re-use is practical, and that it is a harmless water conservation method.

4.4.4. Which information material or activity should be utilised to influence Learners' and educators' acceptance on water re-use?

This research question assisted the researcher to determine the most appropriate information activity which could be used to share information on water re-use. The findings revealed that new and traditional media could be used as tools to assist in the dissemination of information on water re-use issues to different target groups. The majority (63) of the participants reported that they relied on the internet and social media platforms as well as word of mouth while the minority (17) relied more on traditional media, such as television and newspapers as well as word of mouth to access information on different environmental issues. However, both traditional and new media can play a crucial role in disseminating information on environmental issues. Stanyer (2001) emphasises that traditional and new media have vital implications in disseminating information and shaping of public opinion. The findings revealed that the minority of participants, especially the older generation, prefer to access information through traditional media, while the younger generation prefer new media as suitable tools for information sharing and knowledge generation. They further indicate that both traditional and new media can simultaneously be utilised as information activities to share information and raise the level of acceptance on water re-use to different target audience such as learners (young generation who rely new media) and some educators (older generation who mainly rely on traditional media).

4.4.5. Which illustrative learning material is suitable for learners and educators to enhance their understanding of water re-use?

This research question aimed to discover illustrative learning material which would be appropriate for learners and educators to understand and generate knowledge on water re-use. As outlined above, participants are unable to practice water re-use due to a lack of knowledge about this conservation method. Therefore, they need to be taught about the method to increase their cognition of water re-use. Illustrative learning materials are needed to simplify the learning process and to raise cognition on various related issues.

The findings indicate that individuals have different preferences regarding illustrative learning materials. The majority of participants (79) indicated that they preferred the use of posters and storyboards while the minority (1) preferred to use books and booklets. Posters and storyboards were reported as key illustrative learning materials which could be used to teach and generate knowledge on water re-use. Participants reported that posters or storyboards which could be accessed by computer-based materials, such as the internet, should be used to generate knowledge on water re-use. Posters and storyboards were perceived as illustrative learning materials which are easy to comprehend. One participant reported that books and booklets should be utilised as illustrative learning materials because they provide readers unlimited information. However, findings revealed that the majority of participants preferred to use illustrative learning material which was easy to comprehend, share and access at any geographical area through computer-based materials such as the internet. Rajendran and Thesinghraja (2014:609) reinforce the statement by stating that “news and information presented on the internet could be used and accessed anytime and anywhere”. Posters and storyboards were thus reported as the main illustrative learning materials suitable for both traditional and online learning.

4.4.6. Which communication approaches are appropriate to communicate water re-use in Basic Education?

This research question aimed to discover the preferred and most suitable communication approaches to communicate water re-use in Basic Education. The study reveal that the bottom-up participatory and developmental approaches are preferred by all participants to communicate water re-use in Basic Education. Participants (80) preferred to be involved and participate in developmental issues which involve their own wellbeing. The study revealed that information materials and strategies to enhance water re-use should be proactive and open to ongoing dialogue between the messenger and the public. For instance, the internet or social media platforms, community meetings, campaigns, programmes and education are suitable as they provide a platform for two-way dialogue communication, which are perceived to effectively promote and enhance knowledge on water re-use in Basic Education.

4.5. SUMMARY OF THE CHAPTER

This chapter presented the analysis and interpretation of the data. It interpreted the outputs from NVivo which was used to categorise the demographic information of the participants and some a priori themes. The themes and sub-themes have been analysed and discussed with evidence supporting the opinions. The chapter further addressed and discussed the major research questions of the study. The findings generated from the chapter indicated that individuals' perceptions and attitudes towards water re-use differ due to demographic, cultural, religious and social factors. The chapter demonstrates that there is a relationship between individuals' emotions, culture, religion, attitudes, perceptions, education and beliefs. The relationship between these aspects indicates that one factor can considerably affects the other. For instance, both education and knowledge have a great impact on the perceptions, attitudes, opinions and behaviours of individuals. The chapter also demonstrate that water re-use projects, programmes and campaigns cannot succeed dependently, because the determination to engage in water re-use activities lies in the hands of the public, as they should be responsible for their own development (Melkote & Steeves, 2001). This chapter further indicated that for a communication strategy and illustrative learning material to be developed the public's attitudes and perceptions should be recognised and there should be a high level of public participation in order to know what individuals expect. The next chapter discusses the broad outline of a communication strategy on water re-use for Basic Education in South Africa which has been compiled in line with the findings of this chapter.

CHAPTER FIVE

TOWARDS DEVELOPING A COMMUNICATION STRATEGY FOR WATER RE-USE IN SOUTH AFRICA

5.1. INTRODUCTION

The primary aim of this chapter is to present a communication strategy on water re-use for Basic Education in South Africa. First, the chapter presents a literature review of water related communication strategies developed in both local and international arenas. Reviewed water related communication strategies include the national water sector reform communication strategy, communication strategy on water, sanitation and hygiene for diarrhoea and cholera prevention, a communication strategy and outreach plan for direct potable re-use (DPR) and regional awareness and communication strategy for the South African Development Community (SADC). Various models (methods) employed for the development of local and international communication strategies are outlined and deliberated. The models include a joint approach model and a step by step contents of the communication strategy and action plan model. The section is followed by water re-use communication strategy development. The strategy consists of various steps which are discussed with reference to the analysis, interpretations and findings of the study. Communication phases including the introduction and background, context or situation analysis, communication objectives, key strategic issues, strategic emphasis, communication objectives, target audiences, key messages and themes, messengers or communication policy, communication channels, activities or media analysis, strategic communication plan and monitoring and evaluation guidelines are discussed.

5.2. LITERATURE REVIEW ON WATER RELATED COMMUNICATION STRATEGIES

As outlined in chapter two, a well organised communication programme with stakeholders, is essential to the success of any water re-use project (Khan & Gerrard, 2006). Communication is a social process which can build sustainable development initiatives and create participatory environments so that participants share knowledge and understanding (Country STAT, 2014). It is a vital tool which can be used to raise awareness and knowledge on various developmental issues and change individuals' negative perceptions, behaviour and attitude. This chapter aims to develop a communication strategy which can be used to develop and establish an informed

society which is knowledgeable about water re-use, comprehends the various issues involved with water re-use and supports water re-use programmes. A communication strategy is defined as “a well-planned series of actions aimed at achieving specific objectives through the use of communication methods, techniques and approaches” (Mefalopulos & Kamlongera, 2004 in Slabbert, 2019: 11). It is viewed as an effective tool employed to communicate, change behaviours, raise knowledge, awareness and acceptance on water re-use.

This section reviews international and local (South African) water related communication strategies put together by various institutes and discusses various methods which have been used to develop the strategies.

5.2.1. International review on water related communication strategies

The Ministry of Water Resources Management and Development (MWRMD) in Kenya, developed a national water sector reform communication strategy in 2004. Kenya’s water sector undertook reforms aimed at improving the management of their water resources and the provision of water and sanitation services on a sustainable basis. The strategy was influenced by the country’s water scarce condition which posed great challenges for the implementation of the reforms and the provision of services on a sustainable basis. The strategy aimed to communicate water sector reforms and be understood and supported by key strategic stakeholders. It further aimed to improve knowledge, increase awareness of water sector reforms and promote positive water and sanitation management and conservation practices by key strategic stakeholders (MWRMD, 2004).

In Colorado, USA, WateReuse Colorado implemented a communication strategy and outreach plan for direct potable re-use (DPR). The strategy was implemented in 2018 with the aim of presenting the DPR outreach plan, raising awareness and educating stakeholders about the safety and value of DPR. The strategy intended to communicate, provide stakeholders with educational tools and create continuous and active public information which fostered community participation and feedback which lead to the delivery of accuracy of information (WateReuse Colorado, 2018).

Another water related communication strategy was developed in 2013 in Liberia. The strategy focussed on water, sanitation and hygiene for the prevention of diarrhoea and

cholera. Liberia is considered a well-watered country with a sufficiently high rainfall and enough rivers and streams. However, the country experiences a poorly engineered water supply infrastructure. The majority of people located in rural areas collect water daily from the rivers and streams. This had led to poor water quality and the resultant sanitation and hygiene risks which result in the spread of cholera and diarrhoea. These diseases are caused by the consumption of dirty water In Liberia, from the streams and rivers. To address these issues, the Ministry of Health and Social Welfare, in association with the United Nations Children's Fund (UNICEF) developed a communication strategy with the aim of providing stakeholder information, improving water and sanitation services and addressing critical hygiene behaviours. It was intended "to increase the adoption of safe water, sanitary practices and hygiene among families and communities in Liberia" (Ministry of Health and Social Welfare, 2011; Das, 2012: 9).

5.2.2. Local (South African) review on water re-use communication strategies

This section provides a review of water re-use communication strategies that have been developed in South Africa. As mentioned already in an earlier chapter, with reference to literature that has been reviewed in chapter one and two, South Africa is characterised by low levels of rainfall comparative to the world averages, with high variability in rainfall amounts and high levels of evaporation due to high temperatures and increasing water pollution challenges. These pose constraints to the availability of freshwater in the country. The country is approaching a point where accessible freshwater resources have been fully utilised (Adewumi *et al*., 2010; NWRS, 2013; Keremane, 2017). This problem has been recognised by various sectors and needs to be addressed through various strategies (NWRS2, 2012). Swartz, Genthe, Menge, Coomans and Offringa (2015) and Muanda, Cousins and Lagardien (2017) indicated that research has been conducted and developed by community consultations and communication during the implementation of particular water re-use projects. However, Slabbert (2019) indicated that no material or communication strategy has yet been developed for a sustainable water re-use public education programme in South Africa. A water related communication strategy was developed by the Southern African Development Community (SADC) water sector. The strategy focussed on regional water awareness and water problems experienced across South Africa. The

awareness and communication strategy which established water issues strategies and the dissemination of messages and themes was developed in 2008. The strategy aimed to improve awareness and understanding of water issues and advance water resource development and initiatives in the SADC region, in an attempt to contribute to poverty eradication and regional integration. The strategy further intended to communicate that people should participate in their own development, management and conservation (SADC, 2008).

