M.ED. (P.T.E.) RESEARCH PROJECT

A STUDY OF PROBLEMS AFFECTING THE IMPLEMENTATION
OF THE 8:4:4 PRIMARY SCIENCE CURRICULUM
IN SOME PRIMARY SCHOOLS IN EMUHAYA
DIVISION OF KAKAMEGA DISTRICT

BY

OTWOMA MESHACK AMOKOLA

DEPARTMENT OF EDUCATIONAL COMMUNICATION AND TECHNOLOGY
KENYATTA UNIVERSITY

NAME: OTOMA MESHACK AMOKOLA

REFERENCE NUMBER: E55/7514/89

FACULTY: EDUCATION

DEPARTMENT: EDUCATIONAL COMMUNICATION AND TECHNOLOGY

DEGREE: MASTER OF EDUCATION
        (PRIMARY TEACHER EDUCATION)

SUPERVISOR: DR. ETENDE HENRY EMBEYWA

SUPERVISOR'S SIGNATURE:

RESEARCH TITLE: A STUDY OF PROBLEMS AFFECTING THE IMPLEMENTATION OF THE 8:4:4 PRIMARY SCIENCE CURRICULUM IN SOME PRIMARY SCHOOLS IN E MUHAYA DIVISION, KAKAMEGA DISTRICT.

INSTITUTION: KENYATTA UNIVERSITY

DECLARATION

This Research Project is my original work and has not been presented for a degree in any other university.

MESHACK AMOKOLA OTWOMA

This Research Project has been submitted for examination with my approval as University Supervisor.

DR. HENRY ETENDE EMBERWA
DEPARTMENT OF EDUCATIONAL COMMUNICATION AND TECHNOLOGY
KENYATTA UNIVERSITY
DEDICATION

This work is dedicated to my father MR. ELIJAH AMOKOLA, and mother MRS ESTHER SERINAH, whose hard work, prayer, encouragement and patience has made me reach this academic level.

It is also dedicated to my dear children.
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My first thanks go to God who was able to give me strength and life to complete the course as well as this project.

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CHAPTER ONE

INTRODUCTION

1.1. INTRODUCTION

This study focused on the exploration of problems affecting the implementation of the 8:4:4 primary science curriculum in some primary schools in Emuhaya Division, Kakamega District. It explored the current situation as it pertains to the process and product of the primary science curriculum. Emphasis was placed on the difficulties that teachers and pupils face in the process of implementing the new curriculum.

Teachers were considered as chief implementers of the primary science curriculum and hence played a key role in the study. A total of ten primary schools were utilized.

A study of this category has got many aspects that can be explored. This is so because there are many areas of problems in any given specific subject of the total curriculum. Aspects that were explored in this study are listed in the statement of the problem.

1.2. BACKGROUND

Rene (1968) proposed that education must satisfy the real needs and match up to the real capacities of the particular society of which it is part and that
unemployment is an indication of maladjustment - mutual maladjustment in fact - of the educational system and the economy. Previous studies had actually revealed an existence of such maladjustment in the Kenyan educational system. In 1972 we had the Bessey Report which clearly and in detail discussed defects in the Kenyan educational system. Among the problems that were pointed out in the report are: an excessive competitive spirit, domination of the school system with examinations, and that the curriculum was irrelevant, inadequate, narrow and emphasised rote learning while ignoring practical and creative activities. The educational system was above and a discouragement to the majority who could not succeed in it. They were discouraged because the system did not prepare them adequately to secure employment after school. Unemployment was among the key problems created by the 7:4:2:3 system.

During the same year, the International Labour Organization also produced an extensive report on the Kenyan educational system and gave proposals on how to structure it in order to be more acceptable in relation to present needs. They recommended that the education system must be developed to support the basic activities of life. Their recommendations were accepted in principle by the Government.
This was followed in 1976 by the National Committee on Educational Objectives and Policies (NCEOP) which addressed itself in depth to the then current educational system, its past and the future context. It became clear in this report again that the formal educational system though seen by the public as the best access route to advancement created key problems for both individuals and the society. Unemployment again was among the problems identified. The Gachathi group then recommended among other things a nine year basic education in which the last two years was to be geared more towards practical work or vocational training.

It is clear then that the Kenyan educational system seriously needed a change. There was need for it to address itself to changing societal needs and become more relevant in order to respond to the changing technological world.

The Report of the Presidential Working Party (1981) on the Second University in Kenya came into picture at the right time. This was a time when most people advocated a change in the educational system. Having studied past reports, this group led by Dr. Mackay recommended a change from the 7:4:2:3 structure to 8:4:4 structure. This recommendation was immediately accepted by the Government in March 1982 and plans for its
Too many activities began to take place from March 1982 onwards in preparation for the new educational structure. Schools were told to build laboratories, workshops, home science rooms and more classrooms. All these was expected to happen within the remaining two years. Many began now to lament that though change had become necessary, this was not the expected way of changing. Professionals never saw it undergo any trials. Teachers were not adequately trained or inserviced in readiness for 1985 and parents immediately sensed trouble in their pockets as cost-sharing was launched.

In a conference held in Nairobi, 1968, it was observed that:

The planning education is certainly a technique which must have its own specialists; but it is also a concern to all and there can be no hope of carrying it out successfully, without the active co-operation of society as a whole ... But, in any country, if the plan for educational reform is prepared in a vacuum by a group of a few specialists, however qualified they may be and however modern their methods, the plan will never be put into effect.1

Lack of professional style in implementing the 8:4:4 educational system meant problems that ought to have been discovered during the pilot stage and dealt
with, had to appear on a nationally large scale. Everything seems to have been done in a hurry in such a manner that demands on teachers, pupils, parents and even curriculum planners and developers were not clearly known. These had to be observed during the implementation. Makau (1985) argues that:

The attempt to relate education more to development is praiseworthy in view of the large proportion of the country's resources devoted to education, the need to stimulate production and meet the basic needs (including economic opportunity) of population. However, the new system of education which is a far reaching departure from practice hitherto, raises both theoretical and practical issues with regard to the planning and implementation of educational policy as a tool in national development.²

An industrial psychology (Vol. 1 No. 10, p. 6) observes that:

... the 8:4:4 system of education has had no improvement in our education system as claimed by its architects, but only a heavier stumbling block, which strains teachers, parents and children with less impressive results.³

It is proposed that good education must be defined in terms of its value to the citizens individually and collectively and to the interest of national economy. The philosophical stand of the 8:4:4 educational
system addresses itself to these important areas but tends to draw opposition as a result of its many unfulfilled promises and demands which are too expensive to effectively adjust to and that have deeper implications for educational budgeting.

The science component of the 8:4:4 educational systems emphasises:

a) Practical work  
b) Technological awareness and development  
c) Environmental awareness  
d) Manpower development  
e) Self-reliance

In order to make the above realized in primary schools as well, the local communities were advised to build, apart from more classrooms, laboratories, workshops, and home science rooms. This is to be accomplished through cost-sharing and the Harambee spirit. To build laboratories and equip them can be an effective way of implementing the primary science curriculum in all schools in the country. In the Kenyan primary schools syllabuses we have the following aims for science teaching:

1) To enable children to acquire and preserve certain useful attitudes about themselves and their relationship with the environment.
2) To enable children to acquire certain manual and thinking skills which are useful in solving practical problems.

3) To enable children to acquire a basic scientific knowledge.

4) To enable children to acquire ways of seeking further knowledge and of using knowledge to solve problems they meet in life.

Such aims are suitable because they seem to promote science as both a product and a process and as one that possesses acceptable attitudes. Objectives are also generated from the above aims that promote and enhance the growth of process skills in science.

The process skills in science include: observation, discussion, classification, planning, recording, presenting, interacting, applying experimenting, hypothesizing, questioning, predicting, investigating, and evaluating. Attitudes may include curiosity, humility, open-mindedness, skepticism, objectivity among others.

Science is a practical way of finding out about the environment. It is appropriate to children because they are naturally curious. Young children enjoy finding out. They enjoy exploring, asking questions, collecting and studying non-living and living things.
They therefore need materials and equipment for science. They also need physical facilities like classrooms and laboratories which are recommended by the 8:4:4 educational system.

However, Mburu Mwangi (Daily Nation, June 9, 1990) reports that unlike schools in most parts of the republic the provision of workshops, laboratories and other essential facilities for the 8:4:4 system of education in Taveta division of Taita Taveta District do not seem to be a priority right now since the majority of schools are still struggling to put up enough classrooms. In a science meeting held in Nairobi it was observed also that though parents are always pressurized to build workshops and home science rooms especially in primary schools little stress is put on the building and equipping of science rooms at this level.

It is in this context that the present study was designed to investigate the problems affecting the implementation of the primary science curriculum in Emuhaya Division, Kakamega District. A rural context was envisaged because rural schools are slightly more disadvantaged than urban schools in a variety of aspects though most primary schools lie there.
Primary school level was also chosen for the following reasons:

i) It is here that the foundation for science is laid through the provision of appropriate knowledge, skills and attitudes.

ii) The greatest number of dropouts from the school system are at this level, yet our 8:4:4 system aims at producing self-reliant and economically productive citizens.

iii) The age of pupils at this stage is suitable for moulding appropriate attitudes and orienting them towards a problem solving ethic.

