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**FACTORS AFFECTING PERFORMANCE IN PHYSICS  
AMONG LEARNERS WITH CEREBRAL PALSY  
IN THE KENYA CERTIFICATE  
OF SECONDARY EDUCATION.**

**WAUDO EUNICE WANJIRA**

**E55/5594/03**

**A RESEARCH THESIS SUBMITTED FOR THE  
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OF KENYATTA UNIVERSITY.**

Waundo, Eunice  
*Factors affecting  
performance in*




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## DECLARATION

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

**Signature**

  
\_\_\_\_\_  
**Waudu Eunice Wanjira**  
E55/5594/03

Date 8/9/2011

**Supervisors**

We confirm that the work reported in this thesis was carried out by the candidate under our supervision as University supervisors.

**Signature**

1.   
\_\_\_\_\_  
**Dr. Nelly Otube**

Date 8/9/2011

**Department of Special Needs Education**

2.   
\_\_\_\_\_  
**Dr. Violet Wawire**

Date 13/9/2011

**Department of Education Foundations**

## **DEDICATION**

This thesis is dedicated to my family, my mother Monica Wangui, my children Fridah, Melvin and Michelle, my sisters late Anne, Jeniffer, Bernadette, late Mercy and Sheila, and to my only brother, the late George.

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## LIST OF ABBREVIATIONS/ACRONYMS

ASEI	Activity Student Centered Improvisation
C P	Cerebral palsy
CHEM	Chemistry
FGD	Focus Group discussion
HPP	Harvard Project Physics
K I E	Kenya Institute of Education
K I S E	Kenya Institute of Special Education
KCSE	Kenya Certificate of Secondary Education
KNEC	Kenya National Examinations Council
MG	Mean Grade
MOEST	Ministry of Education, Science & Technology
NSTA	National Science Teachers Association of America Organization
PH	Physically Handicapped
PSSC	Physical Science Studies Committee
SCH	School
SEC	Secondary
SMASSE	Strengthening of Mathematics Science in Secondary Education
SSP	School Science Project
UNESCO	United Nations Educational, Social Cultural
USA	United States of America

## ABSTRACT

The purpose of the study was to establish factors that affect performance in Physics among learners with cerebral palsy in the Kenya Certificate of Secondary Examination. The study was based in two provinces i.e Central and Nyanza where two among the only three special schools for learners with disabilities are found. These are i.e Joytown and Joyland secondary schools in Thika and Kisumu respectively. The third secondary school of this kind i.e Mombasa Secondary School for the Physically Handicapped was used as a pilot study. The target population of the study was one hundred and fifty six respondents' i.e one hundred and fifty one students, three teachers and two head teachers. Purposive sampling technique was used to select the sample size whereby all students with C P taking Physics in forms two, three and four were taken. The same method was used to select the teachers who taught Physics in the two schools and the two head teachers of the two schools. The total sample size was therefore forty nine i.e. forty four students, three teachers and two head teachers. The design of the study was descriptive survey study. Data was collected using questionnaires, interview schedules, focus group discussions and classroom observation schedules all designed and developed by the researcher. Data was analyzed both quantitatively and qualitatively. The study found out that factors that affect performance in Physics include lack of a suitable syllabus, absence of adapted facilities and learning equipments, lack of provision of adequate time to complete the syllabus and also during the KCSE examination and questions that are not friendly to learners with C P. Based on the findings of the study, the researcher recommends that K I E develops suitable syllabuses for learners with C P, that teachers teaching learners with C P have some basic training in the area of not less than three months, that the Ministry of Education constructs special science laboratories in the three special schools, that K S C E papers for learners with CP be set by experts in the area and be marked by the same. For further research the researcher recommends a study to establish whether learners with C P actually benefit from science based subjects and especially the practicals since there are a number of activities they are not able to perform

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.0 INTRODUCTION**

In this chapter an attempt has been made to explain the position that science has always held in society and how science evolved from traditional science to process based science. The chapter includes the background of the study, the statement of the problem, purpose of the study, objectives of the study, significance and justification of the study, research questions, limitations and delimitations of the study, assumptions, theoretical and conceptual frameworks and operational definition of terms.

#### **1.1 BACKGROUND OF THE STUDY**

Science has always occupied a significant place in society since time in memorial, hence the great importance attached to it. This is what led to its development and changes in it's teaching approach all over the world (Bee 1981). Initially there was the traditional science which emphasized content, scientific method and excess belief in objectivity, universality and cumulative nature of scientific knowledge (Jevons, 1969, Lee, 1976). The main role of science was to explain nature; science was seen as explanations (Conant, 1975). The purpose of the teacher was to transmit the scientific knowledge as efficiently as possible (Bee, 1981). Jevans (1969) says science was a 'nature story' while Lee (1969) describes scientific instruction then as 'catechist'.

However, the Second World War showed that traditional science could not face the challenges posed by the vast advances in science & technology (Lee 19786). Ramifications of science to

all spheres of our life called for 'science' for all and its humanization (Jenkins & Whitefield 1976). Knowledge explosion made the teaching of facts only too unattainable. There arose a need to give education what was more relevant and future oriented. This led to the development of new curriculum in the United States in the 1960's – Physical Science Studies Committee- (PSSC) and Harvard Project Physics (HPP) in Britain. These trends in America and Britain had ramifications in other countries, Kenya included. There was a swing to process based science, one which emphasizes processes and skills. These includes among others experimentation, observation, inference, communication and representation (Scottfield et al, 1989).

In Kenya the introduction of the School Science project (SSP) in the 1970s had its core shift in investigational work by students. It was an attempt to dump traditional science. A more recent trend has been the 8; 4; 4 educational system and its emphasis on practical work. The objectives of this system also show a shift from traditional science to modern based science with emphasis on how scientific knowledge is acquired and its application to real world. (KCSE syllabus, 1985 – 2001).

Considerable emphasis has been placed on Science education as evidenced by various educational commissions such as the Ominde commission of 1964 and Gachathi report of 1976. Both reports addressed the issue of few students qualifying for advanced studies in science and mathematics and the persistent poor performance of students in national examinations. Learners with disabilities have over the years performed poorly as evidenced by the following table.

**Table 1.1: National performance of Physics, Chemistry and Biology in KCSE examination by learners with Cerebral Palsy in the three special Secondary schools for learners with Physical Disabilities i.e Joytown Secondary School (Thika), Joyland Secondary School (Kisumu) and Mombasa Secondary School for the Physically Handcaped.**

Yr	School	Entry	Subject	Grades											Mean Grade	
				A	A-	B+	B	B-	C+	C	C-	D+	D	D-		E
08	Joytown	13	Physics	-	-	-	-	-	-	-	1	3	5	3	1	D
08	Joyland	10	Physics	-	-	-	-	-	-	-	-	2	3	3	2	D
08	Mombasa	08	Physics	-	-	-	-	-	-	-	-	3	-	5	-	D-
07	Joytown	15	Chem	-	-	-	-	-	3	2	5	2	1	2	-	C-
07	Joyland	11	Chem	-	-	-	-	1	3	1	2	1	-	-	-	C
07	Mombasa	15	Chem	-	-	-	-	-	3	1	2	5	2	2	-	C-
06	Joytown	25	Biology	-	-	-	-	3	5	7	6	1	2	1	-	C+
06	Joyland	20	Biology	-	-	-	-	2	4	3	5	1	2	3	-	C
06	Mombasa	20	Biology	-	-	-	-	1	3	5	4	5	2	1	-	C

The table above is a summary of the national performance in Physics, Chemistry and Biology by learners with Cerebral Palsy in Joy town Secondary School for the Physically Handcaped in Thika, Joyland Secondary School for the Physically Handcaped in Kisumu and Mombasa Secondary School for the Physically Handcaped. The national performance shows that out of the three subjects Physics is the worst performed. Similarly, out of the three, Physics is the most unpopular as it has the least number of candidates.

Despite the great importance attached to Science in the world and in Kenya, the performance of these subjects has continued to deteriorate raising a series of concerns. This has led to many studies being conducted to find out the cause for this. Such studies include those of Kemunto (2005), whose study was about the low achievement among girls in Mathematics , Wambua (2006), whose study addressed the problem of low participation of girls in Physics in secondary schools in Kitui, and Imbwaga (2006) , who studied about constraints encountered by SMASSE programme in enhancing performance in Mathematics and Science subjects in Shinyalu division among others.

## **1.2 Statement of the problem**

The term cerebral palsy can be defined as a disorder of the brain, which occurs as a result of brain damage or lack of development in the part of the brain controlling movement and posture. It is a non-progressive disorder (i.e. it does not become progressively more debilitating) that affects gross and fine motor co-ordination). It is often associated with convulsions, speech disorders, hearing deficits, vision problems and deficits in measured intelligence or combinations of those problems. (Bleck 1975). According to Bleck, people with Cerebral Palsy are considered to encounter difficulties performing functions requiring the use of hands and legs, communication difficulties due to weakness of the speech organs and muscles and low intelligence among others. All these difficulties are said to interfere with their general academic performance.

The current Secondary curriculum i.e. 8:4:4 demands that all students study and be examined on two science practical subjects out of a choice of three namely Physics, Chemistry and

Biology. The same curriculum also offers other science subjects such as Home Science, but these are optional. Science subjects including physics have both theory and practical elements and one other requirement of this curriculum is that a student must pass the practical paper in order for them to qualify to pass in the subject. The practical paper carries a 25% weighting in the KCSE examination. (MOE Syllabus 2001).

Learners with C.P have continued to register poor grades over the years in the sciences as evidenced by the results presented in table 1.1. Poor performance prevents the learner with C P from furthering education in the universities and other middle level colleges. Most of them terminate their education after the K C S E exam and join vocational centers. Most of them are unable to pursue science related subjects. It is common knowledge that lack of advancement in science and technology for any nation including Kenya endangers prosperity and global economic developments. It is also very evident that this country cannot achieve the millennium Development Goals and Vision 2030 while a section of its population still lags behind. The statement of the problem therefore was to establish the factors that affect performance in Physics among learners with C P.

### **1.2.1 Purpose of the Study**

Learners with cerebral palsy encounter numerous problems due to the diverse nature of their conditions and other associated conditions. This could have a negative impact on their learning and performance in national examinations due to the interference of their functioning levels. The purpose of this study was to establish the factors that affect performance in Physics among learners with Cerebral Palsy.

### 1.3 Objectives of the Study

The following were the main objectives guiding this study:

1. To determine whether the current Physics syllabus is suitable to the needs of learners with C P.
2. Establish whether the Physics practical lessons are adaptable and the problems that teachers experience as they try to do this for learners with C.P.
3. Establish whether the facilities and equipment for teaching Physics are available and adapted to suit learners with C P.
4. Establish whether the number of lessons allocated for Physics are adequate for both theory and practical lessons.
5. Find out the challenges that students face during the practical paper examination both at School level and during K. C. S. E examination.

### 1.4 Research Questions

The following research questions guided the researcher in order to achieve the above stated objectives. The questions were directed to the head teachers, teachers and students themselves:

1. Is the current Physics syllabus suitable to learners with C P?
2. Is the Physics practical syllabus adaptable and what challenges do the teachers encounter as they try to adapt it for learners with C P?
3. Are the facilities and equipments available and adapted to suit learners with C P?
4. Is the time allocated for Physics lessons both theory and practicals adequate?

5. What challenges do the students encounter during the practical paper examination both at school level and in KCSE examination?

### **1.5 Significance of the Study**

It is hoped that the major beneficiaries of this study will be the students with C P. They have for a long time been disadvantaged by having to follow a curriculum that they could not manage due to complications associated with their conditions. It is expected that they will develop confidence as they go through a curriculum that they will be more comfortable with and that they will have more realistic career aspiration in scientifically based subjects. It is further hoped that this will improve teaching/learning of the sciences by making it more enjoyable to both the students and teachers and that it will lead to an improvement in performance in KCSE for learners with C P.

This study may benefit the curriculum developers; it will help them design more realistic syllabuses that will suit the needs of this particular group of students.

The study may also benefit the Kenya National Examinations Council. This is because once the curriculum developers develop a curriculum that is suitable / sensitive to learners with cerebral palsy, the examination council will in turn be in a position to set exams that are suitable to these learners based on the curriculum developed.

## **1.6 Limitations & Delimitations of the Study**

### **1.6.1 Limitations of the Study**

The study was limited to two secondary schools for learners with physical disabilities. These were Joyland Secondary School for the Physically Handicapped in Kisumu and Joytown Secondary School for the Physically Handicapped in Thika. The only other school of this kind, i.e Mombasa Secondary school for the Physically Handicapped was used as a pilot study. The findings therefore were generalized. The study was limited to learners with C P who are within the category of learners with Physical Disabilities. It also limited itself to the teachers of Physics and the head teachers of the two schools.

### **1.6.2 Delimitations of the Study**

The study focused on establishing the factors that affect performance in Physics among learners with Cerebral Palsy in the Kenya Certificate of Secondary Education (KCSE). A national survey was carried out in two out of the only secondary schools for learners with physical disabilities, under which the area of cerebral palsy falls. The third school was used for pilot study.

## **1.7 Assumptions of the Study**

The following assumptions were made to guide the study:

- (i) That the complications associated with C P affects the students' performance in Physics in the KCSE exam.

- (ii) That there are no adaptations in the syllabus that guide the teaching and learning of these learners.
- (iii) That students with C P encounter difficulties during the KCSE exam which affects their performance.
- (iv) That there are no adapted facilities and equipment used for the instruction of Physics.



## 1.8 Theoretical & Conceptual Frameworks

### 1.8.1 Theoretical Framework

In his book “Developmental task and Education”, Havighurst (1972) came up with a Theory of Developmental Task. He referred to developmental task as skills, knowledge, frustrations and attitudes that a person has to acquire sometime in his/her life. These are acquired through physical maturation, social expectations and personal efforts. “A developmental task is in between an individual need and a social demand” (Havighurst 1972).