5.3. COMMUNICATION STRATEGY DEVELOPMENT METHODS IN INTERNATIONAL AND LOCAL COUNTRIES

Research indicates that various methods can be employed during the development of a communication strategy. This section outlines and discusses the methods that have been employed by international and local countries to develop their water related communication strategies. Two models (joint or systematic approach and a step-by-step content of the communication strategy and action plan model) were employed in order to develop these local and international communication strategies. Regional awareness and the communication strategy for the SADC water sector developed in South Africa, the communication and outreach plan for Direct Potable Re-use (WateReuse Colorado) and the communication strategy on water, sanitation and hygiene for diarrhoea and cholera prevention developed in Liberia all employed a joint or systematic approach to frame their communication strategy. The communication strategy for the water sector reform program implemented by the Ministry of Water Resources Management and Development (MWRMD) in Kenya employed a step-by-step model which entailed the content of the communication strategy and action plan. The models are outlined below.

5.3.1. Content of the communication strategy and action plan

This is a step-by-step model which consists of six sections which have been used to develop a communication strategy. It emphasises essential elements which should be used and followed when developing a communication strategy.

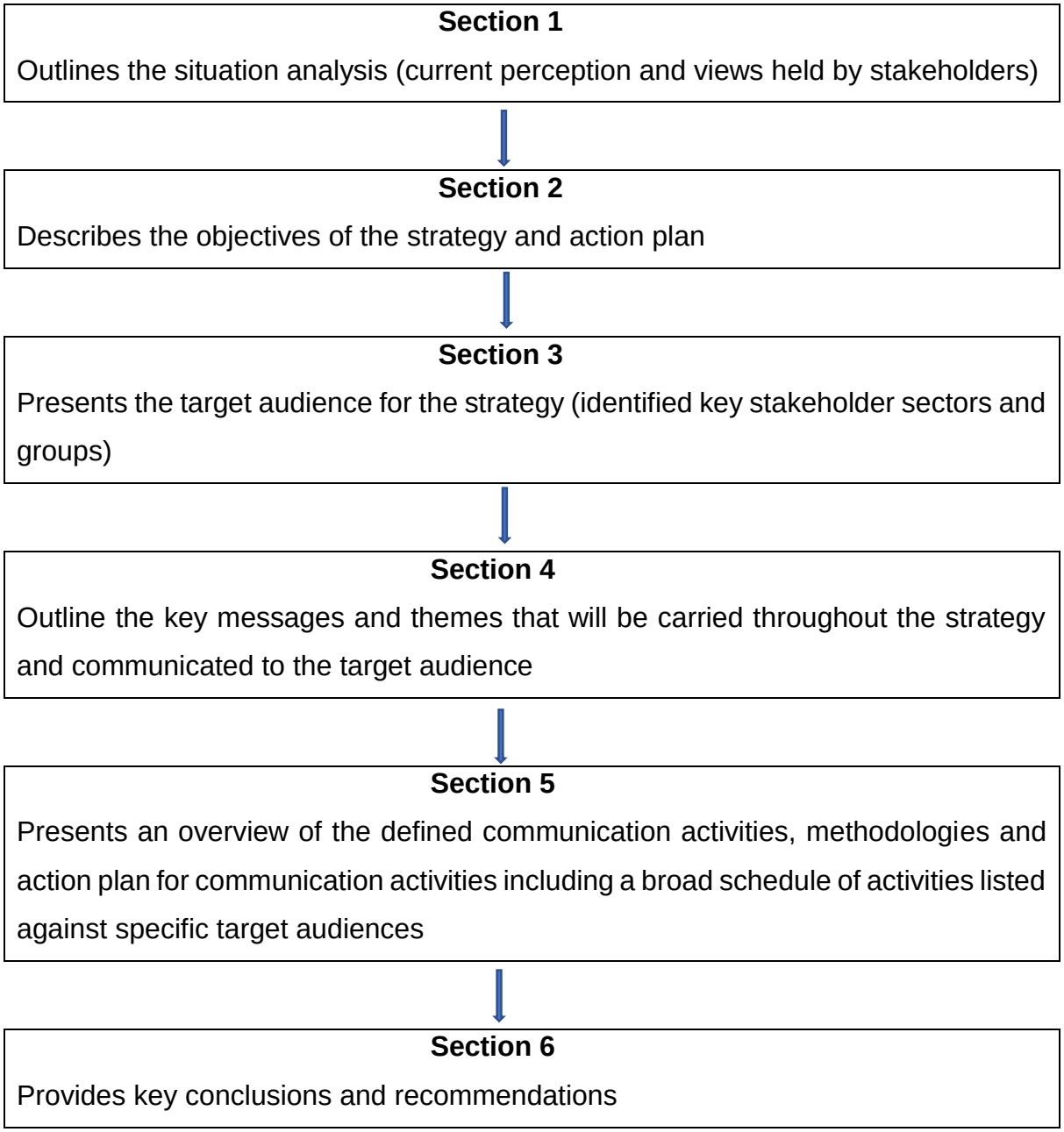

Figure 5.1: Step-by-step content of the communication strategy and action plan model (Water Resource Planning Systems Series, 2012)

Step-by-step content of a communication strategy and action plan model indicate that a situation analysis should be conducted at the initial phase of a communication strategy and action plan. This section discusses perceptions and views held by individuals in a given environmental setting. The situation analysis phase is followed by objectives or aims of the strategy. This section describes the primary achievements of the strategy (what the communication strategy wants to achieve). The model indicates that target audiences of the strategy need to be identified in order to send the right message to the right people.

Themes and messages are critical elements associated with the communication strategy, they must be outlined and then communicated to the target group. The model also highlights that messages and themes cannot reach the target audience without the aid of communication activities or methods. It demonstrates that the communication activities to be used as mediums of communication between the organisation and the audience need to be in line with the overall strategy. Communication activities assist in reaching complex and different target audiences in a different manner (Government communicators' handbook, 2014-2017). The last section of the model indicates that conclusions and recommendations for further strategies must be outlined in the developed strategy.

5.3.2. A Systematic or joint approach to communication strategy

The systematic or joint approach is one of the methods which has been used for framing selected above-mentioned water related communication strategies. It consists of five key elements, considered during the development of a communication strategy. These elements include the aim of the strategy, key messages, target audience, tactics and activities. The model is depicted in figure 5.2 below.

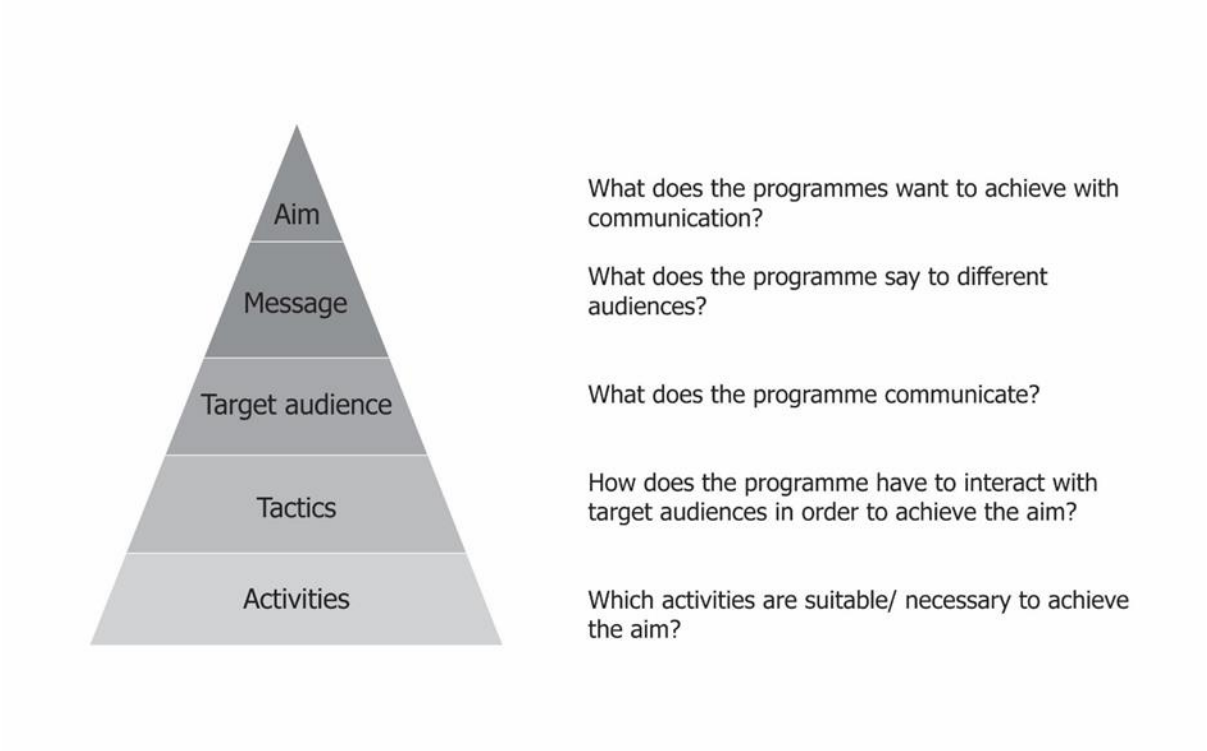

Figure 5.2: A Systematic or joint approach to framing a communication strategy (Communication strategy of Interreg Baltic Sea Region, 2016)

As depicted above, the systematic or joint approach is a pyramid method which indicates that the aim of the strategy, key message, target audience, tactics and activities are vital elements which need to be considered in the process of framing a communication strategy. The method shows that a communication strategy should explain the goal or objective of the communication which must be understood by the recipients. It indicates that, for effective communication to be achieved, the target audience should be identified and the relevant messages and themes which need to be communicated to the audience, must be outlined. The approach further indicates that to effectively reach the target audience, appropriate communication activities (media) and various methods considered suitable to interact with the target, must be outlined in the strategy.

