THE UTILIZATION OF SCIENCE KITS IN THE LEARNING OF GRADE 8-9 ENVIRONMENTAL SCIENCE AT SELECTED BASIC SCHOOLS IN THE KITWE DISTRICT, ZAMBIA.

by

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DECLARATION

I **P.B.Changwe**, hereby declare that this dissertation is my own work and that it has not been previously submitted for a degree at this or any other university.

Signed..Date...4TH MARCH, 2008...

APPROVAL

This dissertation by Purity Beauty Changwe is approved as fulfilment of the requirements for the award of the Degree of Masters of Education in Science Education by the University of Zambia.

Examiners' Signatures

Signed .... Date....26/02/08....................

Signed .... Date....28/02/08....................

Signed .... Date..

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ACRONYMS

AIEMS	Action for Improvement in English, Mathematics and Science.
CDC	Curriculum Development Centre
CHANGES	Community Health and Nutrition, Gender and Education
CSE	Center For Science Education
DBMSE	Diploma in Basic Mathematics and Science Education
DESO	District Education Standards Officer
DHT	Deputy Headteacher
DHTs	Deputy Headteachers
DRC	District Resource Centre
DRCC	District Resource Centre Coordinator
DRCs	District Resource Coordinators
HOD	Head of Department
HODs	Heads of Department
HT	Headteacher
HTs	Headteachers
INC	Incorporated
Inc	Incorporated
JICA	Japan International Corporation Agency.
MoE	Ministry of Education
INSET	In-Service Education and Training.
MSE	Department of Mathematics and Science Education.
NBCC	New Beginnings Christian Center.
NSC	National Science Center.

NISTCOL	National In-Service Teachers' College
PRCC	Provincial Resource Centre Coordinator
PRCs	Provincial Resource Coordinators
RCs	Resource Centres
SAARMSTE	Southern African Association for Research in Mathematics, Science and Technology Education
ScT	Science teacher
SSES	Subject Specialist for Environmental Science
SIP	School INSERT Provider
SPRINT	School Programme of In- service for the Term
SnT	Senior Teacher
SnTs	Senior Teachers
StO	Standards Officer
SPSS	Statistical Package for Social Sciences
TG	Teacher groups
UBE	Universal Basic Education.
U.K	United Kingdom
UNESCO	United Nations Education and Scientific Cooperation.
UNDP	United Nations Development Programme
ZASE	Zambia Association of Science Educators.
ZC	Zone Chairperson
ZIP	Zone INSET Provider

ABSTRACT

The study was conducted in response to the pertinent need to provide Universal Basic Education (UBE) to pupils by 2015. The study was concerned with science kits and their use in the learning and teaching of environmental science. This was to establish whether or not the policy pronouncement of providing 9 years of basic education to equip pupils with a solid academic and practical background in science was being fulfilled.

The purpose of the study was to investigate the utilization of Science Kits in the learning of grade 8 and 9 Environmental Science in basic schools of Zambia from the time they were introduced in 2003 to date. The objectives of the study were: to determine the availability (or not) of science kits in schools; to establish whether or not teachers used the science kits; to find out how science kits were used; to determine the contributions of science kits to the learning of environmental science and to establish constraints and opportunities which teachers faced in using the science kits.

To achieve the above objectives the study addressed the following research questions: Were science kits available in selected Kitwe basic schools? Where available, were science teachers using the science kits? How were science kits being used? What had been the contribution of science kits to the learning of science? Lastly what were the constraints and opportunities which teachers experienced in teaching science by way of the science kits?

The study employed a sample survey research design. The study sample comprised 101 subjects drawn from 8 upper basic schools. They comprised 85 pupils, 8 teachers and 10 stakeholders. Research Instruments used were self-administered questionnaires.

Quantitative data was analyzed using Statistical Package for Social Sciences (SPSS) to generate tables of frequencies and percentages. The results of the study revealed that science kits were hardly used in the learning and teaching of environmental science. The study also showed that pupils were not given opportunity to handle science kits. Although both stakeholders and teachers indicated that science kits were available in schools, pupils did not seem to know of their availability in the researched schools.

Recommendations have been made to stakeholders, science teachers, educational administrators such as DRCC and PRCC and also to policy makers, which they might consider to improve the utilization of science kits in schools. Among the recommendations is the need for frequent monitoring of use of the science kits in the learning and teaching of Environmental Science by the DRCC and PRCC as well as conducting workshops from time to time to assist new teachers gain professional competences I using the kits..

The study has also suggested areas of further research such as exploring the relationship between grade nine science results and the presence of laboratories in basic schools; the relationship between headteacher qualifications and grade nine results and the replication of this study to other districts/provinces to see if similar results would be obtained.

CHAPTER ONE. INTRODUCTION

1.1 Preview

In this chapter the use of science equipment in the learning and teaching of science in other countries is highlighted as well as an outline of the introduction and utilization of science kits in Zambia.

1.2 Background

The Educational Reforms (MoE, 1977) enshrined a policy that the Government of Zambia should provide nine years of basic education. This led to the introduction of basic education in 1982. Since then basic schools have rapidly spread throughout the country in the recent years. At the time of this study in the year 2008, there were 4,500 basic schools countrywide. Kitwe District had 44 basic schools. The Educational Reforms emphasized education as an instrument for personal and national development, hence, the increase in basic schools.

Upper basic education comprising grades 8 and 9 was to be the terminal educational level for the majority of pupils. There was need, therefore, to prepare them for the world of work and also to cater for the minority who would continue into high school. Pupils were expected to attain, among other things, suitable levels of communication and understanding of the scientific method (MoE, 1996). Curriculum aspects necessitated the balancing of content with process and also implied an enhanced role for guided discovery teaching-learning methods (MoE, 1992). In view of this, the MoE (1996:37) stated that '...the curriculum at this level of education will attach highest priority to development of levels of competence in mathematical skills fostered mainly through science.' Boulind (1958) stated that any science course needed to be firmly rooted in practical work. Kerr et al. (1964) found in their study that practical work promoted simple scientific methods of thought in pupils and enabled them to develop manipulative skills. This was because science was always a practical subject and learned better by doing than by listening.

When the Zambian Basic schools were introduced, there was no equipment and adequate teaching materials, if any, in many schools. In addition, laboratories (practical rooms), which were much needed in the learning of science, were absent. The prevailing condition was a very challenging one for the government. Capital investments such as science practical rooms and equipment were needed for science to be properly learned and taught (MoE, 1992).

A study done in South Africa on the use of Micro-science equipment by Vermaack (1997) revealed that most learners enjoyed 'hands on' activities. Following Vermaack's (1997) study, the Mpumalanga Department of Education supplied Micro-science equipment kits to rural schools, between 1999 and 2000, so that those schools might do practical work. Some of the findings of that research were that the Micro-science equipment kit accommodated individualization and learners liked to work with it. In addition, some participants said that with the availability of Micro- science equipment in their schools, there was no need for a formal laboratory building.

In Zambia, the priority of the Ministry of Education (MOE) had been to raise Zambian pupils' general performance in Environmental Science at grade 8-9 level. The plan of the Ministry was to put interventions in place to raise the standards of the poorly resourced basic schools. Hence, Science Kits of the type used in South Africa were introduced to such schools. Science Kit refers to various items/materials that could be used or assembled together by pupils and teachers for use in an Environmental Science lesson.

Through the MoE, the government purchased 5000 Science Kits and supplied them, first, to rural schools and, later, to urban/peri-urban basic schools. This was to enable them to carry out experimental work in Environmental Science. Of these, 3000 Science Kits were bought from Angelic Industries Q.E of India in 2000. Later, in 2004, 2000 Science Kits were bought from Kremer Industries of United Kingdom (U.K) (Sikanyiti, pers.com; 2004). The specifications of the Science Kits are shown in Appendix D (a). In the year 2005, there were plans by the Curriculum Development Centre (CDC) to introduce Science Kits to all High Schools in the country (Shampile, pers.com; 2005).

The equipment and models found in the Science Kits were to assist pupils in the learning of science. Thermometers for measuring temperature, models of teeth to show growth of teeth in humans and hand lenses for magnifying small objects were some of the items in the Science Kit. Ever since the Science Kits were introduced, no research has been done critically to investigate the relevance and role of these Kits in the learning of the subject. It was worthwhile, therefore, to examine the use of Science Kits in the learning of Environmental Science at grades 8 and 9 levels in selected Upper Basic Schools of Kitwe District.

1.3 Statement of the Problem

The absence of practical rooms and equipment prompted government to provide Science Kits in a context where no laboratories had been constructed. It was not known whether the learners had benefited from the science kit intervention or not as no study had been done to establish the role of the science kits on the learning of Environmental Science at grade 8 and 9 level. Where the science kits being used in the learning of science at grade 8 and 9 levels? If, so, how? And, if not, why not? Answers were needed to such questions to guide future practice at various levels of the Zambian Basic education system, including the classroom.

1.4 Purpose the Study

The purpose of the study was to investigate the utilization of Science Kits in basic schools of Zambia from the time they were introduced in the year 2003 to date.

1.5 Specific Objectives of the Study

The objectives of the study were to:

1.5.1 determine the availability (or not) of the science kits in selected Kitwe upper basic schools

1.5.2 establish whether or not teachers used Science Kits.

1.5.3 where they were available, to find out how Science Kits were used.

1.5.4 determine the contribution of science kits to the learning of environmental science at grade 8-9 level.

1.5.5 establish constraints and opportunities which teachers faced in using Science Kits.

1.6 Research Questions

The study addressed the following questions:

1.6.1 Were Science Kits available in selected Kitwe Basic Schools?

1.6.2 If available, where science teachers using Science Kits?

1.6.3 How were science kits being used?

1.6.4 What had been the contribution of Science Kits to the learning of Environmental science?

1.6.5 What constraints and opportunities did teachers experience in teaching science using science kits?

1.7 Significance of the Study

The study might provide information to the Ministry of Education on whether the Science Kits were being used effectively or not.

Policy makers might get information and be able to include practical work in the environmental science curriculum and might advise government on how best to use Science Kits in science.

The study might help school administrators to appreciate practical work and the place of Science Kits in the learning of grade 8 and 9 environmental science.

Standards Officers might be provided with information that might assist them in monitoring the use of Science Kits in the learning and teaching of science.

INSET Providers might know how to plan responsive workshops for basic school teachers to assist them in the use of the Science Kits.

Manufacturers might know how durable their products were and might be helped to improve the quality of their products.

1.8 Limitations of the Study

The study was limited to eight upper basic schools of Kitwe District, Copper belt Province and was confined to grade eight and nine pupils, Environmental Science teachers and stakeholders. The results obtained in the study may be generalized to the whole country.

1.9 Operational Definition of Terms:

The following terms have been operationalised as follows in this study:-

Equipment refers to any item used during a science practical lesson

Role refers to any activity done or performed by pupils and teachers in the classroom.

Stakeholder refers to any officer in administrative position, such as Headteacher (HT), Deputy Headteacher (DHT) and senior teacher (SnT, Provincial Resource Center Coordinator (PRCC) and District Resource Center Coordinator (DRCC).

Institution refers to a place of work where stakeholders are found

CHAPTER TWO. LITERATURE REVIEW

2.1 POLICY ON BASIC EDUCATION WITH RELEVANCE TO SCIENCE KITS

Upper basic education was aimed at providing each pupil with a solid academic and practical foundation. The policy document, 'Educating our future' (MoE, 1996) indicated that the pupils were expected to attain competence in understanding of scientific method in order to approach a topic in a scientific manner. The same document indicated need for enhanced role for discovery teaching-learning methods. According to Brandwein et al. (1958) and Goldstein (1957) scientific method involves recognizing and identifying the problem, gathering information, analyzing and making conclusions. The pupils should try to get correct answers to a particular problem, hence, this necessitated balancing content of what pupils learnt in science with the processes by which they learnt.