One important point in this theory is the concept of ‘teachable moment’. Psychologically speaking the teachable moment is the correct time for teaching and learning a given task. Successful mastery of these tasks results in adjustment and will prepare the individual for the harder tasks ahead, failure in a given developmental task will result in lack of adjustment, increased anxiety, social disapproval and inability to handle the more difficult task to come, Sarantakos (1994) . Havighurst (1972) asserts that none of the developmental tasks can be ignored for research has shown that these tasks are closely interrelated and that difficult in one task, leads to difficult in another, hence the difficulties that learners with C.P experience in the

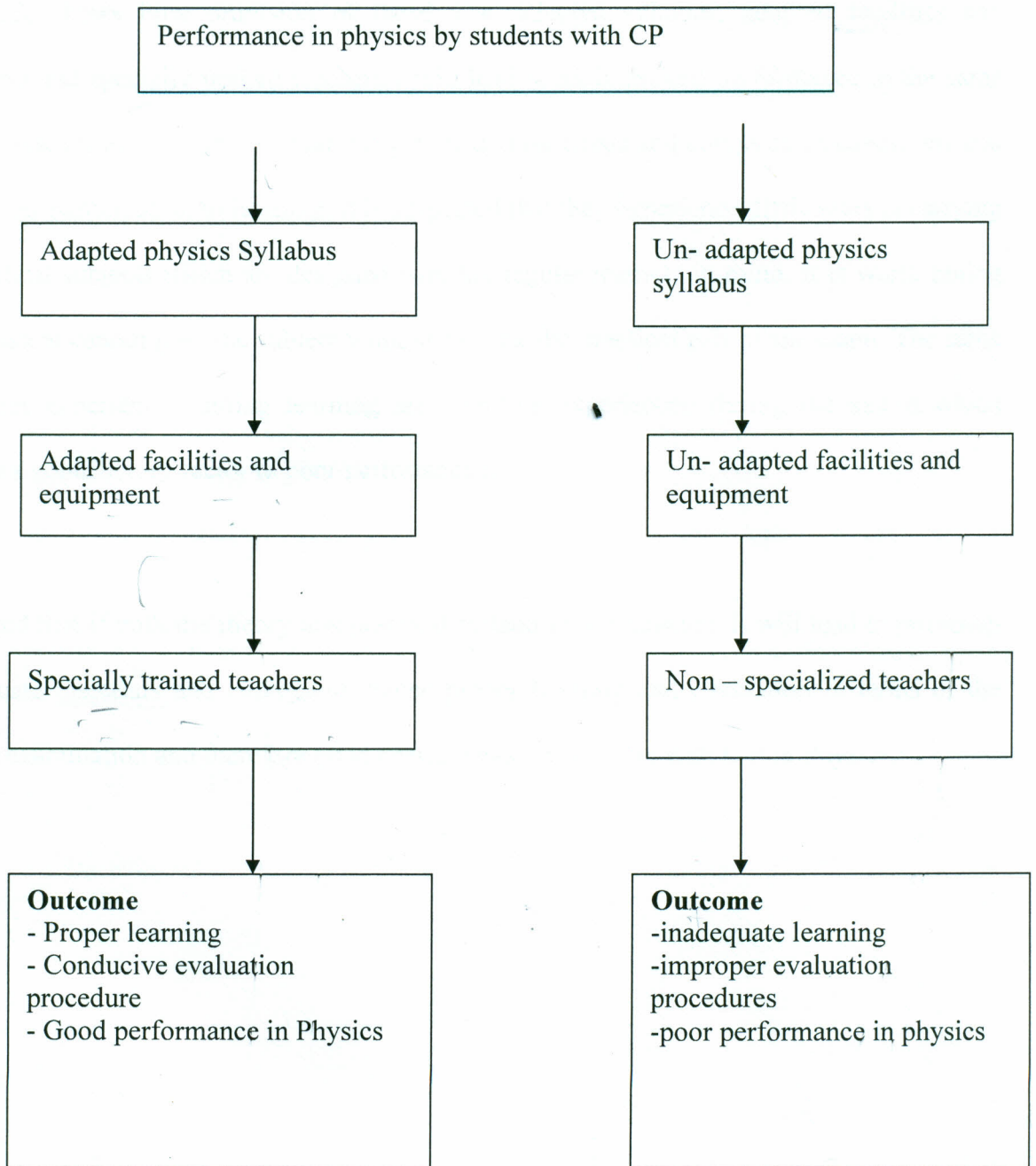
practicals lead to difficulties in the whole subject and sometimes also lead to failure in that particular subject.

In the area of curriculum, this theory would be seen to apply very well in the sense that the difficulties that C P learners experience in Physics practicals are due to the fact that the curriculum has not been adapted. Therefore the difficulties in the curriculum lead to difficulties in the teaching/learning of the subject.

This also brings about difficulties in evaluation because what is evaluated is what is in the curriculum. Since the practical aspect of the curriculum is not adapted, it also leads to setting of an examination which is equally not adapted hence difficulties in performance which probably affects performance in this particular subject.

### **1.8.2 Conceptual framework**

The factors affecting performance in Physics among learners with C P in the KCSE examination can be drawn from the following conceptual framework.



The above conceptual framework demonstrates what contributes to how poor performance in Physics and what could lead to an improved performance in the same subject. Poor performance is attributed to lack of an adapted practical Physics syllabus, lack of adapted facilities and equipment and lack of specially trained teachers. On the other hand, the

framework shows how provision of these, i e, adapted syllabus, adapted facilities and equipment and specially trained teachers could lead to an improved performance in the same subject. Since learners with Cerebral Palsy have diverse needs and complicated conditions that hinder their participation in learning, it is suspected that they experience difficulties in carrying out practical subjects which are designed with the regular learners in mind. It is worth noting that a student cannot pass the subject without passing the practical part of the exam. The same difficulties experienced during learning are therefore experienced during the exams which could be a contributory factor to poor performance.

It is hoped that if both the theory and practical syllabuses are adapted, it will lead to provision of adequate materials and equipment, hence proper learning and evaluation in terms of the national examination and therefore good performance by learners with C P in Physics.

## 1.9 Definition of Operational Terms

<b>Cerebral Palsy</b>	a disorder of movement and co-ordination caused by cerebral defect or injury it is non-progressive and occurs in infancy and early childhood
<b>Curriculum</b>	a course of study offered in a school or college
<b>Disability</b>	refers to the kind and degree of impairment, which results in some loss of capacity or function due to a physical disorder.
<b>Impairments</b>	to weaken make worse or hinder.
<b>Performance</b>	the action of carrying out an activity.
<b>Physically handicapped</b>	refers to orthopedic and health problems which adversely affect a person's educational performance. The term includes impairments from other causes such as fractures and burns that can cause contractures.
<b>Physics</b>	science of matter and energy of interactions between two, grouped in traditional fields such as acoustics, optics and mechanics.
<b>Poor performance</b>	that grade below D+ that does not allow further pursuance of the subject at middle level colleges or institutions of higher learning.
<b>Science</b>	knowledge which can make into system or use and depends on seeing and testing facts.

**Traditional Science** science that comprises of three main elements i.e. theory, operationalization and observation.

### **1.10 Chapter Summary**

The chapter dealt with the background to the problem whereby the significance of science subjects has been discussed from a world as well as a Kenyan perspective. This is based on the fact that the subject of study, Physics is itself a science. The chapter has highlighted the issue of science subjects in the Kenyan secondary schools syllabus and the performance of the subject over the years by both regular students and those with disabilities. The chapter also looked at the objectives of the study as it was noted that very few students with cerebral palsy choose Physics as one of their subjects of study and for those that do, the performance is poor.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.0 Introduction

In this chapter, literature has been reviewed based on the research objectives and include: suitability of the physics syllabus to learners with cerebral palsy, adaptability of the practicals and problems encountered, whether the facilities and equipment for teaching physics are adapted, whether the time allocated to teaching of Physics is adequate and the challenges encountered by students during the KCSE exam.

#### 2.1 Suitability of Physics Syllabus to Learners with Cerebral Palsy

The status, role and image of science have changed with time. Initially, there was the traditional science. This emphasized the products or contents of science, the scientific method and excessive belief in objectivity, universality of science and in cumulative nature of scientific knowledge (Jevons, 1969; Lee 1976). The main role of science was to explain nature; science was seen as 'explanations' (Conant, 1951). The purpose of the teacher was to transmit the scientific knowledge as efficiently as possible (Bee, 1981). Jevans (1969) says science was a 'nature story' while Lee (1969) describes scientific instruction then as 'catechist'. Practical work carried out in science was mostly used to illustrate concepts or theories already explicitly presented or taught. Practical work was seen as subversive to theory (Solomon, 1980; Woolnough and Alsopp, 1985). However a closer look at the history of science and recent developments in science such as Kuhn's and Popper's has put into question that view of science.

New documents in cognitive sciences especially the works of Piaget, Bruner, Gagne, Bloom and others have spearheaded the attack on rote learning which dominated the traditional science. They have called for active participation of the learner in the acquisition of knowledge. This calls for recess based science learning (By bee, 1981; Wellington, 1989). Other factors also added momentum to the swing towards process-based science. Among them is the student's increasing apathy to science as a result of prevalence of rote learning. Students saw science as un-interesting, un-motivating and un-inspiring (Jevans, 1969). Those students judged as knowing by the examinations could do little (Wellington, 1989).

The Second World War showed that traditional science could not face the challenges posed by the fast advances in science and technology (Lee 1976). Ramification of science to all spheres of our life called for 'science' for all and its humanization (Jenkins and Whitefield 1976). Knowledge explosion made the teaching of facts only too unattainable. There was too much to learn. It was better to learn how than what. Lastly there arose a need to give education what was more relevant and future oriented. De Hurt (1962) observed, 'the thrust is for education that will enable young people to live intelligently in the world they are going to live in. What is taught must have values beyond the context in which it is learnt. Young people must be qualified to deal with ideas not yet born and discoveries not yet made'. De Hurt was commenting on the new curricula being developed in the USA in the 1960s such as Physical Science Studies Committee (PSSC) and Harvard Project Physics (H.P.P). These trends in America and Britain soon had ramifications to other countries including Kenya. The trends entailed a swing to process based science; one which emphasizes processes and skills which scientists use to acquire and assimilate knowledge. The process skill includes among others

experimentation, observation, inference, communication and representation (Schofield et al, 1989).

### **2.1.1 The Kenyan Situation**

Parallel with these global were the national trends or changes in Kenya. Among them the introduction of the School Science Project (S.S.P) in 1970s, which had its core shift to more investigational work by the students. It was another attempt to dump traditional science. "Lack of coherent implementation policy led to it's abandonment in the early eighties" (Lewis, 1976). A more recent trend has been the 8:4:4 educational systems and its emphasis on practical work. The objectives also show a shift from traditional science; which had acquisition of knowledge as the main pre-occupation to modern –based science with emphasis on how scientific knowledge is acquired and its application to real world (K.C.S.E syllabus, 1985, 2001).

Considerable emphasis is placed on science education, as can be seen through the Kenya Education Commission of 1964, which set the foundation for education in Kenya after independence. Though it did not deal specifically with issues regarding science education, this is widely mentioned in the report on the National Committee on Educational Objectives and Policies (Gachathi report) of 1976 (Republic of Kenya, 1976). The report states, "There has been a general determination in the quality of Science and Mathematics through out the formal system of education arising from increased enrolments in relation to qualified teachers in these subjects. As a result, repeated failure to identify sufficient number of students who are well qualified in Science and Mathematics persists. This problem is compounded by the persistently poor performance of students in public examinations."The report came up with a number of recommendations aimed at improving the teaching and learning of Science and Mathematics.

The recommendations touched on the syllabus, teaching and learning resources like laboratories, support staff like library assistants and quality of Mathematics and Science teachers. This shows that the problem of Science and Mathematics is not a new one.

The report on the presidential Working Party in Education and manpower training for the next decade and beyond (Republic of Kenya, 1988), popularly known as the Kamunge report of 1988 observed that an important feature of the four year secondary education curriculum is the teaching of sciences in all secondary schools, again showing that Mathematics and Science is held with much importance in the country. This is so because science and technology is seen as the vehicle to drive the country towards industrialization. Science becomes even more important putting into consideration the fact that technology advances with lightening speed and that stagnant science performance in most schools in the world shortchanges the students' future and endangers prosperity and global economic development.

Despite the great importance attached to science in the word and in Kenya as emphasized by the various education commissions and reports, the performance of these subjects has continued to deteriorate raising a series of concerns. This has led to many studies being conducted to find out the cause of this and probably come up with a way forward to arrest the situation. Some of the studies conducted include:

1. Attitude of teachers and female students towards Mathematics in relation to the female student's mathematics achievement by Mary C. Kemunto – 2005. The study was about the low achievement among girls in Mathematics. It sought to find out solutions for this.
2. Factors influencing the choice of Physics by female secondary school students in Kitui district by Fredrick Wambua – 2006. This study has addressed the problem of low

participation of girls in Physics in secondary schools in Kitui district and came up with factors that contribute to this. This was due to the concern that women have been under represented in the physical sciences and that only a small percentage of them account for scientists and engineers.

3. Constraints encountered by SMASSE program in enhancing performance in Mathematics and Science subjects in Shinyalu Division of Kakamega District by Muyanje Imbwaga 2006.

### **2.1.2 Strengthening of Mathematics and Science in Secondary Education (SMASSE)**

One of the solutions sought in an attempt to deal with the poor performance in Mathematics and sciences was the aspect of in servicing the already practicing science and mathematics teachers in order to address the poor performance of the subjects in KCSE.

#### **SMASSE Objectives**

1. To inculcate a positive attitude in the teachers teaching mathematics and science because many of them had a negative attitude towards the subjects, this could also be observed in the students learning.
2. To encourage teachers to change from the traditional methods of teaching to more realistic/heuristic child centered approaches in teaching.
3. To encourage teachers to improve teaching resources and materials from cheap and locally made materials.

Training is done during the holiday's i.e. April/August in form of workshops and seminars and targets science based secondary school teachers (Physics, Chemistry, Biology and Mathematics). Emphasis is on practical skills acquisition and anecdote dubbed A S E I i.e.

Activity Student Centered Improvisation. Teachers perform experiments like students and go to practice in neighboring schools. Though this is very good training for the teachers, it is designed with the regular learners in mind. It does not address issues of learners with disability and especially those with Cerebral Palsy.

## **2.2 Secondary School Curriculum and Problems in Adapting it for Learners with Cerebral Palsy.**

The requirements of the current secondary school curriculum is that at form three, all students must study at least two science subjects from the choice of Physics, Chemistry and Biology and one cannot pass a science subject unless they have passed the practical bit of the examination. Practical work is given a 25% weighting in the final examination but more weighting (about 66%) on the school timetable. (MOEST syllabus, 1985, 2001). During the KCSE examination, candidates are assigned one laboratory assistant to give physical assistance to those who may not be able to carry out some activities such as cutting, heating and mixing. Usually the student (candidate) instructs the lab assistant as to what they want done while the student does the actual recording of findings. This however may not be done as accurately as the student himself/herself would do. This may have an impact on the marks obtained in that particular paper. In some cases, given the fact that the lab assistant may just be one and attending to as many as twenty – twenty five students, some of them get frustrated and give up and end up just writing their names and index numbers on the papers having not done the exam.