5.4. COMMUNICATION STRATEGY DEVELOPMENT

To achieve the primary aim of the study to develop a water re-use communication strategy for Basic Education in South Africa- various methods, models and guidelines to frame a communication strategy were employed. Some elements from Steyn and Puth's (2000) model for communication strategy development, communication strategy guidelines outlined in the Government communicators' handbook 2014-2017, joint approach to communication strategy and contents of communication strategy and action plan were employed and integrated to form the water re-use communication strategy as detailed below.

5.4.1. Introduction

This section sets out a water re-use communication strategy for South African Basic Education. The strategy outlines the objectives, messages and preferred activities (communication channels) and materials which will assist in educating and promoting positive perceptions, attitudes and beliefs regarding water re-use. The section discusses vital elements such as water and the background of water re-use which will aid individuals in comprehending water issues and accepting water re-use as a water conservation method. Situational or environmental analysis, strategic emphasis, communication challenges, messengers, stakeholder segmentation (target audience), communication programmes and milestones and monitoring and evaluation process

are identified and discussed. It should be noted that all data gathered and discussed in the previous chapters have been used here as input into the formulation of the strategy.

5.4.2. Background

South Africa is a semi-arid country faced with insufficient fresh water supplies. It is a developing country, challenged by climate change, which results in drought and floods, poor water infrastructure management and quality, a high population rate, water pollution, agriculture and industries which pose great difficulties for South African citizens and increased economic growth (National Water and Sanitation Master Plan, 2018). With the challenge presented, the World Health Organisation (2006) along with the Department of Water and Sanitation, recognised water re-use as a water strategic conservation method which could curb water loss and the water crisis in South Africa. It is a strategic option which can help reduce water usage and save this natural resource. Water re-use is recognised as a strategy for water insecurity and it has been prioritised by the National Water and Sanitation Master plan, implemented by the Department of Water and Sanitation in 2018. Water re-use has been identified as a strategic method for water scarcity, due to insufficient uses of water and the poor ecological condition of the main rivers in South Africa. Globally, 97% of water occurs as ground water, 3% as ice in alpine and polar regions, 1% as fluid fresh water and 2% in streams and lakes (Anderson, 2003). The above-mentioned water percentages indicate that fresh water is a scarce resource across the entire globe. With the problem and the solution identified, other research (for instance, Po *et al*., 2005) and the research findings of this study indicate that there have been little positive results on the problem because the majority of people are uninformed and resistant to water re-use. Therefore, this communication strategy has been developed to educate, communicate, raise awareness and change behaviour towards water re-use.

5.4.3. Situational or environmental Analysis

A situational or environmental analysis examines the environment where the communication strategy is implemented. It focuses on the public mood, mandate, political issues, the media agenda, demography, and forces at play as well as the concerns and attitudes of various individuals.

5.4.3.1. Mandate

This communication strategy draws its mandate from the South African constitution of 1996, which postulates that all citizens must have access to basic water and sanitation services (Section 27 of the Bill of Rights). The National Water Act (No 36 of 1998) supports section 27 of the Bill of Rights and further indicates that water resources must be used, conserved, developed, protected, controlled and managed. The Act is mandated by section 24 of the Bill of Rights which states that “everyone has the right to an environment which is not harmful to their health or wellbeing and to have that environment protected for the benefit of future generations” through measures that promote water conservation, prevent ecological degradation and pollution and secure ecological use of natural resources and sustainable development. This mandate emphasises that all individuals have the right to access basic water and sanitation services, while regarding water protection and conservation for a sustainable supply. However, the findings of this study indicated that the majority of people located in rural areas have no access to basic water, they depend instead on rain harvesting and buying fresh (drinking) water. This indicates that the Department of Water and Sanitation, along with the government must address these issues in order for this mandate to be achieved.

5.4.3.2. Media Agenda

With reference to news 24 and eNCA news, true negativity of water issues experienced in South Africa have been reported. South Africa has experienced water shortages and a severe drought in 2013 and is still experiencing these problems today, which has meant water restrictions have been imposed in various regions across the country (for instance, in the Eastern and Western Cape and some part of Limpopo province). Contrary to the media reports on the water crisis experienced in South Africa, this study revealed that the media have not given sufficient exposure to the water related issues. The majority of individuals are not aware that South Africa is the thirtieth driest country in the world and is faced with high water demands and a poor supply. This communication strategy aims to target the media, in order to report, raise awareness and communicate water problems and solutions to combat the problem such as a negative perception of water re-use conservation methods.

5.4.3.3. Public Mood

The study findings indicated that the public (especially those located in rural areas) are not satisfied with their current water service delivery. Individuals from some of these areas indicate that they do not have fresh running water, so they have to rely on buying water, ground water sources and rain harvesting. Some of the areas have street taps, but these taps are not reliable, as they can spend a week or more without providing water. This problem is being experienced across the country and accounts for the multiple water protests that are recurring today. For example, the water protests that occurred at eThekwini municipality (Durban) and service delivery protests that took place in Setsotso municipality in the Free State province indicated that they are public dissatisfaction in service delivery (Jankielsohn, 2012).

5.4.3.4. Political issues

South Africa is a country which operates in a dynamic manner where political issues, aggressive communication between stakeholders and the government and challenges regarding service delivery are experienced. It is a country which experiences water scarcity problems which have become a growing source of political conflict. Water and sanitation is not only an environmental, societal and human right issue, it is also a political issue which leads to growing source of political debate and conflict. It is a source of competition and a political tool used by political parties to change the political dynamics of the country (Jankielsohn, 2012). South Africa consists of various political parties which battle and competes against each other regarding scarce resources such as water. These parties manifest on water and sanitation service delivery to influence public opinion. The government postulates that South Africa has developed over the past 25 years, more people have access to clean water, electricity, free education and so forth (African National Congress (ANC) election manifesto, 2019). Opposition political parties, along with the public (as indicated in the study findings) disagree. They state that South Africa is still an undeveloped country which fails to deliver services in various (especially rural) areas. These opposition parties similarly manifest that they will provide the country with water services. The government (ruling party), along with the opposition parties have said little about water re-use. They do not consider or promote the method in their manifestos because this would provide the public with persuasive information which benefits them but not the society at large.

It is true that people need access to clean water services, but on the other hand, they must take responsibility themselves to conserve and save water for future supply and sustainability.

The Department of Water and Sanitation is responsible for water and sanitation service delivery, it emphasises and strives to explain its policy and put the method into practice. This strategy requires political parties to support water re-use and encourage individuals, learners and communities to change their habits towards water resources. There is a need for politicians to support the Department of Water and Sanitation in promoting water re-use and National Water Act (Act 36 of 1998). Some water issues (e.g. water infrastructure) can be solved by the government, but climate change is a natural phenomenon and no government or organisation must be blamed for it).

5.4.3.5. Demography

As outlined above, South Africa is facing water scarcity problems. The Department of Water and Sanitation have presented water re-use as a water conservation method to solve the problem. The department perceives the method as an effective strategy to the water crisis experienced in the country. However, South Africa consists of various individuals from various demographic areas, experiences and cultural backgrounds. These people have different attitudes and perceptions regarding water re-use, some individuals appreciate the method while others reject it. This study has revealed that most learners and female educators do not appreciate or accept the method compared to male educators. People with little or adequate water re-use knowledge appreciate this conservation method more than individuals with no knowledge about the method. This communication strategy emphasises educating, raising awareness and sharing knowledge about water re-use in order to increase acceptance and change individuals' perceptions and attitudes towards the conservation method. The strategy needs to implant information in the minds of individuals (learners and educators) from a range of different demographical factors by means of education and the use of illustrative learning materials which will lead to the provision of knowledge and improved water re-use practices in South Africa.

5.4.3.6. Attitudes and Concerns

Attitudes and concerns are major issues that could jeopardise water re-use practices. Various individuals have both negative or positive attitudes regarding water re-use. The findings from this study indicate that more individuals' have negative attitudes towards water re-use than positive attitudes. This is due to the health and safety concerns associated with water re-use. Individuals lack trust and feel disgust about greywater re-use because they perceive the water as impure. This leads to high level of negative attitudes towards the method. This communication strategy sought out to change individuals' attitudes and concerns regarding water re-use through education and bottom-up participatory communication.

5.4.3.7. Forces at play

The water sector includes various stakeholders with various roles and agendas on water issues. This communication strategy needs to consider, serve, understand, scan and appreciate these role players. Forces at play might be organisations or individuals who are interested in service delivery issues experienced in South Africa. These might be academics with controversial views, traditional role players and/or political parties who are against the ruling party, Non-Governmental Organisations, water specialists, media houses, policy practitioners, and members of the public in general and so forth.

5.4.4. Strategic emphasis

This communication strategy emphasises developing water issues through water re-use. It emphasises water re-use and its significance as a strategic option to water deficit experienced in South Africa. Negative perceptions, lack of awareness, trust and knowledge of water re-use revealed by the study have encouraged this strategy to emphasis the following factors:

- Improve water security and safeguard South Africa against water insecurities by raising water re-use awareness with influential messages;
- Eradicate and re-address the myths about water re-use;
- Water re-use literacy and sustainability;
- Change perceptions and attitudes about water re-use.