Science is fundamentally an experimental subject and, therefore, every learner must have a practical experience (UNESCO, 1962). Perkins (1958) argued that any science course needed to be firmly rooted in practical work of the type that uses experiment and correct techniques. Sunee (1988) observed that practical work was a characteristically strong feature of school science. Paulsen and Leach (1996) also observed that practical work occupied a central place in Science Education and was seen as a means of improving science education.The same view was expressed in Zambia's National Education policy document 'Educating our Future' (MoE, 1996) whose aim was providing a basic education that would promote skill of learning in intellectual and practical fields. Woolnough and Allsop (1985) indicated that practical skills that needed to develop were those of observation, measurement, estimation and manipulation. Woolnough and Allsop (1985) further observed that manipulative skills needed to be developed to handle apparatus and equipment safely and appropriately, hence, Science Kits were introduced to some basic schools to enable pupils carry out practical work.

In 1995, the National Science Center (NSC), with the help of United National Development Plan (UNDP) and United Nations Educational Scientific Corporation (UNESCO), was mandated to produce the Science Kits for basic schools (see Appendix D, b). Only 147 Science Kits were produced between 1999 and 2004. Most of these, however, were bought by private schools that could afford buying (Chongo, pers.com; 2004).

Later on, the MoE bought 5,000 Science Kits between 2001 and 2004 for 4,500 Basic Schools in the country. Training of Provincial Resource Coordinators (PRCs) was done by the MoE. The PRCs then trained District Resource Coordinators (DRCs) in the use of the Science Kits (Sikanyiti, pers.com; 2004). DRCs in turn, trained Environmental Science teachers in Basic Schools in their respective Districts. The evaluation function of the inspectorate was concerned with assessing the quality and effectiveness of actual educational provision in individual schools (MoE, 1996).

Kitwe District received the Science Kits in 2003. A training workshop was then held at the Distinct Resource Center (DRC) based at Kitwe basic school for basic school teachers in the use of the Science Kits for 10 days. Some Heads of Department (HODs) from high schools were chosen to facilitate at the workshop. One senior teacher (SnT) and two environmental science teachers from each basic school attended the workshop. Since then, no other workshop has been conducted. Instead schools were organized into zones and each zone was to organize a workshop if need arose. Some workshops involve Teachers' Groups (TG) which are one of the School Programme of In-Service for the Term (SPRINT) activities which meet on a regular basis to discuss issues decided by teachers themselves. It would be in such meetings, that teachers with problems regarding the science kit could be helped. MoE/CHANGES 2 Program (2007) has stated that resource centres (RCs) have a challenge to provide teachers with opportunities for in-career development. Craft (1996) stated that it was important to carry out a needs assessment before any In-service training (INSET) could be offered. Each zone has a Zone chairperson (ZC) and a Zonal In-service Provider (ZIP) while each school has a School In-service Provider (SIP) who is a senior teacher (SnT) at the school (Chibesa, pers.com; 2005). To ensure that teachers are competent to teach effectively, the SIP has emphasized SPRINT programmes in school. Avalos (1995) observed that INSET stimulated teachers towards being innovative and being able to create new teaching strategies thus leading to improvement in strategies for teaching science. It was important therefore to find out if the teachers of Environmental Science were effectively using the Science Kits in teaching and whether or not they were comfortable in using it.

2.2 RELATED STUDIES ON PRACTICAL WORK IN RELATION TO SCIENCE KITS.

Scholars like Kerr et al. (1964) described practical work as all kinds of experimental and observational activities in science. Other scholars like Woolnough and Allsop (1985) stated that science teaching was concerned with both the content and processes of science and further argued that practical work was vital for teaching those processes. Jenkins (1989) argued that teaching science through processes offered opportunities for the majority of pupils in schools to do science because at least everyone can be taught to observe and to measure but not everyone can understand scientific concepts and ideas. Harlen (1996) stated that the processes of science include observation, measurement and manipulation. In an effort to develop some scientific skills in pupils, the MoE provided Science Kits to basic schools. Woolnough (1994) had the view that processes could be developed alongside scientific understanding and in the context of doing a scientific activity such as experimentation. Woolnough and Allsop (1985) justified the use of practical work as being essential for the development of a range of skills such as reading, drawing, experimentation, investigation, discovering new knowledge and techniques. Using science kits in the learning of Environmental Science could do just that. Sund and Trowbridge (1967) observed that many pupils required the use of actual objects or models, such a those in the science kit, to make the given phenomena sufficiently concrete to be understood and learnt.

Scholars like Perkins (1958) argued that any science course needed to be firmly rooted in practical work of the type that uses experiments and correct techniques. Heaford (1965) observed that practical work was essential for pupils to manipulate simple apparatus. Other scholars like Wellington (2000) indicated that practical work was one of the distinctive features of science teaching and one of the great expectations of pupil learning. Head (1982) agreed with this view by observing that science was associated with laboratories and curricula provided hands on experience in a laboratory setting.

Haambokoma et al. (2002) stated that one of the needs of the stakeholders was that of providing good infrastructure and this included practical rooms. Muzumara (2007) observed that basic schools offering Environmental Science to grades 8 and 9 did not have established science laboratories. Muzumara (2007) added that many such schools depended on science kits and a few stocks of apparatus and chemicals usually used for class demonstrations.

Muzumara (2007) indicated that large classes could create a great deal of management problems especially during environmental science practical activities. Parkinson (1994) stated that the teacher should emphasize group work other than whole class teaching. AEIMS (1995) and Farrant (1980) observed that grouping was an appropriate means of dealing with practical lessons for which there was insufficient equipment for every child. The teacher might use the strategy of group work as this would be more appropriate as the equipment and apparatus in the Science Kit was not enough to accommodate individual practical work.

Pupils experimented, not to discover new knowledge but for the purpose of understanding scientific ideas (UNESCO, 1962). Scholars like Brinkworth (1968) noted that experimentation helped students to reinforce their understanding of the material learned in the theory. Heaford (1965) agreed by indicating that something genuinely learnt as a result of an experiment by the pupil, is more firmly understood and remembered, than something demonstrated to him.

Some scholars like Jacinta and Regina (1981) had the view that pupils must be given chance to discover, to explore and to find out for themselves by touching, feeling and handling of objects. Jacinta and Regina (1981) indicated that learning of environmental science was made more interesting by incorporating experimental work. At the start of the practical the teacher should give full and detailed instructions so that learners know clearly what they have to do. The learners themselves must perform experiments either as individuals or as groups depending on the type of experiment and the material available (UNESCO, 1962). Another scholar Heaford (1965) noted that pupils become familiar with organizing their own work and methods of measurement as they do a practical supervised by the teacher.

Scholars like Hofstein et al. (1976) observed that the teacher plays an extremely important role in what the student learns. This view agrees with Obanya (1980) who indicated that teaching was supposed to promote learning. Woolnough and Allsop (1985) stated that for quality science education to be there, a good science teacher was required to impart knowledge through theoretical knowledge and practical abilities

Other scholars like Kerr et al. (1964) held similar views by adding that practical work might promote learning as the learning became more relaxed and interesting if done in pairs or groups. Scholars like Bennett and Dunne (1990) found in their study found that children working in groups demonstrated much greater involvement in their work where they were expected to achieve a task. AIEMS (1995) and Farrant (1980) also had the view that small group learning gave children an opportunity to participate actively in a lesson. CSE (1992) observed that group work encouraged sharing of ideas and was motivating to the learners.

Scholars like Wallace and Louden (2002) found in their study that when work was done in collaborative groups, it helped students learn, as they explained to each other what they knew and thereby taught each other. Wallace and Louden (2002) further observed that individual groups provided opportunity for creativity while pair or trio group work helped learners to learn by making different aspects of the problem. Solomon (1994) asserted also that cooperative learning helped pupils to work together and to teach one another as it facilitated discussions.

Scholars like Parkinson (1994) indicated that learners worked best in groups where they felt more comfortable, especially single sex groups. However, MoE (1960) deemed individual practical work of much greater value as the thing which was learnt as a result of the pupil's personal experience, was always better than that demonstrated to him/her. Scholars like Holliday and Forrest (1977) found in their study that children largely favored discovery methods and many of them enjoyed their individual practical work.

In testing a leaf for starch, every pupil could learn to follow procedure correctly, observe color changes after boiling it in alcohol and finally being tested with iodine solution. The beaker and test tube are some of the apparatus from the Science Kit that could be used during that practical. A different study by Khoali et al. (2001) revealed that practical work was hardly done in schools and where it was done it took the form of teacher demonstration.

Farrant (1980:16) says:

'Such learning can not be developed without the active participation of the learner. We learn by doing and so full provision must be made in school for activities that aid learning.'

Scholars like Wenham (1995) considered science as a method of exploring and investigating the world around us with a view of learning more about it and understanding it better. Wenham

(1995) added that it involved observations and experimentation which in turn influenced the teaching approach and how best the pupils learnt science. Obanya (1980) stated that a teacher played an important role in how pupils learn and that could be done by the teacher making decisions as what activities to carry out, how best to carry them out and who should be involved in the activities. Muzumara (2007) found that practical activities required a great deal of planning and commitment on the part of the teacher. In addition Muzumara (2007) stated that the teacher must take into account the type of teaching resources to use and how those will affect the pupils.

Tricker (1967) observed that, given a practical exercise, pupils should be able to think scientifically in the context of a practical situation. Jacinta and Regina (1981) said that at the start of a practical, purposeful activity must be planned and supervised by the teacher. Hofstein et al. (1976) agreed with this view and added that the teacher must be sensitive to the intended goals; student needs and appropriate teaching strategies. Scholars like Obanya (1980) stated that the teacher should motivate children by making his/her methods and teaching materials relevant to their needs, hence, the selection of suitable materials depended on the teacher's imagination and originality. On the other hand, Obanya (1980) observed that for learning to be easy, the learner must show readiness to learn and the material to learn must be meaningful and interesting to him or her. Anderson and Simpson (1981) indicated that every learner must be scientifically literate in order to function effectively in the present scientific world.

All the above scholars discussed so far, seem to agree that practical work was important. On the other hand, AIEMS (1994) observed that though many teachers automatically assumed that practical work was a good thing, badly organized practicals could hinder rather than help learning. Scholars like Hodson (1990) disapproved laboratory work saying, practical activities were ill conceived, misguided and unproductive in that students did not engage in true science. In addition, Hodson (1990) criticized practical work in school saying there was a mismatch between the high ideals of laboratory-based inquiry with emphasis on skill development and confirmation of predetermined conclusions. Other scholars like Désautels and Lacrochelle (1998) alluded that laboratory work in school centered on the assumption that students could mimic in some way what happened in a 'real' science laboratory. Désautels and Lacrochelle (1998) further said there was a difference between school science and real science.

Johnston and Wham (1982) revealed that though pupils enjoyed practical work and picked up hand skills, they learned little of the theoretical information illustrated by practical work. Woolnough and Allsop (1985) observed that it was possible to acquire some knowledge of much scientific information without doing any practical work at all. Another scholar Azri (1998) indicated that there was need to emphasize more on the intellectual and problem solving skills than technical skills.

Unlike Vermaack's (1997) study on Micro-science equipment where he found that learners enjoyed hands on activities, a different study, done by scholars Holliday and Forrest (1977), revealed that some children disliked doing experiments and instead preferred class discussions. The students argued, in the same study, that class discussions would enable them put up their own ideas. MoE (1960) suggested that the teacher should stimulate interest in Environmental Science by encouraging observations during field work.

CHAPTER THREE. METHODOLOGY

In this chapter, descriptions of the techniques used to collect, analyze and interpret data are presented.