The stipulated guidelines for admission in the public universities require a pass in a cluster of four subjects. Each degree program has its own cluster of subjects which are selected depending on the nature of the course (Kagama, 2005). Table 1.1 shows the summary of representation by percentage of the degree programmes from all public universities in which Physics was required as a core subject, optional subject or not required at all for 2001/2002 university admissions. From the table below, table 2.2.1 it can be seen that only four degree programs (representing 4.1%) did not require Physics as a core subject Kagama (2005). This means that a student who has taken Physics is potentially eligible for at least 95.9% of all degree programmes offered in Kenyan public universities. This is the case where Physics is required as a core or optional subject. A student who has not taken Physics has fewer choices of up to a maximum of 51% of all the degree programmes. This case includes the degree programmes where Physics is not required as an optional subject (Kagama, 2005).

**Table 2.2.1: Degree Programmes and their relation to Physics**

<b>Physics Required as</b>	<b>Degree Programmes</b>	<b>Percentage</b>
	Number	%
Core subject	48	49.0
Optional	46	46.9
Not required	4	4.1
<b>TOTAL</b>	<b>98</b>	<b>100</b>

Source: Public Universities Joint Admissions Board – Cluster for 2001/2002

Learners with physical handicaps from among who the most prevalent condition is Cerebral Palsy are not an exemption. Recent international and national trends in science education are leading to greater emphasis on practical work and associated process-skills (Woolnough and Alsopp, 1985). In the implementation of these trends, the arm chair strategists who are the planners and policy makers such as international bodies (for example UNESCO), ministries of education, educational commissions and educational theorists have certain expectations of practical work as one of the means of implementing these trends or changes. Their expectations are well documented in books, journals and reports. On the other hand, the teacher and students have their own expectations of practical work, which affects their performance, (Lewis, 1972).

If Science is to be learnt effectively it must be experienced, that is where practical work comes in science. The National Science Teachers Association of America (NSTA) also agrees that science cannot be learnt through discussion alone; practical work is one channel through which one can avoid discussion and experience science. Like science itself the role and status of practical work has changed in view of changing educational priorities and philosophies. 'Recipe' type of practical work is being replaced by genuine investigations emphasizing on 'how' rather than 'what' to know. There is also need for students to think practically and have an understanding of the nature of science, Woolnough & Alson (1985).

This has constituted the shift to process-science (Wellington, 1989). Practical work is one of the avenues through which science can be implemented (Woolnough and Alson, 1985). This calls for more emphasis on practical work in science than before; hence raising its status such

that it is no longer seen as subservient to theory or an after thought (Solomon, 1980). The raising status has led to an increase in the role practical work plays in science. Practical work helps the student acquire concepts, skills (especially process-skills) and good attitude towards science (Bates, 1970). It motivates students by involving them and allowing them new freedom and imagination as they grow older and also serving as an alternative for those who dislike other teaching methods. It provides a multiple access in science (Shayer and Adey, 1981, Solomon, 1980). It enhances learning when students are having group sessions because they use the same language and easily communicate to one another (Lewis, 1972); it is a basis for technology because the two have similar processes (Jones, 1970, Woolnough and Alsopp, 1985). It helps in research to pursue more knowledge as Saga (1991) observed.

The history of civilization shows that through unfettered pursuit of knowledge the most significant practical advances have been made. It supports general aims of education, creativity, autonomy, self-confidence, heightening of interest and enjoyment of learning (Lewis, 1972). New topics are best tackled using a concrete approach (Shayer and Adey, 1980). This can be done through practical work. In developing countries practical work can be used to teach the dignity of manual work (Gago, 1991). Practical work can also help the students experience science like scientists by having a feel of phenomenon (Woolnough and Alsopp 1985). Correct perception of the roles of practical work by both the students is essential if it has to occupy its rightful place in the study of science.

### **2.3 Adaptation of Facilities & Equipment**

Many of the attractive and growing technical careers in today's economy require the completion of at least a first year college Physics sequence. A review of employment projections for occupations with the largest growth pattern between the years 1992-2005 shows several occupations that require postsecondary Physics laboratory courses (U.S. Department of Commerce, 1993). These occupations are included in the broad categories of medicine, nursing, and engineering with opportunities in these fields predicted to increase by up to 80% by the year 2005. Individuals with disabilities, however, have traditionally been left out of these career tracks because of lack of access or ability to fully participate in laboratory courses (Cotler, 1986). For example, a small percentage of students with disabilities (4.3%) who are enrolled in postsecondary institutions chose the natural sciences as a course of study (U.S. Department of Education, 1993). The percentage of students with a disability enrolled in engineering and health-related fields in 1989 was 8.2% and 7.7%, respectively. One of the major reasons for the limited participation of students with disabilities in these fields may be both the real and perceived barriers inherent in traditional laboratories and Physics experiments.

Physics laboratories are areas where individuals with disabilities have experienced difficulties (Crosby, 1981). Cabinetry access, equipment access, and aisle width have been identified as barriers to laboratory participation (American Association for the Advancement of Science, 1991). The use of toxic and corrosive reagents also presents danger to individuals with disabilities that inhibit dexterity and mobility. Specially designed benches with safety features are available. However, these benches can be expensive and used by only one person at a time (Larsen, Buchanan, & Torrey, 1978). Other modifications cited in the literature for individuals

with varying disabilities include the purchase of special wheelchairs, assistive standing devices, special safety equipment and portable science stations (Zimmerman, 1983). Frinks and McNamara (1985) adapted a common table to accommodate wheelchairs in the physics laboratory.

The challenge to students with physical disabilities who use wheelchairs in the Physics laboratory, however, creates a need to identify nontraditional accommodations because of the potential risk factors involved with the experimental procedures that are implemented. Individuals with paraplegia, multiple sclerosis, cerebral palsy, spina bifida, back injuries, arthritis and amputations, and other physical disabilities and mobility impairments all face barriers to fully participate in the traditional laboratory setting. The use of high temperatures and corrosive reagents in many laboratory experiments produces obvious safety hazards for all students. This is particularly true for students with limited mobility. More importantly, perceived safety problems could inhibit enrollment by students with disabilities in Physics laboratory courses.

Experiments designed with low risk and low cost materials can make the study of Physics more accessible to all students, regardless of disability, at a wide variety of secondary and postsecondary institutions (Hill, 1991). In particular, inexpensive experiments utilizing locally available supplies allow an entire laboratory course to be adapted to accommodate small numbers of students with disabilities at short notice. McDaniel, Wolfe, Mahaffy and Teggin (in press) described modifications of instructional materials for a chemistry laboratory experiment to illustrate nonintrusive, cost-effective accommodations that could make chemistry laboratories accessible to individuals with physical disabilities. By developing

methodology that promotes inclusion, students are provided an opportunity to explore a field of study for possible career choices in fields which they previously may have not considered to be accessible.

#### **2.4 Problems in Teaching and Learning of Physics**

The following problems are experienced by both teachers and students in the teaching and learning of science:

Apparatus are becoming more advanced and expensive yet this is inevitable if science is to keep pace with technology. Those with cerebral palsy condition would require specialized apparatus, which would even be more expensive. Laboratories should be more flexible and usable in many more ways. They should have carrels and movable partitions and tables; this is more so for learners with C P, (Shayer & Adey, 1980).

Increased use of field work to allow students to see science in real life, making it interesting and helping them make better career choice. Fieldwork also helps in the demystification of science when students see it in practice. However it is difficult for some C P learners to be involved in fieldwork due to problems of mobility brought by motor in-coordination. Students who are handicapped are yet to be incorporated into the mainstream of teaching and learning Physics. One of the world's leading Physicist's today, Stephen Hawkins is bound to a wheel chair. There could be a lot of handicapped but talented people in Kenya whose talents in Physics are wasting away (Bee, 1981, Klopher, 1990, Newsweek, August 10, 1992).

### **2.4.1 Suggested Adaptations for inclusion of students with Physical Disabilities in Physics practicals.**

The following recommendations for the safe inclusion of students with physical disabilities who use wheelchairs into the described laboratory Physics program are presented. The suggested modifications are made for physical convenience and assurances for safety and do not prevent students with disabilities from developing the same qualities of observations and the calculation of numerical results similar to all other students performing the same experiments in the same laboratory section. Students with varying disabilities will continue to be provided appropriate accommodations in the laboratory setting in addition to being able to take advantage of the revised experimental procedures.

The work can be performed on a simple folding table with adjustable legs. The table must be of a height that allows the arms of a wheelchair to just fit underneath, otherwise the student will not be in the correct position to perform the required manipulations without further modification. Equipment, such as balances, must be placed at a convenient level for use by seated individuals. This factor must be taken into account prior to purchasing laboratory supplies. The equipment to be used must therefore be carefully selected with this criterion in mind. Although two different balances may perform exactly the same functions, it is quite possible only one will be suitable in this setting. It is helpful if two students work together so they can help each other with some of the manipulations. All students in laboratory courses at this university have laboratory partners for this reason. Although two students with disabilities worked together in this study, there would be no disadvantage involved for any two students working at a folding table. It is also a common practice for students to obtain chemicals and supplies for the day's experiment from a central location. It greatly expedites the procedures if

the required materials are supplied on the bench for the students with disabilities. It is a good idea to use large spill trays (ordinary hard plastic domestic trays will do) in order to quickly and easily contain any spills that may occur. Despite the fact that the materials themselves are noncorrosive and nontoxic, this feature reduces the chances for soiling of clothing. Even though the chemicals used in the actual experiments were nonhazardous, all students were required to perform the experiments wearing safety goggles to conform with a general laboratory regulation at our institution because hazardous materials could be present in the same room.

#### **2.4.2 Benefits of Suggested Adaptations**

The proposed Physics laboratory modifications will affect four main areas: The curricular modifications for the Physics laboratory will result in improved access for students with physical disabilities who use wheelchairs. By eliminating the barriers inherent in some experiments while not compromising the integrity of the chemical principles that are demonstrated, students with disabilities can be fully included in the laboratory setting. Students with disabilities who have concerns for personal safety will find the modified experiments risk free. The experimental modifications do not require the purchase of expensive specialized equipment such as motorized wheelchairs and laboratory benches. Installation of these specialized devices might separate the student with a disability from the class as a whole in many crowded laboratory settings. Instead, the modified experiments enhance inclusion by offering nonintrusive accommodations in the laboratory environment and increases safety which benefits ALL students. Accommodations already in place for other specific disabilities should remain.

Because the inclusion philosophy underlying this approach is very cost effective, schools will have the opportunity to engage in a curriculum which may not have been available due to low levels of funding. The inclusion of more individuals with physical disabilities within chemistry courses may lead to an increase in interest in this field and subsequently result in more employees with disabilities in science or health related fields. The development of a Physics program which can be replicated at little expense in secondary and postsecondary institutions will provide greater exposure of nontraditional career fields to students with physical disabilities.

### **Teacher Training** ✓

In Kenya, teachers who teach in secondary schools are mainly holders of a bachelor of Education from the recognized Kenyan universities. However for those that teach Sciences and Mathematics there are a few who may be holders of diplomas in Education from Kenya Science Teachers Training College. These teachers major in two subject areas which they go to teach upon graduation. It is worth noting that for a long time, teachers who were teaching in secondary schools for learners with special needs were also just holders of a Bachelor of Education which had no aspect of special education. Apart from having studied their two subjects of specialization which they would go teach once they qualified, they had no knowledge at all in special education. Once they went out to go and teach, they came across students with conditions which they did not know how to handle and were similarly faced with a curriculum which they could not effectively implement. Author (2008).

It was not until 1995 when Kenyatta University started offering degree courses in Special Education. Yet even then, those that enrolled for these courses were mainly primary school

teachers who do not major in any teaching subject but are trained to teach all subjects at primary school level. Once at the university they studied one subject and special education which still did not qualify them to teach in the secondary schools because for example, how can one teach physics if they never pursued it at 'A' level and university.

In (1999) the universities started admitting fresh graduates into Special Education who now specialize in two teaching subjects as it should be. Kenyatta University, (1999). But even then, among the special areas of education that these students specialize in, Cerebral Palsy is not one of them. Yet teachers are very crucial in the implementation and success of any curriculum. Mayalt, (1974) observes that teachers are central to the change process and their training is quite crucial. It has been emphasized that curriculum package is only as good as the teachers who use it. Since teachers are the official implementers of the curriculum, they are an important ingredient in the learning process.

For the successful implementation of the curriculum, practical work is necessary (Woolnough and Alsop, 1985). For this practical work to be carried out successfully, the student and the teachers must be in the right frame of mind (Pidgeon, 1970). Such a frame of mind consists of right expectations, as appertains to practical work, its contents, the roles played by the teacher and the student and the nature and the functions of its assessment.

### **2.5 Cerebral Palsy and related Impairments and its Impact on Learning.**

Some of the associated conditions that may accompany cerebral palsy are mental retardation, hearing and vision loss, emotional disturbance, hyperactivity, learning disabilities, loss of

perceptual ability and inability to make psychological adjustments and communication difficulties.

Hearly (1982) reports that 60% of all children with cerebral palsy have ocolomotor defects. In other words, children with brain injury often have difficulties in co-coordinating their eye movements. The implications of these physical activities that involve a great deal of ocolomotor tracking of projectiles point to a need for programs that train for ocular-motor control, for appropriate learning of physics.

### **Communication Disorders**

Disorders in speech are found in 70% of the people wit C P. Studies indicate that speech defects are found in 88% of persons with Athetosis, 85% of those with Ataxia and 52% of those who are spastic. Most of the speech problems are caused by problems controlling the muscles used to make speech sounds (dysanthia). Delayed speech may also cause either mental retardation of the cerebral palsy dysfunction. Other communication problems are voice disorders, stuttering and aphasia, Hearly (1982). Disorders in speech pose a problem in the learning experience where the student is expected to participate in discussions in class and even in answering questions. The teacher would have a problem in knowing the extent of the understanding of the student in various topics due to the problem of communication. Although the problem may cut across in all subjects, it would be more serious in an examination situation where the student could be using a teacher Aide in practical examination. If the student is expected to give instructions to the teacher Aide/assistant, in case where he/she may not be able to manipulate some objects due to the nature of his/her condition, the student assistant

might get the instructions wrongly which could eventually lead to the student failing in that particular paper or examination.

### **Sensory Disorders**

Jones (1983) states that about 25-30 per cent of the people with C P have hearing deficits. Hopkins et al (1954) reported a lower figure ranging from 7% to those with spasticity to 22% in those with Athetoids. Athetoids were affected more frequently because Athetosis was often caused by RH incompatibility, which also causes hearing disorders. Hearing deficits/defects will naturally have an effect on learning. Because of the problem, the student may not understand all that is taught and this will naturally translate into poor performance in examination.