In view of these, here follows the problem.

1.3. STATEMENT OF THE PROBLEM

From the time of its launching in 1985 the 8:4:4 educational system in Kenya has been of major concern and challenge to many researchers within the country. Researchers interest was whether the system is working as per its rationale. In the light of these many of them began watching and examining its effectiveness quite hastily. Eshiwani (1987) observes that teaching methods in the Kenyan schools have generally not changed much. Community members have raised complaints that the system is too demanding. It has also been observed
that pupils in primary schools begin attending classes as early as 6.00 a.m. and end as late as 6.00 p.m. The science component which is among the practical subjects in primary schools has also not been addressed to as proposed in the new system.

The present study therefore focused on the science component of the primary school curriculum with the following key aspects addressed:

a) Teacher qualifications and preparedness in coping with the primary science curriculum.

b) Time adequacy.

c) Teachers attitudes towards science.

d) Number of teachers in school.

e) Science resources.

f) Capital sources in schools.

g) School/community relationships.

h) School/industry links.

i) Policy and implementation.

j) Content loading and level.

k) Private coaching.

l) Methodology in science teaching.

m) K.I.E. and Jomo Kenyatta Foundation materials and publications in schools. Whether such arrive in the schools, are adequate in form and content.

n) Professional assistance in primary science curriculum.
In view of this statement, the following objectives and questions were utilized as a guide.

1.4. RESEARCH OBJECTIVES AND QUESTIONS

1) To explore the problems hindering the implementation of the 8:4:4 primary science curriculum in Emuhaya Division primary schools.

2) To explore the remedial measures that teachers use in trying to cope with the problems.

3) To explore the community contributions towards the implementation of the 8:4:4 primary science curriculum.

4) To explore teachers' attitudes that are relevant to the successful implementation of the 8:4:4 primary science curriculum.

Consequently the following research questions were addressed:

1) What are the main problems hindering the implementation of the 8:4:4 primary science curriculum in Emuhaya Division primary schools?

2) What remedial measures are teachers trying to adopt to cope with the problems.

3) Of what contribution is the community towards the implementation of the 8:4:4 primary science curriculum?
4) What teachers' attitudes are relevant to the successful implementation of the 8:4:4 primary science curriculum?

1.5. SIGNIFICANCE OF THE STUDY

The study is useful to the following:

a) Teachers in Primary Schools

The study supplies information to teachers of science in primary schools in areas that touch their attitudes towards science and how such influence pupils' attitudes towards science. It also offers advice that teachers ought to make maximum use of community resources available in order to improve the teaching of science. Since parents have become the chief source of funds for the whole curriculum, the teachers are also advised to develop a stronger relationship with the parents and all members of the community because this affects science.

b) The Inspectorate

Since the inspectorate's concern is educational standards, this study provides some light on the areas that require their attention, for example, the quality of inservice courses and the professional advice that teachers expect from them need to be scrutinized.
c) Curriculum Developers

Problems identified in the study can serve as a feedback. For effective implementation of the primary science curriculum many aspects of it require constant research so that necessary and relevant adjustments or improvement can be done by curriculum developers. Since also the system did not receive any trials such research is very vital.

d) Teacher Training Colleges

Teachers' attitudes towards science is an area that can help teacher trainers to critically examine their college curricula and do the necessary in order to produce teachers that can effectively teach science. Teachers' competence in methodology is a chief purpose of training colleges. The study can be of benefit to them in their handling of the science component in the colleges.

e) Kenya Institute of Education

This is where curriculum plans originate. A lot is also produced here for the purpose of smooth implementation of the curricula. The study is a source of feedback to K.I.E. and feedback can result into relevant moves that improve implementation.
1.6. ASSUMPTIONS

In order to study the aspects listed in the statement of the problem, the following assumptions were utilized:

1) All schools have a similar rural context.
2) Teacher's and pupils' characteristics remain the same during classroom observations.
3) That teachers responses are accurate and faithful to the questionnaire.
4) That participating teachers are aware of the others involved in the implementation of the science curriculum and the parts they play.

1.7. DEFINITIONS OF TERMS

8:4:4 Primary Science - This is a new primary science curriculum that started in Kenyan primary schools in 1985.

Science Curriculum: - This is the totality of activities offered or organized in order to enable the learner to acquire appropriate knowledge, skills and attitudes as well as those out of school activities that have a positive bearing on the pace or quality of the learners effort to acquire the three.
Implementation: - This is the translation of theoretical curriculum intentions into actual practice in schools.

Methodology: - This represents teachers actions, procedures and manipulations of organized subject matter, pupil behaviour, and the classroom environment.

1.8. SUMMARY OF CHAPTER

In this chapter we have introduced the problem and its various aspects upon which the study focused. Reasons for undertaking the study in a rural context and only using primary schools have been mentioned. Significance for the study has also been put forward. The next chapter explores literature related to the problem while chapter three discusses methodology and Data Collection. In chapter four we have the presentation, analysis, interpretation and conclusions. Whereas chapter five gives some recommendations drawn from the analysis of the data.
CHAPTER TWO

LITERATURE REVIEW

2.0. INTRODUCTION

This study explored problems affecting the implementation of the 8:4:4 primary science curriculum. In section 1.2 we gave a rationale for a rural context as well as why it was to be conducted in primary schools. In this chapter we explore literature related to the problem that was investigated.

2.1. HISTORICAL CONTEXT OF THE 8:4:4 PRIMARY SCIENCE CURRICULUM.

The primary science curriculum has been undergoing various changes intended for the purpose of improving the quality of science offered in schools. Owinoh (1979) observes that before independence no provision was made for science education for African primary schools. However, slightly before the attainment of independence a few specific changes began to appear. For example, in 1961, a science Teachers Workshop was formed for the purpose of providing short courses to teachers of primary schools. In 1962 a new syllabus was designed. This syllabus included Nature Study and Gardening for lower classes while the upper classes had Nature Study, Agriculture and Health Education.
It was after independence in 1963 that the real changes in science as far as primary schools are concerned began to take shape. An education commission (1964) headed by Ominde was immediately given the task of surveying the existing educational resources of Kenya and advise the Government of Kenya in the formulation and implementation of national policies in education. They recommended more emphasis on science education and manipulative skills among other things.

In 1966 we had the formation of a primary science group with the intent of improving instruction in science.

The 1962 syllabus which had separated Gardening, Agriculture, Health Education, Nature Study and Elementary Science was replaced by the 1967 syllabus that combined everything under General Science. At this time we also had experiments taking place in some selected schools in the country on the possibility of introducing the African Primary Science programme (APSP). This was implemented in 1972 in all Kenyan primary schools.

However, though such steps were undertaken in the area of science, it was still clear that the quality of formal education provided in schools did not help individuals as well as the society to achieve their objectives. The International Labour organisation's
Report (1972) and that of Bessey (1972) both indicate the low quality of science education offered in schools. That teachers only emphasized facts and memorisation at the expense of practicals is clearly expressed in the two reports.

The Report of the National Committee on Educational Objectives and Policies (1976) also expressed the need for better science in primary schools. They proposed that pupils should be provided with opportunities to gather data by observation and draw valid scientific inferences from the observed data.


2.2. THE IMPLEMENTATION OF THE 8:4:4 PRIMARY SCIENCE CURRICULUM

Indeed science is concerned with the search for knowledge and understanding of the physical world.
Children need to be involved in doing it rather than in hearing about it.

The former 7:4:2:3 did not effectively implement science curricula because:

a) A practical approach to science teaching was lacking,
b) Teachers based their action on perceived constraints other than the real ones,
c) Teachers ignored the technological relevance of science in a developing country like ours.

The teachers held a static view when teaching science to pupils (The K.M.E.C., K.C.P.E. Newsletter, 1987, p. 106). As a result examination became the main reason for teaching science and the main determinant for good teaching.

However, Okinda (1985) observes that science teaching should find its way into primary schools, not for intellectual reasons, or in order to accumulate scientific facts, but to give children experience of research and discovery while at the same time developing technical skills. He notes further that the relevance of science and technology to the needs of the community can be obvious if they enable the survival of the struggle
for food, housing, health, transport, communication, fuel, energy, manufacture, computation, defence, management, rural development and social welfare. If pupils are to benefit from science it must be taught well by relating it to other affairs of life.

A report of the National Council for Science and Technology in its recommendations 4.155 had this to say:

In future education should:

a) be used as a tool for making people more productive in the modern, rural and informal sectors of the economy,

b) lay increasing emphasis on the teaching of science and mathematics,

c) be diversified, functional and of improved quality; and

d) take note of national manpower needs for skilled labour, artisans, craftsmen, technicians, scientists and technologists (p. 78)⁴

These ideas had also been expressed in sessional paper No. 5 (1978). This paper advised for an expansion of the informal sector of the economy with a view of creating
self-employment opportunities. It was also noted here that science should provide the necessary knowledge which underlines the development of appropriate skills and technology that are necessary if the needs of mankind are to be met. Indeed Science and Technology are the essential means by which the development of modern society has been facilitated. The two are implicit instruments of economic policy.