3.1 Research design

The study employed a sample survey design to establish how science kits were being used. Sidhu (2003) defines survey as a method of investigation which attempts to describe and interpret what exists at present in terms of conditions, practices, processes and attitudes. Marshall (1995) gives a more formal definition that sample survey is the most appropriate mode of inquiry for making inferences about a large group of people from data drawn on a relatively small number of that group. Both qualitative and quantitative designs were incorporated.

3.2 Target population

The target population was all grade 8 and 9 pupils, all teachers of Environmental Science as well as all stakeholders at the sampled basic schools of Kitwe District.

3.3 Sample size

To determine the sample, several factors were considered. Basic schools in Kitwe were divided into eight zones. Each zone had four to six basic schools. A total sample of 103 subjects took part in the study. All the subjects were drawn from eight zones in the District and represented all pupils, all teachers and all stakeholders in the District.

3.4 Sample

The sample comprised eight stakeholders, eight science teachers (ScT) and 85 pupils. The stakeholders included two Headteachers (HTs), four Deputy Headteachers (DHTs), two senior teachers (SnTs), one Provincial Resource Center Coordinator (PRCC) and one District Resource Center Coordinator (DRCC).

3.5 Sampling procedure.

Stratified sampling technique was used to categorize basic schools into middle and upper basic schools. Systematic random selection of upper basic schools was then done after which 7 schools were chosen. Systematic random sampling involved choosing a starting point in a frame at random and then every nth person was chosen. Thus, if a sample of 20 is required from a population of 100, then every fifth person is chosen (Robson 1993: 138-139). Using systematic random sampling, the following upper basic schools were chosen: Basic school A, Basic school B, Basic school C, Basic school D, Basic school E, Basic school F, Basic school G and Basic school H (see Appendix E, a). The science teachers and stakeholders were picked by using the Lottery method, a simple random sampling technique. The PRCC and DRCC were hand picked purposively because they were the only ones holding those offices.

3.6 Research Instruments

Self administered questionnaires were given to pupils, teachers and stakeholders who independently answered them. The respondents were assured that their response to any item was to be regarded as confidential. They were reminded that there was no right or wrong answer to any item and the intention was to elicit their views on some issues related to Science Kits in the learning of science.

3.7 Data collection

The researcher herself collected the data. Data was collected during the 1st term of 2006. It took, the researcher, two weeks to collect the data. Data was collected through administration of questionnaires to pupils, teachers and stakeholders.

When the researcher visited the sampled schools, the researcher reported to the Headteacher (HT). The reception was very good at all the basic schools visited. The researcher was informed that no one had visited their schools in a long time. The researcher introduced herself verbally at all, but one, of the schools and she immediately received the assistance. At Basic school F, the researcher reported to the Deputy Headteacher (DHT). This was because the head teacher was out of the station at the time of the study. The DHT demanded for an introductory letter and the researcher produced it. Afterwards the researcher was allowed to distribute the questionnaires to the pupils.

A pilot study was first conducted at Basic school X and Basic school Y (see Appendix E, b) in Kitwe district to test the suitability of the research instruments. After revising the questionnaires, the researcher then proceeded to collect data from the sampled schools. None of the pilot schools had a laboratory but both had two science kits. The researcher found out that the schools had received one science kit from the government through the MoE while the other was bought directly from the NSC.

3.8 Data analysis

Qualitative data was analyzed manually while quantitative data was analyzed by descriptive statistics of frequencies and percentages using the Statistical Package for Social Sciences (SPSS).

3.9 Data Interpretation

Data was interpreted using computer generated tables and figures.

CHAPTER FOUR. RESEARCH FINDINGS

4.1 Introduction

In this chapter, the data collected is presented. The data is about particulars of respondents, roles of stakeholders, pupils and science teachers in the utilization of science kits and the opportunities and challenges they faced.

4.2 Personal Particulars

4.2.1 Gender.

The majority of the stakeholder respondents nine (90%) were female while one (10%) was male. For teachers, five (62.5 %) were female and three (37.5 %) were male. Among the pupils, 36 (42.4 %) were female while 49 (57.6%) were male (See figure 1). This shows that most of the stakeholders and science teachers were female while the majority of the pupils were male.

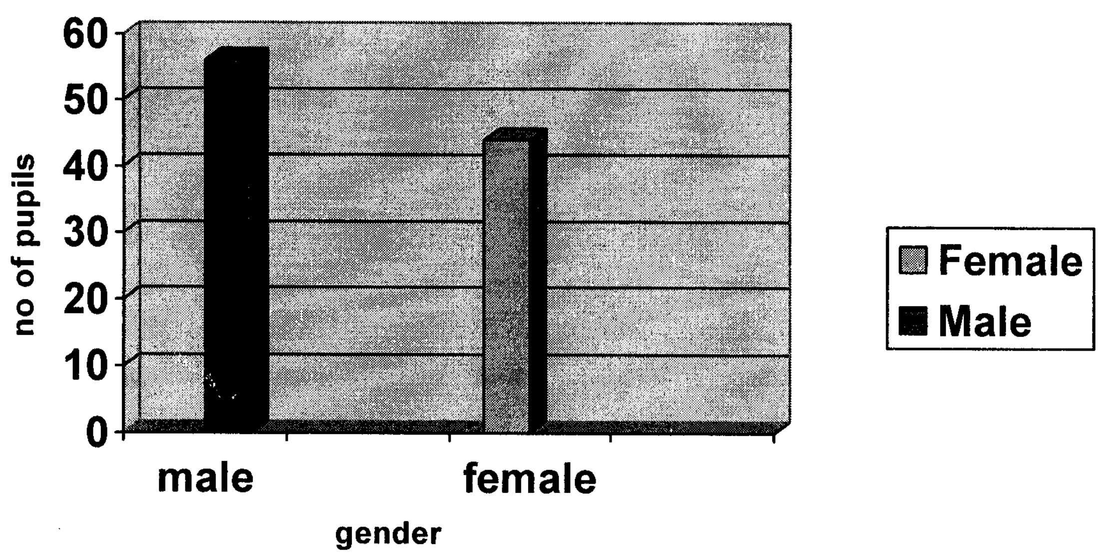

Figure 1. Gender of pupils

4.2.2 Grade of Pupils.

The majority of the pupil respondents 73 (85.9 %) were grade 9s while 12 (14.1%) were grade 8s. These results show that there were more grade 9s who took part in the study than grade 8s. The researcher concluded that more grade nines than grade eights took part in the study because they had been longer in schools than grade eights.

4.2.3 Qualifications of Teacher Respondents

The study was interested in finding about the qualifications of teacher respondents. The responses to the question "What is your highest qualification"? are given in Table 1.

Table 1. Qualifications of teachers at Selected Kitwe Basic Schools.

QUALIFICATION	RESPONSES N (%)
Degree	0 (0)
Advanced Diploma	0 (0)
Diploma	5 (62.5)
Certificate	3 (37.5)
Total	**8 (100)**

The majority of teachers five (62.5%) possessed diplomas while three (37.5%) had certificates. None of the respondents had a University Degree or an Advanced Diploma. From the results above, the researcher concluded that most science teachers had a teachers' Diploma and hence were qualified to teach Environmental Science at grades 8 and 9 level.

4.3 Role of stakeholders.

4.3.1 Introduction of science kits in selected Kitwe Basic Schools.

The respondents were asked to indicate the year when science kits were introduced to their area such as school or district. The responses are tabulated in Table 2.

Table 2. Year that science kits were introduced to schools or districts.

YEAR	RESPONSES N (%)
2002	1 (10)
2003	9 (90)
Total	**10 (100)**

Nine (90 %) of the stakeholder respondents stated that Science Kits were introduced in 2003 while one (10 %) stated in 2002. The researcher concluded from the above findings that Science Kits were introduced to most basic schools and in Kitwe district in 2003.

4.3.2 Availability of Science Kits

The study wanted to establish whether science kits were available in selected basic schools. The respondents were asked the question "were science kits available in selected Kitwe basic schools"?

In response, all the 10 (100%) stakeholders indicated that there were science kits in all the selected Kitwe basic schools. In addition, when they were asked how many science kits were available, all of them (100%) stated that there was only one science kit at each school.

The study wanted to establish whether pupils knew what a science kit was or not. The pupil respondents were asked the question, "Do you know what a science kit is"? The responses are shown in Table 3.

Table 3. Knowledge of Science Kits by pupils at selected Kitwe Basic Schools.

SCHOOL	RESPONSES N (%)			
	YES	**NO**	**No response**	**TOTAL**
A	0	10(11.8)	0	10 (11.8)
B	4 (4.7)	6 (7.0)	0	10 (11.7)
C	15 (17.6)	0	0	15 (17.6)
D	0	10(11.8)	0	10 (11.8)
E	9 (10.6)	0	1(1.2)	10 (11.8)
F	0	10(11.8)	0	10 (11.8)
G	6(7.0)	3 (3.5)	1(1.2)	10 (11.7)
H	4 (4.7)	6 (7.0)	0	10 (11.7)
TOTAL	**38(44.7)**	**45 (51.8)**	**2 (2.4)**	**85 (99.9)**

Results in Table 3 above showed that all the pupils from Basic School C (17.6 %) and 10.6 % from Basic School E as well as most of the pupils from Basic school G knew what a science kit was. However, all the respondents from Basic School D as well as from Basic School F and Basic School A, indicated that they had no knowledge of the science kit. The researcher concluded from the above results that majority of pupils 45 (51.8 %) had no knowledge of the contents of the science kit.

The researcher then asked the pupils if their school had a science kit. Table 4, shows their responses to the question.

Table 4. Pupils' responses on availability of Science Kits at selected Kitwe Basic Schools.

SCHOOL	RESPONSES N (%)			
	YES	**NO**	**No response**	**TOTAL**
A	0	10 (11.8)	0	10 (11.8)
B	5(5.9)	5(5.9)	0	10 (11.8)
C	15(17.6)	0	0	15 (17.6)
D	2(2.4)	8(9.4)	0	10 (11.8)
E	8(9.4)	2 (2.4)	0	10 (11.8)
F	1(1.2)	9(10.6)	0	10 (11.8)
G	5(5.9)	5(5.9)	0	10 (11.8)
H	3 (3.5)	6(7.0)	1(1.2)	10 (11.7)
TOTAL	**39(45.8)**	**45(53.0 %)**	**1 (1.2)**	**85 (100.1)**

The results, in the table above, show that 45 (53%) of the pupils said Science Kits were not available at their school while 39 (45.9 %) stated that there were science kits at their school. 10 (11.8%) pupils from Basic school A, 8 (9.4%) from school D and 9 (10.6%) from school F stated that their schools had no science kit while all 15 (17.6%) from school C indicated their school had science kits. The researcher concluded, from the results in Table 4, that Science kits were not available in selected basic schools of Kitwe District.

4.4 Use of Science Kits by teachers.

4.4.1 Monitoring of the use of the science kit in the learning and teaching of Environmental Science.

The study was interested in finding out if the Standards Officers were monitoring the use of Science Kits in the learning and teaching of Environmental Science in the schools or districts. The study was interested in finding responses to the question "How often is monitoring the use of science kits in the learning and teaching of Environmental Science done"? The results are shown in Table 5 below.

Table 5. Monitoring of the use of the Science Kits in the learning and teaching of Environmental Science at selected Kitwe Basic Schools.

INSTITUTION	**RESPONSES N (%)**			
	Very Often	**Often**	**Seldom**	**Never**
A	0	0	1(10)	0
B	0	0	1(10)	0
C	0	0	0	1(10)
D	0	0	0	1(10)
E	0	0	0	1(10)
F	0	0	0	1(10)
G	0	0	1(10)	0
H	0	0	0	1(10)
I	0	1(10)	0	0
J	0	1(10)	0	0
TOTAL	**0**	**2 (20)**	**3 (30)**	**5 (50)**

Both Institutions I and J representing 20% of the respondents, stated that monitoring of the science kit was often done while basic schools A, B and G indicated that it was seldomly done. On the other hand, five (50 %) of the stakeholder respondents comprising, Basic school C, Basic school D, Basic school E , Basic school F and Basic school H stated that monitoring was never done. None of the respondents indicated that monitoring was done very often. The researcher concluded from the above results that monitoring of the use of the Science Kits was never done.

