A STUDY OF RESOURCES FOR TEACHING AND LEARNING OF SCIENCE IN SOME PRIMARY SCHOOLS OF OLENGURUONE DIVISION, NAKURU DISTRICT, KENYA.

BY

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF MASTER OF EDUCATION (PRIMARY TEACHER EDUCATION) DEGREE OF KENYATTA UNIVERSITY

1990
DECLARATION

This project report is my original work and has not been presented in any other university for the award of a degree.

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This project report has been submitted for examination with my approval as university supervisor.

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DEDICATION

This work is dedicated to my dear wife, Selina and our children Kenneth, Janet, Raphael and Caroline for their patience and encouragement accorded to me during the two-year period I was away on studies.

This work is also dedicated to my parents who sent me to school and encouraged me to work hard.
ACKNOWLEDGEMENTS

I fully appreciate the contributions made directly or indirectly by all those people who helped me in the preparation of this research project.

I am particularly indebted to my supervisor Dr. John Maundu for his invaluable guidance and advice at every stage of my preparation of this work. I benefited immensely from his ideas and experience.

I also acknowledge the assistance from my lecturers Dr. H. E. Embeywa and Prof. M. M. Patel.

Finally, I would like to record my appreciation and gratitude to Joyce Mwangi for tirelessly typing the whole of this work.
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ABSTRACT

The purpose of this study was to survey the various aspects of the resources used by science teachers in some of the primary schools in Olenguruone Division of Nakuru District. These aspects were principally concerned with the availability, use and storage of the resource materials. Other aspects dealt with the improvisation of the resources and the use of the environment in the teaching and learning of science.

The method of the survey involved the use of two instruments. One of these was a questionnaire which was administered directly by the researcher to the teachers of science in each of the eight schools studied. There were four respondents in each school. The other instrument was a checklist which was completed by the researcher with the assistance of each of the science teachers who responded to the items of the questionnaire. The sample size was thirty-two teachers of science. However, the researcher was able to collect responses from thirty-one of them.

The data collected was reported and analysed using descriptive statistics, mainly involving percentages. The main findings of this study were that at present, the ministry of education does not provide any resource materials to the primary schools for the teaching and learning of science. However, it recommends the resource materials to be used and leaves their acquisition to be handled by the respective schools. The text-books recommended and available
in the schools are basically those published by the Kenya Institute of Education (K.I.E.). All teachers base their resource selection for use on one or more criteria, and also have good reasons for using resources in science. Teachers occasionally share ideas on production and use of teaching/learning resources for science with colleagues and other experts. Similarly they use the environment in the study of science, improvise science materials and involve their pupils in this task. The Teachers Advisory Centres are not equipped and hence are not visited by the teachers who may need help. The researcher also found that the storage facilities for the science resource materials are poor.

As the researcher observed, the teachers of science in these primary schools are operating on a limited number of resources. The ministry of education then should be more concerned about this situation and ensure that at least the basic resource materials for teaching science are available in every school. Similarly, the Teachers Advisory Centres should be more resourceful to the teachers of science. An effort should also be made at the school level to provide for better storage facilities for the science resource materials bought or otherwise acquired. Additionally, further research should be carried out in a larger environment to obtain a wider perspective of the extent of the resources problem and constitute a more comprehensive remedial strategies to the problem.
CHAPTER 1

THE PROBLEM AND RELATED COMPONENTS

1.0 Background to the Problem

Before Kenya attained independence in 1963, the colonial government had been running three different school curricula, one for the Europeans, another for Asians and a different one for the Africans. The emphasis on the contents of the former two curricula was different from that of the Africans in that the curriculum for the later was basically designed so that they would remain subservient to the other two white groups, especially the Europeans. The African science graduates then earned their living by working for the Europeans in their farms and businesses.

Toili (1987)\(^1\) notes that during the period 1963 - 1970, the national policy was to graduate more people in science to fill vacant positions in science-oriented careers in medicine, engineering, agriculture, teaching and research work among others. He further observes that as a result of this need, drill methods of teaching science were adopted, and this encouraged rote memorization of facts in order to pass examinations and secure the jobs. Orwa and Underwood (1986)\(^2\) refer to these drill methods as 'traditional science education' and note that this was based on the meaning of science as an accumulation of facts, principles, formulae and experiments which were all received from a commonly accepted body of information. Hence for the pupils, the source
was the teacher and for the teacher, the source was a standard textbook. They further observe that science was well defined, clearly bounded and never wrong.

Our country, and by extension the entire international community, is experiencing dynamic changes due to science and technology which have continued to permeate almost all aspects of our life. Hence as observed by Tisher et al (1972) the strategies that were employed by science teachers earlier have no relevance today as our environment is not stable but changing. They further add that:

"... to remember only the past strategies for survival is to sound your death knell. What is needed are new strategies for new conditions."

Ohuche et al (1981) recognise the environment as a situation where the strategies can be developed and see it as the sum total of the stimulation the individual receives from conception until death. In this, they do not regard the physical presence of objects as constituting the environment unless the objects serve as stimuli for the individual. Toili (1988) then observes that the children must learn by doing and that they have to manipulate nature in which science is hidden. In this way, they develop ideas through raising questions, hypothesizing, communicating and testing their ideas, i.e., using all the process-skills of science. Rather than become the sole proprietor of knowledge, the teacher's role is relegated to that of the facilitator of learning. He should
guide the children to develop ideas, and not impose ideas on them. He should ensure that children develop both process-skills and concepts, and inevitably some subject matter (content) will be gained at the same time.

Further, the teacher should provide simple, understandable and everyday materials found in the familiar environment of the children. These resources should be integrated into the instructional sequence planned for each lesson. As children work with the materials, employing the scientific process, they come to understand their environment, the events in nature and how these relate to technology. They will be better placed to make sound and sustainable decision-making in solving science and technology related problems that they may encounter in their everyday lives.

The highlights raised above may be summarised in the general aims of teaching science to young children: that children

(a) acquire or preserve certain useful attitudes about themselves and their relationship with their environment;

(b) learn certain manual and thinking skills which are useful in solving practical problems from everyday life;
(c) acquire a certain amount of information which is also necessary to solve the problems we meet in modern life.

These needs have been recognised by Kenya and other independent African states for a long time. In the early sixtees an attempt was made by the African Curriculum Development Centre (ACDC) in Nairobi to look into the strategies that would be useful in the attainment of the needs. In order to improve on science teaching, detailed schemes of work and lesson plans were centrally prepared by the centre and released to teachers to use. However, teachers were not enthusiastic about this, first because they felt down-graded by such provision, and secondly some schools lacked resources and so found it difficult to follow these materials.