Malo (1988) also in his key address to a conference of physicists observed that:

A society that has become increasingly more dependent upon Science and Technology requires more professional scientists, more technically trained professionals and more citizens literate in Science and Technology who can make intelligent decisions on the increasing number of questions of public policy with a technical component.  

In order for us to achieve these Rugumayo (1987) suggests that such success will require science educators to make science relevant, practical, and problem-oriented, and in the process produce persons who have the creativity to apply acquired knowledge to new situations, the competence to get things done, the curiosity to discover and understand the world around them, and the compassion to apply what they have learnt to human needs.
This is to suggest that an effective and successful implementation of primary science should have science linked to all affairs including economics, environment, health, nutrition, and so on. Science should promote a better understanding in children of the role of industry in society and the economic contribution which industry makes to the prosperity of our country. Rugumayo continues to assert that science education is a leading agent in the promotion of agricultural development, industrial production, scientific research, each of which has a powerful influence on social development.

A curriculum of this kind should be diversified. Its effective implementation would require that pupils are well motivated and the teaching is oriented towards human needs such as health, food and agriculture, and so on. Kelly (1987) expounds further that under such a curriculum teaching should genuinely reflect the spirit of enquiry and experiment which is science; the spirit of invention and production which is technology; and a framework of content which intimately links the principles and concepts of science and technology to topics of practical relevance to human welfare.

The teacher should make practical work a prominent feature and should frequently make use of community
resources, for example inviting guests to give talks about their work and how it relates to science, visitations to industries or factories, farms, and so on to provide pupils with first-hand experience of how science interacts with real-life activities. Teaching should continually refer to applications and implications of science.

One of the essential elements of the new system of education is an improvement of curriculum content with greater orientation towards technical education and the movement away from examination centred (8:4:4 system of education). The concept of 8:4:4 system was aimed at responding to the challenges of national development and youth participation, need for relevancy in the curriculum, equitable distribution of educational resources, technical and vocational training, assessment and evaluation, and increased opportunities for further training and Education for National Unity. The main aim therefore was to improve the quality of education at all levels. The following objectives of primary education were therefore developed for the new curriculum.

To provide learning opportunities which will enable pupils to:

1) Acquire literacy, numeracy and manipulative skills.

4) Experience a meaningful course of study which will lead to enjoyment and successful learning and a desire to continue learning.

5) Acquire a suitable basic foundation for the world of work in the context of economic and manpower needs of the nation.

6) Appreciate and respect the dignity of labour.

7) Develop desirable social standards and attitudes.

8) Grow into a strong and healthy person.

9) Develop a constructive and adaptive attitude to life based on moral and religious values and responsibilities to the community and the nation.

10) Appreciate one's own as well as other people's cultural heritage, develop aesthetic values and make good use of leisure time.

11) Grow towards maturity and self-fulfilment as useful and well adjusted members of society.

(8:4:4 system of education 1984 p. 3).

The science component of the 8:4:4 educational system is purposed to produce people at this level who can apply scientific knowledge for the solution of environmental problems.
By proposing a more serious practical orientation the 8:4:4 primary science curriculum is in agreement with the Gachathi Reports (1976) from which the system was derived.

An effective implementation of the 8:4:4 primary science curriculum is expected to completely withdraw from treating science as an accumulation of masses of facts, generalizations and principles, which during science teaching are to be imparted to the empty minds of pupils. Instead of passing on scientific details, the new approaches should insist on encouraging skills such as observing, classifying, comparing, predicting, measuring, inferring, estimating, generalizing, recording data, interpreting data, and proposing hypotheses (Fried., 1972). The new approach will have to strictly treat science as doing and not telling. This is the spirit of the 8:4:4 primary science curriculum. The new curriculum in science calls for new teaching techniques. Teaching needs to be related more to the world outside the classroom than it was before.

However, Kelly (1987) cautions that the main conditions required for educational reform include:

1) The nature of the reform has to be clear and the reasons for its adoption acceptable to those who it is intended to benefit.
2) Adequate support in terms of materials, retraining, and motivation has to be provided.

3) Teachers should be active partners in the process of reform; ... 6

Githinji (1985) noting the ushering in of the new 8:4:4 educational system puts that the year before was characterized by fund-raising meetings for the construction of classrooms and workshops in readiness for the new system. He expressed further that an estimated 11,500 untrained teachers had to be deployed to augment the existing teaching force in primary schools.

Since the primary school teacher is the one to transmit the new primary science curriculum intentions to the pupils, his preparedness is important. However, the Ministry had no option but to increase the number of untrained teachers. This of course was a poor take-off. Many such situations that affect the effective implementation of the primary science curriculum have been noticed. The foundation upon which the current primary science curriculum started rather hurriedly was poorly layed. Hence the sections below give an outline of the literature review about the situation of science in particular.
2.2.1. Qualifications of teachers

(a) Academic qualifications

Sifuna (1982) observes that though the teaching profession is increasingly beginning to attract students who generally perform well in the Kenya National Certificate of Education, performance is still poor in the key subjects like Mathematics, English and Science. But the Annual Report from the Ministry of Education (1978) specifies a continued emphasis on passes in English or Kiswahili, Mathematics and Science subjects as among the entry requirements for teacher trainees.

Waweru (Daily Nation, July 21, 1990) stressed in a conference in Nairobi that most primary school teachers lacked a sound scientific background and that colleges admitted candidates who either failed or had done poorly in science subjects. Sifuna had asserted strongly that the Kenya National Certificate of Education is a powerful factor in determining teaching effectiveness.

It appears that academic qualifications have not been taken strictly as is alleged in the Annual Reports of the Ministry. Hence primary teacher trainees begin from a very inferior foundation in science subjects and this in turn affects the implementation of the primary science curriculum.
b) Professional qualifications

Academic qualifications without professional ones will not adequately suit the implementation process of a curriculum.

Byrne (1960) proposed that:

The first thing to be realized is that there is no short cut to a successful educational system. This, like a good house, must have firm and solid foundations. Any country can be proud of its university college and its number of secondary schools but the real test of its education is the amount of attention given in the first instance to primary schools. (p. 1)

Hawes (1979) also tells us that there is no conceivable way in which curriculum implementation can be divorced from the process of teacher education. He says that this is so because the teacher in school interprets the objectives and content in the curriculum plan and manages the learning situations through which intention is transformed into actual practice. Professional qualifications are important in the determination of teacher quality as far as implementing a curriculum is concerned.

Teachers' professional qualifications have been a topic of much discussion and various recommendations have been made in the past. In the sessional paper No. 5 of 1978 a recommendation was made that teacher education
be greatly expanded and improved if the quality of education is to be improved and maintained. It was also noted here that the large force of untrained teachers in primary schools needed either to be trained or phased out by replacing them with trained ones. However, Githinji (The Kenya Times, January 7, 1985) reported that before the start of the 8:4:4 system in primary schools, an estimated 11,500 untrained teachers were employed in order to augment the teaching force in primary schools.

Many reports (Sessional Paper No. 5, MCST, 1980, p. 79) had noted a severe shortage of science and mathematics teachers in primary as well as secondary schools. Though more qualified teachers were needed the Ministry of education had to begin the system in such a rushed manner because there was no option. This shows clearly how the 8:4:4 began with an inadequate supply of qualified teachers. The Annual Report (1978) showed that there was a small decrease in the number of professionally unqualified teachers but their proportion remained high at 30.6 percent.

It is also important to point out that the quality of training matters a lot to the teachers of science. In a seminar report on primary science, Toili (1987) observed that:
In the recent past the teaching of science has been very poorly done mainly because teachers have not been well trained. Proper training in science education is necessary because teacher competence, flexibility and ability to innovate depends largely on the level of educational training. The apparent inability of teachers to teach primary science effectively has been attributed mainly to curricula disparity. College curricula are monstrosely overloaded, often with academic context, some of which is of doubtful value to the teacher in the actual classroom. Colleges and their curricula are remote from the realities of the school. Information about real completions and real problems appears incomplete, student teachers are prepared for what should rather than what is.

Teachers of science, in particular, need to understand the nature of science because it is their responsibility to convey this understanding to their students (School Science and Mathematics, Vol. 86, No. 1, January 1986, p. 43). This can only be done if teachers are adequately trained and qualified.

Again, if teachers lack experience and understanding they feel less certain of their knowledge and rely more and more on the textbook to provide the knowledge they think they are to dispense (Science Educ. Vol. 74, Issue No. 4, July 1990, p. 422). Experience tends to raise the teachers confidence in teaching.
2.2.2. Preparation for the New Curriculum

a) Inservicing

Teachers when in colleges are equipped with knowledge, skills, and attitudes which are very important for their success in schools. Hawes adds that the implementation of curriculum change and the continuation of new approaches in schools depends not only on the retraining of teachers, but also on knowledge, skills and attitudes fostered during initial training. Original pre-service training therefore forms a foundation upon which future growth in experience will be placed.