4.4.2 Experience in teaching Environmental Science.

The study wanted to establish how long the science teachers had been teaching Environmental Science. The question asked was "How long have you taught Environmental Science"? In response, two (25%) had taught between 2-4 years, four (50%) of the teachers stated that they had taught environmental science between 5-9 years and two (25%) had taught between 10-20 years. The researcher concluded from these results that the majority (75%) of teachers had taught environmental science for more than 5 years and therefore had enough experience.

4.5 Use of Science Kits by pupils.

4. 5.1 Competence of teachers to handle Science Kits

The study was interested in finding about whether environmental science teachers were competent to handle science kits. The responses to the question, "Have basic school teachers been trained in the use of science kits"? were that eight (80 %) of the stakeholders reported that teachers had undergone training in the use of the science kit while two (20 %) stated that they had not been trained. The researcher concluded from these results that the majority (80%) of basic school teachers had been trained in using science kits.

4.5.2 Opportunity for pupils to handle science kits during science lessons.

The study wanted to establish whether pupils were given the opportunity to handle science kits during Environmental Science lessons.

The question "Are you given opportunity to handle science kits during Environmental Science lessons involving a practical"? The responses are given in Table 6 and Table 7 below

Table6. Opportunity for pupils (by gender) to handle Science Kits.

GENDER	RESPONSES N (%)				TOTAL
	Yes	No	Sometimes	No response	
MALE	18 (21.2)	30 (35.3)	1(1.2)	0	49 (57.6)
FEMALE	12 (14.1)	21(24.7)	2(2.4)	1(1.2)	36 (42.4)
TOTAL	**30(35.3)**	**51 (60)**	**3(3.6)**	**1(1.2)**	**85(100.0)**

The results in Table 6 showed that 18 (21.2%) of male pupils were given opportunity to handle science kits while 12 (14.1%) of female pupils were given opportunity to do so. Of the 49 males that took part in the study, 36.7% were given opportunity while only 33% of the 36 females who took part in the study got opportunity to handle science kits. The researcher concluded that male pupils were given more opportunity to handle science kits than female pupils.

Table 7. Opportunity for pupils to handle Science Kits at selected Kitwe Basic Schools.

SCHOOL	RESPONSES N (%)				
	YES	NO	SOMETIMES	NO RESPONSE	TOTAL
A	2(2.4)	8(9.4)	0	0	10 (11.8)
B	5(5.9)	4(4.7)	1(1.2)	0	10 (11.8)
C	9(10.6)	6(7.0)	0	0	15 (17.6)
D	3(3.5)	7(9.3)	0	0	10 (12.8)
E	6(7.0)	4(4.7)	0	0	10 (11.7)
F	1(1.2)	9(10.6)	0	0	10 (11.8)
G	3(3.5)	6(7)	0	1(1.2)	10 (11.7)
H	3(3.5)	7(9.3)	0	0	10 (12.8)
TOTAL	**32 (37.6%)**	**51(60%)**	**1(1.2)**	**1(1.2)**	**85 (100.1)**

The majority of pupils nine (10.6%) from school F, eight (9.4 %) from school A, seven (9.3%) each from schools D and H, and six (7%) from school G indicated that they were not given the opportunity to handle science kits. The findings revealed that 51 (60%) of the pupils did not have the opportunity to handle science kits during a practical while 32 (37.6%) had opportunity to do so (See also Figure 2 below).

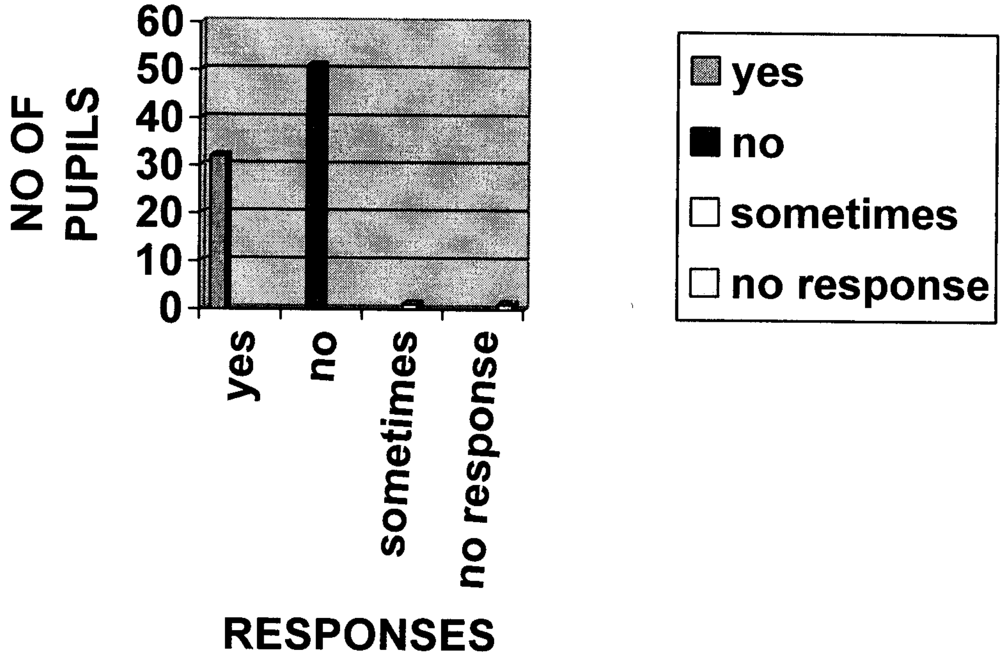

Figure 2 Opportunity to handle Science Kits by pupils

4.5.3 Roles played by pupils during a science practical lesson.

The study was interested in finding out the roles played by pupils during an Environmental Science practical lesson where science kits were used. The respondents were asked the question "What role do you give to your pupils to play during such lessons where science kits are used"? Their responses from the teachers are presented in Table 8.

Table 8. Roles given to pupils by teachers at selected Kitwe Basic Schools.

RESPONSES FROM TEACHERS	FREQUENCY N (%)
As observers	2 (25)
As facilitators	1 (12.5)
Carry out practical and write their results	5 (62.5)
TOTAL	**8 (100)**

The majority of teachers five (62.5 %) stated that they allowed pupils to carry out practicals, two (25%) said pupils observed while one (12.5 %) indicated that the pupils facilitated during such lessons. From the results in Table 8, the researcher concluded that teachers allowed pupils to carry out practicals.

The study was also interested in finding out the roles that pupils themselves played during science lessons involving a practical. The pupil respondents were asked the question "What role do you play during such science experiments"? Their responses are tabulated in Table 9.

Table 9. Roles played by pupils during lessons involving Science Kits at selected Kitwe Basic Schools.

REPONSES FROM PUPILS	FREQUENCY N (%)
Observing	18 (21.1)
I have no role	20 (23.5)
I just listen	9 (10.6)
I hold apparatus	8 (9.4)
Carry out experiments	4 (4.7)
I don't know	3 (3.5)
No response	23 (27)
TOTAL	**85 (100)**

The majority of pupils 23 (27%) did not respond, 18 (21.1%) revealed that they observed while another 20 (23.5 %) indicated they had no role. Only four (4.7 %) said they carried out experiments. The researcher concluded, from the results above, that pupils did not play any role during science experiments. The majority did not respond because they did not know what they did during such lessons.

The study then went on to find out the roles played by teachers themselves during science lessons were science kits were used. The question asked was "what role do you yourself play during such lessons"? Results are given in Table 10.

Table 10. Roles played by teachers at selected Kitwe basic schools.

RESPONSES FROM TEACHERS	FREQUENCY N (%)
Facilitating	3 (37.5)
Demonstrating	2 (25)
Guiding	1(12.5)
Moderator	1(12.5)
Demonstrating and Instructing	1(12.5)
TOTAL	**8 (100)**

The findings in Table 10 revealed that three (37.5 %) of the teachers facilitated, two (25%) demonstrated while three (37.5%) guided, moderated or demonstrated and instructed. From the results in Table 10 above, the researcher concluded that many teachers facilitated during science practical lessons.

4.5.4 How pupils do science experiments.

The study was interested in finding out how pupils did science practicals. The responses to the question, "How do you do science experiments"? are given in Table 11.

Table 11. How pupils do science experiments at selected Kitwe Basic Schools.

RESPONSES FROM PUPILS	FREQUENCY N (%)
Teacher draws diagram on the board	15 (17.6)
Teacher just explain	27 (31.8)
Teacher tell pupils to come with things needed	4 (4.7)
We just read the notes ourselves	8 (9.4)
By listening	3 (3.5)
I don't know	6 (7.0)
No response	22 (25.9)
TOTAL	**85 (99.9)**

The majority of pupils 27 (31.8%) indicated that the teacher just explained, 15 (17.6%) stated the teacher just drew the diagrams on the board. 22 (25.9%) did not respond to the question while three (3.5%) and six (7%) indicated that they just listened and did not know respectively. The researcher concluded that pupils did not carry out practicals in Environmental Science, instead the teacher just explained as 31.8 % had indicated.

The study was interested in finding out the frequency of practical work in basic schools. The researcher asked the pupil respondents, "How often do you do science experiments"? The responses to the question are given in Table 12.

Table 12. Frequency of doing science experiments by pupils at selected Kitwe Basic Schools.

SCHOOL	RESPONSES N (%)					
	Very often	**Often**	**Rarely**	**Never**	**No response**	**TOTAL**
A	1(1.2)	1(1.2)	4 (4.7)	2 (2.4)	2 (2.4)	10 (11.9)
B	3 (3.5)	4 (4.7)	2 (2.4)	1(1.2)	0	10(11.8)
C	2 (2.4)	11(12.9)	2 (2.4)	0	0	15 (17.7)
D	1(1.2)	0	1(1.2)	5 (5.9)	3 (3.5)	10 (11.8)
E	2 (2.4)	2(2.4)	0	4 (4.7)	2 (2.4)	10 (11.9)
F	1(1.2)	0	1(1.2)	2 (2.4)	6 (7.0)	10 (11.8)
G	2 (2.4)	1(1.2)	3 (3.5)	2 (2.4)	2 (2.4)	10 (11.9)
H	3 (3.5)	2 (2.4)	0	1(1.2)	4 (4.7)	10 (11.8)
TOTAL	**15 (17.8)**	**21 (24.8)**	**13 (14.4)**	**17 (20.2)**	**19 (22.3)**	**85(100.6)**

The results in Table 12 showed that 21 (24.8%) of the pupils often did experiments while 13 (14.4%) and 17 (20.2%) rarely or never did any experiments respectively. In addition, 19 (22.3%) did not respond. The researcher concluded from the above results that majority of the pupils never did experiments in Environmental Science at selected Kitwe Basic Schools.

4.5.5 Use of Science Kits in experiments by pupils.

The study was interested in finding about whether or not pupils used science kits in learning environmental science. The responses to the first question, "Do you use the science kit in experiments"? are in Table 13.

Table 13. Use of Science Kits by pupils at selected Kitwe Basic Schools.

