CHAPTER 4

FINDINGS

4.1. Introduction

In this chapter I report my findings. Firstly, I answer and provide evidence from my analysis for all my research questions. Secondly, I compare and contrast my findings with the findings in literature. Thirdly I make suggestions for further research. And finally I conclude by highlighting some of the challenges and significances of my work.

4.2. What are the learners’ African conception(s) of lightning?

The findings in this section of the study suggest that for the majority of learners, the home worldview differs from the worldview of school science. Aikenhead (1999) describes this cognitive setting as collateral learning because learners are learning something in a school cultural setting that is in conflict with their indigenous knowledge. I align my findings with the rainbow illustration by Jegede (1995) stating that “in the culture of Western science, students learn that refraction of light by droplets causes rainbows; while in some African cultures, a rainbow signifies a python crossing a river or the death of an important chief. Thus the African students, learning about lightning or rainbow in science means constructing a potentially conflicting idea in their long term memory.”

Coming back to the study in question I realised that learners have the same conflicting ideas as in Jegede’s rainbow illustration and they get these conflicting ideas in science
from different sources like: Family (parents, grandparents, siblings), community (including religious input) / friends, Unknown source or own thinking. About 33% of the learners mentioned that god causes lightning. A significant number stated that lightning will strike when god is angry or when god wants to show his presence. About 65% of the learners mentioned that the witchdoctors cause lightning. Most learners mentioned the following:

- That lightning will strike as an indication that the ancestors are angry.
- The witchdoctors are fighting amongst each other.
- Caused by the rain queen.
- A person with superpowers dies.

4.3. How does African conception(s) of lighting promote or hinder learning European conception of lightning?

According to participants in this study 72% of the 33 learners mentioned that they find the explanation of lightning from home different from the explanation from school. These statistics agree with both Kawagley (1990) and Ogawa (1995) when they “say non-western students have acquired a traditional culture of their community that interferes with learning western science”. According to Jegede (1995) the socio-cultural background of the learner may have a greater effect on education than does the subject content.

Jegede (1995. p 7) mentioned that learners will accept the scientific truth as a fact when at school, but they will revert to their original beliefs when at home. Most of the learners
maintained that they do not believe in the conventional definition, but they just use it for examinations and school purposes. This proves that there is no meaningful learning in the science class. Some of the learners I have interviewed are top achievers in science, but they still mention that they are writing what the teacher wants them to write but that does not mean they actually believe in what they are writing or learning at school. One leaner mentioned that what she does at school is a ‘compromise’. This statement implies that “a student might perform excellent in a Western science classroom without imbibing, or being enthusiastic about displaying, the associated values and attitudes. This good scientist at school can at home be a traditionalist without feeling of cognitive purbutation.” Jegede (1995. p 7) The approach to teaching does not provide room for conceptual change as Obhiambo (1972) in Dzama and Osborne (1999) maintains that: “An African must find a connecting link between the principles of natural [European] science and basic assumption of his worldview [African science], or he is lost, in this context lost will explain the fact that the learners prior knowledge from their socio-cultural milieu has not been nourished and as a result the new idea has not been stimulated in the cognitive structure.”

Amongst the learners who participated in the study only about 51% knew the actual definition of lightning, 45% gave a wrong definition and about 4% had no idea. This study was conducted while their educator was busy with the section electrostatics in the curriculum. Based on the above statistics one can conclude that the educator did not succeed in teaching content in a plausible manner that would have replaced the prior knowledge of the learners. The African conception that these learners hold is hindering
them and making it difficult for them to learn Western science. “Students have experienced and thought a lot about the world, they enter learning situations with a complex cluster of ideas, beliefs, values and emotions, and it is the potential match between these existing cognitive commitments and the new information which determines how the student will respond to the instructional input”. (Sniverly, 1986, p. 22) cited by Snively and Corsiglia (2001, page 26) The learners’ African conception is a hindrance to the learning of science “because learners cultural identity is often very different from the culture of Western Science most learner’s experience a type of cultural clash whenever they attempt to learn science meaningfully”. (Aikenhead, 1999, page1) This hindrance is based on the fact that Western logic and Non-Western logic are not the same. I have come to a conclusion that these learners do not challenge the validity of the conventional explanation of the origins of lightning. But they believe it is different to the African conception. As an educator who has been exposed to both worlds (Western and non-Western) I can conclude that the issue here is causality. When lightning strikes an African person or his/her property, it is then interpreted in personal terms. And of course personal terms constitute other humans, ancestors, a spirit or a god. What I am implying here is that when lighting strikes this can be explained in western or conventional terms and it will be logical but to a learner from non-Western origins will have to go further and say: Who sent the lightning? or Why should it be me? Jegede (1995. p 7) states that “the African metaphysical thought will investigate why a chance or an incident has occurred while both the Western and African thought rely on objectivity. Western science operates strictly within a positivist /empiricist mode which is hypothetico-deductive and
does not include any humanistic consideration. An African mode of thought interprets objectivity to include causality”.

I have analysed the thoughts of learners based on what they said and will recommend a teaching model that I believe is sensitive to the African mode of objectivity and will align their conception of lightning with the conventional definition.

4.4. What teaching model can be used to enhance learners’ understanding and use of both African and European conceptions of lightning without any contradiction?

Most learners were able to give interesting answers to this question. In going through their responses one would realize that most learners are conscious about how they are being taught. They are critical of the type of resources used at school. This research question may not be fully answered in this research. But based on the data collected the points below give the views of the learners and how they expect educators to approach the electrostatics content. Participants indicated that educators are not willing to talk about the learners' prior knowledge of lightning.