However, pre-service training alone cannot do since knowledge keeps changing. Teachers will require to be inserviced. Hawes (1979) observes that the tried and trusted way of introducing new curricula is by offering a series of specially organized courses for teachers.

Magiri (1988) carried out a study on factors affecting the teaching of science in primary schools in Kiambu Municipality and one of her findings was that teachers lacked opportunities of inservice courses. Inservice courses offer opportunities for continued teacher education and improves the quality of teachers.
Mutahi (1990) notes that, teachers had to improvise in view of lack of teaching facilities and spend most of their free time preparing their pupils to go through the new system for they had not been inserviced. This suggests that teachers were not properly exposed to inservice courses. Lack of inservice courses can lead to poor implementation practices in schools.

b) Inspection

Apart from attending inservice courses, teachers may benefit from the visits that primary school inspectors, officers and TAC tutors make to the schools. Advise given by these educational offers help to improve teachers' treatment of the curriculum. Arap Soi Jeremiah Maina (1990) observes that the majority of teachers consider the work of the inspectorate as being poor.

c) Participation in Seminars, Panels and Workshops

The preparation of teachers through involvement in primary science panels, seminars and workshops will go along way in equipping them with not only the new relevant knowledge, skills and attitudes, but also in raising the level of confidence in the new curriculum. Mohamed Farah Ahmed Goood (1982) observes that seminars and workshops for trained teachers are essential. He continues to note that such workshops and seminars must
be relevant to the programme that will be implemented.

As for as teacher preparation for the curriculum Ahmed continues that pre-service programmes, in-service programmes, workshops, weekend seminars, radio and television, newspapers, transportation and resource centres are among the most important methods for educating the teachers.

2.2.3. ATTITUDES TOWARDS SCIENCE

Blough and Schwartz (1984) proposed that:-

No matter how the science program is organized its success depends largely on the teacher and the teaching. The teacher's attitude towards science and its importance seasons the attitudes of the children. Enthusiasm, interest, background, willingness to learn, and an understanding of the goals are important ingredients of the teacher's potential.

When young children come to school they already have curiosity about the world. They deserve an environment in schools that can cause the growth and nurturing of such curiosity. The development of a scientific attitude comes about only through conscious effort and the study of science should develop pupils towards this.

Simpson and Oliver (1990) observe that school, particularly classroom, variables are the strongest
influences on attitude toward science. They continue by saying that while individual and home influences contribute significantly to this foundation, the basic feelings an adolescent formulates toward the enterprise of science and toward further involvement with science courses is in large measure mediated by the science classroom.

Mrs Waweru (1990) told a science conference in Nairobi that primary school teacher trainees join the colleges with a preconceived idea that science subjects were hard and that when they graduated they passed on the same attitude to the pupils they teach. It is the teacher who will consciously develop children's attitudes by ensuring that they use all their senses in observation. He will provide interesting experiences, opportunities to explore, make, express ideas, use books, discover, discuss, think, manipulate things, problems to seek solutions, and so on. Presence of negative attitudes will hinder the teacher from going this far. It is the teacher who matters in the formation of attitudes especially for primary school children.

2.2.4. **TIME ADEQUACY**

Science is a subject that requires sufficient time so as to involve pupils in as many practicals, projects, and other experiments as possible and also
for completing the syllabuses. Insufficient time will result into unacceptable tendencies in teachers, for example treating science as a heap of information to be given to the pupils. The question of time inadequacy has been a topic of much concern to everybody including the parents of the pupils.

Kihumba Kamotho (1990) reports that the syllabus is so demanding that hardly no time is left for extra-curricula activities. Adongo, the Secretary General of KNUT also complained that teachers have had to put extra efforts more than before in order to implement the more demanding 8:4:4 educational system.

A study carried out by Magiri (1988) revealed that 48 percent of the teachers involved had difficulties preparing lessons and improvising science apparatus due to overloadedness and time inadequacy. Time inadequacy since the introduction of the new curriculum has therefore been a subject of discussion and study.

Pupils in the rural areas have been observed going to school before 6.00 a.m. and leaving school after 6.00 p.m. This are indications of time inadequacy. In designing any curriculum area curriculum planners and developers have to understand whether the time allocated for it will be adequate or not. However, since
this current system had no piloting it was hard to determine the element of time adequacy for the syllabuses designed.

2.2.5. **Capital**

Primary schools require funds for running all the affairs of the school including science. Science being one of the practical subjects requires a lot of resources. Classrooms, laboratories or science rooms, and other science facilities are necessary if effective implementation of the planned science curriculum is to be realised.

However, it has been observed that capital is a major constraint in primary schools. Cost sharing and Harambee are the current philosophies that are utilized in raising funds for all purposes in schools. Since 1979 when the Government directed the formation of PTAs, a wonderful job has been done by them. But Sifuna (1985), in a staff seminar paper argues that though different districts recorded varying success the whole thing was not a rosy experience for all concerned. He continues that there are those who felt the manner in which funds were collected in some areas caused an unjustified strain on family finances.
Magiri also adds here that lack of funds in schools makes it impossible for them to purchase textbooks and science apparatus. It is even more difficult to construct science rooms and storage facilities.

Introduction of a new curriculum and new philosophies of financing its implementation may instead of improving the situation worsen it.

2.2.6. School and Community Links

The school is a part of the community and cannot do without it. The community has many resources which science can use. Blough and Schwartz (1984) add that communities have many things of scientific nature which children can carry to school for use in science lessons, communities have places to visit, people to enlist, and so on. School and community links are therefore vital when it comes to the effective implementation of a science curriculum.

Links are also vital because the responsibility of building schools and equipping them with all their requirements has currently become the community's. It is clear that their major achievement, through PTAs, has been to provide the extra facilities required for the implementation of the 8:4:4 educational system (Daily
Good (1982) proposed that although teachers are directly involved in implementing the curriculum into actual-teaching-learning situations, other programme users who include inspectors, administrators, the learners and parents must not be overlooked. Instead their common agreement of thought should be sought since they will also have to take crucial policy decisions under intense political, economic, social, religious and cultural pressures. When reasonable understanding exists between schools and their communities each one's contribution in the implementation process of curricula will be clearly highlighted and understood for the benefit of all.

2.2.7. Science Resources

The implementation of the primary science curriculum requires use of a lot of science resources. Science needs good modern classrooms, laboratories or science rooms, many apparatus and equipment as well as materials. Some of these will be improvised by the teacher and his pupils. Others must be bought. Failure to have them leads to bad implementation practices and excuses.

Before the current educational system many had complained that science was being taught in a theoretical
and not practical manner. Many commissions recommended a more practical approach to teaching science (Ominde Report (1964); Bessey (1972); I.L.O. (1972); Gachathi (1976). A practical approach requires in turn enough or adequate science resources.

The National Council for Science and Technology (1980) observed that facilities for the teaching of science and mathematics were inadequate and recommended an improvement in the teaching of science and mathematics by providing more qualified teachers, facilities and developing locally made teaching aids and science kits. On the same note, sessional paper No. 5 (1978) also had recommended a mass production of primary school science kits to help improve the quality of science teaching.

The recommendation that science becomes more practical oriented was therefore not new. However, the difficulties that were formerly faced in the implementation of the 7-year programmes in science were not largely dealt with before the 8-year programme started in 1985. Mwangi (1990) reported that unlike schools in most parts of the Republic the provision of workshops, laboratories, and other essential facilities for the 8:4:4 system of education in Taveta division of Taita Taveta district seem not a priority since the majority of schools in the area were still struggling to put enough classrooms.
Mrs Waweru (1990) observes that:

Ironically, although parents are always pressurized to build workshops and home science rooms especially in primary schools, there is stress on the building and equipping science rooms at this level.10

Leaders seem not to be giving science in primary schools a serious attention as we note from the above statements.

In the sessional paper No. 5 advise is provided that books and other educational materials are the basic tools for educational development and must be available to the learner in adequate quantity and quality, at the time they are required and at a cost the learner can afford. However, Magiri reveals further that schools are experiencing an acute shortage of teaching apparatus and materials including textbooks yet reading remains an important tool in learning science.

The Kenya Institute of Education is the main producer of school books and other materials. The other is the Jomo Kenyatta Foundation. The Gachathi Report (1976) recommended the Jomo Kenyatta Foundation to operate on commercial basis in publishing locally produced materials apart from those produced by K.I.E. Schools have to buy all that they require in form of textbooks, charts, still photographs, and so on. Schools used to get some of these materials free of charge.
2.2.8. Methodology

How science lessons are taught by teachers in primary schools is an area that requires much attention. The classroom provides an environment where pupils formulate feelings, interests and attitudes towards science. It is an accepted principle that teachers of science in primary schools have the responsibility to effectively convey science to their pupils. They should have understood its nature first. Miker and Milson (1974) stressed that science calls upon a child to take a stand, to make a decision, and then expose his belief to the test of what is happening in the around him. They proceed by emphasising that science involves action, tearing, destroying, constructing, building up in the such for truth.