### **Vision Defects**

Vision defects in those children with cerebral palsy vary according to type of disorder. Hopkins et al (1954) reported an incidence rate ranging from 42% in ataxia to 27% in spastic and 20% in athetoids. Jones (1983) indicates that 50% of those with C P have ophthalmological problems. This includes eye muscle Inco-ordination and balance. Vision problems interfere with learning where the student may not be able to see the blackboard clearly or even the textbooks. In a practical lesson (with reference to Physics) it would be a serious problem because the student might make the wrong observations due to sight problem leading to failure in that particular paper.

### **Intellectual Ability**

Studies indicate that 50% of the people with C P have iqs below 70 (Hohman and Fredhein, 1958; Hopkins et. 1954). Low iq will naturally translate to low achievement in examination especially when such people are subjected to the same curriculum and the same examination just like other (regular) learners. The percentages of the people with C P that have convulsive disorders vary considerably. Denhoff (1966) estimates 30-60%, Jones (1983) reports 30% while Keats (1965) reports 86% of the people with spasticity and 12% of the people with athetoid have convulsive disorders. This again will definitely interfere with learning and performance in examinations.

### **Co-ordination and Balance**

Over 80% of all learners with C P have difficulties in muscle co-ordination and balance. This is more so with those with athetoid condition who are unable to control muscles and have many primitive reflexes, (Jones 1983). This becomes a major problem when students are undertaking a practical lesson or examination. Manipulation of objects and equipment is seriously interfered with which may cause the student to get wrong results in an experiment leading to failure in the examination paper.

### **2.6 Chapter Summary**

The chapter has discussed the status of science from a global perspective and narrowed down to the Kenyan situation. It has shown how science evolved from traditional to the process based . The issue of poor performance in Science and Mathematics has been highlighted and the various attempts made towards improvement of the same. The chapter has further discussed

the secondary school syllabus and problems in adapting it for learners with cerebral palsy. Adapted facilities and equipment have been discussed and suggested adaptations for students with C P in Physics practicals given. The aspect of teacher training has also been discussed as an important factor that affects performance. The chapter has concluded by discussing C P and related impairments' and its impact on learning.

## CHAPTER THREE

### METHODOLOGY

#### 3.0 Introduction

This chapter presents the research design, the location of the study, target population, population sample and sampling procedures, research instruments, piloting of the study, reliability and validity of instruments, measuring of variables, data collection and analysis procedures.

#### 3.1 Research Design

The study adapted a descriptive survey research design utilizing both qualitative and quantitative techniques in gathering data. A descriptive research design presents what is or what was, in a social system. This includes the conditions existing, relationships, opinions held, processes going on and trends developing among others (Best, and Khan, 1993, Abagi, 1996). It aims at getting a true picture of a situation, behaviours or attitude of individuals and the community at large (Onyango, 2000). It was therefore appropriate since it sought to analyze factors associated with certain occurrences, outcomes or types of behaviour. It provides clues for subsequent research that is more specific and aims to uncover the nature of facts in a given situation.

Qualitative data was derived from information collected through interviews, observation schedules and focus group discussions. This gave a more holistic picture of the actual situation. On the other hand, quantitative method has the advantage of getting responses of the same questions from a large number of people and these responses can be quantified for conclusion

to be drawn from them (Bell 1993). Quantitative approach was applied by use of the same instruments i.e. questionnaires, observation schedules and focus group discussions for the number of teachers, students and head teachers. The quantified information summarized the results while at the same time it complemented the qualitative data. As anticipated, the design was the most appropriate for this study that was, to obtain exhaustive and accurate accounts of various factors contributing to performance of Physics among learners with Cerebral Palsy in the KCSE examination.

### **3.2 Research Variables**

Research variables are measurable characteristics that assume different values among subjects (Mugenda and Mugenda, 1999). There were two types of variables used in this study.

- i) The dependent variable was poor performance in Physics among learners with Cerebral Palsy.
- ii) The independent variables were;
  - (a) The Physics syllabus.
  - (b) Learning/ teaching materials.
  - (c) Facilities and equipment.
  - (d) No of lessons allocated to physics lessons

### **3.3 Location of the Study**

This study was conducted in two schools based in two provinces, i.e Central and Nyanza.

These were Joyland Secondary School for the Physically Handicapped, located on the

Eastern side of the Kisumu – Nairobi road as you get to Kisumu town from Nairobi and Joy

Town Secondary School for the Physically Handicapped, in Thika. These schools offered a wide range of subjects just like other secondary schools. The science subjects offered were Biology, Physics, Chemistry and Home Science. The third school, Mombasa secondary school for learners with Physical disabilities was used as a pilot study.

### 3.4 Description of the Target Population

This study intended to reach one hundred and fifty six respondents. They were distributed as shown in the table.

**Table 3.4.1: Target Population**

Students, teachers and headteachers.	Form 2 Students	Form 3 Students	Form 4 Students	Physics Teachers	Head teachers	Totals
Joytown Sec School	30	28	25	2	1	86
Joyland Sec School	25	23	20	1	1	70
<b>Total</b>	<b>55</b>	<b>51</b>	<b>45</b>	<b>3</b>	<b>2</b>	<b>156</b>

### 3.5 Sampling techniques and sample size

#### 3.5.1 Sampling techniques

Purposive sampling technique was used to select the teachers who teach Physics in the two secondary schools and students who have cerebral palsy. Mugenda and Mugenda, (1999) contend that at other times, the target population is so small that selecting a sample would be meaningless and that taking the whole population in such cases is advisable. This is why the two head teachers and all the teachers who teach Physics in the two schools were interviewed,

because they were so few that sampling them would have been meaningless. The same case applied to students with Cerebral Palsy in forms two, three and four. Again the numbers were so few that sampling them would have limited them further.

### 3.5.2 Sample Size

Students, teachers and headteachers.	Form 2 Students	Form 3 Students	Form 4 Students	Physics Teachers	Head teachers	Totals
Joytown Sec School	14	07	06	2	1	30
Joyland Sec School	08	05	04	1	1	19
<b>Total</b>	<b>22</b>	<b>12</b>	<b>10</b>	<b>3</b>	<b>2</b>	<b>49</b>

All students with C P in form 2 in the two schools were interviewed. This is because at that level students did not have a choice of subjects and were expected to study all the three science subjects. It was therefore important to get their views about the subject. In forms 3 and 4 in all the two schools, the students sampled were those that had chosen Physics as their subject of study. This explains why the number of students is small in forms 3 and 4 compared to the number of students in form 2.

Data from form two students was important because at that level, students did not have an option of choosing subjects and all subjects were compulsory. It was therefore important to understand their feelings about Physics as a subject and whether they wished to pursue it or not in forms three and four. At form three, students had chosen Physics, they were therefore able to explain the reasons why they chose the subject and the successes or challenges they had so far

faced. At form four, students had a wider perspective of Physics as a subject and they were able to tell whether their expectations had been met and whether in their opinion, they had made the right decision by choosing Physics. Having already been exposed to the examination format and mode through school based examinations, they were able to give their expectations about the final examination (KCSE). All this information gathered from the students shed light to the researcher as to whether the process of teaching, learning and examinations may be among the factors that affect performance in Physics.

### **3.6 Data Collection Instruments**

The instruments that were used in this study were questionnaires, classroom observation schedules and focus group discussions.

#### **3.6.1 Questionnaire**

The questionnaire consisted of 3 sets. One set of questionnaire was administered to students in the two schools, one to teachers and another one to the head teacher. The questionnaires contained open and closed -ended questions divided into four sections. The questionnaire for students consisted of fifteen items; the one for teachers consisted of fifteen items and that of the head teachers consisted of twenty items. They included the background information of the respondent, adequacy of the curriculum, appropriateness of the facilities and equipment and examinations. The open-ended questions gave the respondent greater freedom of expressing their own ideas and opinions and gave suggestions where necessary, Mugenda & Mugenda (1999). The closed ended questions enabled the researcher to obtain specific responses from the respondents.

### **3.6.2 Focus Group Discussions**

This involved holding discussions with a few selected students in forms two, three and four in the two schools. The few were selected from the larger group of those with C P that were among those that were interviewed. Two students from each class i.e. two from form two, two from form three and two from form four were selected randomly to represent the classes. The discussion was held by putting the selected students together. This therefore formed a group of six in each of the two schools. The discussions with the teachers were held differently from those with the students. The discussions were conducted by the researcher herself guided by the interview guide.

### **3.6.3 Observation Checklist**

Since time immemorial, observation has been the prevailing method of inquiry. Observation offers the researcher a distinct way of collecting data. It does not rely on what people say they do, or what they say they think, it is more direct than that. Instead, it draws on the direct evidence of the eye to witness events first hand. It is based on the premise that, for certain purposes, it is best to observe what actually happens. Under the observation method, the information is sought by way of investigator's own observation without asking questions direct from the respondent. The observation schedule enabled the researcher to observe practical Physics lessons in session in actual setting. This gave rise to issues of adequacy of facilities and equipment, adaptations made during the Physics practicals, the importance of a teacher-aid, time utilization and constraints.

### 3.7 Piloting of Instruments.

The purpose for piloting in research is to check for ambiguity, confusion and poorly prepared items. Through piloting of research procedures/instruments, deficiencies may be uncovered that were not apparent by simply reviewing the items Wiersma (1995). Pilot study was conducted in one school i.e Mombasa Secondary school for the Physically Handicapped and it did not form part of the study. The pilot study included two teachers, twelve students with C P in form two, seven students with C P in form three and five students with C P in form four at Mombasa secondary school for the Physically Handicapped. The researcher was assisted by the Educational Assessment and Resource Centre co-coordinator at Mombasa using the test and retest method. The following steps were employed to determine the reliability of the questionnaires instrument:

- a) Developed questionnaires were given to 26 identical respondents.
- b) Completed questionnaires were scored and analyzed manually.
- c) The same questionnaires were given to the same respondents after two weeks and scored manually in the second instance.
- d) The score in (i) and (ii) above were analyzed and co-related using Spearman Brown prophesy formula.

Administration and piloting of instruments took a day. This procedure is supported by Orodho (2005) who states that selected sample for pre-test should be similar to actual sample and should be identical to study. The purpose of piloting was to discover any weaknesses in the instruments, check for the clarity of the questions or items and also elicit comments from respondents that would assist in the improvement and modification of the instruments. Piloting

also enabled the researcher to detect any flaws in the administration of the research instruments.

### **3.7.1 Validity**

Validity is concerned with ensuring that a research instrument does what it is intended to do (Codican, 1969). In this case therefore it refers to whether the items in the instruments ask what they are intended to ask. Content validity of the instruments was achieved in collaboration with the two supervising lecturers. The lecturers took time to go through the instruments. Thereafter they had a session with the researcher and the comments and suggestions that arose from the discussions were incorporated to better the instruments before data collection was done. The use of different methods to collect data also ensured that the findings could be relied on. These included questionnaires, observation checklist and focus group discussions whose data was triangulated to ensure validity of the results obtained. These were to ensure that in-depth and relevant data were collected.

### **3.7.2 Reliability**

Mugenda (1999) defines reliability as a measure of the degree of which a research instrument yields consistent results or data after repeated trial. Reliable instruments are supposed to be consistent and stable hence can be depended upon to yield similar results under similar circumstances (Borg and Gall 1989). Split-half correlation method was applied. The test items were split into two sub-sets; one with even numbered items and the other with odd numbered items. Scores for each subset were computed and correlated using the Pearson's Product Moment Co-relation (r). Pearson's Moment Co-relation Co-efficient Formula is as under:

$$r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}}$$

$$\sqrt{(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}$$

Since the 'r' value obtained represents one half of the test, a correlation measure, the Spearman – Brown Prophecy was used to establish reliability of the full instrument.

$$Re = \frac{2r}{1+r}$$

Where: - Re- Reliability coefficient

r – Correlation co-efficient between halves.

A reliability co-efficient of 0.7 was obtained and accepted as recommended by Mugenda and mugenda (1999).

### 3.8 Data Collection Techniques

Before going to the field, the researcher obtained a letter of introduction from the Special Education department of Kenyatta University. Permission and authority to carry out research was sought from the commission for Higher Education. After acquiring the research permit the researcher informed the District Education Officers of both Kisumu and Thika and presented them with copies of the letter of authority. Before visiting the two schools the head teachers were informed of the intended visits. On the material day of visit the researcher presented the letter of introduction to the head teachers of the two schools who organized for the completion of the questionnaires.

After one week the researcher went back to each of the two schools to collect the completed questionnaires. The researcher conducted the interviews and the focus group Discussions in person.

### **3.8.1 Questionnaire**

The researcher issued the questionnaires to the head teacher, teachers and forms two, three and four sampled students. The researcher went over the questionnaire before asking the participants to complete it. They were given a period of two days to respond to the items in the questionnaire and there after the researcher picked the questionnaires.

### **3.8.2 Focus Group Discussions**

The Focus Group Discussions were held between the researcher and a group of twelve students selected randomly from forms two, three and four. Each of these classes gave out four students to represent the class. Before the material day of discussion, the researcher had a meeting with all the classes concerned to inform them of her intention and to brief them of what was expected of them. They were also advised to seek the views of their classmates so that whatever views they gave were representative of the whole class. Both the researcher and the students agreed on the day and time of the discussion in consultation with the school administration. This gave both the interviewer and the teachers and students a chance for a face to face session and therefore an opportunity to clarify issues which were not clear.

### **3.8.3 Observation Checklist**

Observation was carried out by the interviewer during the physics practical lesson in form three. This gave the interviewer the benefit of getting information direct without having to enquire from anybody. The main purpose of the observation was to see students performing physics practical activities in an actual setting in order to give the researcher a deeper

understanding of the issues that the students and teachers may have come up with in the questionnaires. The main areas of concern in the lesson observation were whether the students were able to set up the apparatus for themselves, whether they were able to carry out the demonstrations as guided by the teacher or whether they required assistance, whether they were able to carry out the readings and record the findings, whether they were able to manipulate the apparatus, whether there was any specialized equipment specifically designed for them and whether the laboratory had any special design to cater for these learners, whether the teacher went through the lesson as required in the syllabus or whether he was forced to make some adaptations for the C P learners, whether the time provided for according to the time-table was adequate and whether the objective of the lesson was achieved.