Further attempts to improve the teaching of primary science were made by the African Primary Science Programme (APSP) which was launched in Entebbe, Uganda in 1965. This was later replaced by the Science Education Programme for Africa (SEPA) in 1970 with its headquarters in Accra, Ghana. Both APSP and SEPA strongly advocated for the adoption of practical teaching of science in primary schools whereby pupils would learn by doing rather than by rote memorization of facts, and as Toili (1987) puts it, wherever possible, the pupil would intervene with his own thought, his own hands, and his own will to learn. Although curricula materials for both teachers and pupils were prepared under the auspices and initiative of APSP and SEPA, most teachers
throughout Africa were not inserviced on their use and this resulted in a slow adoption of these materials. It took Kenya ten years (1967 - 1977) to adopt these materials.

The new primary science syllabus which became operative in 1977 was prepared by the Kenya Institute of Education (K.I.E.) in 1976 and it emphasized that only a few science topics were enough to enable pupils acquire useful manual and thinking skills, attitudes and scientific information that would be necessary in helping them solve practical problems they encounter in modern life. The K.I.E. prepared pupils' books and teachers' guides to help in inquiry methods of teaching in order to achieve these goals. These books were prepared under the auspices of the Kenya Primary Science Programme (KPSP) which incorporated the original APSP ideas. The books emphasized ample use of instructional materials to facilitate pupil quest for scientific ideas, phenomena and generalizations while at the same time acquiring the much needed skills and attitudes.

However since 1977, not much has been observed by way of pupil acquisition of skills through science. Toili (1987) notes that a research by Abidha (1982) indicated that primary science teachers still used drill methods which rendered the pupils less creative and devoid of any useful scientific skills, rather than using the process-based inquiry. Toili (1985), found that grade 7 primary school children in rural areas showed higher mastery of science content but performed poorly on tests which
required acquisition of scientific skills. However basic skills were acquired but not at a satisfactory level. Similarly Toili (1987) quoting from Munyiri (1981) who worked with grade 6 pupils in Nairobi area (urban setting) notes that pupils did not attain a high level of proficiency in skill development.9

The 1976 Primary Science Curriculum Programme had not achieved its goals by 1985 and was then officially abandoned. Among the reasons cited for disbanding the mid 1970s science curriculum is lack of equipment and other teaching resources. The Kenya School Equipment Scheme of the Ministry of Education is charged with the responsibility of preparing and delivering various facilities such as text-books, charts, etc., but cannot cope with the demand and so we now find that the community is helping to provide some of these facilities (cost-sharing). Teachers are also expected to be creative and be able to find other alternative teaching resources. At the same time, K.I.E. is trying to inservice teachers in the production, use, repair and maintenance and evaluation of low-cost science teaching materials such as the new science books which are made available to schools at relatively low cost.

The demise of the Primary Science Curriculum Programme was simultaneously followed by the introduction of a new educational structure called the 8-4-4 system (i.e. 8 years in primary school instead of 7 years, 4 years in secondary school instead of 6 years and 4 years in the university instead of a minimum of 3 years).10 The K.I.E. has since been
actively involved in the development of primary science sample syllabi, pupils' books and teachers' guides under the auspices of the Primary Education Project (P.E.P.) funded by the World Bank. P.E.P. started in 1978 and was piloted in 49 primary schools randomly sampled all over the 41 districts of the country. These P.E.P. materials emphasize the acquisition of skills rather than mere memorization of scientific information. The 8-4-4 programme was formally introduced in schools in 1986, covering all primary school grades (i.e. standards 1 - 8).

The P.E.P. materials are simple, illustrative and give alternative approaches both to the pupils and teachers. The pupils' books encourage pupil participation in the learning process through which they should acquire skills, attitudes and knowledge of practical value. The teachers' books provide useful teaching approaches for given tasks (in the corresponding pupils' books) and suggest materials to be used. Sometimes the teacher is instructed on how to prepare equipment and other teaching materials and how to use these to teach a given task.

Because of historical developments of science teaching in primary schools, most of the time in the past has been spent on giving children information. The new 8-4-4 system of education is broad-based and, among other things, it lays emphasis on practical skills. In the attainment of skills, use of resources become important. This study tried to investigate on the various aspects of the resources
such as their availability, use and whether the science teachers improvise and use the environment during the teaching and learning of science in some of the primary schools in Olenguruone Division of Nakuru District.
1.1 **Statement of the Problem**

There have been calls from within the education system and the community at large for changes in the school curricula with a view to making it more relevant so that school leavers are capable of being self-reliant and able to apply what they have learned to solve problems in their immediate environment. Among other things, it has been observed that resources are lacking in schools and this should be considered seriously if changes have to be meaningful. This project then tried to study the resources for teaching science and how they are used in certain primary schools in Olenguruone division of Nakuru District.

More specifically, this study sought to find out:

(a) the types of resources available that are used in the teaching and learning of science in the primary schools in Olenguruone division,

(b) the various sources of the resources,

(c) how often the environment is used in the teaching and learning of science in the division,

(d) whether the teachers and pupils make their own resources for teaching and learning of science,

(e) whether the teachers in the division have an opportunity to share ideas on the use and
production or acquisition of the science resources with teachers from other schools or with the Teachers Advisory Centre tutors within the division,

(f) how the resources are stored,

(g) how the teachers in the division choose the various resources they use in the teaching and learning of science.

1.2 Research questions

The following questions provided guidance for this study.

(a) What resources are available in the schools for teaching science?

(b) Who provides the resources that are found in the schools?

(c) Do teachers and pupils ever use the environment in studying science?

(d) Do teachers and pupils ever improvise science teaching aids?

(e) Do teachers in each school share ideas on various aspects of resources among themselves and with colleagues from other schools?
(f) How do teachers store their science teaching resources for later use?

(g) What criteria do teachers use in choosing the resources for teaching science?

1.3 Significance of the Study

It is hoped that the results of this study will be of interest to a number of institutions and people such as those discussed herein under:

(a) The Ministry of Education

It is in the interest of the Ministry of Education to ensure that the science graduates become useful members of the society and this can only be achieved when the appropriate basic skills and attitudes are imparted on them. Resources are important in developing some of these skills and attitudes. The ministry should naturally be interested to know the results of this study as this will act as an indicator of what goes on in the classrooms in terms of availability and utilization of science resources.

(b) Kenya Institute of Education (K.I.E.)

K.I.E. has been trying to inservice teachers in the production, use, repair and maintenance of science teaching materials and so it should be interested in knowing how successfully the resources are being employed in the teaching of primary science. The results can act as a feedback to K.I.E. which could then take advantage of these results to revise accordingly regarding their strategies of ensuring meaningful utilization of teaching
(c) The School Inspectors and the Teachers Advisory Centre Tutors

This group is basically concerned with the supervision of teachers in their schools and it will be in their interest to know more about the supply, use and effectiveness of school resources following which they can then arrange for seminars, workshops or the inservice courses for science teachers to help improve the quality of instruction.