Andersen, Harty and Samuel (1986) also proposed that in the search for knowledge, science is process-oriented, it is dynamic, on-going activity rather than a static accumulation of information. It appears that science can never be well taught by merely treating it as information to be passed on. It is never memorisation of facts, principles and generalisations. Science in primary schools can be a joyful experience for both teachers and pupils if an emphasis is placed on creative approaches to problem solving.
and critical thinking (School Science and Mathematics, Vol. 91 No. 1, January 1991, p. 10). Problem solving should be a fundamental goal of science instruction.

Ogonda (1988) observes that there is a logical relationship between the acquisition of science process skills and problem solving among primary school pupils. As a result, he advised that a strong emphasis should be placed on the acquisition of science process skills in primary education so as to inculcate in the minds of the young people the ability to solve problems.

Blough and Schwartz go yet further by proposing that:

Knowledge of science concepts, understanding of science processes; and the development of attitudes, interests, and appreciation are all to avail if we produce adults who are unable or unwilling to use these in helping to solve the serious problems that face the world today (p. 29).

Practical methods of teaching primary science are by inference more acceptable than theoretical ones.

However, actual school science lessons do not seem to be implementing the above assertions. Hence Muya's (1990) observation that sciences remains on
enigma in our schools as reflected by the poor results in science subjects. The standard of science has been deteriorating instead of improving (KNEC 8:4:4 KCPE Newsletter, 1990, p. 106).

Factors related to teaching style and mode of presentation affect student's interest in science. Tobin, Briscoe, and Holman (1990) state that traditional approaches to teaching science and mathematics, many of which persist today, are based on a conduit metaphor of knowledge transfer from teachers and textbooks to students. Knowledge is piped from the full container of the teacher's head to the empty vessels of the students' heads, they continue. But teachers when asked by Magiri (1988) on what factors mostly affect their choice of teaching methods in science, 76% of them indicated that provision of facilities and adequate teaching apparatus greatly influence the instructional method chosen. Theoretical approaches are only but a last resort, according to the teachers.

Okinda (1985) says that science teaching should find its way into the primary schools, not for intellectual reasons, or in order to accumulate scientific facts, but to give children experience of research and discovery while at the same time developing technical skills. Teachers complain that they lack apparatus and so
resort to theoretical approaches rather than the recommended practical approaches where problem solving techniques and science process skills find expression. But the fact that teachers have neglected improvisation of apparatus shows clearly their refusal to try. In this connection, Tobin and his colleagues (1990) continue that from a constructivist perspective constraints are constructions of individuals formed on the basis of prior knowledge, beliefs, and experiences.

Teachers have compromised and implemented that which was not originally intended due to the so called constraints. Rote learning and content coverage have taken the place of learning with understanding.

Researchers, from all these seem to agree that science in primary schools can be properly implemented by making it more practical and emphasising problem solving and the science process skills, rather than the utilization of traditional approaches which only leads to memorisation of facts of science.

Our primary schools can do better scientifically, if their teachers of science can do away with the outdated chalk and talk method of teaching (The KNEC: KCPE Newsletter, 1987) that puts their pupils at a disadvantage. Teachers can facilitate learning by
providing resources for students to use and structure the learning environments in which students access data sources and have time to connect what they observe with what they know. In this way new knowledge is constructed when an individual is unable to find "fit" between his/her constructions and the perceived environment or "fit" with others with whom interactions are taking place (Tobin, Briscoe and Holman (1990) pupils have in the past not given such opportunities by their teachers. The 8:4:4 primary science has intentions of providing such opportunities.

2.2.9. **School and Industry Links**

Kelly (1987) observes that the development of health; food and agriculture; energy resources; land, water and mineral resources; and industry and technology; the environment; and information transfer and technology, are essential for any country's future and that an understanding of science and technology is fundamental to such development.

It follows that the 8:4:4 primary science curriculum can be well implemented if it also includes links with industry. The mechanisms of such links can include visits to industries, factories, and such related places. It can also be through talks offered by invited guests from industries. Pupils can be made to develop
positive attitudes towards such places only if they are allowed to see how they function.

2.3. SUMMARY

This chapter discusses the historical context of the 8:4:4 primary science curriculum and various issues that have been raised so far about the curriculum's implementation. Chapter four will detail how some of these issues are affecting the implementation of the 8:4:4 primary science curriculum.
CHAPTER THREE

METHODOLOGY AND DATA ANALYSIS

3.0. INTRODUCTION

Guided by the objectives and questions stated in section 1.4, the present study explored the problems affecting the implementation of the primary science curriculum in some primary schools in Emuhaya Division of Kakamega District.

The rural as well as primary schools focus was based on the rationale outlined in section 1.2.

A pilot study was initially undertaken so as to discover faults or weaknesses in the instruments and eliminate them before the main study. It was also to acquaint the researcher with the situation expected in the main study.

3.1. SAMPLE

The sample of this study included a random sample of thirty (30) primary school teachers drawn from ten (10) out of eighty-six (86) schools in Emuhaya Division.

3.2. RESEARCH INSTRUMENTS

The main instruments for the study included:

1) Questionnaire (Appendix A).
2) Observation schedule for science lessons (Appendix B).
3) Observation schedule for science resources (check Appendix C).

3.3. PROCEDURES

3.3.1. Sampling

(a) Pilot Study

For the purpose of refining the instruments four teachers were selected from two schools for a pilot study.

(b) Main Study

Ten schools were randomly selected from the remaining eighty-four (84) primary schools. From each selected school, one teacher was chosen from lower primary and two teachers from upper primary. Thirty teachers in all were involved in the study.

3.3.2. Instruments

(a) Questionnaire (check Appendix A)

The pilot study brought results which refined this instrument by eliminating an unnecessary part of a question. Its results also suggested that some discussion with teachers on the instrument was necessary for motivation and understanding the importance of the study.

The questionnaire when refined consisted of nineteen (19) questions which had been constructed by the researcher.
Questions touched on the aspects listed in section 1.3.

(b) **Observation Schedule for Science Lessons**

This instrument (Appendix B) was also constructed and refined through a pilot study. It was purposed to assist during the observation of the actual teaching and learning of science in the classrooms. It was mainly to find out teacher's steps or actions, pupils' actions and the whole classroom environment i.e. the methodology.

(c) **Observation schedule for Science Resources**

(Appendix C)

The concern here was the availability of science resources in schools. There was need also to introduce some unrecorded discussion and questioning on the non-availability of some science resources in schools and classrooms in particular.

3.3.3. **Administration of Refined Instruments**

The researcher personally administered the three instruments to the teachers and their respective classrooms. The school timetable was used to arrange suitable days for each respective school participating. Two consecutive days for each school were used for the administration of the three instruments.

Before giving out the questionnaire a discussion
was held with the three teachers in each school. The purpose was to introduce the questionnaire to them and state the importance of the whole study.

Having given the questionnaire, the observation schedules B and C were also started. Observation schedule B was completed for each class-lesson in science for only the participating teachers. For each classroom a record of its facilities including charts, photographs, nature corner and so on were recorded. This was scheduled according to the school timetable to end in two days.

Finally the questionnaires were collected from the teachers. This went on until all the thirty teachers from the ten schools had fully participated. All data collected was then properly arranged for analysis.

3.3.4. Data Analysis and Presentation

Data collected was analyzed and reported using tables and ratios where applicable. Quantitative data, where applicable, is supported by qualitative information. The findings are reported in Chapter Four.

3.3.5. Summary

This study utilized thirty primary school teachers who were selected from ten schools. Three instruments were administered in two phases: Pilot Study and main study. Data collected was analyzed and is reported in Chapter Four.
CHAPTER FOUR

PRESENTATION, ANALYSIS, AND INTERPRETATION

4.0. INTRODUCTION

This study made use of thirty (30) teachers together with their thirty (30) classrooms selected from ten schools. Three instruments were utilized. In this chapter we present, analyse, interpret (where necessary) and provide conclusions from the data. Tables and ratios are utilized in the analysis. Only where it is applicable, quantitative data is supported by qualitative information.

4.1. QUALIFICATIONS OF TEACHERS AND THEIR EXPERIENCE

TABLE 1:

<table>
<thead>
<tr>
<th>School</th>
<th>Educational Level</th>
<th>Professional Qualifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Form Two</td>
<td>Form Four</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
The table shows that there are four form-two level teachers, twenty-six form-four level teachers, twenty-two P1 teachers, six P2 teachers and two are untrained. 100% of the teachers are of secondary school level. According to their qualifications, they should be in a position to handle primary science without much problem. A very low ratio (2/30) of the teachers are untrained. Academic and professional qualifications reinforce each other. It would appear that teachers of such academic standard require much help in implementing the primary science curriculum.

As far as experience of teachers is concerned, it was found that (24/30) teachers had an experience of over six years in the field of teaching. The majority of the teachers can therefore tell the difference between the former 7:4:2:3 system and the current 8:4:4 educational system as far as science in primary schools is concerned.