### **3.9 Data Analysis**

After the field work, the data collected from the questionnaires, interview schedules, focus group discussions and observation checklist was read through by the researcher and categorized into data themes and patterns. The data was processed through editing, coding, classification, tabulation and computation of percentages. Qualitative data analysis was based on analysis of content from open ended questions in the questionnaires, interview schedules and focus group discussion. This involved describing, decoding and translating information gathered (Cooper & Schindler, 2006). The information was then converted into numerical variables for quantitative data analysis. The data was then used to compute frequencies and percentages. This was quantifiably analyzed and interpreted. Tables were constructed to present the data in the report appropriately.

### **3.10 Logistical and Ethical Considerations**

The researcher obtained a letter from the Department of Special Education, Kenyatta University addressed to the Ministry of Education which in turn gave her a letter authorizing her to conduct the research. Before this permission was granted, the researcher presented a copy of the final proposal to the Ministry of Education. She then sought informed consent of each respondent explaining the true nature and purpose of the research to them. The confidentiality and identity of the respondents was kept and their privacy was not invaded and this was made known to them right from the start.

### **3.11 Chapter Summary**

In this chapter, the design and methodology used in the study have been discussed. Descriptive research method has been discussed and the reasons why it was chosen. Effort was made to describe the target population, the sample and sampling procedure as well as the manner of collecting data from the field.

## CHAPTER FOUR

### DATA ANALYSIS, RESULTS AND DISCUSSION

#### 4.0 Introduction

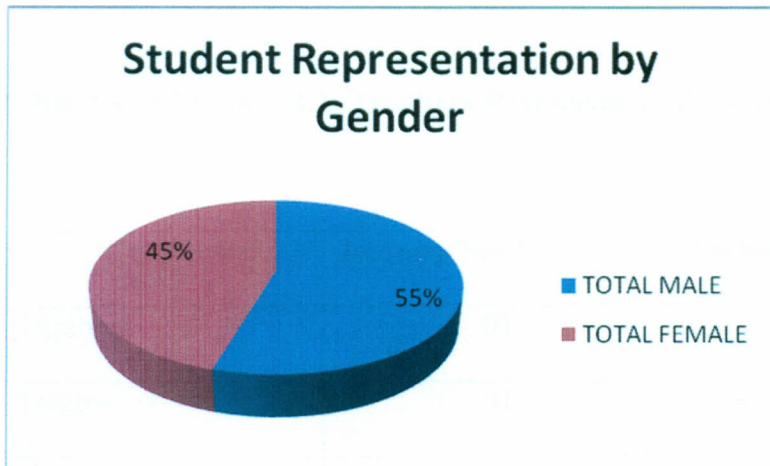
This chapter contains the findings of the investigation into the factors affecting performance among learners with Cerebral palsy in the Kenya Certificate of Secondary Education. The findings of the study were presented based on the themes that were derived from the research objectives. Data was analyzed under the following sub-topics: questionnaire return rate, demographic information, appropriateness of the Physics syllabus to learners with CP, adaptability of the physics practical's and problems associated with it, adaptation of the facilities and equipment to suit learners with C P, adequacy of the teaching time for both theory and practicals and problems experienced by students during the practical examination at school level and in KCSE.

#### 4.1 Questionnaire Return Rate

There were forty nine questionnaires issued. These included forty four (44) for students, three for teachers and two for head teachers. All the questionnaires issued were returned which was therefore 100% return rate.

#### 4.2 Demographic Information

The students were asked to provide information concerning their gender and class (form). For the teachers and head teachers, they were asked to provide information about their gender, *professional qualifications and teaching experience. This information was necessary as it* showed the characteristics of the respondents which had an impact in their responses.

**Figure 4.1 and Table 4.1: Students representation by Gender**

	Boys	Girls
Joy Land Sec. Sch	9	8
Joy Town Sec Sch	15	12
<b>Total</b>	<b>24</b>	<b>20</b>

Figure 4.1 shows the number of respondents by gender, 55 per cent were male respondents while 45 per cent were female. This was a fair distribution as the involvement of both boys and girls in taking Physics subject was almost fifty fifty.

**Table 4. 2 Respondents (Students) classes ( Forms)**

	Joytown Sec Sch	Joyland Sec Sch	Frequency	Percentage
Form 3	06	04	10	10
Form 4	07	05	12	35
Form 2	12	10	22	55
<b>Total</b>	<b>25</b>	<b>19</b>	<b>44</b>	<b>100</b>

Table 4.2 shows that majority of the respondents i.e. 55% were in form two, while the rest i.e. 35 % and 10% in forms three and four respectively.

**Table 4.3 and Figure 4.2: Teachers Responses on Professional Qualifications.**

	Joytown Sec Sch	Joyland Se Sch	Frequency	%
Diploma	01	01	02	67
Degree	01	-	01	33
<b>Total</b>	<b>02</b>	<b>01</b>	<b>03</b>	<b>100</b>

**Figure 4.2: Professional Qualifications**

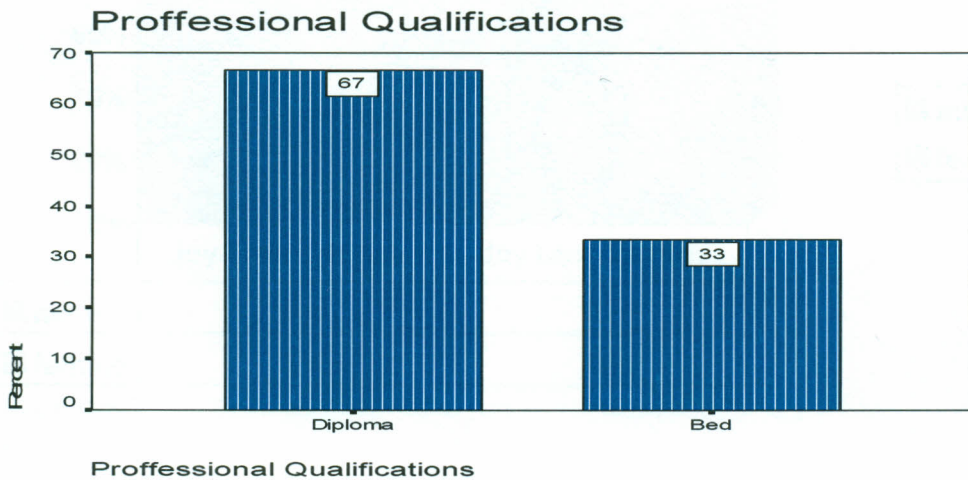
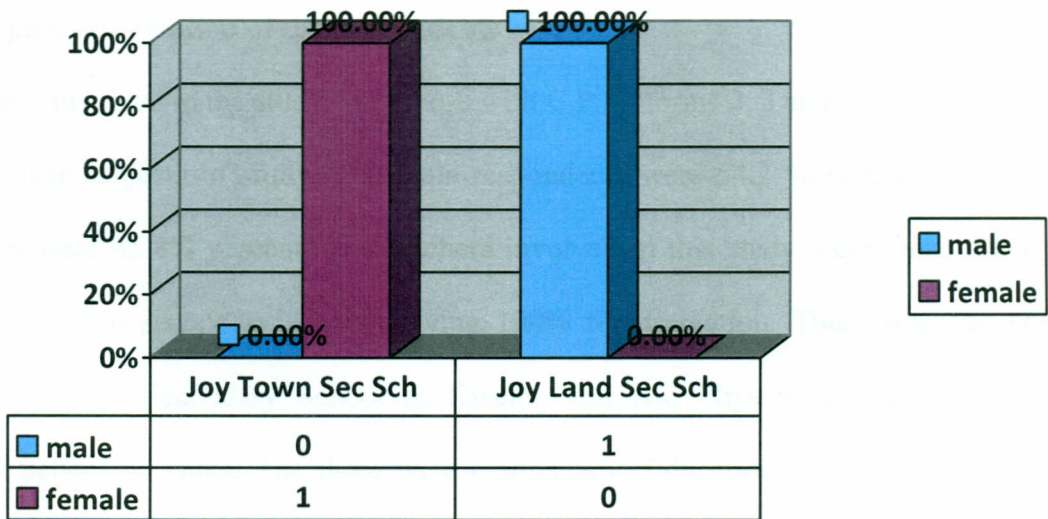


Figure 4.2 shows that out of the teachers interviewed, 67% were diploma trained while 33% were holders of a Bachelors Degree.

**Table 4.4 Responses on Teachers teaching Experience.**

Teaching experience	Joytown Sec sch	Joyland Sec Sch	Frequency	%
5 - 10 years	02	01	3	100.0

The teachers teaching experience ranged between five and ten years giving 100% representation as shown in Table 4.4.

**Figure 4.3 & Table 4.5: Gender of Head teachers interviewed**

On the question of the gender of the head teachers, there was a hundred per cent representation for both male and female as illustrated by figure 4.3 above.

**Table 4.6: Professional Qualifications of Head teachers**

	<b>Joytown Sec Sch</b>	<b>Joyland Sec Sch</b>	<b>Frequency</b>	<b>%</b>
Diploma	-	01	01	50
Bed	01	-	01	50
<b>Total</b>	<b>01</b>	<b>01</b>	<b>02</b>	<b>100</b>

One of the head teacher's i.e. 50 % was a holder of a Diploma in Education while the other one, again 50% representation was a holder of a Bachelors Degree.

## **Discussion**

### **Demographic information of the respondents**

The students involved in the study were those with C.P. in forms 2, 3 and 4 and taking Physics as one of their subjects of study. The male respondents were 54.2 % percent while female respondents were 45.8% percent. The teachers involved in this study were those that taught Physics in the two secondary schools giving 100% representation. There was one Physics teacher in Joyland Secondary School in Kisumu and two Physics teachers in Joy town Secondary School in Thika. The three were graduates in Education which showed that they qualified to teach Physics. They also had a teaching experience of between five to fifteen years which meant that they were qualified and had gathered the necessary teaching skills.

However, they did not have training in Special Education which could have helped them understand and manage the learners better. Mayalt, 1974:2 observes that teachers are central to the change process and their training is quite crucial. It has been emphasized that curriculum

package is only as good as the teachers who use it. Since teachers are the official implementers of the curriculum, they are an important ingredient in the learning process.

Two (100%) of the head teachers interviewed had served between ten to twenty years. None of them had served for less than three years. Both of them had been in their current stations for not less than three years. This implied that the head teachers had served in their current stations long enough and they might have understood the factors affecting performance among learners with C.P. in Physics in the K.C.S.E. examination.

The demographic information was necessary in order to understand the characteristics of the respondents and to help establish whether they were ideal and could be relied upon to deliver correct information.

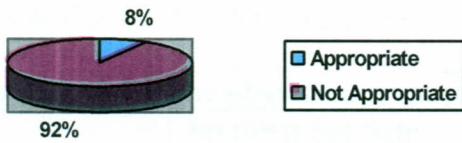
#### 4.3 Suitability of the Physics Syllabus to Learners with C P

In order to determine whether the physics syllabus was appropriate for learners with Cerebral palsy, the views of the students, teachers teaching Physics and the head teachers of the two schools of study were sought. The following were the responses.

**Table 4.7: Students responses on appropriateness of Physics syllabus to learners with CP.**

	Joytown Sec	Joyland Sec	Frequency	Total
Appropriate	02	02	04	8.3
Not appropriate	22	18	40	91.7
<b>Total</b>	<b>24</b>	<b>20</b>	<b>44</b>	<b>100</b>

**Figure 4.4: Joy Town Sec Sch. Student's responses on Suitability of physics syllabus to learners with CP**



**Figure 4.5: Joy Land Sec Sch. Students responses on Suitability of physics syllabus to learners with CP**

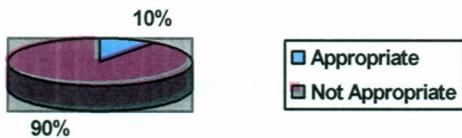


Figure 4.4 and figure 4.5 illustrate student's responses on whether they found the Physics syllabus suitable to them as learners with Cerebral Palsy. 92% and 90% respectively from the two schools reported that the syllabus was not suitable while 8 % and 10% reported that it was suitable. Some of the reasons they gave can be seen in the following quoted students own voices. These were voices of students who said they did not find the syllabus suitable for them.

Student 'A' – 'Because physics is more of practical and my body trembles when doing the practicals'.

Student 'B' – 'Because sometimes you have to be helped carrying out practicals and the information might not be reliable'.

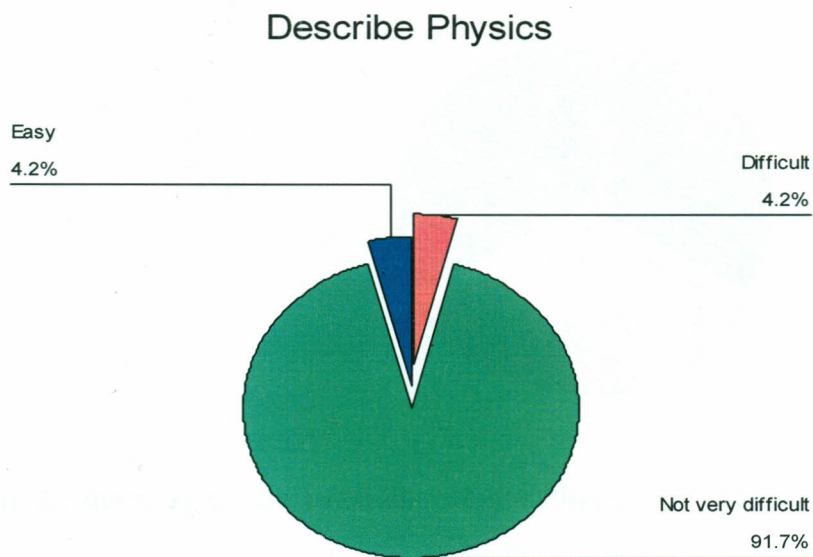
Student 'c' – 'Mixing is a problem to me and i usually ask for assistance from the lab technician and the Physics teacher'.

Student 'c' – 'Mixing is a problem to me and i usually ask for assistance from the lab technician and the Physics teacher'.