5.4.5. Communication objectives

Strategising for communication consists of specific communication goals the strategy aims to achieve. This study discovered that the majority of individuals are reluctant to re-use water because they are uninformed and have negative perceptions and attitudes towards the conservation method. They appear to lack knowledge and education about water re-use. These findings encouraged this communication strategy to focus on the following communication objectives:

- The overall objective of this communication strategy is to raise water re-use awareness and adaption in order to fight water scarcity in South Africa;
- To promote the individual's support of water re-use;
- It aims to educate and to ensure that water re-use and its different facets are well understood by the target audience;
- To promote sustainable knowledge and education on water re-use;
- To popularise and sustain positive attitudes towards water re-use as a water conservation method in South Africa;
- To address stakeholder concerns and misunderstandings regarding water re-use; and
- To promote water re-use and assure that it is well practiced and sustained in South Africa.

5.4.6. Communication challenges

Communication challenges are barriers or obstacles which prevent the attainment of communication objectives. Various factors, such as water re-use education, information programmes, educational resources or materials and language have been revealed to be challenges to water re-use awareness, knowledge and practice in South Africa. These challenges require budget factors to be addressed. Therefore, this strategy emphasises the following communication challenges which need to be overcome:

- Lack of water re-use educational resources which can aid in enhancing an individual's knowledge and learning capacity;
- Budget constraints to informational activities which can assist in raising both popularity and awareness of water re-use.

- Lack of service delivery (freshwater services) experienced in most rural areas. This communication challenge also violates the eight Batho Pele principles.
- How can people save and re-use water when they do not have access to water?
- Language constraints – the researcher proposes that the language used to communicate water and water re-use issues can have an impact on communication objectives (e.g. English as a medium of instruction - not everyone understands English sometimes, using one's home language can aid in achieving communication goals). This was evident during the data collection process, some participants (especially learners) faced difficulties in comprehending some of the questions asked in English. This is the reason this study employed two languages (English and Sepedi) during the data collection process.

5.4.7. Messages and Themes

Corresponding and consistent messages are vital for effective communication (WHO, 2017). The message leads to trust and credibility. This strategy focusses on the following key message and theme:

Core message of the strategy:

- Together we can fight water deficit in South Africa through greywater re-use.

  This key message encourages all learners and educators in South African Basic Education to participate and contribute towards water re-use, as a water saving strategy. It inspires them to mobilise, share knowledge and encourage water re-use across the country.

Communication theme:

- Re-use every drop because every drop matters.

5.4.8. Communication messengers

Communication has an impact if the message is delivered in one voice by our professional leaders (Government communicators' handbook, 2014-2017). This strategy will employ the president or deputy president, minister or deputy minister, members of the departments (Department of water and sanitation, Department of

Education and Department of Agriculture and Fishery) and water service institutions as water messengers.

5.4.8.1. The president or deputy president

The president or deputy president, as the leader of the country, should share water re-use messages. This will lead to a high level of interest and might change people's perceptions and attitudes towards water re-use which could result in daily water re-use practices. Citizens would believe that it is important and feel encouraged to practice the method as the message has been delivered by an influential person with credibility.

5.4.8.2. Minister and deputy minister

The minister and deputy minister have an impact on delivering messages. For this strategy, the minister of the Department of Water and Sanitation, Department of Education and Department of Agriculture and Fishery must deliver water and water re-use messages to the audience through outreach programmes, awareness campaigns, imbizo, traditional and new media and other information activities which may attract various stakeholders from various communities.

5.4.8.3. Water services institutions

Water services institutions, as water expert can assist in delivering water messages to relevant stakeholders. They have the potential to portray the message and provide clear answers to questions which arise. Water service institutions consist of the following:

- Water Service Authority (WSA) (Metro, District and Local government municipalities)

WSA is a municipality which is responsible for ensuring adequate access to water and sanitation. WSA can be in the form of a metro, district or local government municipality. These municipalities can form part of water and water re-use communication messengers. Local municipalities play a vital role in service delivery, and in this role, they should be able to communicate and promote water re-use within their communities. This aspect has been reinforced by the findings of the study which

showed that municipalities must take responsibility for communicating and sharing water re-use messages to their communities through community meetings.

- Water Boards

Water Boards play a crucial part in the South African water sector and resource management. They are service providers of public water and operate wastewater systems, dams, water supply and retail infrastructure (WRC, 2018). These institutes can aid in distributing water messages through school and community outreach programmes and campaigns. The following water boards must serve as communication messengers for water and water re-use issues in South Africa:

- Rand Water
- Umgeni water
- Overberg water
- Albany coast
- Amatola
- Bloem water
- Boshelo
- Bushbuckridge
- Lepelle Northern
- Magalies
- Sedibeng
- Namakwa
- Pelladrift
- Mhlathuze
- Ikangala water
- Water Services Intermediary or Water User Associations (WUA)

Water Services Intermediary or Water User Associations (WUA) refers to an individual or group of individuals who operate at local level, form part of a contract and provide water to the public (Overview of the South African water sector, n.d). For instance, traditional role players, farmers, mining companies and so forth.

- Catchment Management Agency (CMA)

Catchment Management Agency (CMA) initiates water resource management at a provincial level and encompasses the public within the framework of the National Water Resource Strategy (National Water Policy Review (NWPR), 2013).

- Water Services Provider (WSP)

This water institute provides water sources and sanitation services to the public under WSA contract. It can be performed by community-based, public or private organisations (WRC, 2018).

5.4.8.9. Non-Governmental Organisations (NGOs)

NGOs as landscapes of development are proposed to assist in sharing water re-use messages. Their role would be to support government entities and emphasis water re-use messages to raise awareness and create knowledge within various communities and institutes.

5.4.9. Communication channels or activities

Selecting appropriate communication activities or channels for the intended objectives is considered a vital aspect to communication strategy development (Mefalopulos, 2008). Communication channels or activities are key materials which can aid in achieving the intended communication goals. This study revealed that various communication activities can be employed to inform and address the target' concerns regarding water re-use. Reach (2015) reinforced the statement by noting that employing multiple communication activities to deliver messages has a more positive impact than carrying out messages through a single communication channel. The study findings indicated that the following communication channels should be used to promote water re-use messages:

- Traditional and new media through the internet, social media, television slots etc.
- Community-based media through public participation community meetings held at various communities across the country
- Posters
- Public involvement campaigns and programmes

This strategy proposes that the following communication channels can also be employed to reinforce, communicate, educate and popularise water re-use:

- Public water re-use debate
- Websites, web pages or web banners
- Loudhailers
- Community development workers
- Seminars and conferences held at various schools and communities across the country
- Newsletters and facts sheets
- Briefings
- Intranets and internal newsletters
- Notice Boards
- Outreach programmes (e.g. visiting communities and schools to raise awareness and share water re-use knowledge)
- Government documents
- Personalities, prominent opinion leaders, political figures and ambassadors.

5.4.10. Stakeholder Identification

This water re-use communication strategy aims to communicate and deliver water and water re-use messages to the primary target audience of the study (learners and educators in Basic Education). However, the study findings revealed that the strategy must also focus on the stakeholders (whom will aid in promoting and sharing water re-use messages) mentioned below:

- Public servants
- Consumers
- Civil society
- Local government municipalities
- Traditional leadership or role players
- Basic Education
- The media

For water-use to be known and practiced effectively, the strategy further recommends that the following secondary audiences must also be reached and informed:

- Environmental, conservation and water sector groups
- Metro and district municipalities
- Private sector or NGOs active in the water sector
- Academics and research institutions
- The Trans Caledon Tunnel Authority (TCTA) responsible for fund and implementation of various water projects.
- National, Provincial and local water government (departments)
- Teachers unions and learner formations (primary and secondary schools)
- Industrial and agricultural (farmers) sector
- Politicians: councillors, parliamentarians and cabinet ministers
- Policy and decision makers
- South African Local Government Affairs (SALGA)
- Faith-based organisations
- Local water resource management institutions
- International audiences

5.4.10.1. Stakeholder engagement strategy

Priority issue	**Desired outcome**	**Target audience of the strategy**	**Key message to be communicated**	**Communication tools**
Initialise the culture of conserving water to combat water scarcity in South Africa.	➢ Raise awareness about water re-use and its importance to the environment which will lead to changed individuals' perceptions and behaviour towards the conservation method.	➢ Traditional leadership	➢ Value water re-use within your respective communities.	➢ Meetings/ Izimbizo

	➢ Increased water re-use practices			
		➢ Agricultural sector (farmers)	➢ Long-term water security and changed cultivation practices for increased long-term crop yields.	➢ Meetings ➢ Print and electronic media ➢ Community based media through community radio stations and print media ➢ Websites, web pages or web banners ➢ Government documents.
		➢ Consumers	➢ Adopt and practice water re-use as a water saving method in South Africa. It will lead to increased water availability and supply. ➢ Teach your children not to waste water and engage them in water conservation methods. ➢ Saving water is everyone's responsibility.	➢ Electronic and print media through social media, television slots, newspapers etc. ➢ Community based media through community radio stations and print media ➢ Websites, web pages or web banners ➢ Billboards ➢ Loudhailers ➢ Posters, Flyers and Billboards ➢ Community development workers ➢ Public participation meetings, seminars and conferences held at various communities across the country ➢ Social media ➢ Personalities through opinion leaders, political figures and ambassadors

				➢ Outreach programmes, exhibition and campaigns (e.g. visiting communities and schools to raise awareness and share water re-use knowledge).
		➢ Public servants ➢ Environmental, conservation and water sector groups ➢ Private sector ➢ Civil society ➢ Academics and research institutions ➢ Municipalities: Metro, district and local government municipalities ➢ National, Provincial and local government ➢ Politicians: councillors, parliamentarians and cabinet ministers ➢ Policy and decision makers	➢ Promote and educate individuals about water re-use and increase water security in South Africa.	➢ Newsletters and facts sheets ➢ Briefings ➢ Social media ➢ Intranets and internal newsletters ➢ Notice Boards ➢ Government documents ➢ Meetings ➢ Promotional materials and CD-ROMs
		➢ International Audiences	➢ Fight water scarcity in your regions and help South Africa fight water scarcity through the use of water re-use.	➢ Electronic and print media through, television slots, newspapers etc. ➢ Websites, web pages or web banners ➢ Social media

		➢ Faith-based organisations	➢ Educate consumers about saving water as God's gift through water re-use.	➢ Outreach programmes and provides individuals with pamphlets, factsheets, etc.