However when teachers were asked whether they were adequately prepared to handle primary science teaching during their student life in schools and colleges, 12/30 indicated that they were not. This ratio is enough to suggest that more work needs to be done in the colleges in order to adequately prepare the teachers for an effective implementation of the primary science curriculum.
4.2. PREPARATION FOR THE NEW CURRICULUM

Hawes (1979) observed that implementation of a new curriculum involves a series of related tasks that include the dissemination of ideas to people so as to prepare them to accept change, understand what it involves and why it is worth making the change. It is a time of challenge and adjustments.

(a) Training

Two-thirds (2/3) of the teachers in the study showed that they were not adequately prepared to handle the new demands of the 8:4:4 primary science curriculum. Training ought to offer teachers the relevant knowledge, skills and attitudes that will make them to quickly adjust to changing curricula in schools. Effective teacher preparedness through training will ensure that teachers become better implementers of the curriculum.

(b) Inservicing of Teachers

Inservice courses offered to teachers help to equip them with the new knowledge, skills and attitudes that the newly introduced curriculum demands. The majority of the teachers in this study (27/30) have attended inservice courses in primary science since 1985. But when teachers were asked whether the
in-service courses were of value to them in the handling of primary science, their responses were as follows:

TABLE 2: Value of Inservice Courses

<table>
<thead>
<tr>
<th>Option</th>
<th>Frequency</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Very valuable</td>
<td>3</td>
<td>(\frac{1}{10})</td>
</tr>
<tr>
<td>B - Valuable</td>
<td>8</td>
<td>(\frac{4}{15})</td>
</tr>
<tr>
<td>C - Neutral</td>
<td>9</td>
<td>(\frac{3}{10})</td>
</tr>
<tr>
<td>D - Not valuable</td>
<td>10</td>
<td>(\frac{1}{3})</td>
</tr>
<tr>
<td>E - Very unvaluable</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The value of in-service courses in science should be clearly known to the teachers. The above table gives indication that teachers have not benefited a lot from in-service courses. Measures must be undertaken to improve its worth. This provides an opportunity where teachers' views about a new curriculum in science can be dealt with, changed, and improved for its successful implementation.

(c) Participation in Primary Science Seminars, Panels and Workshops

These areas are intended to provide the teachers with the opportunity to discuss and participate in the formulation of whatever may appear necessary in the curriculum. Teachers feel part of the system when
they are involved. The study revealed that a majority of the teachers have not participated in primary science seminars (20/30), panels (27/30), and workshops (16/30).

(d) Inspectorate

22/30 teachers agreed that professional advise in primary science is necessary. The rate of visitation is shown below:

TABLE 3: Rate of Visiting Science Teachers in Schools

<table>
<thead>
<tr>
<th>Rate</th>
<th>Frequency</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very often</td>
<td>9</td>
<td>$\frac{3}{10}$</td>
</tr>
<tr>
<td>Often</td>
<td>11</td>
<td>$\frac{11}{30}$</td>
</tr>
<tr>
<td>Rare</td>
<td>10</td>
<td>$\frac{1}{3}$</td>
</tr>
</tbody>
</table>

All teachers indicate that they have been visited. Inspectors have made a good effort to see the teachers. However, the majority that actually visit the schools are the Teacher Advisory Centre (TAC) tutors. It was also revealed that:

1. Teachers gain very little from such visits.
2. The officers lack sufficient scientific knowledge and professional competence in their efforts to assist the teachers in primary science.
(3) Promotions should be awarded to teachers who have shown competence in science and that more training should be offered after such promotions.

4.3. ATTITUDES TOWARDS SCIENCE

Positive attitudes towards science when possessed by the science teacher will be passed over to the pupils through the teacher's conscious efforts. The teacher is the key that will open the store of positive attitudes towards science in his pupils.

The majority (18/30) of the teachers in this study showed that science is not their favourite subject. They all indicated that their pupils like science.

During classroom observations it was clear that teachers displayed negative attitudes towards science. Teachers did not adequately prepare their lessons, did not allow their pupils to exercise more curiosity, adequate time was not given for observations, had a right answer attitude and ignored those that had a different answer. Pupils cannot effectively develop positive attitudes towards science unless teachers give opportunities for them to exercise curiosity, questioning, experimenting, and so on during science lessons. Teachers in this study displayed limited
scientific behaviour that could easily promote the growth of positive attitudes towards science in children.

4.4. **TIME ADEQUACY**

Science needs sufficient time so as to complete the syllabus and effectively teach the practicals. As far as time is concerned teachers had it that:

(a) It is not adequate for practical work and coverage of the syllabus (22/30).

(b) Time allocated is not fair to science (20/30) when compared with other subjects.

The majority of lower primary teachers had no complaint with time adequacy. According to them time allocated is enough.

Due to time inadequacy especially in upper primary, teachers teach during the school holidays. Two reasons are given for teaching during the school holidays:

(a) Have sufficient time to teach the more difficult topics in the syllabuses.

(b) Overcome the difficulty of over-loadedness.

The planning of the curriculum should strictly observe the situation of time so as to overcome difficulties of overloadedness of curricula. Time is
needed not only for school subjects but also for other important things happening in the environment, at home, and so on.

4.5. CAPITAL

To the question as to whether the school and community relationship is effective in raising capital for building science rooms, buying science facilities, and providing funds for primary science field trips, the teachers responded that it was ineffective (27/30). 25/30 teachers also replied that parents are not co-operative in buying their children science facilities for specific planned experiments at school.

Without sufficient money schools cannot effectively implement the primary science curriculum. The local communities need to be educated on the value of science so as to participate more in its promotion in schools.

4.6. SCHOOL AND INDUSTRY LINKS

All teachers in the study responded that no links exist between their schools and industries or factories. They never visit industries or informal sectors around. They alleged that such links do not exist due to lack of capital, failure to understand what such links will contribute, lack of time due to overloadedness of
curricula and lack of such places in the near vicinity for schools to visit.

4.7. SCIENCE RESOURCES

The 8:4:4 educational system advocates that schools through Harambee and cost-sharing should build not only sufficient classrooms, but also laboratories and any other science rooms that may be deemed necessary in the school. Apart from such constructions, schools and their communities should raise capital to equip laboratories and any other science rooms with apparatus, equipment and other relevant science materials. Parents of the children are therefore the key people to raise such money and equip the schools with science resources.

4.7.1. Physical Facilities

Schools had nearly a classroom for each standard. The actual states of the classrooms was terrible. The floors (24/30) are generally rough and so are the walls. Classrooms again had no shatters (doors and windows) thus making it difficult for the teachers and the pupils to leave anything behind when schools break off for home. Hence classrooms had no nature corners, wall charts, photographs, pictures, and so on, especially in upper primary classes. 3 out of 10 lower primary classes had nature corners that
were poorly maintained due to lack of doors and windows that are lockable. No actual expected environment for science teaching and learning where corners have resources of scientific nature and walls have pictures, charts, photographs, and so on was observed in all the thirty classrooms.

Laboratories were not a priority here. No one seems to be thinking about constructing a laboratory. Laboratories seem to be in the far future. In one school they had a completed workshop with no property inside. One school had a foundation for it. Eight schools had nothing started. However this shows that workshops and home science rooms are considered while science rooms are least thought about.

4.7.2. Apparatus, equipment, chemicals, and so on bought for science.

Schools do not buy any science apparatus, equipment, chemicals, etc. no matter how cheap they are. In one school there were few donated saws, beakers, and glasses. There is need to advise schools to take part in buying science resources beginning from the very cheap ones.
4.7.3. Teacher and Pupil Improvised Materials for Science Instruction

This is an area where a teacher's ability to create is most wanted. Improvisation of apparatus and equipment for use in science instruction is very vital. Not all apparatus and equipment or materials need to be bought. The teacher can make use of local materials to improvise apparatus. He can also guide his pupils to improvise together with him, especially when they have been exposed to the topic. If pupils are sufficiently guided they can skillfully create apparatus that can be stored for future use in science.

However, the study revealed through observations that due to lack of storage facilities schools do not have any improvised science apparatus, equipment, etc. Teachers complained that they have been discouraged from doing so due to no shatters on classrooms and other storage facilities. Nevertheless, this was an extreme case. Schools are facing a serious shortage of apparatus and science materials in general due to lack of improvisation. Some schools do not have staffrooms for teachers' preparation purposes (7/10).

Lack of storage facilities can be dealt with by ensuring lockable classrooms and building specified rooms for storage purposes and dividing into compartments.
so that each subject has room.

4.7.4. Radio/Radio Cassette

All schools observed had a radio but no radio cassette, However those with radios complained that lack of cells makes it hard to frequently use them. The importance of radio lessons is clearly known and teachers of primary science should make use of this resource in science teaching.

4.7.5. Books, Charts, Still Photographs, etc.

Most of these materials are produced by the Kenya Institute of Education and Jomo Kenyatta Foundation. These materials from K.I.E. are the currently recommended ones. There is an extreme shortage of all these materials in schools. Of the schools observed only three pupils (3) in lower primary had a science textbook. The upper primary section which was expected to have a lot of books and other publications had less thirty science textbooks. Even, it was observed in one of the schools that a teacher had no science textbook for use in instruction. Those books that were available to teachers were generally shared. Few teachers had personal science textbooks. All books are supposed to be bought by the parents of the children. Teachers ought to be advised to buy science books for use in teaching. They must be an example to their pupils.
Other science related materials such as charts, still photographs, and so on which are produced by K.I.E. are not present in schools at all. Teachers do not know why they do not receive such materials. They were generally unaware of the existence of some of K.I.E. science resources such as films.