SCHOOL	RESPONSES N (%)			
	Yes	No	No response	TOTAL
A	0	8 (9.4)	2 (2.4)	10 (11.8)
B	7 (8.2)	3 (3.5)	0	10 (11.7)
C	5 (5.9)	3 (3.5)	7 (8.2)	15 (17.6)
D	3 (3.5)	7 (8.2)	0	10 (11.7)
E	7 (8.2)	2 (2.4)	1(1.2)	10 (11.8)
F	1(1.2)	9 (10.6)	0	10 (11.8)
G	6 (7.0)	4 (4.7)	0	10 (11.7)
H	2 (2.4)	7 (8.2)	1(1.2)	10 (11.8)
TOTAL	**31(36.4)**	**43 (50.5)**	**11 (13.0)**	**85 (99.9)**

The majority of the pupils 43 (50.5%) indicated that they did not use science kits in experiments while 31 (36.4 %) stated that they did so. Most of the pupils who indicated that they did not use science kits in doing practical work were nine (10.6 %) from Basic school F, eight (9.4 %) from A and seven (8.2 %) each from basic schools D and H. Among those who stated that they used science kits in experiments were seven (8.2%) from school B, seven (8.2%) from school E and six (7 %) from G basic school. The researcher concluded that the majority of pupils did not use science kits in science experiments as 43 (50.5%) had indicated that they did not use science kits.

The second question asked to pupils was, "do you use science kits in science experiments at your school"? The responses given to this question are shown in Table 14.

Table 14. Use of Science Kits in science experiments at own school.

SCHOOL	RESPONSES N (%)			
	Yes	**No**	**No response**	**TOTAL**
A	0	10 (11.8)	0	10 (11.8)
B	3 (3.5)	5 (5.9)	2 (2.4)	10 (11.8)
C	13 (15.3)	2 (2.4))	0	15 (17.6)
D	0	6 (7.0)	4 (4.7)	10 (11.7)
E	7 (8.2)	2 (2.4)	1(1.2)	10 (11.8)
F	0	9 (10.6)	1(1.2)	10 (11.8)
G	1(1.2)	6 (7.0)	3 (3.5)	10 (11.7)
H	2 (2.4)	4 (4.7)	4 (4.7)	10 (11.8)
TOTAL	**26(30.6)**	**44 (51.8)**	**15 (17.6)**	**85 (100.0)**

The results, in Table 14 above, showed that 10 (11.8 %) pupils from School A and nine (10.6%) from Basic school F did not use science kits at their school. On the other hand, 15 (17.6%) pupils from Basic school C and seven (8.2%) from Basic school E indicated that they used science kits at their schools. The researcher concluded from the results in Table 14 that the majority of pupils 44 (51.8%) did not use science kits at their school.

4.6 Contribution of Science Kits to schools.

The study was also interested in finding about the contributions of science kits to basic schools of Kitwe District. This aspect is reported in the next four pages in items 4.6.1 and 4.6.2

4.6.1 Opinions of stakeholders on the value of science kits to pupils and to teachers.

The question asked was "what is your personal opinion on the value of science kits to pupils"? The opinions of the stakeholders on this question are shown in Table 15 below.

Table 15. Opinions of stakeholders on the value of science kits to pupils of selected Kitwe Basic Schools.

STATEMENTS	FREQUENCY (%)
Life skills	1 (10)
It is good	2 (20)
Of very good value	3 (30)
Understand easily	1 (10)
Helps them learn by seeing and touching	3 (30)
TOTAL	**10 (100)**

The majority of the stakeholders constituting three (30 %) indicated that science kits were of very good value and an equal number stated that they helped pupils to learn by seeing and touching. Only one (10%) of the stakeholders had the view that pupils acquired life skills. The researcher concluded, from results in Table 15, that science kits were of very good value to pupils as they helped them to learn by seeing and touching.

The researcher then went on to find out the opinions of stakeholders on the value of science kits to teachers by asking them "What is your personal opinion on the value of science kits to teachers"? The responses are in Table 16 below.

Table 16. Stakeholders' opinion on the value of science kits to teachers of selected Kitwe Basic Schools.

STATEMENTS FROM STAKEHOLDERS	FREQUENCY N (%)
Easy to inculcate quality education to pupils	1(10)
Helps to teach	4 (40)
Help to make science real	1 (10)
Help in explanation	2 (20)
Helps to build up the lesson as they teach	2 (20)
TOTAL	**10 (100)**

The majority of stakeholders constituting four (40%) indicated that science kits helped teachers to teach while two (20%) stated that science kits helped in explanation and in building up the lesson respectively. One (10%) stakeholder stated that science kits helped to make science real. From the results in Table 16, the researcher concluded that science kits helped teachers to teach.

4.6.2 Good things pupils get by using science kits.

The study further wanted to find out what good things pupils got by using science kits.

The responses to the question, "what good things do you get by using science kits in learning Environmental Science"? are given in Table 17.

Table 17 Good things pupils get by using Science Kits in learning environmental science.

STATEMENTS	FREQUENCY N (%)
Knowledge	20 (23.5)
Skill to operate experiments	6 (7.0)
Easy to understand	5 (5.9)
Nothing	23 (27.1)
I don't know	9 (10.6)
No response	22 (25.9)
Total	**85 (100.0)**

The results in the Table 17 above showed that the total number of pupils who got skills in operating experiments, got knowledge and found environmental science easy to understand were about 31 (36.4%). Pupils who did not respond were 22 (25.9%) while those who stated that they got nothing were 23 (27.1%). The researcher concluded that pupils got some good things by using science kits in learning Environmental Science.

The study was also interested in finding out how comfortable pupils were in handling science kits. The question asked was, "how comfortable are you in handling science kits in the science class"? The responses of pupils are given in Table 18.

Table 18 Comfortability of handling Science Kits in learning Environmental Science.

SCHOOL	RESPONSES N (%)					
	Very comfortable	**Comfortable**	**Not comfortable**	**Scared**	**No response**	**TOTAL**
A	0	2 (2.4)	7 (8.2)	0	1(1.2)	10 (11.8)
B	2 (2.4)	6 (7.0)	1(1.2)	1(1.2)	0	10 (11.8)
C	0	2 (2.4)	13(15.3)	0	0	15 (17.7)
D	1(1.2)	2 (2.4)	7 (8.2)	0	0	10 (11.8)
E	6 (7.1)	2 (2.4)	2 (2.4)	0	0	10 (11.9)
F	1(1.2)	2 (2.4)	5 (5.8)	2 (2.4)	0	10 (11.9)
G	3 (3.4)	4 (5.3)	3 (3.4)	0	0	10 (12.3.)
H	2 (2.4)	5 5.8)	1(1.2)	1 (1.2)	1 (1.2)	10 (11.9)
TOTAL	**16 (18.8)**	**36 (42.4)**	**27 (31.8)**	**4 (4.7)**	**2 (2.4)**	**85(100.1)**

The majority of pupils (36, (42.4 %) indicated that they were comfortable in handling science kits in learning environmental science, 27 (31.8%) were not comfortable while four (4.7%) were scared. The majority of pupils (15.3%) from school C and 8.2 % from schools A and D respectively stated that they were not comfortable in handling science kits. The results in the above table showed that many pupils 36 (42.4%) were comfortable in handling science kits.

4.7 Constraints and opportunities teachers faced in using the science kits

The study was interested to know who was in charge of the science kit and to establish whether the officers had any bearing on the success or failure of experimental work in the learning and teaching of Environmental Science schools. The responses from the teacher respondents to the question "who is in charge of the science kit?" are given in Table 19.

Table 19 Officers in charge of Science Kits of selected Kitwe Basic Schools

SCHOOL	RESPONSES N (%)					
	Head teacher	**Deputy head teacher**	**Senior Teacher**	**Head of Department**	**Stores officer**	**TOTAL**
A	0	0	1(12.5)	0	0	1 (12.5)
B	0	0	0	1(12.5)	0	1 (12.5)
C		0	0	1(12.5)	0	1 (12.5)
D	0	1(12.5)	0	0	0	1 (12.5)
E	0	0	0	1(12.5)	0	1 (12.5)
F	1(12.5)	0	0	0	0	1 (12.5)
G	0	0	0	0	1(25)	1 (12.5)
H	0	1 (12.5)	0	0	0	1(12.5)
TOTAL	**1 (12.5)**	**2 (25)**	**1(12.5)**	**3 (37.5)**	**1(1.25)**	**8 (100)**

The majority of the teacher respondents three (37.5 %) indicated that the Science Kits were kept by the heads of department (HODs) and one (25%) stated the stores officer kept the science kit. At Basic school D, the science kit was kept by the DHT while at Basic school F the HT kept it. The researcher concluded from the results in Table 19, that HODs kept the science kits.

4.7.1 Opportunities teachers faced in using the science kits

Teachers were asked the question "how useful has the science kit been in the teaching of environmental science to your grade 8-9"? Responses are tabulated in Table 20.

Table 20 Usefulness of Science Kits in teaching Environmental Science.

RESPONSES FROM TEACHERS	N (%)
Pupils have learned practical skills	1 (12.5)
Subject made live and interesting	2 (25)
They learn more from what they see than what they just hear	2 (25)
Not much	1(12.5)
Motivating and easy to teach and achieve the objectives	1 (12.5)
To understand well	1 (12.5)
Total	**8 100**

The majority of teachers two (25 %) stated that when science kits were used the subject was made live and interesting; another two (25%) indicated that it helped children learn more from what they saw than from what they just heard while one (12.5 %) stated that pupils did not get much. The researcher concluded that majority of the teachers four (50%) had the view that science kits made the subject live, interesting and helped children learn more from what they saw than from what they just heard.

4.7.2 Constraints faced by teachers faced in using the science kit.

The study was interested in establishing whether or not science kits were easily available for use by the teachers.

The responses to the question, "is the equipment in the science kit easily available to you and the pupils for use"? are shown in Table 21.

Table 21 Availability of science kits for use by science teachers and pupils.

RESPONSES FROM TEACHERS	FREQUENCY N (%)
The people keeping are not always available	3 (37.5)
Due to lack of some chemicals	1(12.5)
The school has no laboratory at all	1 (12.5)
No Response	3 (37.5)
Total	**8 (100)**

About three (37.5%) respondents indicated that the science kits were not always available to them because the people keeping the science kits were not always available while another three (37.5%) did not respond to the question. One respondent (12.5%) cited lack of chemicals as the reason for not using the science kits. The researcher concluded, from the results in Table 21, that science kits were not always available to the teachers.

The study was interested in knowing how lost or worn out equipment was replaced. The responses to the question, "how are lost or worn out equipment replaced"? are given in the Table 22.

Table 22. Replacement of lost or worn out equipment.

RESPONSES FROM STAKEHOLDERS	FREQUENCY N (%)
By buying	2 (20)
School can improvise using local materials where possible	1 (10)
They are never replaced	1 (10)
No system in place	2 (20)
Buy or ask sister school	4 (40)
Total	**10 (100)**

The majority of the stakeholders four (40%) stated that they either bought or asked from sister schools, two (20%) indicated that they replaced lost or worn out equipment by buying. On the other hand one (10%) stated that they were never replaced or improvised using local materials respectively while two (20%) revealed that there was no system in place. The researcher concluded, from the above results, that basic schools replaced lost or worn out equipment by either buying or asking from sister schools.

The study was interested in finding out if basic schools had laboratories. The question was "Have any laboratories been constructed in upper basic schools since introduction of science kits"? The responses to the question are tabulated below in Table 23.

Table 23 Construction of laboratories in Basic Schools since the introduction of Science Kits.

INSTITUTION	RESPONSES N (%)		
	YES	NO	TOTAL
A	0	1	1
B	0	1	1
C	1	0	1
D	0	1	1
E	0	1	1
F	0	1	1
G	0	1	1
H	0	1	1
I	1	0	1
J	1	0	1
TOTAL	**3(30)**	**7(70)**	**10(100)**

Results in Table 23 showed that seven (70%) of the respondents indicated that no laboratory had been constructed since the introduction of Science Kits while only three (30%) stated that they had been constructed. Of the 30% only school C had constructed a laboratory. Respondents I and J revealed that some basic schools in the district had constructed laboratories. The researcher concluded that the government had not constructed laboratories in basic schools since the introduction of Science Kits.