Table 5.1: Stakeholder engagement strategy

5.4.11. Communication Programme and Milestones

A communication programme is a guide for upcoming actions; it preserves campaigns and measures the success or failure of communication (Government communicators' handbook, 2014-2017). The table below illustrates the proposed communication programme and milestones of this strategy.

Programme	Targeted milestone	Communication approach	Budget	Responsibility	Time frame
Public information and awareness campaigns on water conservation	Generate water re-use knowledge and raise interest levels in water conservation	➢ Information materials ➢ Outreach programmes in schools and communities ➢ Folk media ➢ Community meetings ➢ Edutainment and enter-educational radio or television programs	Depends on the organisation's or department's budget	Depends on the selected official who will be accountable for the event	Depends on the organisation's or department's schedule

Table 5.2: Communication programme and milestone

5.4.12. Action Plan

For the objectives of this communication strategy to be achieved, an action plan or approach which aims for substantial engagement with the target audience and attains positive input from the target must be developed. The table below illustrates an action plan which serves as a guide for this strategy.

Event/ opportunity	Activity	Action	Channels	Budget	Time frame
➢ Water conservation forums and public information and awareness campaigns	Provide information, communication support and knowledge on water re-use	➢ Engage with the community to promote public participation at various levels ➢ Encourage opinion leaders to mobilise communities and promote water conservation and management methods through excellence leadership awards ➢ Engage with various sectors (e.g. water officials) to aid in promoting water conservation methods to various communities and institutions across the country	➢ Briefing materials ➢ Leadership award mobilisation at national, regional and local level ➢ Community meetings ➢ Outreach programmes ➢ Radio and Television commercials and programmes ➢ Information materials ➢ Edutainment programmes ➢ Folk media ➢ Seminars and workshops	Depends on the organisation's or department's budget	Depends on the organisation's or department's schedule

Table 5.3: Action plan

5.4.13. Media Engagement Plan

A media engagement plan is vital for a well-developed communication strategy. It consists of press briefings, targeted media, detailed plan of interviews and a statement of key messages, questions and answers for writers and communicators to use (Government communicators' handbook, 2014-2017).

Event/Activity	Activity	Action	Channels	Budget	Time frame	Responsibility
Water and water conservation programmes and awareness campaigns	Face to face interview	Send request to the media	Radio or Television	Depends on the organisation's or department's budget	Depends on the organisation's or department's schedule	Depends on the selected official who will be accountable for the event

Table 5.4: Media engagement plan

5.4.14. Monitoring and Evaluation Process

The impact of the strategy, implementation and implementation process that has taken place must be evaluated to measure the effectiveness of the strategy (Government communicators' handbook, 2014-2017). Evaluating the effectiveness of this strategy will focus on appraising the message to discover if water re-use messages have been received, comprehended and practiced. Feedback will be obtained through various evaluation methods outlined below.

- Use public awareness and perception questionnaires or surveys to determine the level of community understanding of water issues experienced in South Africa and water re-use as a water conservation method to combat water challenges across the country.
- Track social media pages to determine the total number of individuals who visit the page.
- Evaluate public participation and feedback from water events.
- Visits areas where outreach programmes have taken places (such as schools, communities, etc.) and conduct research to discover if the messages have been heard, understood, changed perceptions and led to water re-use practices.

- Monitor website usage to access individuals' interest in water issues.
- Track media coverage (volume and nature of coverage) through the use a professional service provider.

5.5. SUMMARY OF THE CHAPTER

This chapter focused on water and water re-use communication strategies. It outlined a literature review on water related communication strategies and various methods necessary to develop a communication strategy. The chapter indicated that individuals do not have a clear picture of water re-use as a water conservation method as a solution to water deficit experienced in South Africa and the negative attitudes and perceptions regarding the method as a result. The public do not comprehend facts related to water issues due to the lack of proactive communication and information, which has resulted in a lack of awareness and capacity building. The media has negatively reported on water issues experienced in South Africa; it reinforces the distrustful view of water issues among the public. The chapter further presented a water re-use communication strategy aimed at providing proactive communication which will provide a platform for two-way communication. Sufficient information and messages must be presented to various communities through various activities to facilitate and promote public understanding and knowledge regarding water re-use.

CHAPTER SIX

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

6.1. INTRODUCTION

This chapter presents the summary of findings, recommendations and conclusions of the study. The chapter consists of five sections. The first section discusses the summary and interpretation of the research findings. This section provides a summary of key elements of the study which consists of the research objectives, literature, theoretical framework, methodology and key findings. This study aimed to develop a water re-use communication strategy for Basic Education which will include illustrative learning materials suitable for online learning. It has focused on four major objectives (refer to section 1.5.1) which aided in achieving the intended aim. The study placed its roots on Geertz's interpretation of cultures which offered cultural cognition, Vygotsky's social constructivism and behaviour ecological model which provided cognisance regarding education and human experience and behaviour regarding a phenomenon. A participatory action research method which emphasised participation for development and social change was employed to understand human experiences and achieve the intended aim of the study.

The chapter outlines recommendations on further research, illustrative learning materials, communication strategy and water re-use promotion and practice. Contributions and limitations of the study which comprise of methodological, theoretical, sample size and geographical limitations are further presented and lastly, a concluding remark about the study.

6.2. RESEARCH DESIGN AND METHOD

Participatory action research design was employed to direct the study and aid in achieving the intended aim and objectives of the study. As outlined in section 3.2.2, participatory action research, intent to understand an individuals' experience with the aim of producing social change and sustainable knowledge (MacDonald, 2012; du Plooy-Cilliers *et al*., 2014; Morales, 2016). This study employed participatory action research to understand participant's experiences, behaviours and perceptions towards water re-use with the aim of developing a water re-use communication

strategy and illustrative learning materials which would be used to encourage social change and water resource development. Participants who contributed in the study were perceived as active individuals in the research process. Participatory action research comprises of plethron of data collection methods which provide the researcher with substantive realities, experiences and understating (Nieuwenhuis, 2007). Focus group discussions, interviews, participant observations and workshops were used as data collection method. Focus group discussions were used to gather water re-use information from secondary school learners and educators. Four group discussions were held at each secondary school with ten learners and five educators (refer to section 3.6.1.1). Further information was gathered from primary school educators through interview sessions. Interviews were conducted over nine weekdays (refer to section 3.6.1.2). A stakeholder consultation workshop was held to discover in-depth information about water re-use and its challenges. The participants' non-verbal cues were observed and analysed. A topic guide, interview guide and an audio recorder were used as data collection tools. A topic guide directed focus group discussions, interviews were directed by an interview guide and an audio recorder was used to record information from both interview sessions and focus group discussions. Four primary and four secondary schools were conveniently selected due to their geographical proximity (refer to section 3.4). Both thematic analysis and NVivo software were used as methods to analyse the data collected. These methods provided the researcher with in-depth understanding of the data which led to credibility of findings.

6.3. SUMMARY AND INTERPRETATION OF THE RESEARCH FINDINGS

This study initiated by examining learners and educators' perceptions and understanding of water re-use. Po *et al*. (2003), Nancarrow *et al*. (2008), Lazorova *et al*. (2013) and Adewummi *et al*. (2014) stated that public perceptions are considered main factors to the success of any implemented water re-use programme. The success of water re-use programmes does not depend on infrastructure alone but also on individuals' perceptions which could be considered major barriers to water re-use practices. The study findings indicated that positive perceptions lead to water re-use acceptance while negative perceptions constitute to rejection. Participants who had a positive perception of the phenomenon were willing to practice the conservation

method rather than those with negative perceptions. The findings are similar to studies conducted in Israel, Australia, USA, Ghana and Tanzania (refer to section 2.5.1). These studies indicated that individuals who had positive perceptions towards water re-use were willing to practice the method. It is indicated that people located in these areas have positive perceptions towards wastewater (greywater) and are willing to re-use the water for non-potable or non-drinking purposes (Chen *et al*., 2015, NWRS1, 2011; Melborne water, 1998). Studies conducted in South Africa also indicated a high level of acceptance of wastewater when used for non-human contact purposes such as industrial, mining and agricultural purposes (Bungu, 2014, Mashabela, 2015, Stoakley, 2010; Ilemobadade *et al*., 2013). This study further revealed that individuals were willing to re-use water for construction purposes across the country (refer to section 4.3.3.2). This finding has not been mentioned in any of the earlier studies conducted in other regions, therefore, it adds to the body of knowledge and contributes to the distinctiveness of this study.