To avoid situations like the one above Snively and Corsiglia (2001, page 26) advise that “educators need to know that it is possible to teach Western scientific concepts to native students with a preferred traditional spiritual view of the world, without changing in the sense of replacing, the learners preferred orientation.” Educators should not try to present content for learners to accept, but to present it so that learners are able to understand it
and are able to explore the similarities and differences between their own African concepts and Western science concepts. Sniverly (1995) as cited by Snively and Corsiglia (2001, page 27) outlined a five-step process that we I believe can be used to address the limitations in the present models in our curriculum. Sniverly refers to this model as TEK unit in cross cultural science teaching.

**Step 1. Choose a science concept. In this case lightning**

- Discuss the importance of respecting the beliefs of others
  - Here educators may talk about traditional wisdom in terms of respect, ethics, reciprocity, holism and spirituality

- Brainstorm what we know about the concept or topic
  - Learners can be given a platform to talk about the definition of lightning form their communities and from their parents and peers.
  - This may include personal experiences and stories told by elders about lightning.

- Brainstorm questions about concept or topic
  - An educator or facilitator may probe the learners on the statements they had just made.
  - Learners can be allowed to interact and question each other about the statement they just made about lightning.

- Identify ideas, beliefs and opinions
  - The educator can make a summary of classes’ discussion and then classify it into the categories like: ideas, beliefs and opinions.
Step 2. Identify personal knowledge

- Research the western modern science perspective
  - Learners may give the conventional definition of lightning from what they may have gathered in their experiences.
  - Group discussion may be allowed so that they explore what they may have learned from different sources.
- Research the various indigenous perspectives including perspectives from several ethnic groups.
  - Learners are from different ethnic groups can mention conceptions of lightning from their respective groups.
- Organise/process the information.
  - At this stage learners may report back from their groups and a facilitator or educator can classify and ask clarity seeking questions.
- Identify similarities and differences between the perspectives at hand.
  - The educator as a facilitator will categorise the learners’ statements and show them the similarities and differences.
- Ensure that authentic explanations from the perspectives are presented.
  - Learners must be probed were necessary so that they are able to give explanations and justify their statements.
Step 3. Research the various perspectives

- Research the western modern science perspective.
  - At this stage learners may be allowed to visit the library and surf the internet for conventional definitions.

- Research the various African conceptions.
  - It may be difficult to find some of the African conceptions at the libraries or on the internet at this stage. Learners may be encouraged to talk to elders and scholars in African knowledge systems.

- Organise/ process the information
  - At this stage learners may report back from their groups and a facilitator or educator can classify and ask clarity seeking questions.

- Identify similarities and differences between the two perspectives
  - Educator as a facilitator will categorise the learners’ statements and show them the similarities and differences.

- Ensure that authentic explanations from the perspectives are presented.
  - Learners must be probed were necessary so that they are able to give explanations and justify their statements.

Step 4. Reflect

- Consider the consequences of each perspective
  - At this stage educators must crate an environment where learner may freely evaluate each perspective.

- Consider the concept or issues from a synthesis of perspectives
Because some of the points are similar and some are different, the educator may guide the learners by referring to the similarities and differences discussed.

- Consider the consequences of a synthesis
  - This is a critical state of concept development and educators have to be sensitive but factual.

- Consider the concept or issue in view of values, ethics and wisdom
  - The synthesis should be examined contextually so that it addresses the local wisdom in terms of respect, values, ethics and wisdom.

- If appropriate, consider the concept or issue from a historical perspective
  - This may be attempted if it helps to bring about conceptual change.

- Consider the possibility of allowing for the existence of differing viewpoints.
  - Some learners may still have alternative conceptions, it will be advisable to give them a platform to express their reservations.

- Consider the possibility of a shared vision.
  - Learners may go back to their groups.

- Ensure that learners compare their previous perspectives with their present perspective.
  - A report back session may be ideal to be able to evaluate this.

- Build consensus

**Step 5. Evaluate progress.**

- Evaluate the decision making process
The educator must check if the process was enough to eradicate misconceptions that may have existed before.

- Evaluate the effects of personal or group actions
  - Did your criterion for grouping these learners work.
- Evaluate possibilities in terms of future inquiries and considerations.
  - Did the class explore all possibilities, if not what could have been the problem?

The researcher would like to refer this section for further research where the teaching model will be put to practice.

4.5. Conclusion and Recommendations

Science educators have long assumed that only Western modern scientific knowledge was true knowledge. This assumption prevents them from realising that “learners bring a broad range of ideas, beliefs, and values, and experiences to the classroom which forms a spectrum of view points”. Snively and Corsiglia (2001, page 25) The fact that learners bring to the classroom ideas based on prior experience and that children of different cultural backgrounds frequently interpret science concepts differently to the standard scientific view suggests that teachers need to begin the exploration of multicultural science instruction with the prior knowledge that learners bring to class. Snively and Corsiglia (2001, page 26)
In this study I learned that teachers have a depth of the content but they lack the understanding of the fact that giving knowledge without tapping into the learners’ belief system is a futile exercise because constructivism suggests that the concept of knowledge and belief are not strictly separable. “Rather than attempt to convert learners so that they shed their indigenous ‘primitive’ world view in favour of ‘more scientific’ explanations, school science should recognise situations in which these primitive views are useful and those which may also, or instead, be approached through them.” Jegede (1995, page 7)

I have also concluded that the socio cultural background of the learner may have a greater effect on education that does the subject content. I recommend that educators should note that any western science curriculum in an African classroom environment that does not take account of the traditional worldview of the learner risks destroying the framework through which concepts are likely to be interpreted. The researcher would like to refer this section for further research where the teaching mode will be put to practice.