(d) College Tutors

These are the instructors of the college trainees who eventually go out to teach in the primary schools. The knowledge of the availability and use of various resources should assist the tutors in exposing their trainees to a variety of approaches in obtaining/making and using resources for teaching science, thus helping them provide a rich and varied learning environment that will benefit the primary science pupils.

1.4 Basic Assumptions of the Study

The following were basic assumptions for the study:

(a) Teachers in the field rely mainly on the commercially produced resources and make very little effort in improvising their own resources.
(b) Teachers in the field are not aware of the rich and varied environment either at school, home or in the community which can help pupils perceive science as real,

(c) Pupils are not given adequate opportunity to handle and manipulate the resources in the teaching and learning of science.

1.5 Definition of Significant Terms

1. **Resource**: Anything that children use to help them learn, or an aid to the teacher during teaching.

2. **Environment**: A surrounding out of the classroom which enhances learning when its resources are utilised in the teaching and learning process.

3. **Supplementary books**: Books used by the teachers and pupils to further support the recommended textbooks.

4. **Reference books**: Books that can be consulted for more information on many topics.

5. **T.A.C. Tutor**: An officer in the Teachers Advisory Centre who assists teachers in the improvisation and use of resource materials.

6. **Improvisation**: The making of a resource material for teaching and learning when the commercially produced one is either not available, may not be sufficient for use, or is too expensive.
1.6 **Scope and Limitations of the Study**

The time allocated for the project was three months and so it was not possible to cover many schools to obtain data on resources. In this respect the results obtained cannot be generalised on the status of resources for all the schools in the country.

The survey covered eight schools in Olenguruone Division in Nakuru District, Kenya.
NOTES


11. Ibid.
CHAPTER 2
REVIEW OF RELATED LITERATURE

2.0 Meaning of Resources

A resource is anything which can be an object of study or stimuli to the pupils or an aid to the teacher.\(^1\) It includes printed form, audiovisual and museum items, as well as specimens in the locality. Other literature add further to the list by including teachers, helpers or resource persons, parents, other children, public libraries and the local environment.

2.1 Importance of Using Resources in the Teaching and Learning of Primary Science

Effective learning cannot be possible without access to any resource at all. Resources in education have been in use for a long time now, and on this Walton et al (1975)\(^2\) observed that:

"John Dury, tutor to the children of Charles I, recommended long ago that the large common room ought to be furnished with all manner of mathematical, natural, philosophical, historical, medicinal, hieroglyphic and all sorts of pictures, maps, globes, instruments, models, engines, and whatsoever is an object of sense in reference to any art of science."

We also find that in the fifteenth century, Erasmus had worked out an elaborate system of teaching aids (including) alphabets in bone, and even biscuits,
maps, pictures, charts and real objects.³

It is a common observation now that what is new is the scale on which resources are being used, their variety and complexity, and the complexity of the learning systems into which they are being fitted. It is then important to note that what is needed is the skill and work to structure the resources into meaningful learning experiences based upon detailed curriculum review and course planning. This poses a challenge to the teacher on the facilities available to him. Walton et al (1975)⁴ recommended that the teacher has to have:

(a) information about the existence of resources already produced by commercial organizations, public bodies, donor agencies, and colleagues,

(b) ready access to resources and the opportunity to use them,

(c) advice and training in all aspects of resource-based learning including the specification, selection, application and management of resources on a systematic basis.

It is also important that the teacher should add to such variety of resources by improvising in order to create a rich and varied environment conducive to the teaching and learning of science.
Reflecting on these requirements, resource centres have been set up in Kenya on local levels of the primary schools. These centres, which are also known as the Teachers Advisory Centres, are located either in market places, primary teacher colleges or in any one of neighbouring primary schools. These are places where science teachers may obtain advice and demonstrations on how to use or improvise various kinds of teaching and learning resources. The centres are designed to operate and support scientific thinking and the science curriculum development within the schools and enable the teachers, regardless of their varying competencies, to develop their professional skills more fully. On the National level we have specialised agencies like the Kenya Institute of Education which handles matters that include drawing up standards and specifications of educational equipment. These may reach the schools directly or through the ministry officials such as the Assistant Education Officers.

In the teaching and learning situation we ought not to use any one medium of communication in isolation, but rather use many instructional materials to help the learner concretize his experience so that he can deal with it effectively. The more numerous and varied the media and experience employed the richer and more stable will be the understandings which emerge.

Tisher et al (1972)\textsuperscript{5}, emphasize that a multi-media approach to science teaching, and particularly when the
materials are carefully developed and properly used by the teacher can:

(a) Supply a concrete basis for conceptual thinking and hence reduce meaningless word responses of learners,

(b) Stimulate a high level of interest in new tasks,

(c) Help make learning more permanent,

(d) Offer a reality of experience which stimulates self activity on the part of pupils,

(e) Contribute to the growth of meaning and hence to vocabulary development,

(f) Provide experiences not easily obtained through other materials and contribute to the depth and variety of learning.

Learning proceeds through various levels of development and it is a common observation that effective learning begins with first-hand or concrete experiences and proceeds towards more abstract experiences (Wittich et al., 1967). Tisher et al. (1972) represent this development in what they call a cone of experience.

![The cone of experience](image)
Level 1 is the stage of direct learning through first-hand experiences. It is here where the learner is subjected to immediate sensory contacts with reality. These include things like exhibits, contrived experiences, demonstrations, projects, laboratory work, excursions, field trips, and environmental encounters.

Level 2 is the stage of vicarious learning through audio-visual materials. Here, the learner is subjected to mechanical representations of reality. These include things like charts, graphs, pictures, slides, film-strips, specimens, models, films, and television.

Level 3 is the stage of vicarious learning through words and symbols, and here the learner is subjected to abstract representations of reality. These include mathematical models, formulae, equations, speech, and writing.

It is important to note that not all teaching and learning need move from the base of the cone to the pinnacle. Where direct learning through first-hand experience is not possible, representations of reality can provide vicarious experience.

2.2 Criteria for Selecting Resources

Well chosen and developed instructional materials can provide a variety of experiences which enhance the learning of science for pupils at all levels of development. Brown et al (1973) indicate that the resources we use
should be determined by what we want our students to know, how we want them to behave and what levels of accomplishment we wish them to achieve. The teacher must also pick and choose according to the ability of pupils, and the length of lessons. Decisions then must be made on the basis of proper conditions and availability of resources.