Geertz's theory of culture and the behaviour ecological model was employed to understand factors which constitute to human perceptions, behaviour and attitude towards water re-use. Demographic, social, cultural and religious factors appeared to be drivers of individual perceptions. Geertz (1973) pointed out that culture is recurrent and individuals from the same culture share the same sentiments. Culture influences behaviour and shapes how individuals perceive and behave towards a phenomenon. The behaviour ecological model indicates that individuals behave in certain ways due to various social structures (e.g. religion, culture and social factors) which influence human behaviour and perceptions. With this in mind, representatives of different cultural groups should be involved to build community trust, relationships and address social justice matters. The study further indicates that demographical factors such as age, education, gender and occupation have an influence on the individuals' perceptions. It indicates that there is a relationship between perceptions, cognition, occupation and gender. Individuals who are employed and have knowledge about water re-use have more positive perceptions than those with insufficient knowledge and are unemployed. It was further shown that males have more positive perceptions compared to females. This finding is similar to that of Bungu (2014) which posited that males have more positive perceptions when compared to females and it is in direct contrast with the findings of Yilmaz *et al*. (2004) in Eroğlu *et al*. (2016) which indicated

that female learners have more positive attitudes and perceptions towards environment issues than males.

The second objective sought to examine strategies that could be employed to gain learners and educators' understanding and acceptance of water re-use. As indicated in the literature review, the success of water re-use programmes depends on community involvement in all phases of the programme. They should be considered and participate in such development programmes (Po *et al*, 2003; Adewumi *et al*., 2014; Kimathi, 2016). This study revealed that strategies which promoted bottom-up approaches to communication should be employed to promote water re-use. Education is considered a key element to water re-use knowledge and awareness (refer to section 4.3.5). Vygotsky's social constructivism was employed to understand the concept and processes which should be followed to promote effective education. The scholar posits that learning is a two-way process which requires effective participation between the learner and the facilitator. For effective cognition to be produced, learners must be able to participate in a classroom, raise questions and concerns regarding the issue under discussion. Teachers must not be teachers but facilitators who facilitates the learning process and provide participatory platforms for learners.

"Participatory communication is the landmark of the digital age where passive audiences are replaced by active audiences who create their own content, write, photograph, interpret and publish" (Orhuela, n.d in Slabbert, 2019: 39). The fourth industrial revolution (digital age) focusses on new media which is perceived as an effective communication tool which should be employed to promote water re-use (refer to section 4.3.5.3). It provides a platform for bottom-up participatory communication which focuses on active users. The literature review provided in chapter two discussed environmental education, rules, policies and regulations and projects, programmes and campaigns as strategies employed to promote water and water re-use information, however, communication activities have not been considered as tools which could be employed to promote water issues in Basic Education. This study revealed that communication mediums can in fact be employed to promote such environmental issues in Basic Education.

Community meetings and water re-use outreach programmes such as community and school campaigns which provide a platform for participation have also been revealed to be effective strategies which should be employed to promote water re-use. South African Development Community (2006), Asumah *et al*. (2012) and Adeolu *et al*. (2014) reinforce the statement by asserting that promotion materials (new media, community meetings, campaigns and programmes) which value participation in development programmes are more effective than any other materials. Traditional media, rules, policies and regulations are regarded as additional materials for water re-use promotion and attitudinal change. The present literature does not discuss community meetings, media and outreach programmes as strategies to water re-use promotion. This study will add to the existing body of literature on water re-use promotion strategies.

The third objective required to discuss communication approaches to water re-use in Basic Education. As indicated earlier, Vygotsky's social constructivism theory was employed to guide the roots of the study. Vygotsky posits that effective learning occur through effective participation and communication throughout the learning process. In order to communicate water re-use and raise awareness, the study revealed that participatory and developmental approaches to communication which foster for ongoing dialogue and participation between the water department (institute) and the society should be employed as communication approaches to water re-use in Basic Education for both learners and educators. As indicated in the preliminary literature, Servaes (2002) argues that participatory and development communication approaches foster two-way participatory communication and prioritise the needs of the public and support communication tools which provide sufficient information and a platform for participatory vertical communication between the public and the government. The communication approach focuses on the premise that successful development requires conscious and active participation of the intended beneficiaries, at every stage of the development. It was further observed that language is a major barrier to effective messages, thus, language approaches to communication are also perceived as effective approaches which must be used to communicate water re-use and effectively pass on the message to the Basic Education sector.

The last objective sought to develop water re-use illustrative learning materials, suitable for online learning. Learning materials are tools which educators use to

facilitate and support the learning process. The literature review indicates that learning materials can be in the form of books and booklets, flyers, posters, storyboards, factsheets, computer-based tools and environmental games (South African Development Community, 2006). Participants postulate that illustrative learning materials which provide deep cognisance, and which are easy to comprehend should be used to educate them about water re-use. It has been shown that learning materials which are accessible online, and which are easy to comprehend are considered to be more effective than traditional materials. New media tools were reported as communication activities which must be employed to support and share such materials. Today's contemporary society operates within a digital environment which functions within a digital culture. It is faced with speedy development and intricacy of technology that makes things transform quickly (Alsina, 2010). Information is distributed and accessed through online platforms. The study revealed that illustrative learning materials which are understandable, grab attention and can be accessed online should be used. Posters and storyboards received considerable attention and were identified as suitable materials which must be used to educate and raise awareness and cognisance about water re-use. Posters and storyboards portray information in an attractive and understandable manner, they integrate information (key message) with pictures and colours and are suitable for all age groups (South Africa Development Community, 2006; Orihuela, n.d in Slabbert, 2019). The finding led to the development of storyboards and posters as illustrative water re-use learning materials. Environmental Posters and storyboards have been developed in Namibia, Botswana and Tanzania. The materials have been employed to disseminate information regarding environmental issues (SADC, 2006; Taylor, 1997). This study developed water re-use learning materials which could be used to educate and raise cognition about water re-use. A South African review of water re-use illustrative learning materials indicates that the DWA has developed various learning materials about water and water re-use issues (Slabbert, 2019), however, no posters or storyboards on water re-use were previously developed. This makes the study distinctive and fills an identified gap.

6.4. LIMITATIONS OF THE STUDY

The following are possible limitations of the study.

6.4.1. Methodological Limitations

This study employed a participatory action research method and was limited to focus group discussions, interviews, workshops and participant observations as data collection methods. Using these methods did present some limitations for the study. During the focus group discussions some individuals had difficulty expressing their experiences. Some learners did not express themselves freely as they felt inhibited by the face to face interaction with the researcher and the other participants (especially their educators). In some of the schools, some learners were quiet while educators and other learners dominated the group. Some primary educators who were interviewed felt uncomfortable expressing themselves to the researcher. Another educator from one of the primary schools said to the researcher: "*Are you going to cuff me after providing you with the information you need*?". This indicated that the participant was not comfortable about the interview until the researcher explained the study and provided him with both a consent letter and consent form. During a stakeholder consultation workshop, there were arguments about issues regarding the relevant term which would be best served to present water re-use. A question was asked about the preferred term which should be used, and which would be the most suitable so that all the learners, from various social contexts could comprehend the material. One participant reported that: "*I am right, water recycle should be used, and am saying this because I am a scientist*". The researcher observed from her non-verbal cues that she was aggressive and angry. Use of questionnaires as a data collection method could have limited these challenges because a questionnaire presents closed questions which do not require participants to discuss in-depth information or participate verbally.

6.4.2. Theoretical framework

The researcher holds a view that Geertz's theory of culture serves a critical role in the study. However, if the theory was coupled with Afrocentricity by Asante (1980), it could have been even more relevant, as it would present an African perspective which would have given greater insight of the participants. Afrocentricity is a theory for African

development. It originated from African cultural realities and promotes the interest of African people (Asante, 1980; Mazama, 2003; Modupe, 2003). The theory realises the cultural liberation and cognition of African people as Africans (Modupe, 2003). It considers African ideas, values, and ideals as vital factors for any analysis and interpretation which involves African thoughts, interests, and behaviour (Mazama, 2003). It is therefore recommended that future research employ African perspectives when studying Africans (Afrocentricity).

6.4.3. Geographical area

The study was context-bound, it was primarily conducted in one geographical area. Information was gathered from four primary and four secondary schools which all fall under the Mankweng Circuit. The limitation does not support generalisation of findings to learners and educators located at other schools which fall under the circuit. The study is also not generalisable to other regions and schools across South Africa. With various geographical locations, the study might have produced more or different information regarding water re-use. Another limitation is that the illustrative learning materials designed from the study findings might not be suitable for other learners and educators located in other schools and provinces across the country. Diverse views from individuals located in various schools and provinces may provide more comparative findings on water issues, effective learning materials and communication strategy regarding water re-use. It is thus recommended that future research should be conducted in various regions for effective results and learning materials which are adaptable to suit various classroom learning situations.

6.4.4. Sample size

The study comprised of a sample size of 80 participants (40 educators and 40 learners). This sample represented a small proportion of the entire population of learners and educators in the Mankweng circuit schools and South Africa as a whole. South Africa consists of nine provinces and a sample size of 80 participants from one province and township might not be representative of the entire country.

6.5. CONTRIBUTIONS OF THE STUDY

This study developed a water re-use communication strategy and illustrative learning materials which will contribute to water re-use practices by raising awareness, educating and enhancing knowledge and understanding of water re-use. It could assist in educating and promoting water re-use information to learners, educators, researchers and the entire public, increase trust and improve the functional quality of decision-making regarding water re-use.

The communication strategy could help the department, water utilities and other communication messengers to communicate the importance of water re-use as a water conservation strategy across the globe. The study highlights legislative frameworks as strategies which could be used to promote water re-use in South Africa (refer to section 4.3.5), this provides insight to the government, policy makers and the Department of Water and Sanitation, to advance and develop water and water re-use legislative frameworks and ensure that they are put into practice.