**Table 4.8 & Fig 4.6: Students responses on perception of Physics.**

How would you describe physics as a subject?				
	Joytown Sec Sch	Joyland Sec Sch	Frequency	Percentage
Difficult	-	02	02	4.2
Not Very Difficult	25	15	40	91.7
Easy	02	-	02	4.2
<b>Total</b>	<b>27</b>	<b>17</b>	<b>44</b>	<b>100</b>

**Figure 4.6 Students response on perception of Physics**

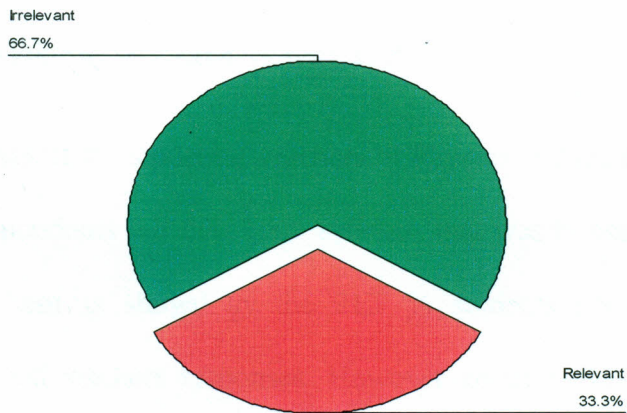


In the above figure 4.5, respondents (students) were asked to describe Physics in terms of whether it was difficult, easy or not difficult. Most respondents reported that they didn't find it

**Table 4.9: Teachers responses on the suitability of the Physics syllabus to learners with C P**

How suitable is the Physics syllabus to learners with cerebral palsy?				
	Joy town Sec Sch	Joyland Sec Sch	Frequency	%
Suitable	01	-	01	33.3
Not Suitable	01	01	02	66.7
<b>Total</b>	<b>02</b>	<b>01</b>	<b>03</b>	<b>100</b>

**Figure 4.7**



On the question of the suitability of the Physics syllabus to learners with C P, 66.7% of teachers reported that the syllabus was not relevant while 33.3% reported that it was relevant as shown in figure 4.7 above.

**Table 4.10: Head teacher's responses on the suitability of the syllabus to learners with cerebral palsy.**

<b>Is the current physics syllabus suitable to learners with cerebral palsy?</b>				
	<b>Joytown Sec</b>	<b>Joyland Sec</b>	<b>Frequency</b>	<b>%</b>
Yes	-	-	-	-
No	01	01	02	100
<b>Total</b>	<b>01</b>	<b>01</b>	<b>02</b>	<b>100</b>

The head teachers responses on the relevance of Physics syllabus to learners with C P was that it was not suitable as shown in their 100% responses in Table 4.10 above.

## **Discussion**

### **Suitability of Physics syllabus to Learners with C P.**

From the above responses of the students, teachers of Physics and the head teachers, it is clear that majority of the respondents felt that the syllabus that was in use by learners with C P was not suitable for them as shown by the 91.7 % students responses, 66.7% teachers responses and 100% head teachers responses. However another 91% students also felt that Physics itself as a subject was not difficult. The students further explained that there were aspects of the syllabus content, especially those that required fine motor steadiness that were a challenge to them. This was especially in aspects that required manipulation of apparatus during the practicals and drawing of graphs. This came out clearly during the Focus Group Discussions that the researcher had with them. As far as the teachers were concerned they felt that the syllabus was not suitable due to issues such as a congested curriculum, practical's not running parallel to theory and lack of enough time to carry out the tasks. The head teachers felt

that the subject was too practical oriented which made it unmanageable and unsuitable for learners with C P. The head teachers and the teachers felt that the syllabus called for drawing of graphs which is not possible by learners with C P due to their condition. The practical's also called for manipulation of apparatus which these learners were not able to do due to their uncoordinated and jerky impulses. All the teachers interviewed therefore felt that there was need to revise the curriculum. This was 100% representation. Yet again, as much as there was need for curriculum review to make it suitable for learners with C P, it should as much as possible remain practical in nature.

According to Mukachi (2006), Science is a distinct discipline consisting of knowledge, activities and methods important in understanding the natural phenomena and solving problems in society. In science, pupils are encouraged to learn a form of science as close to the way a practicing scientist works as possible. There are many methods or strategies in the currently recommended process-based approach of teaching that can be used to help students learn the aforementioned activities. They include laboratory work, project work, question-answer method, demonstration, class or small group discussions and informal lectures (Shiundu & Omulando 1992). These methods (process –based approach) promote positive attitudes towards science and place emphasis on teaching science process skills, thereby over-coming the conceptual difficulty that characterize science. This makes science more motivating and relevant. On the contrary, the product approach is teacher centered with minimal independent learning by pupils.

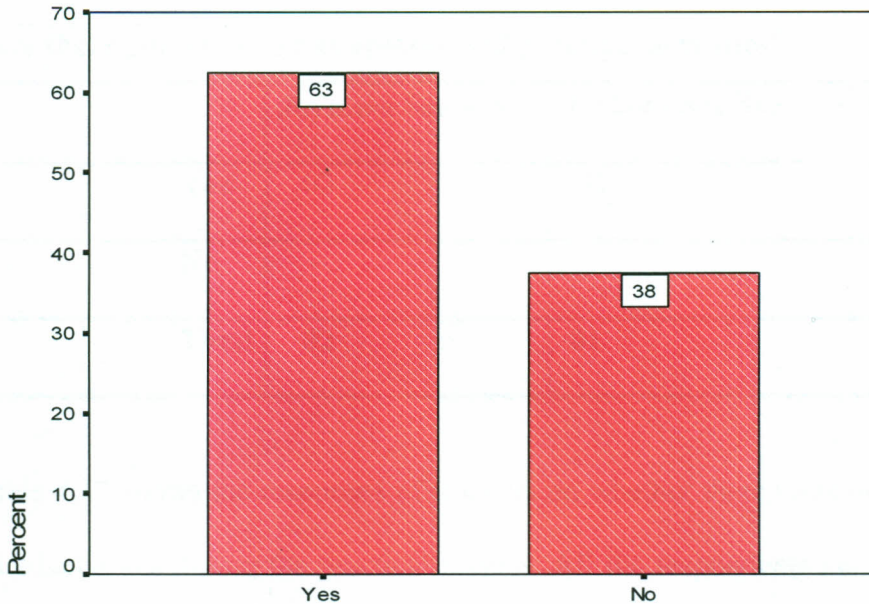
The main goal of laboratory instruction is the teaching of manual and science process skills. Further, practical work aims at helping learners in the appreciation of the work of scientists, promotion of positive attitudes and enhancement of interest in science. Lastly, practical experiences in science aim at helping learners to acquire and apply scientific knowledge and methods in solving problems in their everyday lives (Hazel, 1994). Therefore for us to succeed in training pupils to acquire a full scientific capability, they must be actively involved in each of the skills used in the laboratory work as it has been considered the hallmark and the unique feature of science education (Toin & Woolnough, 1990; Hegarty, 1991). Practical work especially in the laboratory is important hence the need to come up with a curriculum that does not cut off learners with Cerebral Palsy from the practicals but provide a way in which they can be able to carry out the practicals even with their diverse limitations notwithstanding.

#### 4.4 Adaptability of Physics practicals and challenges encountered by teachers.

**Table 4.11 Students responses on whether teachers were forced to make adaptations during the practical lessons.**

<b>Do teachers make any adaptations during the practical lessons?</b>				
	<b>Joytown Sec Sch</b>	<b>Joyland Sec Sch</b>	<b>Frequency</b>	<b>%</b>
Yes	17	10	27	63
No	07	10	17	38
<b>Total</b>	<b>24</b>	<b>20</b>	<b>44</b>	<b>100</b>

**Figure 4.8 Students responses on whether teachers were forced to make adaptations during the practical lessons.**



On the question of whether teachers make adaptations during the practical lessons, 63% of students reported that teachers do make adaptations while 38% reported that no adaptations are made. The students cited some of the following adaptations as quoted:

Student 'A' – 'The teacher is forced to arrange for me the apparatus in a separate table as i can not be able to work on the one provided in the lab as it is too high and i sit on a special chair because a tremble'

Student 'B' – 'I am unable to mix different solutions because i shake so sometimes the lab assistance mixes for me or i just watch other students mixing'.

**Table 4.12 Teachers responses on whether there were adaptation guidelines on how to adapt the practicals**

<b>Are there guidelines on adaptations of practical activities?</b>				
	<b>Joytown Sec Sch</b>	<b>Joyland Sec Sch</b>	<b>Frequency</b>	<b>%</b>
Yes	02	01	03	100
No	-	-	00	00
<b>Total</b>	<b>02</b>	<b>01</b>	<b>03</b>	<b>100</b>

Table 4.12 shows the responses of teachers on whether there were guidelines on how to carry out adaptations during the practical lessons. All the respondents i.e. 100% reported that there are no guidelines.

**Table 4.13 Teachers responses on whether they were forced to make adaptations during the practicals.**

<b>Are you forced to make adaptations during the practicals?</b>				
	<b>Joytown Sec Sch</b>	<b>Joyland Sec Sch</b>	<b>Frequency</b>	<b>%</b>
Yes	02	01	03	100
No	-	-	00	00
<b>Total</b>	<b>02</b>	<b>01</b>	<b>03</b>	<b>100</b>

**Table 4.14 Head teachers' responses on whether physics practicals were adapted**

<b>Are the practicals adapted to suit students with cerebral palsy?</b>				
	<b>Joytown Sec Sch</b>	<b>Joyland Sec Sch</b>	<b>Frequency</b>	<b>%</b>
Yes	-	-	-	-
No	01	01	02	100
<b>Total</b>	<b>01</b>	<b>01</b>	<b>02</b>	<b>100</b>

The head teachers responses on whether Physics practicals were adapted to suit learners with C P was a clear 'no' as shown in the 100% responses in table 4.14.

### **Discussion.**

#### **Adaptability of Physics Practicals**

On adaptability of the Physics practical's, the students did report that each time they had a Physics practical lesson, the teacher was forced to make some adaptations. This was expressed by 73% of the student respondents. On the part of the teachers which was 100% representation, they reported that the only guidelines in the adaptation of the syllabus was provision of physical assistance which was vague as it did not exactly spell out what kind of assistance. Teachers were therefore forced to improvise their own adaptations depending on the condition and the individual needs of the learners. The main challenge encountered as they tried to do this was the fact that each learner had his/her own unique condition and therefore the teacher was compelled to make adaptations for each and every learner yet for some it was almost impossible due to the complications of their condition. It was also very obvious that some activities were not adaptable which therefore meant that the student was either left out

completely or was given an alternative activity all together yet teaching the same skill/concept. As for the head teachers, they reported that the syllabus was not adaptable at all which was 100% representation.

The secondary school syllabus and science emphasize student's active participation in all the activities of the practical lessons. Newton (1988) recommends that students should be engaged in scientific activities so that they might realize the impact of science and technology on modern society. This active learner participation is referred to as hands on learning or inquiry learning. A hands on learning is learning by doing. It involves the learner in total learning experience.

According to Toh & Woolnough (1990) and Hegarty (1991), full active learner participation in all the activities (skills) of practical lessons is required in order to train learners to achieve scientific capability. According to the Kenya National Examinations Council report of 2003 on science practicals, illustrations of students were poor hence recommended that teachers should make sure that students practice making correct illustrations to enable them score higher marks (KNEC 2003). This serves to explain the importance of practicals and the fact that many students in the secondary schools are not given enough exposure to the practicals as portrayed by the KNEC report. If this is the case with 'normal learners', then one can visualize how the situation is with learners with C P. who already experience difficulties in carrying out the practicals.

#### 4.5 Adaptation of facilities & Equipment

**Table 4.15 Student's responses on adaptation of facilities and equipments.**

Are the facilities and equipment in the laboratory adapted?				
	Joytown Sec Sch	Joyland Sec Sch	Frequency	%
Yes	14	16	30	67
No	04	10	14	33
<b>Total</b>	<b>18</b>	<b>25</b>	<b>44</b>	<b>100</b>

**Figure 4.9 Students responses on adaptation of facilities and equipment**

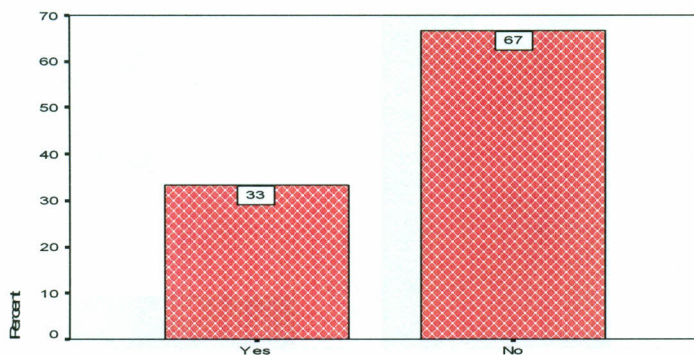
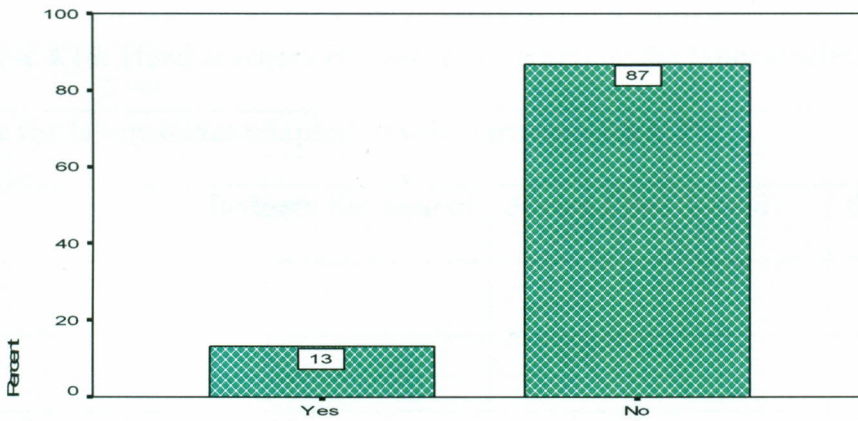


Figure 4.9 above shows the responses of students on whether the facilities and equipment in the laboratory are adapted. 67% reported that the facilities were not adapted while 33% felt that some facilities are adapted.

**Table 4.16 & Figure 4.12: Student's responses on whether the facilities in the lab were adequate.**

Are the facilities in the laboratory enough for use by all learners				
	Joytown Sec Sch	Joyland Sec Sch	Frequency	%
Yes	04	02	06	13
No	20	18	38	87
<b>Total</b>	<b>24</b>	<b>20</b>	<b>44</b>	<b>100</b>

**Figure 4.10 Students responses on whether the facilities in the lab were adequate.**



On the question of whether the facilities in the laboratory were enough for use by all learners, 87% of students reported that the facilities were not enough while 13% reported that they were enough.