It appears that the Kenya Institute of Education has not properly advertised its productions to the schools. If the materials have to be bought by the schools the same has not been relayed to them hence the extreme lack of K.I.E. materials in schools. This affects the implementation of the primary science curriculum.

4.8. METHODOLOGY

It is during science lessons that science is learnt by the children through the conscious efforts of the teacher. It is during this time that pupils develop attitudes that enhance science learning. Present day research recommends that pupils should be trained in science process skills and techniques of problem solving rather than merely being fed with facts, principles and generalizations of science.

However the findings from the observations of classroom lessons as well as some parts of the questionnaire
indicate that problem solving techniques and science process skills are not yet being taught and exercised. When teachers were asked whether primary school age children can generate scientific knowledge via problem solving techniques 21/30 denied that such can happen. They said such is impossible due to (a) children's age (b) lack of time (c) lack of science resources. The teachers agreed that pupils can report results of experiments through discussions, charts, diagrams, and so on to the whole class.

Teachers did not originally understand the meaning of a problem solving approach to science teaching. After explaining what it is, the responses to the question of how often they utilized a problem solving approach to teaching primary science are as follows:

TABLE 4: Responses to how often a problem solving approach is used:

<table>
<thead>
<tr>
<th>Rate</th>
<th>Frequency</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>All the time</td>
<td>6</td>
<td>$\frac{1}{5}$</td>
</tr>
<tr>
<td>Rarely</td>
<td>10</td>
<td>$\frac{1}{3}$</td>
</tr>
<tr>
<td>Never because of lack of facilities</td>
<td>14</td>
<td>$\frac{7}{15}$</td>
</tr>
</tbody>
</table>
This implies that a problem solving technique of teaching is under-utilized in schools.

The following key points were noted during classroom observations:

1. Of all the thirty teachers observed, only seven had lesson plans. Teachers generally were not well prepared for the lesson. In some cases (3) pupils were sent out to go and collect apart from chalk specimens for experiments.

2. Most of the lessons observed were practical lessons (23/30). Teachers planned their practicals according to the science textbooks they had. Pupils during such practicals were expected to produce the teacher's answer or if not be ignored.

3. Children in lower primary seemed more active and curious about scientific investigations. In one practical of floating and sinking pupils could be seen throwing even their pens into the water and examining the effect. All sorts of things were thrown in and observed. Pupils also discussed and talked freely at this level. Teachers at this level gave such opportunity to their pupils.
Pupils in upper primary seemed more fearful and less active and curious. Here the teacher tended to be talking alone while the pupils only listened. Pupils responded to his/her questions through one-word answers. No explanation was sought for the right or wrong answer. It was either accepted or rejected and nothing further than that.

It was realised that the language of communication was the really cause of extreme silence on the part of pupils. At this level they are expected to talk in English and not in mother tongue.

4. When giving explanations teachers mixed English and mother tongue. In \( \frac{7}{10} \) schools this was practiced even in standards five to seven. Hence the researcher sees that if mother tongue is used at this level it is bound to affect pupils in the National examination which is given in English.

5. Due to the language factor in upper primary, the general trend was pupils that wait for the teacher's summary from a textbook in form of simple drill-like notes. After every lesson the teachers made such a summary on the blackboard which combines both notes and assessment. These drill-like notes were examined to be all over the pupils' notebooks.
The teachers' notes also were structured in this manner. No flexibility was allowed.

6. The only process skill that teachers seem aware of is that of observing. However pupils are not given sufficient time for observation. In most cases pupils are hurried. Teachers also displayed a right answer attitude during science lessons.

7. Experiments that require the use of heat provided a lot of difficulties in carrying them out. This was done outside in the open. Firewood which tended to produce a lot of smoke was utilized. This in most cases affected the pupils' eyes leading to observations that were not anticipated. Lack of suitable apparatus and equipment makes it difficult to carry out such experiments requiring heating.

8. Teachers tended to be closer to their textbooks when teaching science practicals. This can lead pupils into thinking that science comes from a textbook.

The above eight points illustrate the fact that though teachers are involving pupils in carrying out practicals and experiments much needs to be done by them for effective science instruction.
Problems of resources are encountered by schools and science is suffering greatly. Nevertheless teachers are trying to overcome these difficulties and still emphasise a practical approach to teaching science. Practicals can only be improved by improving the situation of science resources and the teacher who is the chief implementer of the primary science curriculum.

4.9. ASSESSMENT

Teachers responses to the questions of how often they used the observation method in assessing progress in primary science for each child are as shown below:

<table>
<thead>
<tr>
<th>Rate</th>
<th>Frequency</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very often</td>
<td>13</td>
<td>$\frac{13}{30}$</td>
</tr>
<tr>
<td>Often</td>
<td>14</td>
<td>$\frac{14}{30}$</td>
</tr>
<tr>
<td>Rarely</td>
<td>3</td>
<td>$\frac{3}{30}$</td>
</tr>
<tr>
<td>Very Rarely</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Never</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

It is clear here that teachers use the observation method in assessing their pupils' progress in science.
However, during observations using observation schedule C, no records were actually found for this type of method. Also when using observation schedule B, it was observed that teachers use this assessment method to very limited proportions and that nothing went into record. As far as other assessments are concerned, teachers practiced them.

There is need for teachers also to realise how important the observation method of assessment for each child in science is and how such can promote the growth of science in each child.

In summary it has been observed that:

(a) All the teachers were of secondary level and that 23/30 are PI's.

(b) Teachers were not adequately prepared for the new demands of the primary science curriculum.

(c) Though teachers have participated in in-service courses they have questioned the value due to the low quality of instruction and guidance offered in them.

(d) There is a general lack of participation in panels, seminars and workshops in primary science.
(e) Professional advise is neccessary for effective science teaching but so far its quality has been low due to the low competence of the primary school inspectors and other related officers.

(f) The majority of the teachers do not see science as their favourite subject. Have negative attitudes.

(g) There is time inadequacy in the teaching of science in primary schools.

(h) Schools lack capital for use in building laboratories, buying apparatus and other related science materials. There is no capital also for field trips in primary science.

(i) Schools have no links with industries.

(j) No improvisation of science resources takes place in schools due to lack of lockable classrooms and storage facilities.

(k) Drill methods of teaching science practicals are still practiced in schools.

(l) Schools have an extreme lack of science textbooks and other K.I.E. materials such as charts, still photographs, and so on.

(m) Pupils are not being trained in problem solving techniques and science process skills.
Assessment procedures used do not include the observation method where the progress of each child in an aspect of science is keenly examined and followed.

The language of communication in upper primary being English has affected both the teaching and learning of science.

Hence, in conclusion, it may be contended that the problems affecting the implementation of the 8:4:4 primary science curriculum in Emuhaya Division are:

1. Lack of adequate preparedness for the new curriculum. This takes into account:
   
   (i) that teachers were not well trained while in colleges to cope with the new demands in science teaching.
   
   (ii) the inservice courses provided lack the needed quality that can reform the teachers.
   
   (iii) that teachers did not adequately participate in primary science panels, seminars and workshops to make them ready for the new challenges of the new curriculum.

2. The negative attitudes of the teachers towards science.

3. The poor quality of inspection offered in primary schools.
4. Lack of time to complete the syllabus and perform the required science practicals. This is due to overloadedness of the syllabuses and has led to teaching during school holidays.

5. There is an acute shortage of capital. This has led to:

   a) an extreme shortage of science resources, including laboratories, apparatus, equipment, chemicals, and so on in schools.

   b) lack of suitable classrooms. The present classrooms have no doors and windows leading to little use only.

   c) lack of storage facilities. Improvisation has been neglected due to lack of storage facilities.

   d) lack of field trips in primary science.

   e) an extreme shortage of science textbooks, charts, still photographs, and so on mostly from K.I.E.

6. Lack of school/industry links - These links are necessary if the present curriculum in science is to be properly implemented.

7. Use of methods of teaching that are not recommended in the syllabuses. Methods recommended clearly show the pupil as the centre and not the teacher. Use
7. Of drill methods in teaching science practicals defeats the whole purpose of science teaching and yet most teachers use such methods.

8. Language used in upper primary section. The two languages i.e. mother tongue and English can easily confuse pupils.

9. Poor relationships between the schools and the surrounding communities leading to lack of co-operation in the implementation of the primary science curriculum.
CHAPTER FIVE

RECOMMENDATIONS

In view of the problems affecting the implementation of the 8:4:4 primary science curriculum in Emuhaya Division as listed above, the following recommendations follow:

1. The teacher as the chief implementer of the primary science curriculum needs to be adequately trained while still in college pursuing studies (professional). College tutors should take their work seriously in preparing trainees for the challenges they are bound to meet due to changing curricula in the field. Positive attitudes can be formed in the trainees through performing many practicals in science using the recommended methods for teaching science in primary schools. Lessons in science during training should mostly be practical so as to acquaint teachers with the type of life in the schools.