Tisher et al (1972), further list the following general criteria for the selection and evaluation of materials as:

1. ** Appropriateness:** The experiences should be appropriate to the content and objectives of teaching.

2. **Accuracy:** The teacher should be aware whether the material contains unstated assumptions, unwarranted conclusions, biases or over-simplification of errors.

3. **Comprehensiveness:** The teacher should know whether the material attempts to help learners to think critically and/or to organise information for themselves as well as to convey information.

4. **Variety:** The teacher should consider whether the material provides a wide variety of experiences.

5. **Relevance:** The teacher should note whether the contents and difficulty level are appropriate to the needs, interests, and ability of the learners.

6. **Validity:** The teacher should note whether there is any evidence that the aid will do what we hope it
will do.

7. **Usability:** The teacher should check whether the device is reliable, and simple to use and whether it has a guide to ensure it is used effectively and if it is flexible.

8. **Cost:** The teacher should know whether the outcomes of use are commensurate with the cost in time, money and effort.

9. **Demand:** He should know whether the materials demand a high degree of involvement on the part of learners.

10. **Range:** He should also be able to recognise whether the materials are likely to claim learner's attention for a sufficient period of time.

Victor *et al* (1968)\(^{11}\) also recognise that what is taught in a science programme and how it is to be taught should determine the equipment and material needed. They proceed to say:

"Building the activity around the equipment is educationally unsound-like putting the cart before the horse."

For a given classroom undertaking a science programme Victor *et al* (1968)\(^{12}\) list down some of the factors which determine the materials and equipment needed as:
1. the grade level,
2. the geographical location,
3. the text-book or the science guide or manual,
4. availability of utilities in the classroom,
5. ingenuity of the teacher, and
6. the content and method which they particularly emphasized as bearing directly on the needed materials.

2.3 Use of Resources by Teachers and Pupils

Ogomo (1985)\textsuperscript{13} groups the available resources into three categories as:

(a) Audio-visual resources i.e., recorded audio programmes, photographs, pictures, etc.,

(b) Print resources, i.e., books, pamphlets, maps, charts, etc.,

(c) Realia i.e. real items e.g. bones, stones, tins, packets, cartons, etc.

Ogomo (1985)\textsuperscript{14} further recognises that resources become useful in the teaching and learning process and recommends that a teacher should:

(a) avail to the pupils a variety of relevant resources in various formats for them to handle and manipulate in order to obtain knowledge that they are required to have,
(b) design his programme in such a way that it requires the pupils to look for information on their own from various sources. Such a programme should discourage pupils from depending on the teacher as the sole source of information.

Victor et al (1968)\(^{15}\) point out that in learning science children plan, discuss, read, report and listen, but these alone do not add up to effective science teaching. They are of the view that the vital elements are experimentation and demonstrations, and that these elements should ideally be such that they can be repeated, varied or extended at home. They do not approve of the use of complicated materials and equipment which they said may confuse the children and sometimes actually interfere with the principle to be taught.

Orwa and Underwood (1986)\(^{16}\) maintain that the resources for use in the classroom should not involve an outlay of expensive scientific equipment. They list some of these equipments which can be within reach of schools, as follows:

(a) **Materials** such as: tins, bottles, cardboard, cloth, plastic bags, wood, wires, strings.

(b) **Tools**: Scissors, knives, hammers, saws.

(c) **Apparatus**: both commercially produced and teacher made.

(d) **Measures**: Spoons, caps, bottles, tins, buckets, home-made balances.
(e) **Discarded artefacts:** Old electrical plugs, car parts, clocks, watches.

(f) **Reference materials:** Books, pictures, magazines for cutting up to illustrate (on) class scrapbooks.

(g) **Natural specimens:** Leaves, insects, small animals.

They also point out that improvisation of materials for use in the classroom should be done by the teacher whenever possible, and that he should be able to involve the pupils in this task. According to them, the purposes of improvisation are:

(a) that the improvised material enables the pupils to conceptualise the principles underlying the function of the commercial articles,

(b) that it provides equipment at low cost.

The use of the local environment is very important in teaching and learning of science. When pupils make visits outside the school compound, they will find many new interests as they explore this local community, and their interest in the materials already in the classroom will be renewed by these visits, and this will stimulate later classroom work. Blough *et al* (1964) observe that the local environment, which includes the school, the home and the community, is not only useful in making ideas clearer to the pupils but also because seeing science at work in their own environment helps pupils to realise how real science is.
As Victor et al (1968)\textsuperscript{18} observe, considerable learning can result with no materials or equipments being handled in a science lesson, for example when children make observations of the day and the night sky, of natural habitats of plants and animals, and of land and rock formations. They also draw attention to the science materials in the environment. They say that collection of such materials besides being useful in the study, may often lead to careers, hobbies, and leisure-time activities. They further observe that personal contributions by children, when they help to bring specimens to the classroom, will help them to identify more closely with the projects of study and to develop self-direction and resourcefulness. They however caution that the practice of engaging children in participation by having them contribute material or construct apparatus should in no way replace the use of essential equipment and materials provided through the school budget.

2.4 Storage of Resources

It is important that resources are stored properly and maintained in good condition if they are to last for a long time and give longer service. Storage makes supplies and equipment readily available to all teachers when needed.

Walton et al (1975)\textsuperscript{19} require that whenever possible, open display storage should be used for all materials,
and that storage in drawers and cabinets should be reduced to a minimum.

The inventory needs are often overlooked in planning for storage facilities. This system provides a means of determining what is stocked in the storage area and when to replace or reorder existing items.

On storage, planning for the future is important and this is determined by the anticipated needs of the individual class as well as the total school.
NOTES


3. Ibid.

4. Ibid.


CHAPTER 3

METHODOLOGY OF THE STUDY

3.0 The Sample

This study involved a random selection of eight primary schools in Olenguruone Division of Nakuru District. In each of these schools, four classes were studied, i.e., two classes in the lower primary and two in the upper primary. In the lower primary standards 2 and 3 were studied because if any science at all has been done in the lower primary, the researcher expected these two classes to have gone beyond the introductory stages and hence to offer much on various aspects of the resources employed in the teaching and learning of the subject. Because of the closeness of standard 4, in the upper primary to standard 3 in the lower primary, standard 5 was studied instead. Similarly standard 6 was left out in preference to standard 7. Standard 8 was not studied because it was preparing for the national examinations and therefore their science teachers were busy with them. In each school four science teachers, teaching the classes studied respectively, were involved as respondents for the questionnaires administered during the study. The expected sample size was thirty two. However, the researcher managed to recover only thirty one questionnaires.
3.1 The Instruments

Two survey instruments were used. The first was a questionnaire, and its copies were administered to the teachers who taught science in the classes that were being studied. The purpose of this instrument was to obtain information regarding:

(a) the science materials, both provided and not provided by the Ministry of Education, and are available in the schools,

(b) the sources of other science materials being used in the schools,

(c) the criteria used by science teachers in the selection and use of resources,

(d) why science teachers use teaching aids,

(e) the system of keeping a check on the science materials available in the schools,

(f) the opportunities for teachers meeting with colleagues and/or other experts to share ideas on production and use of materials on teaching and learning of science,

(g) the improvisation of resource materials, both by the science teacher and the pupils,

(h) the use of environment in the teaching and learning of science,
(i) whether science teachers make use of the resources available in the Teachers Advisory Centres in the division.