**Table 4.17: Teachers Responses on whether the laboratories were adapted to cater for Physics Practical Lessons.**

<b>Are the laboratories adapted to cater for practical lessons</b>				
	<b>Joytown Sec Sch</b>	<b>Joyland Sec Sch</b>	<b>Frequency</b>	<b>%</b>
Yes	01	-	01	33.3
No	01	01	02	66.7
<b>Total</b>	<b>02</b>	<b>01</b>	<b>03</b>	<b>100</b>

On the same question of adaptation of the laboratory, 66.7% of teachers felt that the labs were adapted while 33.3% reported that they had not been adapted as shown in figure 4.17 above.

**Table 4.18: Head teachers Responses on whether the laboratories had been adapted.**

<b>Are the laboratories adapted to suit learners with C P ?</b>				
	<b>Joytown Sec School</b>	<b>Joyland Sec School</b>	<b>Frequency</b>	<b>%</b>
Yes	-	-	00	00
No	02	01	03	100
<b>Total</b>	<b>02</b>	<b>01</b>	<b>03</b>	<b>100</b>

The head teacher's responses on the question of whether the laboratories were adapted were a clear 'no' as shown by the 100% responses in figure 4.18 above.

**Discussion.****Adaptation and Adequacy of Facilities & Equipment in the Laboratories.**

On adaptation of facilities and equipment 67% of students felt that the laboratories were not adapted to cater for learners with C P. They further cited the high cost of equipment as a contributing factor to lack of their availability. This led to a shortage or inadequacy of the equipment required. The fact that most of the equipments that are specially designed for learners with C P were not readily available was also cited as a problem. The head teachers further expressed the following in as far as facilities and equipment were concerned

- That the facilities are not enough.
- That the facilities are not adequately adapted to the unique conditions of learners with CP.

From the above observations, it was clear that there were no enough adequate and adapted facilities in the laboratories. When the laboratories were constructed in the schools, cases of C.P. were unknown. This explains why the laboratories had been constructed without the learners in mind. As for the adaptation of equipment, this also had not been done and the learners had to do with the equipment of regular learners. All the teachers interviewed were of the opinion that adequate and adapted facilities be provided as a measure to solve the problem of facilities and equipment.

In as far as facilities are concerned; the 8.4.4 system of education emphasizes a practically oriented science curriculum that requires additional teaching resources. However, the provision of these resources is not adequate in our schools. The lack of the learning resources is critical

at secondary schools and higher levels of education because science equipment or apparatus have become increasingly sophisticated and expensive. This is perhaps the reason why most teachers have resorted to theoretical approaches that often contribute to negative perception of science by learners. Where improvisation is not possible, teachers resort to theoretical approach that has often led to poor performance in national examinations (Ndirangu 2000).

Although improvisation on the part of the teacher and student is encouraged, some aspects of science equipment are not amenable to improvisation and direct experimentation due to such constraints of time, size, danger or lack of resources.(Lumeta & Hoftein, 1991). This poor state of science learning facilities may lead to overcrowding of students when doing group work or demonstrations in science classes (Changeiywo 2000). Therefore the learning of science is mostly theoretical due to lack of equipment and other resources among other factors. Subsequently, science process skills and attitudes that students are expected to acquire through experimentation and other hands on activities are omitted or overlooked in the teaching with reduced learner participation in the practical activities. Changeiyo (2002) argues that the problem of inadequate facilities is common and more serious in most schools in Kenya. Mwiria (2004) asserts that these problems limit experimentation or practical work in Kenyan schools – UNICEF (1997). The following extract from the National Institute of Neurological Disorders and Stroke emphasizes the use of assistive technology in helping learners with C P move about more easily and communicate more effectively. These devices are if provided would be very essential in facilitating the learner with C P carries out practical work.

## Assistive Technology

Devices that help individuals move about more easily and communicate successfully at home, at school, or in the workplace can help a child or adult with cerebral palsy overcome physical and communication limitations. There are a number of devices that help individuals stand straight and walk, such as postural support or seating systems, open-front walkers, quadruped canes (lightweight metal canes with four feet), and gait poles. Electric wheelchairs let more severely impaired adults and children move about successfully. The computer is probably the most dramatic example of a communication device that can make a big difference in the lives of people with cerebral palsy. Equipped with a computer and voice synthesizer, a child or adult with cerebral palsy can communicate successfully with others. For example, a child who is unable to speak or write but can make head movements may be able to control a computer using a special light pointer that attaches to a headband. Ways should therefore be explored to find out whether the assistive technology can be of help when it comes to conducting practicals for learners with Cerebral Palsy.

### 4.6 Adequacy of teaching time

**Table 4.19: Student's responses on adequacy of teaching time**

<b>Do you find the time allocated for teaching physics adequate for you as a learner with C P?</b>				
	<b>Joytown Sec School</b>	<b>Joyland Sec School</b>	<b>Frequency</b>	<b>%</b>
Yes	07	06	13	30
No	20	11	31	70
<b>Total</b>	<b>27</b>	<b>17</b>	<b>44</b>	<b>100</b>

Table 4.19 represents the responses of students on the question of adequacy of time where 54.2 % reported that the time allocated for teaching is not enough while 45.8% said it was enough.

**Table 4.20: Teachers responses on adequacy of time allocation**

<b>Is the teaching time allocated for teaching physics adequate?</b>		
	<b>Frequency</b>	<b>Percent</b>
Not adequate	2	66.7
Adequate time	1	33.3
Total	3	100.0

On the question of whether the time allocated for teaching was adequate, 66.7 % of teachers responded that it was not adequate while 33.3% reported that it was adequate.

**Table 4.21 Head teachers' responses on adequacy of teaching time.**

<b>Is the time allocated for teaching Physics adequate?</b>	<b>Frequency</b>	<b>Percent</b>
Inadequate	2	100.0

The head teacher's responses were that the time was not adequate which was 100% representation .

## **Discussion**

### **Adequacy of Time Allocated for Teaching Physics**

All the respondents i.e. the students, teachers and head teachers felt that the time allocated for teaching both theory and practical's was not enough. This was because the time allocated is the same as that of regular learners yet learners with C.P. are slow due to the complications of their conditions. They therefore require more time to complete the tasks i.e. both theory and practical's. These views by all the respondents i.e. students, teachers and head teachers were 100%. Some scholars have also expressed the view that teaching methodology also poses a number of problems especially that of inadequate time allocated within the school timetable. Since some areas of the subject matter demand more time for practical work among other activities that enhance effective learning, there is a tendency of teachers to be selective when time is not adequate. Consequently, most of the science process skills and attitudes that students are expected to acquire through experimentation and students 'hands on' activities are overlooked. If this is the situation within 'normal' learners (those without disabilities) then one can imagine the way it is for learners with C P who have multiple complications as already gathered in this study. It definitely means that they require much more time to cover the syllabus effectively and efficiently. In the absence of such time, then it is evident that teachers rush through the syllabus or probably omit some of the activities which in the very end could be contributing to the poor performance by learners.

#### **4.7 Challenges encountered by students during the practical paper examination**

##### **4.7.1 Responses by students on challenges they encounter during the practical paper examination**

Students were asked whether they encounter any challenges during the practical paper examination at school level and during KCSE. They gave the following responses.

- That they found it difficult to handle questions that required fine motor steadiness because that is what learners with C P lack. Whenever such questions arose then they require assistance from the teacher or laboratory assistant. This had as implication on the issue of time because a lot of time was wasted as they waited for the lab assistance to finish with one learner and move on to the other.
- During KCSE, the extra thirty minutes awarded was not enough as each student has a unique condition that is different from the other. For those that said that they would require more time, they gave such reasons as the facilities being few and so they were forced to share hence could not finish the work within the given time, some said that they were slow due to their condition while others said that the time allocated was just like for regular students yet theirs should be more because of the complications associated with their conditions.
- Lack of enough and adapted equipment to carry out the practicals during the examinations.
- Lack of enough assistance in carrying out the activities, one teacher aide is not enough to attend to all the students requiring assistance during the examinations.

#### **4.7.2 Suggestions of teachers and head teachers on how to deal with the issues of curriculum**

- Revise the curriculum.
- Only very practical concepts should be taught.

#### **4.7.3 Teachers & Headteachers suggestions on how to solve the problem of facilities & Equipment**

- Provide adapted facilities designed to suit individual needs of learners.

#### **4.7.4 Teachers' responses on the question of how to deal with difficulties encountered by learners**

- Allocate more time
- Exclude students with C P from practical's
- Minimize graphs

#### **4.7.5 Head teachers responses on what could be done to solve the various problems encountered during the exam.**

- That both teaching and examination time be increased considerably.
- That learners with C P be allowed to register for less than seven subjects
- That officials of the Kenya National Examinations Council should carry out an assessment of each case and design appropriate tests and facilities for such candidates.
- That those appointing supervisors and invigilators should ensure that those chosen are competent in handling the science practical's so as to help the students handle the apparatus.

#### **4.8 Observation schedule (Observation of a Physics Practical in session at joy town Secondary school for the Physically Handicapped)**

The researcher observed a physics practical lesson on session guided by the 'Classroom Observation Schedule' she had prepared. This was a form three lesson carried out between 2 – 4 pm. It was conducted in the only laboratory that the school has. The class was composed of twelve learners in total.

The main objective of the observation was for the researcher to establish and clarify for herself certain issues which were also addressed in the questionnaires and in the

focus group discussions and see whether the information given and what she observed was related.

The key issues to be observed in the lesson were;

- 1) Whether there were any adaptations made by the teacher in the carrying out of the activities depending on the various conditions of the learners.
- 2) Whether there was any specialized equipment specially designed for the learners or whether they just used the ones used by regular students.
- 3) Whether the students experienced any difficulties in carrying out the tasks and whether there were any activities some learners were not able to carry out.
- 4) Whether the students required assistance in performing some activities either from the teacher or from the laboratory assistant.
- 5) Whether the students were able to accomplish the tasks within the double lesson of eighty minutes or whether they required extra time.
- 6) Whether the objective of the lesson was achieved.

### **Observations**

- Though the practical lesson was a double of one hour twenty minutes, the lesson was not concluded as some students were slow in carrying out some activities due to their various conditions. This forced the teacher to move at a much slower pace.
- Some students required physical assistance by the teacher or the lab assistance in the handling of some equipment such as connecting wires to the batteries and making observations. This was difficult for them as one needed to be steady to be able to

connect the wires .This forced the teacher to move slowly to give the students a chance to carry out the activities hence he could not cover the lesson within the time given.

- The equipment being used such as the working tables and some wires were not ideal for learners with C P and needed some adaptations. The teacher was forced to improvise some adaptations.
- There was need for much more time as the teacher needed to give individual attention to all the seven learners with C P to be able to help and ensure that that they carried out the activities and that they were at par with the rest of the class.

#### **4.10 Chapter Summary**

The chapter has presented data analysis and results of the study. This was done using tables and figures showing the various frequencies and percentages drawn from the respondents responses. It has further discussed the results of the study under themes which were developed from the objectives of the study.

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS.

#### 5.0 Introduction

This chapter presents a summary of the research findings, implications of the study, conclusion, recommendations of the study and suggestions for further research. The concern of the study was to examine factors affecting performance in Physics among learners with cerebral palsy in the Kenya Certificate of Secondary Education.

This was a descriptive research involving sixty six students with Cerebral Palsy who were taking Physics as one of their subjects of study in forms two, three and four in two among three secondary schools for learners with Physical disabilities. It also involved three teachers of Physics in the two secondary schools and the principals of the two schools. The schools under study were Joytown Secondary School for the Physically Handicapped in Thika and Joyland Secondary School for the physically handicapped in Kisumu. The study employed questionnaires, interview schedules, focus Group discussions and classroom observation schedules as the main research instruments.

#### 5.1 Summary of the Study Findings

The major findings of the study are summarized on the basis of the research objectives. The findings were as follows:

### **5.1.1 Suitability of the current Physics Syllabus to Learners with C P**

The study found out that the syllabus which was in use for the teaching of Physics to learners with Cerebral Palsy was not adapted to suit their needs. The only adaptations suggested in the syllabus were provision of physical assistance which was only ideal to a learner with mild Physical Handicaps. The respondents also reported that the syllabus was too congested hence it was difficult to manage it with learners with C P, it called for drawing of graphs in some parts yet students with CP have difficulties in drawing due to un-coordinated and jerky movements. In the practicals there were some activities that learners with C P were not able to carry out because of the way they were designed and because of the complications of the learners' conditions.

### **5.1.2 Adaptation of Facilities & Equipment**

The study findings on adaptation of facilities and equipment was that the facilities that the learners were using were not adapted at all. This was as per the responses i.e, 67% responses by the students and 100% responses by both the teachers and head teachers. Apart from not being adapted, they also said that the equipment was not adequate for use by all learners. This therefore implied that it was not possible to have quality and adequate practical activities.

### **5.1.3 Adequacy of Teaching Time for both Theory & Practical**

The study found that the time allocated for teaching was not adequate as far as learners with C P were concerned. This was because they followed the syllabus followed by regular learners which teachers complained that is too congested. They also followed the time-table used by regular learners of forty minutes a lesson. Yet, because of the nature of their conditions they

were slow in writing and carrying out the practical activities which actually called for extra help from the lab assistant. This was as shown by 54.2 students' responses, 67.7 teachers' responses and 100% head teachers' responses.

#### **5.1.4 Challenges Encountered by Students during the Practical Paper Examination.**

The respondents cited the following challenges during the practicals in the KCSE exam;

- The extra thirty minutes awarded is not enough for learners with Cerebral Palsy to complete their tasks.
- Some questions require fine motor steadiness which learners with Cerebral Palsy lack.
- There is usually lack of adapted materials and equipment for use by the learners.
- Lack of enough physical assistance for the learners due to inadequate personnel, e.g one lab assistant in the school.

### **5.2 Implications of the Findings**

The findings of this study have implications for the policy and curriculum developers, teachers and researchers.

First there is the need to recognize that Cerebral Palsy is now the most prevalent condition in both primary schools and secondary schools for learners with Physical Disabilities' and in many regular schools that are now embracing inclusive education. It is important that this group is catered for in as far as curriculum design and implementation is concerned so that all pupils in the country access and benefit from quality education without discrimination in line with the country's policies such as Free Primary Education (FPE),

Education for All (EFA), Millennium Development Goals and Vision 2030. This calls for a curriculum design that meets the needs of these learners yet not cutting them off from the world of science, providing adequate and adapted facilities and equipment that will enhance the teaching and learning and most of all equip teachers with techniques to enable them facilitate learning to such learners effectively.

Once a new curriculum set aside for these learners has been put in place, then the Kenya National Examinations Council (KNEC) should also change its evaluation method so that it is in line with the provisions of the new curriculum.