The study was interested in finding out if pupils had any suggestions on science kits. The question that was asked was "What suggestions can you make on how best to make use of science kits"? Their responses are in Table 24

Table 24. Suggestions from pupils on how best to make use of Science Kits.

STATEMENTS FROM PUPILS	FREQUENCY N (%)
They should be made available to us	26 (30.6)
To have many kits	13 (15.3)
Giving us opportunity to handle science kits	7 (8.2)
I have no suggestions	2 (2.4)
To have a laboratory in school	18 (21.1)
No response	19 (22.4)
TOTAL	**85 (100.0)**

The majority of pupils 26 (30.6%) in Table 24 stated that science kits should be made available to them, 18 (21.1%) stated that they should have a laboratory in school and 13 (15.3%) suggested to have many kits. Two (2.4) and 19 (22.4%) had no suggestions and no responses respectively. The researcher concluded from the results that science kits should be made available to pupils.

The study was interested in finding out suggestions on the future of science kits from stakeholders. The question asked was "Kindly make suggestions on the future of Science Kits. The responses are given in Table 25.

Table 25. Suggestions from Stakeholders on the future of Science Kits.

STATEMENTS FROM STAKEHOLDERS	FREQUENCY N (%)
We need more than one kit and we will turn one classroom into a lab	1(10)
Laboratories should be constructed and more science kits with chemicals to be provided	2 (20)
They should be availed to pupils	2 (20)
Build resource centers in basic school for easy storage	1(10)
To have many science kits	4 (40%)
TOTAL	**10 (100)**

The results in Table 25 showed that four (40%) of the stakeholders indicated that basic schools should have many kits, two (20%) indicated that laboratories should be constructed and more science kits with chemicals to be provided while another two (20%) stated that science kits should be availed to pupils. The researcher concluded, from the above results, that six (60%) of the stakeholders suggested that basic schools should have many science kits.

In conclusion, the study had established that science kits were available in all basic schools of Kitwe District. The study had also revealed that many pupils did not know that their schools had Science Kits. In addition, the study had also established that practical work, where science kits were used, was never done in the basic schools of Kitwe District. Several reasons such as: non availability of the science kit for use; no system in place to replace lost or worn out equipment as well as non availability of chemicals. have been cited as reasons for not engaging learners in practical work. Furthermore the study had revealed the officers responsible for monitoring the use of Science Kits in Basic schools were not doing so.

CHAPTER FIVE. INTERPRETATION OF RESULTS

5.1 Introduction

This chapter will discuss the findings of the study. The study will focus on five main areas, namely: availability of science kits in basic schools; use of science kits by teachers; how science kits were being used; contribution of science kits to the learning of environmental science as well as constraints and opportunities teachers faced in using science kits.

5.2 Availability of science kits.

The study established that science kits were introduced to Zambian basic schools in 2003. In Table 2, the majority of the stakeholder respondents nine (90 %) stated that Science Kits were introduced in 2003 while one (10 %) stated in 2002. The researcher concluded that Science Kits were introduced to most basic schools in 2003. The information obtained from the Ministry of Education (MoE), stakeholders and science teachers (ScT) indicated that science kits were available in all upper basic schools of Kitwe district.

However, Table 4 showed that the responses from pupils were different. 45 (53%) indicated that their schools had no science kits and only 39 (45.9%) stated their school had science kits. Among the respondents that indicated that science kits were not available, were all the 10 (11.8%) pupils from school A, nine (10.6%) from school F and eight (9.4%) from school D. On the other hand, all the 15 (17.6%) respondents from school C were among the 39 (45.9%) who indicated that their school had science kits.

The study revealed that while the stakeholders and teachers were aware of the availability of science kits at their schools, the majority of pupils 45 (53%) had no knowledge while 39 (45.9%) knew that their school had science kits. The researcher argues that the majority did not know that their school had science kits because they were not using them in learning Environmental Science. The researcher further argues that pupils were not engaged in practical work that was why they did not know what the science kit was.

As the researcher went around collecting data at the selected schools, most of the pupils expressed ignorance about the science kits. Even at School C the pupils were not sure what a science kit was despite the results indicated in Table 3. However, after the Headteacher took the pupil respondents to a 'strong' room where the science kit was kept and showed it to them, the respondents changed their responses and indicated that they knew what the science kit was.

Table 5 showed that Institutions I and J representing 20% of the stakeholder respondents stated that monitoring of the science kit was often done while Institutions A, B and G indicated that it was seldomly done. On the other hand, five (50 %) of the stakeholder respondents comprising, Institution C, Institution D, Institution E, Institution F and Institution H stated that monitoring was never done. Institution H informed the researcher that the SIP did the monitoring. From these results, the researcher argues that monitoring of the use of the Science Kits was never done. The researcher further argues that Institutions I and J indicated that monitoring of the science kits was often done because they were in charge of monitoring the use of science kits and might have justified their position.

5.3 Use of Science Kits by teachers.

The findings of the study showed, in Table 1, that most of the teachers were qualified to teach environmental science at upper basic school. The majority of teachers five (62.5 %) had a teachers' diploma qualification and had received training in the use of the science kits. This could have been as a result of the diploma course that was offered at NISTCOL, Diploma in Basic Mathematics and Science Education (DBMSE) course designed to upgrade teaching skills and quality of teaching (UNDP/MoE, 1995). The teachers' teaching experience ranged from two to 20 years and most of them had taught for more than five years. The study, therefore, established that the teachers had enough teaching experience.

The results in Table 10 showed that three (37.5%) of the teacher respondents facilitated during practical lessons, two (25%) demonstrated and only one (12.5%) guided and moderated respectively. The researcher concluded from these results that the teacher took very active roles during Environmental Science practical lessons.

In Table 8, five (62.5%) of teachers stated that they allowed pupils to carry out practicals and write their results but, Table 9 showed that only four (4.7%) of the pupils carried out experiments, 18 (21.1%) observed while eight (9.4 %) held the apparatus. A greater number of pupils, in Table 9, 29 (34.1%) either just listened or had no role to play regarding science kits while 23 (27%) did not respond and another three (3.5%) did not know.

The researcher concluded from the preceding results that 55 (64.1%) of the pupils did not play active roles during lessons where science kits were used and only 30 (35.5%) played active roles. The researcher argues that 29 (34.1%) pupils in Table 9, either just listened or had no role to play regarding science kits because the teachers took very active roles during lessons where science kits were used. In addition the researcher argues that the pupils did not reinforce their understanding through experimentation, as would be the case if experimentation were done. The researcher concluded, again, that teachers did not use science kits in the teaching of Environmental Science at Kitwe basic schools.

Results in Table 21 showed that the equipment was not always available for use because three (37.5%) of people in charge were not available. However, Table 19 showed that in most schools, the HODs kept the Science Kits in store rooms. The researcher wondered why the HODs would not avail the science kits to their teachers knowing that science was a practical subject. The researcher concluded that experiments were rarely or never done because 30 (34.4%) of the pupils in Table 12 had indicated so.

Two (25%) teacher respondents in Table 20 indicated that science kits made the subject live and interesting, another two (25%) stated that pupils learnt from what they see than what they just heard. One (12.5%) revealed that science kits were motivating and easy to teach. From these findings the researcher observed that the majority of teachers 5 (62.5%) had the view that using science kits in teaching would make subject live and interesting , motivate pupils as the pupils learnt easily from what they saw. The researcher concluded that if the science kits were availed to the teachers, the Environmental Science would be made easy to teach.

5.4 How science kits were being used by pupils.

The results of the study revealed that 44 (51.8%) of the pupils (Table 14) did not use science kits at their school. This was noted for basic schools A, D, F and G. The researcher argues that pupils were supposed to use science kits in learning environmental science since the science kits were available in the schools. In addition, their teachers were qualified to teach the subject at upper basic and had been in the service for quite some time. The researcher wondered why the pupils were not using science kits in learning since the stakeholders and the teachers had confirmed that that the science kits were available in their schools.

The study revealed that at most upper basic schools, practical work was never done despite availability of the science kits in schools. Table 11 showed that the majority of the pupils 27 (31.8%) indicated that the teacher just explained concepts while 15 (17.6%) of them stated that the teacher just drew diagrams on the board instead of doing experiments. The researcher argues that by just explaining the teacher used the lecture method within a teacher centered methodology and not pupil centered methodology. The researcher, once again, argues that pupils did not use science kits in science experiments.

The results in Table 6 showed that 18 (21.2%) of male pupils were given opportunity to handle science kits while only 12 (14.1%) of female pupils were given opportunity to do so. Of the 49 males that took part in the study, 36.7% were given opportunity while only 33% of the 36 females who took part in the study got opportunity to handle science kits. The researcher observed that male pupils were given more opportunity to handle science kits than female pupils.

Table 7 showed that 51 (60%) of the pupils were not given an opportunity to handle science kits. At Basic school A, Basic school D and Basic schools F pupils were not given opportunities to handle science kits. Scholars like Jacinta and Regina (1981) stated that pupils must be given chance to discover by touching, feeling and handling of objects. The above findings, the researcher argues, contradict the views by Jacinta and Regina (1981) to the detriment of quality science learning by pupils of Kitwe basic schools. The researcher argues that pupils were not given opportunity to handle science kits because the Science Kits were not available for use and consequently pupils did not do practical work.

In Table 13, the majority of the pupils 43 (50.5%) indicated that they did not use the science kits in science experiments while 31 (36.4 %) stated that they did so. Most of the pupils who indicated that they did not use science kits in doing practical work were nine (10.6 %) from Basic school F, eight (9.4 %) from A and seven (8.2 %0 each from basic schools D and H. Among those who stated that they used science kits in experiments were seven (8.2%) from school B, seven (8.2%) from school E and six (7 %) from Basic school G. The researcher noted that seven (8.2%) of the pupils from Basic school C did not respond while 3 (3.5%) indicated that they did not use the science kits and only five (5.9%) stated they used them. The researcher argues that majority of pupils at basic school C did not use science kits despite all of them knowing what the science kit was as Table 4 showed. The researcher further argues that the number of those who said they did not use the science kits together with those who did not respond was 10 (11.7%) for Basic school C. The researcher argues that despite Basic school C having a science laboratory, science kits were not used in the learning of Environmental Science that was why 10 (11.7%) indicated that they did not used science kits at their school.

The findings in Table 9 revealed that during a practical science lesson 20 (23.5%) of the pupils did not play any role three (3.5%) did not know while 23 (27.1%) of the pupils did not respond to question. The researcher concluded that pupils took passive roles during such lessons. Based on these findings, the researcher, once again, argues that science kits were not being used in the teaching and learning of environmental science at selected Kitwe basic schools

5.5 The Contribution of Science Kits to Environmental Science in selected Kitwe Basic Schools.

The study revealed that three (30%) of the stakeholders in Table 15, were of the opinion that science kits were of very good value to pupils, another three (30%) stated that science kits would help pupils learn by seeing and touching. Two (20%) had said science kits were good and one ((10%) stated they enabled pupils to understand easily. In Table 16, four (40%) of the stake holders stated that science kits helped teachers to teach, two (20%) indicated that science kits helped to build up a lesson and also helped in explaining. From the opinions of the stakeholders, the researcher concluded that science kits had contributed positively to environmental science.

Despite stakeholder opinions in Table 15 and 16, pupils had a different view on the contribution of science kits to science learning. Table 17 revealed that majority of the pupils 23 (27.1%) indicated that they got nothing from the use of science kits, six (7 %) stated that they got skill to operate some apparatus while 22 (25.9 %) did not respond to the question. The researcher observes that the number of pupils who got nothing from the science kits together with those who did not respond was 45 (53 %). The researcher argues that science kits had not contributed positively to the learning of environmental science because 53 % of the pupils had not benefited from their use.