The second instrument was a checklist which attempted to obtain information on:

(a) the use of science text-books which are recommended by the Ministry of Education,

(b) the science supplementary books used,

(c) the library (reference) books used for teaching and learning of science,

(d) the available teacher-made and pupil-made resources,

(e) the resource materials found in the schools which were supplied or made by the T.A.C.,

(f) the available commercially manufactured resources used,

(g) the storage systems employed in schools for the science materials.

3.2 Administration of the Instruments

The questionnaire was administered by the researcher personally. Each of the eight (8) schools was visited and a questionnaire was issued to the respective class teachers teaching science. They were given four days
to respond to the questions, after which the completed questionnaires were collected by the researcher.

The checklist was completed by the researcher assisted by the respective class teachers of science. This was done when he went round the school collecting the completed questionnaires from the science teachers.

3.3 Presentation, Analysis and Interpretation of data

The data that was collected was analysed on the basis of the research questions posed in this study and is reported in chapter 4 of this project.

The data is presented in percentages and frequency tables.

After the data analysis and presentation, discussions and recommendations are made in Chapter 5 of this project.
4.0 Introduction

Out of the anticipated thirty two (32) teachers of science in the primary schools studied by the researcher, questionnaires were collected from thirty one (31) of them. Similarly checklists were completed by the researcher assisted by each of these thirty one (31) teachers in their respective schools. In this chapter the data from each of these two instruments used will either be considered separately or will be integrated together in the presentation and analysis as necessary. Data involving mathematical analyses will be based on the thirty one (31) respondents who participated in the study.

4.1 Teaching Experience of Teachers

Table 1 below shows the teaching experience of teachers.

<table>
<thead>
<tr>
<th>Teaching Experience (in years)</th>
<th>Number of Teachers</th>
<th>Percentage of Teachers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 5</td>
<td>8</td>
<td>25.8</td>
</tr>
<tr>
<td>6 - 10</td>
<td>6</td>
<td>19.4</td>
</tr>
<tr>
<td>11 - 15</td>
<td>8</td>
<td>25.8</td>
</tr>
<tr>
<td>16 - 20</td>
<td>6</td>
<td>19.4</td>
</tr>
<tr>
<td>21 - 25</td>
<td>1</td>
<td>3.2</td>
</tr>
<tr>
<td>26 - 30</td>
<td>1</td>
<td>3.2</td>
</tr>
<tr>
<td>31 - 35</td>
<td>1</td>
<td>3.2</td>
</tr>
</tbody>
</table>
The teaching experience referred to in this study is the number of years that the teacher has spent in teaching since the first year of appointment.

Over fifty percent (54.8%) of the teachers who participated in this study have a long experience of over 10 years teaching. Science classes are then bound to benefit from such experience if the teachers perform their teaching work as is expected.

Table 2 shows the number of pupils in the classes that were studied.

Table 2

<table>
<thead>
<tr>
<th>Number of Pupils</th>
<th>Number of Classes</th>
<th>Percentage of Classes (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 - 30</td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td>31 - 40</td>
<td>11</td>
<td>35</td>
</tr>
<tr>
<td>41 - 50</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>51 - 60</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>

From these findings, nearly sixty percent (58%) of the classes have less than 41 pupils. These classes are not over-crowded and hence are manageable. The pupils can benefit immensely in a well planned science lesson involving the use of resource materials as the teacher can easily
reach every pupil for any necessary assistance.

4.2 Science Materials Found in the Schools and their Sources

Five science teachers (16%) indicated that there is nothing at all for teaching science that the Ministry of Education provides to their schools. However the rest of the teachers indicated the presence of a few items in their schools which can be used for teaching science, but added that most of the items are old and out of use as they were provided long before the new 8-4-4 system of education was introduced. Some of these materials included charts like those showing the human skeleton, blood vessels, the human body and the types of animals. Others are the minimum and maximum thermometer, radio, spring balances, raingauge, and basic science series booklets covering topics such as electricity, space and man. The researcher discovered that the primary schools which were started in the 1980's have none of these materials, while those which were started in the 1960's have very few of some of the materials; the common ones present were the minimum and maximum thermometers and the spring balances.

Hence from these findings, the Ministry of Education does not provide any resource materials for teaching and learning of science in these primary schools.

However, the Ministry of Education does recommend books for use in the teaching and learning of science.
At present, science text-books commonly found in most primary schools are basically those published by the Kenya Institute of Education (K.I.E.). Some of these books include:

1. The primary science for lower primary, standards 1 to 3, a teacher's guide.

2. Primary science for standard 5.

3. Primary science for standard 7.

Of the thirty one (31) teachers who participated in this study, six of them (19%) did not have any of these books. Their major text-books for teaching science are those written by Patel and Malkiat Singh. They were, however, aware that these books are not approved for use by the Ministry of Education and so they keep them safely away to avoid any victimisation incase any ministry official sees them using the books.

The study revealed that the supplementary science books recommended for use by teachers of science in primary schools are rare to find. In a few schools the only science books available to the teachers are those written by Patel and Malkiat Singh. Teachers in other schools indicated that they had one or more of the following books that they use as supplementary books:

2. Practical science for primary schools by Mugiri, E. M.

3. A course in Junior Science by Creaser, H.

4. Experimental science for tropical schools by Bishop.

5. Beginning science for standard 7 by Berluti, A.

6. Let's find out series books by Hillary Ngweno.

All the schools that were studied do not have a library. What they have are a few book-shelves either in the Deputy Headteacher's or the Headteacher's office and even here, science books are rare to find. Since the teaching and learning of science is done spirally in primary schools, teachers in any given lower class normally use books of a higher class as library or reference books, for example, the reference book for a standard five class using the book "Primary Science for Standard 5", may be the book "Primary Science for Standard 7".

Some other science books indicated as reference books in the various schools studied include one or more of the following:

1. Start finding out series for standard 4 and 5 respectively by Beryl Kendall.

2. Beginning Science for Standard 5 by Berluti, A.

3. Health Science for Primary Schools by John Ball.

4. A Course in Junior Science by Creaser, H.
In all the schools studied the researcher gathered that both supplementary and reference books are not accessible to the pupils directly but that the teachers read them and take notes which are then carried to the class as pupils' notes.