Finally, the Kenya National Science and technology policy is not adequate or clear as disparities still exist in the provision and procurement of the required resources such as manpower and facilities in the schools as evidenced by the problems found in the schools under study. Apart from ensuring adequate provision of financial and manpower resources to enhance science education, a clear science policy can also popularize science outside the school and also among learners with disabilities, community science fairs where parents participate and regional science resource centres.

### 5.3 Conclusion

Based on the research findings, the following conclusions were drawn:

That Science is an important subject for all learners to study at secondary school level as science and technology are the major driving force towards achievement of economic development in any country. This is probably the reason why in the Kenyan system of

education at secondary school level, it is compulsory for all learners to study at least two science subjects among physics, Biology and Chemistry.

That the syllabus is a major hindrance to most learners with cerebral Palsy in studying science subjects and more so Physics because of the many practical activities involved. This makes many of them shy away from pursuing the subject beyond form two school level.

That very few learners with C.P opt to choose Physics as one of their subjects of study. This is because they are limited by their conditions as by the time they get to form three where they choose their subjects, they realize that there are several learning activities especially to do with the practical's which they are not be able to handle, yet the requirement is that one must pass the practical's in order for them to pass the entire subject. That for those learners with C P that proceed with the subject up to form four, many of them register poor performance that is below average i.e. D+ and below.

That factors that contribute to this poor performance include lack of a suitable curriculum for these learners, lack of adequate adapted facilities and equipment, lack of adequate time to complete the syllabus, lack of enough exposure to practical work during learning, lack of skills on the part of teachers on how handle learners with Cerebral palsy and unfriendly/unsuitable questions such as those involving drawing and manipulation of apparatus during the practical examination. This findings relate very closely to those of Muli (2005) who established that factors such as lack of motivation on the side of Physics

teachers, lack of books and equipment for the laboratories, poor guidance and counseling for students and poor staffing of Physics teachers as among the major causes of poor performance in Physics in the KCSE examination in Mutomo division of Kitui district.

#### **5.4 Recommendations of the Study**

The researcher makes the following recommendations based on the research findings:

- 1) K I E should adapt the Physics syllabus to suit the needs of learners with C P. The current adaptations which have been done can only benefit a learner with mild physical disabilities. There should be a separate syllabus addressing the needs of those with C P.
- 2) The Ministry of Education in collaboration with donor agencies should ensure that the three special secondary schools for students with physical disabilities, i.e Joytown Secondary School, Joyland Secondary school and Mombasa Secondary are well equipped with adequate and specialized facilities, i.e specially designed laboratories well equipped with special facilities and equipment designed to cater for both learners with physical disabilities and those with Cerebral Palsy.
- 3) The directorate of Assurance & Standards in collaboration with the Kenya Institute of Special Education and K I E and teachers who teach sciences in the three schools should make provision for a special school's time-table to be used in the three secondary schools in order to address the issue of time constraint.
- 4) The Kenya National Examinations Council should look into the issue of time during the KCSE exam and award extra time based on the needs of each particular learner rather than just awarding a 'blanket' extra time.

- 5) The K. C.S.E exam for learners with Special Needs and particularly for learners with C P should be set by experts who have knowledge of the abilities of these learners. These exams should also be marked by teachers who are specially trained in the area of C P. The Kenya National Examinations Council in collaboration with K I E should ensure that this is done.

### **5.5 Further Research**

The study recommends the following areas for further research:

- a) A study to establish whether students with C P do actually benefit from other Science based subjects such as Chemistry and Biology.
- b) A study on how the use of technology could be used to enhance learning of practical subjects for learners with C P.
- c) A study on alternative methods that can be used to teach and examine learners with C P in science based subjects.

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## APPENDIX 1

## QUESTIONNAIRE FOR STUDENTS

**Instructions**

Respond to ALL the items in the questionnaire by ticking in the box provided or writing out information in the space provided. Information given will be treated with utmost confidentiality.

**Background information**

1. Gender

a) Male b) Female 

2. Form

a) Form 3 b) Form 4 **CURRICULUM**

1. How would you describe physics subject in general?

a) Very difficult  b) Difficult  c) Not very difficult  d) Easy 

2. Do you find physics curriculum suitable for you as a learner with C P?

a) Yes b) No 

If No

**Give details**

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4) Are there topics you find difficult to undertake because of your condition?

a) Yes

b) No

If yes give details of the topics and why

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5) Are there adaptations made during the lessons?

a) Yes

b) No

6) Do you feel the time allocated for a Physics lesson is adequate?

a) Yes

b) No

## **FACILITIES AND EQUIPMENT**

1. Do you consider the facilities in the lab adequate for a practical lesson?

a) Yes

b) No

2. Are the facilities in the lab such as working tables adapted?

a) Yes

b) No

3. Is the equipment in the lab enough for use by all learners with C P?

a) Yes

b) No

4. Are you provided with a teacher aide to assist you in case you are not able to Manipulate the equipment?

a) Yes  b) No

5. Do you find the Aide/ assistance necessary?

a) Yes  b) No

How? Explain

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## EXAMINATIONS

1. Where is the physics practical exam done?

a) Physics lab  b) Chemistry lab  c) Biology lab  d) Classroom

2. Is the time allocated?

a) Too long  b) Adequate  c) Inadequate

Explain

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2. From past revision exercises have you come across some questions or part of questions you are not able to handle due to your condition?

a) Yes  b) No

Explain

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3. Is there any form of assistance given during the exam?

a) Yes  b) No

a) Are you able to manage the exams with the assistance given?

a) Yes  b) No

If no explain

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## APPENDIX II

### FOCUS GROUP DISCUSSIONS (GUIDE FOR STUDENTS)

#### CURRICULUM

1. Did you decide to pursue physics out of choice or was it compulsory?

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i If out of choice what prompted you?

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2. Are there times you are unable to carry out an experiment because of your condition?

Yes

No

3) What areas pose a challenge to you when carrying out an experiment?

a) Cutting     b) Mixing     c) Heating     d) Recording

In such a situation what do you usually do?

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#### FACILITIES AND EQUIPMENT

1) Where do you normally have the Physics practical lesson?

a) In the lab

b) Classroom

c) Both places

2) Do you experience any difficulties in manipulating equipment in the lab?

a) Yes

b) No

3) Where you encounter difficulties do you get any form of assistance?

a) Yes

b) No

4) If Yes what kind of assistance and by who?

Explain

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Are the facilities and equipment in lab adapted to suit your needs?

a) Yes                       b) No

### EXAMINATIONS

1. How much extra time are you given during the practical examination?

a) 1 hr     b) 40 mins     c) 30mins     d) Any other

2. Is the time allocated?

a) Adequate                                       b) Inadequate

3. Are some questions adapted to suit your needs?

a) Yes                                       b) No

Explain further

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4. Are you given any form of assistance during the exams?

Explain what assistance and how

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5. Do you think your performance in the exam is affected by lack of or the form of assistance given?

Explain

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## APPENDIX III

## QUESTIONNAIRE FOR TEACHERS

Name of school \_\_\_\_\_

## INSTRUCTIONS

Respond to ALL the items in the questionnaire by ticking in the box provided or writing information in the space provided. Information given will be treated with utmost confidentiality.

## BACKGROUND INFORMATION

1. Professional qualifications

- a) Diploma     b) Bed     c) Bed (Special)     d) Others

2. For how long have you been teaching in a school for learners with cerebral palsy?

- a) Below 1 year     b) 1 – 5 yrs     c) 6 – 12 yrs

- d) Above 10 yrs

## CURRICULUM IN USE FOR LEARNERS WITH CEREBRAL PALSY

1. Comment on the suitability/relevance of the content in the syllabus in relation to learners with cerebral palsy

- a) Very relevant     b) Relevant     c) Irrelevant     d) Not sure

2. How would you rate the achievement of the stated objectives of this syllabus with regard to learners with C P

- a) Easily achievable     b) Achievable     c) Not easily achievable     d) Not sure

3. What is the attitude of majority of the learners towards the subject

- a) Positive       b) Negative       c) Not sure

4. Are learners with cerebral palsy able to carry out the practicals that are involved in this subject?

- a) Yes       b) No

If **Yes** to what extent?

- a) To a high extent       b) To some extent       c) Not at all

### Explain

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5. I would consider the adaptations

- a) Adequate       b) Inadequate

6. Are there any guidelines on how to adapt this curriculum?

- a) Yes       b) No

### FACILITIES AND EQUIPMENT

1. Where are the practical lessons carried out?

- a) Classroom       b) Lab       c) Both

2. Are the students able to carry out the practical's given the nature of their handicaps?

- a) Yes       b) No

3. If No are you forced to carry out some adaptations?

- a) Yes       b) No

**Please Explain**

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4. Is the laboratory equipped to cater for a Physics practical lesson?

- a) Yes       b) No

5. Comment on the adequacy of the time allocated

- a) Too long       b) Adequate       c) Too short

6. How many practical lessons do you teach in forms 3 and 4 per week? Mention for each class if you teach more than one class.

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7. In general what problems do you encounter while undertaking physics practical's in relation the following?

a) Curriculum

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b) Facilities and Equipment

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c) Time Allocation

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## Exams

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5) What in your opinion could be done to solve the problems mentioned above?

a) Curriculum

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b) Facilities and Equipment

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c) Time allocation

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d) Exam

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## APPENDIX 1V

## INTERVIEW SCHEDULE FOR THE TEACHERS

## INSTRUCTIONS

Kindly respond to all the items. All information shall be treated with utmost confidentiality.

## BACKGROUND INFORMATION

## Gender

- i) Male                       ii) Female

## 1. Professional Qualifications

- a) Diploma       b) Bed       c) B. Ed Special       Others

## 2. Teaching Experience in the school

- a) Below 1 year       b) 1 – 5 yrs       c) 6 – 12yrs   
 d) Above 10 yrs

## 3. Have you undertaken any training to do with learners with C P?

- a) Yes                       b) No

If Yes, what kind of training?

4. Has the training helped you manage learners with C P better especially in aspects to do with curriculum delivery?

Please Explain

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**CURRICULUM**

1. Is the Physics practical syllabus adapted?

a) Yes

b) No

If **No** are you able to teach it as it is or are you forced to improvise your own adaptations?

Please Explain

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2. What challenges do you come across as you try to adapt is?

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3. Is it really adaptable or would there be need for a totally different curriculum?

Please Explain

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4. Are students with C P able to cope with the practical bit of the syllabus?

a) Yes

b) No

IF **No**, what challenges do they come across?

Explain

5. What in your opinion do you think should be

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**FACILITIES AND EQUIPMENT**

1) Is there a Physics lab in the school?

a) Yes

b) No

If No where do you carry out the Physics practical lessons?

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2) Is the laboratory suitable for learners with special needs especially those with C P?

a) Yes                       b) No

If No how do you conduct the practicals?

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3) Explain the challenges you encounter while conducting an experiment with learners with C P?

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## EXAMINATIONS

4) How long is Physics practical paper in K C S E?

2hrs     1 1/2 hrs     1hr     40mins     30mins

5) How much extra time is awarded to learners in this school?

Please state

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6) Is the extra time awarded uniform or is it specific to every learner?

Explain

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7) Are the students given any form of assistance during the exam?

a) Yes                       b) No

If **Yes** what kind of assistance?

Explain

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8) Have there been instances where learners with C P have not been able to attempt certain questions because of their condition?

9) What would be your recommendations in the following areas?

Curriculum

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Facilities and Equipment

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Exams

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- a) Yes  b) No

If No, what do they do during practical lessons?

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4. I would consider the available facilities adequate for use by learners with C P

- a) To a high extent  b) To some extent  c) Not at all

5. How would you rate the maintenance of these facilities?

- a) Adequate  b) Inadequate

6 To what extent do you consider the facilities adapted?

- a) To a high extent  b) To some extent  c) Not at all

### **CURRICULUM IN PLACE**

1. Comment on the suitability/ relevance of the existing curriculum to learners with cerebral palsy

- a) Very suitable/relevant  b) Suitable/relevant  c) Not suitable/relevant

2. Is the Physics syllabus adapted to suit learners with C P

- a) Yes  b) No

3. I would consider the adaptations

- a) Very adequate  b) Adequate  d) completely inadequate

4. Has the Physics teacher/teachers complained to you about the teaching of certain topics?

5. a) Yes  b) No

If **yes** which ones and why? Explain

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#### 4.0 KCSE Exam

1. According to your own observation, is the time allocated for Physics practical

Exam

a) Too Long  b) Adequate  c) Inadequate

2. Do the questions address the needs of learners with C P ?

a) Yes  b) No

3. Are the learners with C P given any form of assistance during the exam?

a) Yes  b) No

If **yes** give details

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5. What problems are encountered by your teachers when teaching Physics to learners with C P in your school in relation to the following

a) Curriculum

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b) Equipment and facilities

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c) Time allocation and workload

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6. Suggest ways of improving the teaching of physics practicals to learners with C P in relation to

a) Curriculum

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b) Equipment and facilities

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c) Time allocation and workload

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7. Suggest ways in which the conduct of physics practical exam can be improved.

a) Conduct of exam

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**APPENDIX VI**  
**OBSERVATION SCHEDULE**

**INSTRUCTIONS**

Respond to the items in the questionnaire by ticking in the box provided or writing out information in the space provided. Information received will be treated with utmost confidentiality.

Name of school \_\_\_\_\_

Class \_\_\_\_\_

**Part 1: Physics lesson**

1. Is Physics indicated on the timetable

a) Yes       b) No

2. How many lessons are indicated per week for forms 3 and 4?

\_\_\_\_\_

3. How long is a lesson (single or double) in terms of minutes/hours?

\_\_\_\_\_

4. What time are the Physics lessons scheduled on the timetable? (Mornings or afternoons)

\_\_\_\_\_

**Part 2: Lesson observation**

1. Where is the lesson being conducted?

a) Lab       b) Classroom

2. State the facilities in use?

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3. Were the pupils able to access the equipment e.g. test-tubes, beakers, Bunsen burners etc?

a) Yes                       b) No

4. Were the pupils able to manipulate the tools and equipment?

a) Yes                       b) No                       c) To some extent

Give details

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5. Is the equipment in use sufficient in quality?

a) Yes                       b) No

6. Is the equipment adapted for learners with cerebral palsy?

a) Yes                       b) No

7. Were all the students able to perform all the activities as explained by the teacher?

a) Yes                       b) No

8. Which activities were they unable to perform?

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9. Were all the parts of the practical lesson carried out?

a) Yes       b) No

If **yes** were they adequately covered?

a) Yes       b) No

If **No** which components were not covered and why?

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10. Did the teacher have any assistant?

a) Yes       b) No

If yes, what assistance did he/ she provide?

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11. What was the teacher student ratio?

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