Some respondents at the selected schools openly stated 'we never do experiments'. Most of the pupils saw some of the apparatus for the first time during the researcher's visit to their school. It could be for this reason, the researcher argues, that pupils got nothing from the science kits as they never used hem in learning. The researcher concluded that science kits were not used in the teaching of environmental science to grade 8 and 9 pupils of selected Kitwe basic schools.

The findings in Table 18 showed that 36 (42.4%) of the pupils were comfortable in handling science kits, 33 % were not comfortable while four (4.7%) were scared. The study revealed that 15.3% from school C and 8.2 % from schools A and D respectively stated that they were not comfortable in handling science kits. The researcher argues that since pupils were not given opportunity to handle science kits as Table 7 showed; they could not be comfortable in using the science kits.

The study revealed that the majority of pupils 26 (30.6%), in Table 24, stated that science kits should be made available to them, 18 (21.1%) stated that they should have a laboratory in school and 13 (15.3%) suggested to have many kits. Two (2.4) and 19 (22.4%) had no suggestions and no response respectively. The number of pupils who wanted to have many kits together with those who wanted to have them available was 39 (45.9%). The researcher concluded from the results that the number of science kits should be increased and also the kits should be made available to pupils.

In Table 24, the majority of pupils 13 (15.3%) suggested to have many kits and six (60%) of the stakeholders in Table 25 indicated that basic schools should have many kits. The total number of pupils and stakeholders that indicated schools should have many kits was 19 (20%). 26 (30.6%) of the pupils and two (20%) of the stakeholder respondents stated that science kits should be availed to pupils. The researcher observed that 30 (31.8%) of the pupils and stakeholders combined had the view that science kits should be availed to them. The researcher concluded that basic schools should have many Science Kits and that the kits must be availed to the pupils.

18 (21.1%) of the pupils in Table 24 stated that they should have a laboratory in school while two (20%) stakeholders in Table 25 indicated that laboratories should be constructed and more science kits with chemicals to be provided. The researcher observed that a total number of 20 (21.1%), consisting of the pupil and stakeholder respondents, wanted laboratories to be

constructed in basic schools. One (10%) of the stakeholders at basic school H suggested that one classroom would be turned into a laboratory.

5.6 The Constraints and Opportunities teachers faced in using science kits.

The study was interested in finding out constraints and opportunities teachers faced in using Science Kits in the teaching of Environmental Science. The study wanted to establish whether these had any bearing on the success or failure of experimental work in schools.

5.6.1 Opportunities teachers faced in using science kits.

Table 19 showed that Heads of department (HODs) were in charge of science kits at Basic school B, Basic school C and Basic school E. The stores officer was in charge of the science kits at Basic school G. Learners at Basic school C were able to do practical work. From these findings the researcher concluded that pupils were able to do practical work when HODs kept science kits. In Table 19 three (30%) stakeholders kept the science kits. The researcher observes that, stakeholders at Basic schools A, D, F and H, did not avail the science kits to the teachers and pupils and therefore contributed to the failure of practical work in those schools.

The findings of the study showed that four (40%) of the Basic schools replaced lost or worn out equipment by buying, two (20%) indicated that there was no system in place to replace while another one (10%) stated that they were never replaced. Table 22 also showed that in some schools, the teacher improvised by using local materials where possible while in other schools (they either bought or asked from sister schools. The researcher concluded, from the above findings, that basic schools bought lost or worn out equipment.

5.6.2 Constraints teachers faced in using science kits

One of the constraints teachers faced, in using the science kit, was that it was not always available to them for use as five (63.5%) of them had indicated in Table 21. The other constraint was that there were no chemicals so certain experiments could not be done. If schools were able to replace lost or worn out equipment the researcher argues, they could also buy the chemicals and other materials needed to carry out a practical. If that happened, the teachers would not ask the pupils to come with the things needed as indicated by four (4.7%) of the pupils in Table 11.

The findings revealed that there were no laboratories in all the schools visited by the researcher except one (Table 23). The only school which had a laboratory was Basic school C and the pupils at this school were able to do some practical work. The researcher concluded that they were able to do so because they had a laboratory and the HOD was in charge of the science kit. At Basic school A, Basic school F and Basic school D pupils did not do practical work as shown in Table14. In addition, it was one of the stakeholders who were in charge of science kits at the same schools. The findings of the study revealed that teachers had difficulties accessing the science kits because they were not readily available to them.

Some respondents had suggestions on the future of science kits. Among the pupils 26 (30.6%) in Table 24 suggested that science kits should be made available to them, 18 (21.1%) stated that they should have a laboratory in school and 13 (15.3%) suggested to have many kits. The results in Table 25 showed that four (40%) of the stakeholders indicated that basic schools should have many kits, two (20%) stated that laboratories should be constructed and more science kits with chemicals to be provided while another two (20%) stated that science kits should be availed to pupils. From the above suggestions, the researcher concluded that basic schools should have many science kits and that laboratories should be constructed in all basic schools.

In conclusion the findings, the researcher argues, revealed that science kits were not being used in the teaching and learning of environmental science at selected Kitwe basic schools as a result pupils took passive roles during such lessons. The students, therefore, did not reinforce their understanding through experimentation.

The researcher argues that if science kits are not used in the teaching and learning of environmental science, then pupils are not motivated to learn science. The researcher concluded that teachers did not use science kits in the learning and teaching of Environmental Science at Kitwe basic schools.

CHAPTER SIX. CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the conclusions and recommendations of the study. The recommendations are designed for possible implementation by stakeholders, resource coordinators, standards officers and policy makers. Each recommendation arises from actual research findings of this study as noted below.

6.2 Conclusions

The study found out that the utilization of the science kits was a challenge to both stakeholders and teachers. The study established that science kits were not being used in the teaching and learning of environmental science because the findings in Table 11 showed that teachers just explained science concepts to pupils. In cases where conventional equipment was not available, the teacher improvised by using local materials. Hence, for the utilization of science kits to be effective, deliberate effort from both stakeholders and teachers was required.

The main finding in this study is that science kits were not being used in the learning and teaching of Environmental Science. In addition to 27 (31.8%) of the pupils who stated that the teachers just explained 22 (25.9%) pupils did not respond when asked about how they did their experiments (Table 11). The researcher therefore argues that pupils did not do experiments and were not given opportunity to handle science kits, hence, they could not respond to the question.

The findings in Table 19 revealed that three (37.5%) respondents indicated that officers keeping the science kits were not always available. The stakeholders must be committed to ensuring that experimental work was done in schools by making the equipment available to teachers. At basic school C, the HOD kept the science kit and the majority of pupils constituting 13 (15.3%) were able to carry out practical work as Table 14 showed.

6.3 Recommendations

6.3.1Targeted to Stakeholders-

The study recommends that:

a) Stakeholders should make science kits available to science teachers and pupils. This is in relation to the finding that the officers in charge of science kits were not always available.

b) The study also recommends that all basic schools should have Heads of department to be in charge of science kits. This was in relation to the revelation that schools which had HODs were able to conduct practical work.

c) Stakeholders should work towards building laboratories at their schools so that the science kits and other equipment could be kept there. This is because of the finding that no laboratory had been constructed.

d) The study has further recommended that money should be sourced so that more science kits could be bought and that lost or worn equipment could be replaced. This is because of the finding that schools had only one science kit and there was no system in place to replace lost or worn out equipment.

e) Stakeholders should organize SPRINT programs in schools so that teachers with difficulties of conducting science experiments could be helped. This was in relation to the findings that some teachers either just drew diagrams on the board or just explained concepts instead of using science kits in science experiments.

6.3.2 Recommendations Targeted to Standards Officers and Resource Coordinators.

The study recommends the following:-

a) Increase the rate of monitoring the use of science kits. This is because of the finding that monitoring of the use of Science Kits was never done.

b) Facilitate regular orientation and training workshops involving stakeholders and science teachers focusing on science kits. This recommendation addresses the finding that no training had been conducted in the use of science kits since the last one in 2003. The MoE (1996:116) indicated that the ministry would promote on going professional development of teachers and would ensure annual availability of funds for the same.

c) In relation to the revelation that science kits were not used in the teaching and learning of environmental science, there was need to support SPRINT programs in schools so as to encourage on going professional development at schools.

6.3.3 Recommendations Targeted to teachers

The study recommends the following to teachers: -

a) To always involve learners at all stages during a practical lesson. This is because of the revelation that majority of the pupils never did experiments and they did not use science kits in Environmental Science at their schools. They therefore did not know what a science kit was.

b) To fully participate in SPRINT programs in schools as well as at the resource center. Teacher's professional skills would improve as a result of attendance at TG and, hence, frequent participation in SPRINT activities is hereby encouraged.

c) Teachers should affiliate to the Zambia Association of Science Educators (ZASE). This is due to the finding that teachers did not utilize science kits in the learning and teaching of environmental science. During ZASE meetings, different professional issues pertaining to science are discussed and by doing so some problems faced by teachers could be tackled

6.3.4 Recommendations Targeted to Policy Makers

The study recommends that:

a) Policy makers should facilitate the construction of laboratories in basic schools and should enact a deliberate policy to compel all basic schools to construct laboratories. This is in relation to the fact that among the schools visited by the researcher only one school had a science laboratory. The research findings revealed that no laboratory had been constructed since the introduction of Science Kits to basic schools.

b) Policy makers should design the environmental science syllabus in such a way that practical lessons are incorporated. The way the environmental science curriculum is prescribed, implemented and incorporated by pupils has a major impact on the quality of science education provided. The research findings revealed that the teachers just explained instead of carrying out practical work with the learners.

6.4 Suggestions for future Research

The study also suggests that further research activities be conducted on evaluation of practical work in schools after construction of laboratories.

The study has suggested some areas of further research such as relationship between good grade nine science results and presence of laboratories in basic schools and the replication of this study to other districts/ provinces.

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APPENDIX A

THE UNIVERSITY OF ZAMBIA

SCHOOL OF EDUCATION
DEPARTMENT OF MATHEMATICS AND SCIENCE EDUCATION

RESEARCH TOPIC:

UTILIZATION OF SCIENCE KITS IN THE LEARNING OF GRADE 8-9 ENVIRONMENTAL SCIENCE AT SELECTED BASIC SCHOOLS IN THE KITWE DISTRICT, ZAMBIA.

PROVINCE:...............................

DISTRICT:.....................

SCHOOL:...

GENDER:.......................................

GRADE:........................

QUESTIONNAIRE FOR PUPILS

I am a Researcher studying the use of Science Kits in the learning of Environmental Science in Grade 8 and 9.

INSTRUCTIONS:

a) Please, feel free when answering this questionnaire. It is not an examination, but a research study. Your responses will be treated as confidential.

b) Answer all questions

c) The questionnaire requires you to either tick or give a short answer.

d) Do not copy responses from each other

e) Do not write your name on this paper

1. Does your Environmental Science class have a laboratory?

   Yes [ ]   No [ ]

2. If the answer is NO, how do you do science experiments?
   ....

3. If the answer to question 1 above is YES, how often do you carry out the experiments in Environmental Science? Criteria / week: 4 times (very often); 2-3 times (often); once (rarely); zero times (never)

   Very often [ ]   often [ ]   rarely [ ]   never [ ]

4. Do you know what a Science Kit is?
   Yes [ ]   No [ ]

5. Do you have a Science Kit at your school?
   Yes [ ]   No [ ]

6. If the answer to Question 5 is YES, do you use the Science Kit in science experiments?
   Yes [ ]   No [ ]

7. Do you use the Science Kit in science experiments at your school?

   Yes [ ]   No [ ]   Sometimes [ ]

8. What role do you play during such science experiments?
   ....

9. What good things do you get by using the Science Kit in learning Environmental Science?..

10. Are you given an opportunity to handle Science Kits during science experiments?

    Yes [ ]   No [ ]

11 How comfortable are you in handling Science Kits in the Science Class? Criteria: 1(very comfortable); 2 (comfortable); 3 (not comfortable); 4 (scared) Tick whichever is applicable.