Other resource materials that the Ministry of Education approve for use in science lessons are those that can be obtained in the vicinity of the schools, for example, tins, small animals, seeds, and so on. These ones are occasionally used by the teachers who are also expected to add to the variety by improvising further resource materials.

As noted earlier five teachers (16%) indicated that the only books they have for teaching science are those written by Patel and Malkiat Singh. Some of their titles include:


3. Learning Science and Agriculture for Standards 5 and 7 respectively by Patel N. M. and Vashista.

4. Science for Standard 2 by Patel, N. M.

Apart from the charts and diagrams drawn by teachers of science, there are, in some few schools, equally useful
charts, some of which are entitled growth charts, mental health and dental care and are donated by the United Nations International Children's Emergency Fund (UNICEF).

The science text-books cited above are bought locally in the bookshops either by the teachers themselves using their own money, (in which case the books bought remain their property) or by the parents who contribute some specified amount for such purchases. In certain cases the individual science teachers ask the pupils to tell their parents to buy them the required books.

4.3 Criteria for Selection of Resources

Table 3 below shows the criteria on which the teachers base the selection of resources for teaching and learning of science.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Number of Teachers</th>
<th>Percentage of Teachers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson objectives</td>
<td>30</td>
<td>97</td>
</tr>
<tr>
<td>Nature of topic</td>
<td>26</td>
<td>84</td>
</tr>
<tr>
<td>Class size</td>
<td>21</td>
<td>68</td>
</tr>
<tr>
<td>Age of pupils</td>
<td>19</td>
<td>61</td>
</tr>
<tr>
<td>Cost</td>
<td>10</td>
<td>32</td>
</tr>
</tbody>
</table>
These findings reveal that all the science teachers at least base their selection of resources on one or more of the criteria for fruitful use in science lessons. The most common of these criteria are the lesson objectives and the nature of the topic. Five teachers (16%) mentioned availability of the resources as another important basis.

4.4 Why Science Teachers Use Teaching Aids

On the question of why teachers use teaching aids in the teaching of science, there were various responses. The table below shows these responses.

Table 4

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Teachers</th>
<th>Percentage of Teachers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For better understanding</td>
<td>16</td>
<td>52</td>
</tr>
<tr>
<td>For clarity of ideas</td>
<td>11</td>
<td>35</td>
</tr>
<tr>
<td>More permanent learning</td>
<td>9</td>
<td>29</td>
</tr>
<tr>
<td>Learning becomes real</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>Expose pupils to practical experience</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Arouse learner's interest</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Develop skills</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

These findings reveal that teachers are aware of the usefulness of employing resources in science lessons.
Over fifty percent (52%) recognise that teaching aids bring about better understanding of the concepts being taught. Others (35%) note that aids are essential if ideas are to be made clearer to the pupils. About thirty percent (29%) said that aids are necessary so that the pupils can remember what they have learned for a longer period of time, i.e.; so that learning becomes more permanent.

Other responses indicated that teaching aids are necessary so that:

1. Learning by the pupils is made real
2. The learner’s interest is aroused.
3. Skills are developed and
4. To expose pupils to practical experience.

On record-keeping of the available resource materials in the schools, there are two major systems given for this purpose. These are:

1. the inventory book for items such as text-books, and
2. the stores ledger book for materials such as tools and science equipment.

4.5 Teachers Meeting with Colleagues, Ministry Officials or Other(s) to Share Ideas on Production and Use of Teaching/Learning Resources for Science

Table 5 on the following page shows the findings
about the meetings to share ideas on the production and use of the resources for science between teachers with other colleagues, or with the ministry officials, and the local community experts.

**Table 5**

**Meeting to Share Ideas**

<table>
<thead>
<tr>
<th>Teachers meeting with:</th>
<th>Number of teachers</th>
<th>Percentage of teachers(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colleagues in the same school</td>
<td>31</td>
<td>100</td>
</tr>
<tr>
<td>Colleagues in other schools</td>
<td>17</td>
<td>55</td>
</tr>
<tr>
<td>Ministry of Education Inspectors</td>
<td>21</td>
<td>68</td>
</tr>
<tr>
<td>T. A. C. Tutors</td>
<td>21</td>
<td>68</td>
</tr>
<tr>
<td>Local community experts</td>
<td>13</td>
<td>42</td>
</tr>
<tr>
<td>NCPB</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>AMREF</td>
<td>4</td>
<td>13</td>
</tr>
</tbody>
</table>

All the teachers agreed that they do share ideas on the various aspects of the resources with colleagues in their respective schools. Other persons who are often accessible to the teachers are the Ministry of Education officials and the T.A.C. tutors. Nearly seventy percent (68%) of the teachers benefit from the ideas of the Ministry officials. Similarly the same proportion of the teachers communicate with the T.A.C. tutors. It is also encouraging to note that the local community experts are involved in this task. Over forty percent (42%) of the teachers...
benefit from their ideas and more particularly from the agricultural officers. At least one teacher noted that he has had the opportunity to benefit from the services and ideas of the National Cereals and Produce Board (NCPB).

During the study, the officials from the African Medical Research Foundation (AMREF) were going round all the primary schools in the Division to make a follow-up of the establishment of the Health Education Clubs in the schools. At least thirteen percent (13%) of the teachers said that they benefited from the AMREF's ideas. All the respondents noted that they normally share the ideas whenever they are confronted with a problem in any aspect of the resources.

In the Division, there are two Teachers Advisory Centres, one is situated in the office of the Assistant Education Officer, and the other, which was started last year (1989), is situated in a market place. The schools that were involved in this study are at a distance ranging from 1km to 12 km away from the nearest Teachers Advisory Centre.

Seventeen teachers (55%) indicated that they had never made use of the T.A.C. Centres because they are not equipped and so have no facilities that the teachers can go and ask to be assisted with. Over forty percent (45%) of the teachers who reported that they make use of the Centres, noted that they do not visit the centres themselves, but that the centre tutors normally go to their schools during such occasions as when they go to observe teachers, doing their inservice
training, on their teaching practice, or when there are seminars organized in some particular schools (though rarely held). In such circumstances science teachers normally mix with them and ask them a few things relating to the resources such as the improvisation of all teaching aids.

Radio is another important resource in schools that can be useful in science lessons. At present, there are no science radio programmes offered for lower primary in the country. The study revealed that not all upper primary classes use radio for teaching and learning of science. Reasons given for not using the radio were that:

1. the school radio is often out of order,
2. the dry cells are not available in the school,
3. the radio programme timetable is not available in the school,
4. the radio teachers are very slow whereas there is too much work needed to be covered in science.