2. Teachers should be inserviced frequently whenever it is possible. But during such times we should be clear in our minds what we need to achieve in them. Inservice courses should have a clear objective and purpose. Their high quality can be assured by using experienced and competent staff in primary science matters.
3. Improvisation of apparatus for science teaching in primary schools should be taken seriously by all teachers concerned. Though storage facilities affects the spirit of improvisation, we should not have situations whereby a school has no improvised science resources. This is an indication of laziness which should not be the case.

4. There should be a fair distribution of teachers participating in panels, seminars and workshops so that many teachers are provided with an opportunity to see what happens in the planning of a science curriculum. In this way they become a part of it and struggle for its smooth implementation.

5. Schools should construct storage facilities and also ensure that classrooms are lockable i.e. have windows and doors which can be closed.

6. Closer relationships should be established between schools and their communities since such are the ones to generate funds for the schools' functioning. This will result into schools possessing adequate science resources.

7. Schools should establish links with industries, factories, and various Jua Kali places so as to acquaint their pupils with what goes on there. They should also
make use of all the available community resources in the teaching of science.

8. Parents in the rural areas should be educated on the value of buying their children textbooks especially for the case of science which is most neglected.

9. The effects of cost-sharing in the provision of science resources in schools needs to be examined in serious detail if at all we wish to promote science and technology in this country.
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APPENDIX A
INSTRUMENT A - QUESTIONNAIRE

Introductory message:

Please note that this is not a test but a means of getting information from you who is among the key people as far as science education in primary schools is concerned. Your positive response, accuracy and faithfulness in providing answers is therefore highly appreciated. You are requested again to be as brief as possible in your answers.

1. Name of the school you are teaching ______________________

2. Class in which you will be observed in this study ______________________

3. Highest academic qualification ______________________

4. Highest professional qualification ______________________
   i.e. if trained.

5. Number of years of experience ______________________ years

6. Is the present 8:4:4 primary science curriculum easier or more difficult to handle? ______________________

7. (a) Do you think children of primary school age can generate scientific problems and solve the problems by themselves using scientific methods?  YES/NO.
(b) If NO please indicate your reason(s).
1. 
2. 
3. 

8. Which of the following are impossible according to your experience in teaching primary science?

(a) Children generating their own scientific knowledge through experimentation without having been taught by the teacher.

(b) Children reporting their experiments in form of discussions, charts, diagrams, etc. to the whole class.

9. (a) Is the time provided for the teaching of science in primary schools adequate for practical work and coverage of the syllabus? YES/NO.

(b) If NO give the reason(s).
1. 
2. 
3. 

(c) Do you think the time allocated for science is fair in comparison to other subjects? YES/NO.

10. (a) Is science your favourite subject? YES/NO.

(b) If NO which subject is your favourite?
(c) Were you adequately prepared in the school and college you attended to handle primary science? YES/NO.

(d) Do your pupils like science? YES/NO.

(e) How often do you carry out practical work in science for this class?
   (1) Very often   (2) Often
   (3) Once a week  (4) Where it is possible

(f) How often do you use a problem solving approach to teaching science?
   (1) All the time   (2) Rarely
   (3) Never because of lack of facilities

11. (a) How effective is the community and school relationship in doing the following:—
   (i) Raising capital to buy science materials.
   (ii) Raising capital to build laboratories or science rooms.
   (iii) Raising capital for field trips in science.

(b) How effective is your school's utilization of community resources in implementing the primary science curriculum?
   (1) Very effective   (2) Effective
   (3) Rare            (4) Ineffective
(c) Do you ever take your class for visits to industries? YES/NO.
If NO why? ____________________________

12. Since 1985 have you participated in any of the following:-

(a) Primary Science Panel at any level YES/NO
(b) Seminars on Primary Science YES/NO
(c) Workshops on Primary Science YES/NO
(d) An inservice course in Primary Science YES/NO
(e) A representative of your school or Division or District in a gathering on Primary Science Curriculum. YES/NO

13. (a) How many times have you been inserviced since the new Science Curriculum was introduced in 1985? ____________________________
(b) How valuable were the inservice courses to your effectiveness in teaching science?
   (A) Very valuable (B) Valuable
   (C) Neutral (D) Unvaluable
   (E) Very Unvaluable

14. (a) How often do primary school inspectors visit you? (A) Very Often (B) Often
   (C) Rare (D) Very Rarely
   (E) Never
(b) Do visitations from them benefit you in science?
   (A) Very little (B) Little (C) Nothing

(c) Please list the officers that have been of value to you in the implementation of the primary science curriculum.

(d) From your experience, is professional advice in science necessary? YES/NO.
   If NO what is the reason?

15. (a) Do you think the way you were trained adequately prepared you for the new demands of the primary science curriculum? YES/NO

(b) Comment on the professional competence of the primary school inspectors, Tutors, and any other officers in primary science as far as their assistance to you is concerned.

16. How co-operative are parents of your pupils in buying science facilities for their children?
17. (a) Do you face any difficulties in covering the science syllabus? YES/NO.

(b) Is the syllabus too difficult and above the level of children in some cases? YES/NO.

If YES give examples of areas in the syllabus that are too difficult.

(1) ________________________

(2) ________________________

(3) ________________________

(c) Do you practise private coaching in primary science? YES/NO.

If YES for what reasons is it done?

(1) ________________________

(2) ________________________

(3) ________________________

(d) Do you teach primary science during the school holidays? YES/NO.

If YES for what reasons is it done?

(1) ________________________

(2) ________________________

(3) ________________________

18. (a) How do materials produced from K.I.E. and Jomo Kenyatta Foundation e.g. books, teachers guides, recorded cassettes, charts, still photographs, etc. reach you for use in science instruction.

______________________________________
(b) Comment on the method used for these materials to reach you.

19. (a) How often do you use the observation method in assessing progress in primary science for each child?
   (A) Very often  (B) Often
   (C) Rarely      (D) Very rarely
   (E) Never

(b) Does preparation for National Examinations i.e. K.C.P.E. affect the manner in which you teach science? YES/NO. Explain.

(c) How many teachers are you in this school?

(d) Does this number influence your total number of lessons per week? YES/NO.

(e) Is the manner in which you teach science influenced by the total number of lessons per week? YES/NO.
OBSERVATION SCHEDULE B - TEACHING/LEARNING

Main areas to be observed here are:

(1) Teacher's Preparation for the lessons

(2) How lesson is introduced?

(3) Practical work. Use of apparatus and their suitability to the lesson.

(4) Teacher's activities.

(5) Pupils' activities.

(6) Summary, conclusion and assignment.

(7) Time adequacy.
### APPENDIX C

**OBSERVATION SCHEDULE C - SCIENCE RESOURCES**

<table>
<thead>
<tr>
<th></th>
<th>(A) Adequate</th>
<th>(B) Inadequate</th>
<th>(C) Very Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Books for pupils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Books for teachers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Teachers K.I.E. guides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Charts from K.I.E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Still photographs from K.I.E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Tapped Cassettes from K.I.E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Lesson plans from K.I.E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Schemes of work from K.I.E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Science materials bought by school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Pupil-made materials in science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Teacher-made materials in science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Any films on science (Primary)</td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Present</th>
<th>Absent</th>
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</thead>
<tbody>
<tr>
<td>13.</td>
<td>Laboratory</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Workshop</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Science Corner</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>School garden</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Past pupils' science notes to examine</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Past teacher's science notes to examine</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Radio</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Radio cassette</td>
<td></td>
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</tbody>
</table>
INTRODUCTORY NOTE FOR THE RESEARCH PROJECT.

M.ED. (PTE) II COURSE - 1991

OTWOMA MESHACK AMOKOLA - REG. NO: E55/7514/89

The above named is our post-graduate student undertaking a Master's programme at this university. In the final year of the programme, it is the practice of this University for Masters Students to produce a piece of research project work as a partial fulfilment of the degree.

It is in this regard that I request you to assist and encourage this student in carrying out project work of the title:

A STUDY OF PROBLEMS AFFECTING THE IMPLEMENTATION OF THE 8:4:4 PRIMARY SCIENCE CURRICULUM IN SOME PRIMARY SCHOOLS IN EMUHAYA DIVISION, KAKAMEGA DISTRICT.

Thanking you in advance.

Yours faithfully,

Dr. Twoli N.W.

COURSE CO-ORDINATOR, DEPARTMENT OF EDUCATIONAL COMMUNICATION & TECHNOLOGY

TNW/enk.
**TIME SCHEDULE FOR RESEARCH**

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>PERIOD OF TIME</th>
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<tbody>
<tr>
<td>1. Pilot study, its analysis and reconstruction of research tools.</td>
<td>10th to 12th September, 1991.</td>
</tr>
<tr>
<td>4. Writing of the final report</td>
<td>8th November to 30th December 1991.</td>
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<td>5. Submission Dateline</td>
<td>7th January 1992</td>
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