The study further discussed environmental, cultural, social and religious factors which provide background insight to human behaviour and beliefs regarding water re-use. Geertz's interpretation of cultures and the behaviour ecological model provided an explanation of the factors and their effect on behaviour. Vygotsky's social constructivism (refer to section 4.2.1) argues for bottom-up participatory education between the facilitator and the learner, this will contribute to effective water re-use education and lead to sustainable water re-use knowledge and practice. Employing water re-use learning materials and educating in a participatory manner will lead to behavioural change, cognisance and acceptance of the water conservation method.

6.6. RECOMMENDATIONS

To develop positive attitudes and facilitate water re-use implementation and practice, public engagement and involvement should form part of any water re-use programme. The public should be engaged and provided with a platform for vertical participation from planning to evaluation and monitoring phase of the programme (Po *et al*., 2003; Tan, Mooney, White, Hoverman, Mackenzie, Burry, Baldwin, Bowmer, Jackson, Ayre & George, 2010; Adewummi *et al*., 2014; Chen *et al*, 2015). It is thus recommended that the government should engage with the public in the implementation of various

water re-use programmes and developments. The study indicates that water re-use programmes fail due to various challenges such as water re-use education, language barriers, and psychological, cultural, social, religious, environmental as well as demographic factors. The Department of Water and Sanitation and other water institutes in association with the public should discuss the problems, regarding water re-use, address the challenges and find appropriate solutions for the challenges. The department should employ participatory and developmental approaches throughout the process. Greywater re-use campaigns and programmes should be developed, and the public should be involved in the initiation phase of the projects. The public should be consulted on various issues, this will aid the programme or campaign, communicate and inform on issues that would be relevant to a given society and consider their cultural compassions.

It was raised that water re-use legislative frameworks should be used as strategies to promote water re-use in South Africa. The mandate of a communication strategy (refer to section 5.4.3.1) indicates that no policy have yet been implemented, specifically on water re-use. The government, in association with the Department of Water and Sanitation and other water institutes should revise the legislative frameworks in favour of water and develop new policies and guidelines which emphasise water re-use and its practices.

The majority of participants have insufficient knowledge about water re-use, there is a lack of education concerning the preservation method (refer to section 4.3.2). It is recommended that the Department of Education should “integrate water re-use into school curricula” (Slabbert, 2019: 37) or develop a module for primary and secondary schools which focusses on environmental issues incorporated into water and water re-use as major issues faced in South Africa. This will allow individuals to receive water, water re-use and other environmental education at early ages. Attitudes and interest that are shaped at an early age contribute to positive future behaviours (Adewumi *et al*., 2010). Furthermore, Water re-use (grey) outreach programmes should take place in various schools and communities with the aim of communicating and sharing knowledge regarding water re-use.

Water re-use is further rejected by individuals due to health apprehensions. Po *et al*. (2005) reinforced this statement by stating that the majority of the public are reluctant

to water re-use since they believe the wastewater to be harmful to their health. Therefore, the study recommends that medical experts should be appointed by the government, departments or water institutes to address safety and health issues (Slabbert, 2019).

As indicated in chapter 4, local authorities are perceived as key influencers to raise awareness and educate about water re-use. Local authorities, in association with their communities and the Department of Water and Sanitation should take the incentive and organise informative projects competitions (edutainments) on water re-use which reward individuals who participate in such projects.

This study developed a water re-use communication strategy which recommends that political parties, water services institutions, Non-Governmental Organisations and academic institutions should support and aid in promoting greywater re-use practices and projects held at various schools. Although new media receive more attention and popularity, traditional media still plays a vital role in disseminating information (Stanyer, 2001). Therefore, it is recommended that political parties and the above-mentioned organisations share and reinforce water re-use key messages by communicating through various activities which will reach various individuals in various communities and social structures (e.g. television, radio, internet, magazines and newspapers).

6.7. CONCLUDING REMARKS

South Africa is experiencing water scarcity issues due to various environmental factors such as population growth, a high birth rate and climate change which results in high temperatures and low average rate of rainfall, poor water management, agricultural practices and cumulative industrialisation and urbanisation (Keremane, 2017). Water conservation strategies are considered as vital issues which can be employed to combat the problem. This study aimed to develop a water re-use communication strategy for Basic Education, which included illustrative learning materials suitable for online learning. This study aimed to educate and raise awareness on water re-use as a water preservation method. Water re-use perceptions and communication approaches were highlighted. The study revealed that individuals' perceptions affect behaviour, attitude and decision-making regarding water re-use. The study thus recommends that individual perceptions should be considered in any development and

social change programmes such as water re-use programmes and campaigns (Po *et al*., 2003; Adewumi *et al*., 2014). The study further revealed that individuals desire participation in development programmes. Developmental and participatory approaches to communication have been revealed to be effective methods for effective development and social change. Individuals must be involved in all phases of development; they should be offered a platform for participation and active communication.

They study employed Geertz's interpretation of cultures which explained the component of culture, Vygotsky's social constructivism examined effective education elements and the behaviour ecological model provided insight into individual behaviour. The study revealed that there is a relationship between education, culture and behaviour. It indicates that people who have knowledge or who have been educated about water re-use have more positive perceptions towards the method than those who lack knowledge. It has further shown that cultural beliefs have an impact on behaviour. People behave in particular ways because of what is considered moral or acceptable in their culture. Education and culture make people behave differently towards a phenomenon. The study reveals that individuals accept or reject water re-use because of their knowledge (education) and their cultural or religious beliefs.

The study revealed that the majority of participants have deficient information regarding water re-use. Water re-use illustrative learning materials were thus perceived as effective teaching elements which can effectively generate cognition and sustainable knowledge. The study findings revealed that not all learning materials are suitable for effective learning. Posters and storyboards appeared to promote effective learning better than any other learning materials. It is shown that they distribute information effectively due their colourful, pictures-based nature and that information is presented in a comprehensible and precise manner.

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APPENDICES

APPENDIX 1: ETHICAL CLEARANCE LETTER

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE CLEARANCE CERTIFICATE

MEETING:	**27 November 2018**
PROJECT NUMBER:	**TREC/310/2018: PG**
PROJECT:	
Title:	Towards developing a communication strategy for water re-use in South Africa.
Researcher:	MR Mamabolo
Supervisor:	Dr IP Saunderson
Co-Supervisor/s:	Ms ME Choung
School:	Languages and Communication Studies
Degree:	MA Communication Studies

PROF TAB MASHEGO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:
i) **Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.**
ii) **The budget for the research will be considered separately from the protocol.**
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

Finding solutions for Africa

APPENDIX 2: PERMISSION LETTER

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Private Bag X1108
SOVENGA
0727
Tel. No.: 015 267 5641
Fax No.: 015 267 5243

DEPARTMENT OF EDUCATION
MANKWENG CIRCUIT

2018/11/28

Enq : kekana MJ
Tel No: 015 267 5641

MS MAMABOLO M.R
UNIVERSITY OF LIMPOPO
PRIVATE BAG X1106
SOVENGA
0727

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH BASED ON DEVELOPING A COMMUNICATION STRATEGY FOR WATER RE-USE IN SOUTH AFRICA AT MANKWENG CIRCUIT HIGH SCHOOLS.

1. The above matter refers:
2. We acknowledge the receipt of your letter. Requesting to conduct a research project titled: Developing a communication strategy for water re-use in South Africa at selected Mankweng Circuit School:
   - Mountainview high school
   - Makgoka high school
   - Ditlalemeso high school
   - Hwiti high school
   - Marobathota high school
   - Dikolobe primary school
   - Toronto primary school
   - Pula-Madibogo primary school
   - Moriting primary school
3. Permission is hereby granted for the above mention request.
4. Wishing you for success in your studies

..... 2018/11/28
MAGAGANE M .D DATE
(CIRCUIT MANAGER)

DEPARTMENT OF EDUCATION
CAPRICORN DISTRICT
"We Belong, We Care, We Serve"

APPENDIX 3: CONSENT LETTER

My name is Mamogobo Rosinah Mamabolo. I am currently enrolled for Master of Arts in Communication Studies at the University of Limpopo. I am conducting a research project entitled 'Towards developing a communication strategy for water re-use in South Africa'. The study aims to develop a comprehensive water re-use communication strategy for basic education, which will include illustrative learning material suitable for online learning. It intends to understand public's (learners and educators) attitudes, opinions and perceptions on water re-use.

I have identified you (learners and educators) as participants of the proposed study because you are perceived as the role players who might effectively help reduce environmental issues such as water shortages in South Africa. Your participation in interview sessions and focus group discussions will be done on a voluntary basis, and no learner or educator will be forced to take part. You are more than welcome to withdraw from this research whenever you feel uncomfortable. Your names will not be reflected during interview sessions or focus group discussions and your anonymity will be protected.

Please be informed that information provided during interviews or focus group sessions as response will remain confidential, and no information provided will be used to identify you. Only the researcher, supervisor and the co-supervisor will have access to the collected data.

Should you require any further information, please contact me, my supervisor or my co-supervisor on the following contact details:

Researcher: Ms M.R Mamabolo
061 934 8426

Supervisor: Dr I.P Saunderson
015 268 2750/083 454 5846

Co-Supervisor: Ms M.E Choung
015 268 3465/072 284 9713

Regards,
Mamabolo M.R

APPENDIX 4: PRINCIPALS CONSENT FORM

I as the principal have read and understood the terms and conditions as outlined on the consent letter to interviewees. I therefore allow my senior phase learners to voluntarily participate in this research project entitled “Towards developing a communication strategy for water re-use in South Africa”.