### 4.6 Use of the Environment

All the teachers accepted that they occasionally use the environment for various studies in science, for example, when they make field trips to collect different small animals, plants, leaves, insects or when they go for nature walk. The frequency of making such trips depends on the nature of the topics studied.
4.7 Material Improvisation

All the teachers indicated that they occasionally improvise materials for teaching and learning of science and that they also involve their pupils in such improvisation exercise. Some of the improvised materials observed by the researcher in the various schools visited included the windvane, windsock, anemometer, pin-hole camera, electric magnet, charcoal balls and jikos, thermometer, flutes, string telephone, raingauge, propellers, drums, beam balance, kite, pulleys and construction models such as bridges and car toys. Of these improvised materials all the teachers indicated that none has either been provided or made by the Teacher Advisory Centre Tutors.

4.8 Storage of Resource Materials

The researcher found out that the storage for the various science resource materials varies from one school to another. Any available science materials were stored in one or more of the following places:

1. Either in shelves, boxes or cupboard in the deputy Headteacher's office.
2. Either in shelves, boxes or cupboard in the Headteacher's office,
3. The staff-room shelves,
4. Boxes in the classroom,
5. The charts and diagrams were hung on the classroom walls.
The researcher was also able to see a 'nature corner', 'nature table', and the 'centre of interest' within the classrooms in the lower primary classes. These are areas where items of interest from the topics being learned at one particular time are kept for sometimes. The researcher further noted that the materials found in these areas and on the classroom walls were basically those relevant to the topics that were being learned at the time. The teachers reported that they could not help such a condition because their classrooms were made of temporary materials and so were not safe for storage. They also accepted that their pupils destroy them.

4.9 Summary

The data presented and analysed in this chapter dealt with the following aspects of this study:

(a) The teaching experience of the teachers,
(b) The number of pupils in the classes studied,
(c) Science materials found in the schools and their sources,
(d) Criteria for selection of resources for science,
(e) Why science teachers use teaching aids,
(f) Teachers meeting with colleagues, ministry officials or other(s) to share ideas on production and use of teaching/learning resources for science,
(g) Use of the environment,
(h) Material improvisation,
(i) Storage of resource materials.
CHAPTER 5

SUMMARY, DISCUSSION AND RECOMMENDATIONS

5.0 Summary of the Findings

The following is a summary of the findings of this study:

1. Over half (54.8%) of the teachers who participated in this study had a long teaching experience of over 10 years,

2. Nearly three-fifths (58%) of the classes have less than forty one pupils,

3. At present, the Ministry of Education does not provide any resource materials to the primary schools for teaching and learning of science,

4. Science text-books commonly found in the schools are approved by the Ministry of Education and are those published by the Kenya Institute of Education (K.I.E.),

5. Both supplementary and library (reference) science books are rarely found in most primary schools,

6. Books authored by Patel, N. M., and Malkiat Singh remain popular in the primary schools for teaching and learning science despite the ministry's reluctance to recommend them for use,
7. All teachers base their science resource materials selection on one or more criteria,

8. All teachers have good reasons for using teaching aids in science,

9. Teachers occasionally share ideas on the production and use of teaching/learning resources for science with colleagues from their schools. They also share with colleagues from other schools, with ministry officials and with the T.A.C. tutors,

10. Teachers never visit the T.A.C. centres for help because the centres are not equipped and so lack the facilities that would be useful to the teachers,

12. Teachers occasionally use the environment in the teaching and learning of science.

13. Teachers improvise science materials and involve their pupils in this exercise.

14. The storage facilities for the science resource materials are poor.

5.1 Discussion

Ten years in teaching is a long enough experience. As was found out by the researcher over fifty percent (54.8%) of the teachers who participated in this study had been in the teaching profession for at least ten
years. If teachers then are motivated enough for example, by being provided with the science facilities and materials for teaching and learning science, and if they are assisted particularly by the T.A.C. tutors in the improvisation of the teaching/learning materials for science, then this long experience will help the pupils to benefit more in their learning of science.

Nearly sixty percent (58%) of the schools studied had class sizes of less than 41. These classes are not overcrowded and so would be manageable. Thus at any one given science lesson, a teacher can practically reach each and everyone of the pupils for any assistance that would be necessary. The pupils would be actively involved in the learning.

However, it is common to find that with the experience and a manageable number of pupils in most classrooms, the teachers have not dedicated their efforts to the improvement of classroom instruction. From resources point of view, this is understandable particularly when teachers have to buy their own science teaching materials like text-books. The Ministry of Education merely recommends the resources and leaves the burden of their acquisition to the respective schools. The community on the other hand is not very enthusiastic about supplying the required resource materials to the schools. So here we find most science teachers are in a situation where they are operating on very few resources.

On the other hand the Teachers Advisory Centre tutors are few and their offices are temporarily located. From the
findings these offices have no facilities in them that the teachers could go and study. When on their field work, the tutors concentrate particularly on observation of those teachers doing their inservice training courses in the various colleges in the country. It is then common to find that the only teachers who mind about using resource materials are those undergoing the inservice training.

The foregoing brief discussion reveals that although teachers recognize the value of using teaching aids, and can use various criteria in their selection and use, science teachers have not been keen on using the varied resources found both in their schools and in the environment out of the schools.

From the findings, the number of the available improvised materials for science are quite few in the schools visited. This may mean that the science teachers rarely improvise them for use in the science lessons. One other factor is attributed to the poor storage facilities available in the schools. Teachers do not appear to mind keeping them safely for future use and often discard after use.

5.2 Recommendations

From the results of the study, the following recommendations are presented:
1. The Ministry of Education, through its ministry officials, should be more effective in visiting each and every primary school in the Division, and checking to see that all the basic science resources are available. They should assist the science teachers e.g. with funds, so that they can buy certain materials like hammers, saws, wood adhesives, among others, with which they can improvise additional teaching aids.

2. The Teachers Advisory Centre should be a good resource for the teachers of science. The centre tutors should have a wide variety of materials, particularly the improvised ones, that the science teachers can study. The teachers can also borrow the materials from the centre for use in their science lessons.

3. The teachers should be more concerned about the safety of the resource materials that they use in teaching science. They can arrange with the respective headteachers to have a special room where they can safely keep their materials for later use and where they can be readily accessible.

4. Science Radio programmes may sometimes be affected by bad weather. All schools should have a radio cassette, and the taped radio lessons which may be conveniently used at any time of the day, even for remedial purposes.
5. This study was limited to only one division in Nakuru District. In order to obtain data that would facilitate wider generalizability, a similar study could be conducted elsewhere in the republic. It may also be carried out in other divisions in the same (Nakuru) district.