Very comfortable [ ] comfortable [ ] not comfortable [ ]

Scared [ ]

12. What suggestions can you make on how best your school could make use of Science Kits?
....

....

THANK YOU VERY MUCH FOR YOUR TIME AND THOUGHTS.

APPENDIX B

THE UNIVERSITY OF ZAMBIA

SCHOOL OF EDUCATION

DEPARTMENT OF MATHEMATICS AND SCIENCE EDUCATION

RESEARCH TOPIC

UTILIZATION OF SCIENCE KITS IN THE LEARNING OF GRADE 8-9 ENVIRONMENTAL SCIENCE AT SELECTED BASIC SCHOOLS IN THE KITWE DISTRICT, ZAMBIA.

PROVINCE:.................................

DISTRICT:.....................

SCHOOL:..................................

POSITION:..

QUESTIONNAIRE FOR TEACHERS

I am a Researcher studying the use of Science Kits in the learning of Environmental Science in Grade 8 and 9.

INSTRUCTIONS:

a) Please, feel free when answering this questionnaire. It is not an examination, but a research study. Your responses will be treated as confidential.

b) Answer all questions.

c) The questionnaire requires you to either tick or give a short answer.

d) Do not copy responses from each other

e) Do not write your name on this paper

1. What is your gender? .... Male [ ] Female [

2. For how long have you been teaching Environmental Science?
....

3. What is your qualification?...

   a) Bachelor Degree [ ] b) Advanced Diploma [ ]

   c) Diploma [ ] c) Certificate [ ]

   e) Any other [ ] Please, specify..............................

4. Do you have Science Kits at your school?

   Yes [ ] No [ ]

5 If the answer is YES, how many Science Kits do you have in your school?

   One [ ] Two [ ] none [ ] more than two (specify number)

6. If the answer to Question 4 is YES, is the equipment in the Science kit easily available to you and the pupils for use?

   Yes [ ] No [ ] Sometimes [ ]

7. If the answer to Question 6 is NO, why is the equipment not easily available for use? Please explain. ....

8. Who is in charge of the Science Kit?

   The Head teacher [ ] The Senior Teacher [ ] others (specify)......

9. How useful has the Science Kit been in the teaching of Environmental Science to your grade 8-9?
....

10. What role do you give pupils to play during such science lessons where the science kits are used?
....

11. What role do you yourself play during such lessons?
....

THANK YOU VERY MUCH FOR YOUR TIME AND THOUGHTS

APPENDIX C

THE UNIVERSITY OF ZAMBIA

SCHOOL OF EDUCATION

DEPARTMENT OF MATHEMATICS AND SCIENCE EDUCATION

RESEARCH TOPIC

UTILIZATION OF SCIENCE KITS IN THE LEARNING OF GRADE 8-9 ENVIRONMENTAL SCIENCE AT SELECTED BASIC SCHOOLS IN THE KITWE DISTRICT, ZAMBIA.

PROVINCE:…………………………..
DISTRICT:…………………
SCHOOL:……………………………..
GENDER OF RESPONDENT…………………………………..
RESPONDENT'S TITLE……………………

QUESTIONNAIRE FOR STAKEHOLDERS

INSTRUCTIONS:

I am a Researcher studying the use of Science Kits in the learning of Environmental Science in Grade 8 and 9.

a) Please, feel free when answering this questionnaire. It is not an examination, but a research study. Your responses will be treated as confidential.

b) Answer all questions

c) The questionnaire requires you to either tick or give a short answer.

d) Do not copy responses from each other

e) Do not write your name on this paper

1. When were Science Kits introduced in the schools of your area /province/ district/ school? (Please, tick whichever is appropriate here).

2 Are these Science Kits available in Upper Basic schools of Kitwe District?

Yes [ ] No [ ]

3 If YES, how many Science Kits does each school have in Kitwe District?

One [ ] Two [ ] More than two [ ]

4. Are the Science Kits being used in the teaching of Environmental Science?

Yes [ ] No [ ]

5. Have Basic school teachers been trained in the use of the Science Kit?

Yes [ ] No [ ] Some [ ]

6 Give reasons for your answer to question 4 above.

....

....

7. How often is monitoring of the use of science Kit in the teaching and learning of Environmental Science?

Very often [ ] Often [ ] Seldom [ ] Never [ ]

8. How are lost or worn out equipment replaced?

....

....

9. Have any laboratories been constructed in upper basic schools since introduction of Science Kits?

Yes [ ] No [ ]

10. What is your personal opinion on the value of Science Kits?

(a) to the pupils

....

....

(b) to the teachers…………………………………………………………………

……………………………………………………………………………

10. Kindly make suggestions on the future of Science Kits?

……………………………………………………………………………

……………………………………………………………………………

THANK YOU VERY MUCH FOR YOUR TIME AND YOUR THOUGHTS.

APPENDIX D SCIENCE KITS

a) Schedule of Requirements for 2, 000 Sets of Science Kits from the Ministry of Education.

Item No	Equipment model	Specifications	Quantity
1	Human skeleton (plastic)	A full replica articulated. The skull is divisible into three parts. The arms and legs are detachable and their natural movements can be demonstrated. Supplied complete with rolled stand and dust cover	2000
2	Beakers 250 mls	Graduated. Borosilicate glass with spout	8000
3	Human eye [plastic]	Internal eye structure with necessary organs eyelid, tear sac etc. (Enlarged 5 times)	2000
4	Human ear [plastic]	A four part model enlarged approximately three times. Must show essential details of the ear	2000
5	Skin [plastic]	Vertical section of the skin enlarged Approximately 70 times mounted on a board	2000
6	Teeth	A set of four models showing upper and lower jaws at different stages as described below: a. Dentition of a new born baby b. Dentition of a child about 5 years old c. Dentition of a child about 9 years old d. Dentition of a full adult e. The four stages must be mounted on one stand	2000
7	Alimentary canal	A full replica articulated (plastic)	2000
8	Test tubes	Borosilicate glass light wall (0.8-1.0 mm) with corks. To be supplied in packets of 10	10,000 packets
9	Spring balance	Graduated on grams [1-100g]	4000
10	Metre Rule	Wooden, graduated 0- 100 cm Figured every 5 cm 0n both edges. Fitted with a central handle and hanging hole	2000

Item No	Equipment model	Specifications	Quantity
11	Spirit burner [50]	Borosilicate glass. With glass lid	4000
12	Magnifying glass	Plastic one place construction. Magnification X10	4000
13	Filter funnel 65 mm	Unbreakable, resistant to acids, alkalis, oils, spirit. Polythene	4000
14	Evaporation dish	Flat bottom with spout. Borosilicate glass. Round bottom with spout	4000
15	Gas jar	Clear crystal with heavy foot and ground flange supplied with cover [circular sheet glass]	4000
16	Petri dishes	Clear crystal glass, polished top and bottom, 100 mm diameter, and depth 15 mm	4000
17	Measuring cylinder 500 cc	Glass/plastic-PE graduated	4000
18	Aquarium tank	A complete kit supplied with all necessary accessories already wired for immediate operation. Bonded glass tank	2000
19	Tuning fork	Set chromic scale from C^1 256 to C^2 512. Each fork being marked with its pitch and frequency complete in case	2000
20	Set of masses	Comprising a 10g wire hanger with Slotted masses each of 10g giving a total mass of 100g	2000
21	Ball and ring	Comprising a captive brass ball secured to a Mounted brass ring by a chain. Ring mounted on a rod with a wooden handle	2000
22	Vacuum flask	Domestic type with wide mouth. Silver double walled wide necked glass inner vessel within plastic outer case incorporating handle on side	2000
23	Glass Rods	One end rounded, one end ground flat for crushing crystals Ø3 x 100. Supplied in packs of 10	2000

Item No	Equipment model	Specifications	Quantity
24	Wire Gauze	Square mesh supplied in packets of 10	2000
25	Tripod stand	For use with laboratory burner	4000
26	Trough	Circular clear glass with ground top edge flat bottom Ø200 mm	4000
27	Pressure Gauge	Comprising a length of clear PVC tubing connected to an aneroid type gauge for measuring human lung pressure	2000
28	Water Equilibrium	Transparent plastic	2000
29	Mirrors	Back silvered with protective coating. Packets of 10 of each of the five sizes (mm) 75x25, 150x25, 75x75,150x50,100x75	2000
30	Prisms	Clear glass polished faces	2000
31	Periscope	Standard size	2000
32	Torch	Battery operated	2000
33	Circuit board	Consisting of a baseboard, terminals, a set of metal connecting pillars, a number of clips on flexible connection strips and accessory units	4000
34	Water table model	Plastic	2000
35	Beam balance	With digital readout of gram weights. Range 100g. Readability 0.01g	2000
36	Triple beam balance	Single pair low form balance beams on 500gx 100g, 100g x10g, 0-10g x0.1g. Pan-stainless steel, diameter 150 mm	2000
37	Syphon model	Durable carrion proof polyethylene, squeeze bulb on vertical limb, with flexible side limb for dispensing from bulk	2000
38	Bar magnets	80 mm	10,000

Item No	Equipment model	Specifications	Quantity
39	Horseshoe magnets	100 mm	10,000
40	Compasses	A large educational pattern having a 100 mm needle in a tough plastic case, 125 mm overall diameter. With white dial showing 32 compass points and must have a 360 degrees scale around its edge	4000
41	Electric bell	Twin coil, battery or transformer operated 3v to 6v batteries, 3-9v transformer. Clean molded design with plated bell diameter 68 mm	4000
42	Fire extinguisher	Dry powder, suitable for use against flammable liquids and electric fires. Work in ambient temperatures from 40 to 70 degrees centigrade	2000
43	Scalpel	Steel blade with plastic handle	2000
44	Stevenson screen	Simple form. To contain maximum and minimum thermometers, wet and dry bulb hygrometer. Supplied with instruments	2000
45	Pinhole camera	To show the principals of image formation and progressing to the use of a single lens to obtain images of greater brilliance with clarity	2000
46	Open pit mine model	Plastic	2000
47	Underground mine model	Plastic	2000
48	Plasticine	Supplied in 500g packets I assorted colours (10 colours)	2000
49	Instrument trolley	Push handle: stainless steel construction, mounted on approximately 75 mm ant-static castors: removable upper and lower stainless steel shelf: 100 x 60 x 80 cm (length x width x height)	2000

b) Science Kit from the National Science Centre

The components were as follows:

(1) 2xFlat/round bottomed flasks

(2) 2xRetort stands and clamps

(3) 1 xSpirit burners

(4) 2x18mm test tubes

(5) 2x15mm test tubes

(6) 2xtest tube racks

(7) 2x100ml glass beakers

(8) 2x250ml glass beakers

(9) 2xMearsuring cylinders

(10) 2x Induction coils

(11)2xHand lenses

(12) 2xCircuit boards

(13) 2xBi-metallic strips

(14) 2x Chalk dusters

(15) 2x Funnel

(16) 2xEngine model

(17) 2x Science trolley

(18) 2xEngine model

APPENDIX E a) SAMPLED SCHOOLS

	Name of School	Symbol
1	Bulangililo Basic School	school A
2	Ndeke Basic School	school B
3	Wesley Nyirenda Basic School	school C
4	Kampemba Basic School	school D
5	Twashuka Basic School	school E
6	Riverain Basic School	school F
7	Mindolo Basic School	school G
8	Twatemwa Basic School	school H

E b) PILOT SCHOOLS

	Name of School	Symbol
1	Buntungwa Basic School	school X
2	Machona Basic School	school Y