…… ……
Principal’s signature Date

…… ……
Learner’s signature Date

Your permission to conduct this research project will be highly appreciated.

APPENDIX 5: PARENTS CONSENT FORM

I as the parent/guardian have read and understood the terms and conditions as outlined on the consent letter to the interviewee (learner). I therefore allow my child as a learner at Ditlalemeso High School to voluntarily participate in this research project entitled “Towards developing a communication strategy for water re-use in South Africa”.

…… ……
Parent/guardian signature Date

…… ……
Learner’s signature Date

Your permission to conduct this research project will be highly appreciated.

6: EDUCATORS CONSENT FORM

I as the educator have read and understood the terms and conditions as outlined on the consent letter. I therefore allow to voluntarily participate in this research project entitled “Towards developing a communication strategy for water re-use in South Africa”.

…… ……
Signature Date

Your permission to conduct this research project will be highly appreciated.

APPENDIX 7: INTERVIEW GUIDE

My name is Mamogobo Rosinah Mamabolo. I am currently enrolled for Master of Arts in Communication studies at the University of Limpopo. I am conducting a research project entitled 'Towards developing a communication strategy for water re-use in South Africa'. The purpose of the project is to develop a water re-use communication strategy for basic education, which will include illustrative learning materials suitable for online learning and to discover people's opinions, attitudes and perceptions towards water re-use.

The questions are designed to collect information about water re-use in South Africa. The data collected will be treated with utmost confidentiality. Obtained data will be used for research purposes and is subject to ethical rules of research at the University of Limpopo. Respondents will remain anonymous and none of the responses will be traced back to the respondents. Your honest answers will be appreciated.

Section A: Demographic Information

1. Gender :
2. Age :
3. Race :
4. Home language :
5. Occupation :

Section B: Water Re-use Information

1. What do you think are the causes of water scarcity in South Africa?
2. What is water re-use?
3. Have you had any formal education (training) in water conservation or water saving skills at your community?
4. Are you familiar with the concept of water re-use as a water conservation method?
5. At what extent do you understand the dynamics (different facets) of water re-use? Please elaborate
6. How often do you re-use water?
7. What do you use re-used water for?
8. What are your perceptions and attitude towards water re-use? Please elaborate.
9. What are the drivers or influencers of your perceptions towards water re-use?

10. What are your beliefs about water re-use?
11. What do you think must be done to promote water re-use as a water conservation strategy in South Africa?

Section C : Information Source (Activity)

1. Which information material or activity (media) do you prefer or use to access information about environmental issues such as water and water re-use?
2. Is the media reporting sufficient information on water related issues such as water scarcity and conservation methods?

Section D: Illustrative learning materials

1. What kind of illustrative learning material would you prefer for learning and optimising knowledge or information about water re-use (grey water)?
2. Why do you prefer the material? Please elaborate.

Thank you for your participation!

APPENDIX 8: TOPIC GUIDE

My name is Mamabolo Mamogobo Rosinah. I am conducting a study entitled 'Towards developing a communication strategy for water re-use in South Africa'. The study aims to develop a water re-use communication strategy for basic education, which include illustrative learning materials suitable for online learning. The topic guide is designed to explore learners and educators' experiences, perceptions and opinions regarding water re-use. Obtained data from the discussions will be treated with utmost confidentiality. Research participants will remain anonymous and no information will be traced back to the participant. Please probe all questions in detail. Your participation in the discussion will be highly appreciated.

Section A: Demographic Details

- Gender:
- Age:
- Race:
- Home language:
- Occupation:

Section B: Water re-use discussions

Open ended questions:

- What do you think are the causes of water scarcity in South Africa?
- Are you familiar with water re-use as a water conservation method?
- Do you re-use water at your households? If yes, what do you re-use it for?
- Let us talk about your perceptions, attitudes and beliefs regarding water re-use.
- What the divers or influencers of the held perceptions, attitudes and beliefs?
- Have you had any formal education or training in water conservation or water saving skills in your community?
- At what extent do you understand the dynamics of water re-use? Please elaborate.
- Discuss strategies which could be employed to promote water re-use as a water conservation method in South Africa

Section C: Information activities (media)

Open ended questions:

- Which media do you use to access information on environmental issues?

- Is the media reporting enough information on environmental issues such as water re-use? Why do you think so?

Section D: Illustrative learning materials

Open ended question:

- Which illustrative learning materials do you think are effective sustainable water re-use education and why?

APPENDIX 9: SUMMATIVE ASSESSMENT

All questions presented in this assessment need a critical observation of the developed illustrative learning materials. Please observe the materials and answer the below questions.

1. What do you understand by observing these illustrative learning materials?
2. What message does each learning material send?
3. Do you think the information is well presented and understandable?
4. Where should we prioritise re-using non-soapy water?
5. Where should we re-use all types of greywater (soapy and non-soapy)?

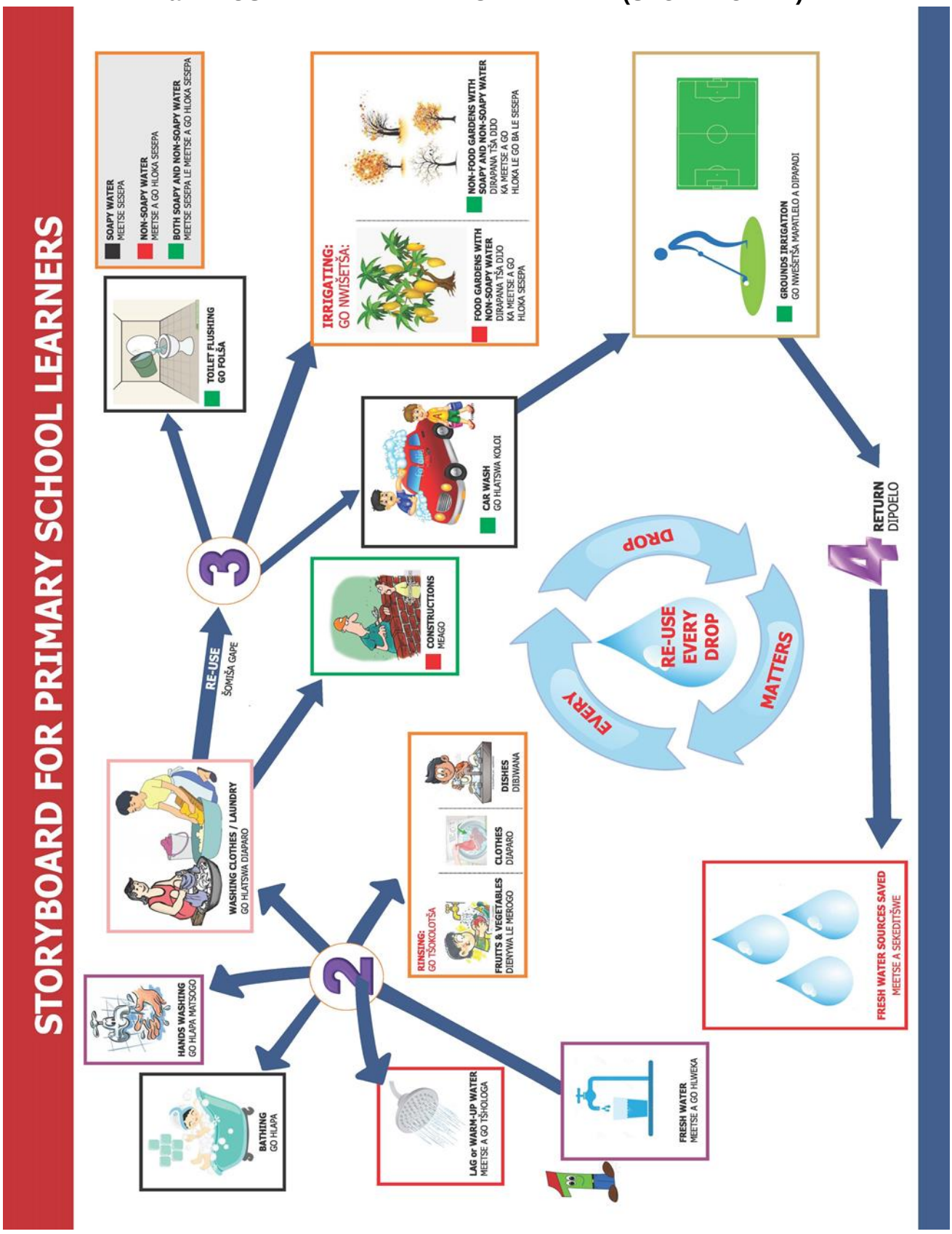
Thank you for your participation!

APPENDIX 10: OBSERVATION SHEET

Date and Time	Participants situation	Participants	Actions observed

APPENDIX 11: WORKSHOP PROGRAMME

APPENDIX 12a: ILLUSTRATIVE LEARNING MATERIAL (STORYBOARD)



APPENDIX 12b: ILLUSTRATIVE MATERIAL (POSTER)

APPENDIX 13: EDITING CERTIFICATE

Student : Mamogobo Rosinah Mamabolo (201412134)

Topic : MA thesis entitled ‘Towards Developing a Communication Strategy for Water Re-use in South Africa’.

Grammar, syntax, punctuation, argument, vocabulary, tenses, logic and general language use have been addressed.

S Harman
P O Box 110
Haenertsburg
083 799 1009

APPENDIX 14: TURNITIN REPORT

Last Doc

ORIGINALITY REPORT

13%	9%	4%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	en.wikipedia.org Internet Source	1%
2	Submitted to North West University Student Paper	<1%
3	uir.unisa.ac.za Internet Source	<1%
4	www.dwa.gov.za Internet Source	<1%
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9	Submitted to University of South Africa Student Paper	<1%