6. Since improvised materials are a good resource for a science teacher, research can be done on the various materials that young children make in the homes during their play time and detail how these materials can be used to teach science.
BIBLIOGRAPHY


A QUESTIONNAIRE FOR THE SCIENCE TEACHER

This is not a test. The purpose of this questionnaire is to collect information on various aspects of the resources you use in teaching science. I am therefore asking you kindly to assist me by responding to the items in this questionnaire. Please feel free and respond for the information you provide will be treated as confidential.

Thank you,

Yours faithfully,

RICHARD K. TUEI,
KENYATTA UNIVERSITY,
P.O. BOX 43844,
NAIROBI
I. PERSONAL INFORMATION

(a) Name of school ...........................................
(b) Teaching experience in primary schools ..............
(c) Class(es) taught ........................................
(d) Number of pupils per class ............................

II. OTHER INFORMATION

(a) Which science teaching materials are provided by the
Ministry of Education?
1. ..............................................................
2. ..............................................................
3. ..............................................................
4. ..............................................................
5. ..............................................................
6. ..............................................................
7. ..............................................................
8. ..............................................................

(b) Which ones are not provided by the Ministry of Education?
1. ..............................................................
2. ..............................................................
3. ..............................................................
4. ..............................................................
5. ..............................................................
6. ..............................................................
7. ..............................................................
8. ..............................................................
(c) Who provides those materials you listed in (b) above?
1. ..............................................................
2. ..............................................................
3. ..............................................................
4. ..............................................................
5. ..............................................................
6. ..............................................................
7. ..............................................................

(d) What criteria are used by science teachers in the selection of resource materials?

[[indicate by a tick (✓)]]
- (i) Lesson objectives
- (ii) Nature of topic
- (iii) Class size
- (iv) Age of pupils
- (v) Cost
- (vi) Other (specify) ____________________________

(e) Why do you use teaching aids?

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

(f) Does your school keep an inventory (record) of science teaching materials? If so, what system is used in keeping a check on these materials?

____________________________________________________________________
____________________________________________________________________
(g) Do you get opportunities to meet and share ideas on production and use of materials with [indicate by a tick (✓)]

(i) Colleagues in your school? ( )
(ii) Colleagues in other schools? ( )
(iii) Ministry of Education Inspectors? ( )
(iv) T. A. C. tutors ( )
(v) Local community experts? ( )
(vi) Other(s) (specify) ________________________________

(h) How often do you meet to share the ideas?
Regularly, yes ( ), No ( )
If Yes, how regularly ________________________________

Rarely ( )

Never ( )
If never, what is the reason? ________________________________

(i) How far is the nearest Teacher Advisory Centre (TAC) to your school? State distance ______

(ii) Do you make use of this T.A.C. facility?
Regularly: Yes ( ), No ( )
If yes, how regularly ________________________________
Rarely (  )
Never (  )
If never, what is the reason? __________________________________________

(k) Do you make use of science radio programmes?
Yes ( ), No ( )
If no why? __________________________________________

(l) Do you normally take your pupils on field trips/excursions/or environmental encounters to learn science?
Regularly (  )
How regularly __________________________________________
__________________________
Rarely (  )
Never (  )
If never, what is the reason? __________________________________________

(m) (i) Wherever possible, do you improvise materials for teaching science? __________________________________________

(ii) If not, why? __________________________________________

__________________________
__________________________
(n) (i) Do you normally involve your pupils in improvising the materials for learning science? Yes ( ), No ( )

(ii) If not, why? __________________________________________

____________________________________________________________________

____________________________________________________________________
AN OBSERVATION CHECKLIST FOR THE AVAILABLE RESOURCES

I  Personal Information

(a) Name of the school ________________________________
(b) Class ____________________________
(c) Subject ____________________________

II  Science Text-books

(a) Recommended text-books by the Ministry of Education.

(i) Main Class Text-books

1. ________________________________
2. ________________________________
3. ________________________________
4. ________________________________
5. ________________________________
6. ________________________________
7. ________________________________
8. ________________________________

(ii) Supplementary Text-books

1. ________________________________
2. ________________________________
3. ________________________________
4. ________________________________
5. ________________________________
6. ________________________________
7. ________________________________
8. ________________________________
(iii) **Library (Reference) Books**

1. 

2. 

3. 

4. 

5. 

6. 

(b) **Text-books being used in your school but not recommended by the Ministry of Education.**

1. 

2. 

3. 

4. 

5. 

6. 

(c) **Who recommends the books you have named in (b) above?**

1. 

2. 

3. 

4. 

III **Other resource materials for teaching science:**

(a) **Recommended by the Ministry of Education**

1. 

2. 

3. 

4. 

5. 

6.
(b) Teacher-made resources

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 

(o) Pupil-made resources

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 

(d) Resources provided/made by the Local Teacher Advisory Centre

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8.
(e) Commercially manufactured resources

1. ________________________________
2. ________________________________
3. ________________________________
4. ________________________________
5. ________________________________
6. ________________________________
7. ________________________________
8. ________________________________

(f) Indicate how you store the various resource materials that you use in teaching science such as class text-books, models, charts and so on.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
APPENDIX C

LIST OF THE PRIMARY SCHOOLS STUDIED

1. Olenguruone D. E. B.
2. Kiptenden
3. Kiptaragon
4. Cheptuech
5. Kabugunot
6. Simotwet
7. Sukutek
8. Emitik
APPENDIX D

TIME SCHEDULE FOR THE STUDY

5. Presentation of project to supervisor 7th Jan. 1991.
Dear Sir/Madam

TO WHOM IT MAY CONCERN

The bearer Richard K...Tuei.................. is a bonafide 2nd year student of the M.Ed. (PTE) programme at Kenyatta University in the Department of Educational Communication and Technology.

Kindly assist him/her in the collection of information for his/her project.

Thanking you for the anticipated assistance.

Yours sincerely,

OCHIENG MOYA
M.ED. PTE COURSE CO-ORDINATOR

OM/gr.
APPENDIX F

MINISTRY OF EDUCATION

Divisional Education Office
P.O. Box 5,
Olenfurone Division.

REF:OGEN/ED/GEN/4/VOL.1/355

19th October, 1990

The Headmasters,
Olenfurone Division

REPR: INTRODUCTION LETTER

This is to introduce you to the bearer of this letter, Mr Richard Tuel who is a student of Kenyatta University, He is in a research mission in your school. Accord him the necessary co-operation he may need.

He has been permitted from this Office.

( LAURENCE O. MUSEWE )
ASSISTANT EDUCATION OFFICER OLENFURONE DIVISION

Kenyatta University Library