CLASSROOM VERBAL INTERACTION PATTERNS IN RELATION TO STUDENT PERFORMANCE IN PHYSICS IN BARINGO CENTRAL SUB-COUNTY, KENYA

BY

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AUGUST 2015
DECLARATION

This Thesis is my original work and has not been presented for a degree in any other university, or award.

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ABBREVIATIONS AND ACRONYMS

AS: Attitude Scale

ASEI: Activity Student centred Experimentation and Improvisation.

BOM: Board of Management

CDE: County Director of Education

EFL: Extra Foreign Language

FIAC: Flanders Interaction Analysis Category

KCSE: Kenya Certificate of Secondary Education

KICD: Kenya Institute of Curriculum Development

KNES: Kenya National Examinations Council

PDSI: Plan Do See and Improve

PGDE: Post Graduate Diploma in Education

PTQ: Physics Teachers Questionnaire

QASO: Quality Assurance and Standards Officer

SMASSE: Strengthening Mathematics and Science in Secondary Education

SPAT: Students Physics Achievement Test

SPSS: Statistical Package for Social Sciences

TSC: Teachers Service Commission

UNDP: United Nations Development Programme
ABSTRACT

Kenya has been recording poor student performance in Physics for a long period of time. There has been some revision of the Physics syllabus to reduce the level of difficulty and overloading of the students. Projects like Strengthening Mathematics and Science in Secondary Education (SMASSE) and other in-service workshops and seminars, integration of information communication and technology, employment of more teachers and Government subsidized tuition have been introduced but all these efforts have not significantly improved student performance in Physics. It is believed that the manner in which a teacher interacts with his/her students can either encourage the students to participate in the learning activities or inhibit such participation. This may affect their concept development and hence academic performance. The research topic was classroom verbal interaction patterns in relation to student performance in Physics in Baringo Central Sub-County, Kenya. The objectives of this study were: to investigate the relationship between the various types of verbal interaction patterns and the learners participation in learning activities; to establish the ratio of teachers direct to indirect behaviour based on verbal interactions in Physics classrooms and finally to investigate the relationship between various verbal classroom interaction patterns and student performance in Physics. A total of six Physics teachers from six stratified randomly selected schools were involved in the research. A modified version of Flanders’ Interaction Analysis Category (FIAC) was used in Form Three classes. Form three students responded to an eight- item Physics achievement test (SPAT) in addition to an attitude scale (AS) while the Physics teachers filled a Physics teachers’ questionnaire (PTQ) indicating their views on interactions in Physics classrooms. The data collected were analysed using SPSS computer software. Data collected through FIAC were tabulated and coded. Each table was analysed and interpreted using percentages. All categories from 1 to 10 were added and the mean of 10 categories for the six secondary classes calculated. Talk time was calculated by adding frequencies from categories 1 to 9 and converted into percentages by dividing the frequencies with total time of interaction. Teacher’s talk time was calculated by adding frequencies from categories 1 to 7 and converted into percentages by dividing the frequencies with total talk time. Teacher’s direct talk time was calculated by adding frequencies from categories 5 to 7 and converted into percentages by dividing the frequencies with teacher’s total talk time. Teachers indirect talk time was calculated by adding frequencies from categories 1 to 4 and converted into percentages by dividing the frequencies with teacher’s total talk time. Inferential statistics of Pearson correlation was used to determine the relationship between classroom interaction pattern and student performance in Physics. T-test was used to compare means in students’ performance in SPAT. Qualitative data from the Likert scale was analysed by tallying the numbers of similar responses. The findings showed that verbal interaction had some influence on the learner’s participation. It was also found that the Teachers ratio of indirect to direct verbal
interaction is 1:2. The study also established that schools which used indirect verbal interaction performed better than those using direct verbal interaction.
CHAPTER ONE: INTRODUCTION

1.1 Background of the Study.

Physics is a branch of science which deals with the study of matter in relation to energy (Minishi, Muni and Okumu, (2008)). It consists of basic concepts used to explain real life situations, for example: why objects always fall towards the centre of the Earth which is explained by the concept of Force of Gravity as discovered by Sir Isaac Newton; Why large ships made of steel can float on water despite steel being about ten times denser than water is explained by the concept of Up thrust; Law of Floatation and Archimedes Principle which are associated with the great Greek scientist called Archimedes; and the Crackling sound produced when removing a nylon cloth from the body is explained by the concept of static charges (Minishi et al., (2008)). Through the study of Physics, the various forms of Energy available can be harnessed for a more easily manageable and fulfilling life. Thus, a waterfall or a hot spring is seen as a source of electrical energy. On the other hand, Radio waves and Microwaves as means of energy propagation have been put into use in the working of the radio, television, satellites, computers and telephone. As a subject, the study of Physics involves measurement of quantities and collection of data. Through experimentation and observations, hypothesis are drawn, tested and consequently laws and principles established.

Rabari (2003) considers that Physics as a study may be split into six branches, namely: mechanics, electricity and magnetism, thermodynamics, geometrical optics, waves and atomic Physics.
The field of Mechanics involves the study of motion of bodies under the influence of forces. In mechanics, the characteristics of linear, circular and oscillatory motion are explained. The equilibrium of forces for bodies and fluids at rest and when in motion are also explored. The Italian physicist and astronomer Galileo brought together the ideas of other great thinkers of his time and began to analyze motion in terms of distance travelled from some starting position and the time taken. He showed that falling objects accelerate steadily during the time of their fall. This acceleration is the same for both heavy and light objects, provided air friction (air resistance) is discounted. The English mathematician and physicist Sir Isaac Newton improved this analysis by defining force and mass and relating them to acceleration. For objects travelling at speeds close to the speed of light, Newton’s laws were superseded by Albert Einstein’s theory of relativity. For atomic and subatomic particles, Newton’s laws were superseded by quantum theory. For everyday phenomena, however, Newton’s three laws of motion remain the cornerstone of dynamics, which is the study of what causes motion.

Electricity and Magnetism deals with the relationship between electric currents magnetic fields and their extensive applications when operating Electric motor, Magnetic relay, Telephone receiver, Electric bell, Circuit breakers among others.

On the other hand thermodynamics is the study of transformation of heat to and from other forms of energy (Onah, 2010). A major reference is made to gas behaviour in which thermal exchanges and the accompanying changes of pressure and volume are explained in line with the kinetic theory of matter.
Geometrical optics focuses on the behaviour of light as it traverses various media. Optical instruments such as telescopes, microscopes, periscopes and laws governing their working form a major part of this branch of Physics.

Waves deal with the propagation of energy through space. In addition, effects such as reflection, refraction, diffraction and polarisation of sound and light are easily explained using wave theory.

Last but not least, atomic Physics involves the study of the behaviour of particles constituting the nucleus and the accompanying energy changes. It is within this area that radioactivity, nuclear fusion and fission are studied. Atomic Physics also studies atoms as an isolated system of electrons and an atomic nucleus. It is primarily concerned with the arrangement of electrons around the nucleus and the processes by which these arrangements change. This includes ions as well as neutral atoms unless otherwise stated, for the purposes of this discussion it should be assumed that the term atom includes ions. Atomic model consists of a single nucleus that may be surrounded by one or more bound electrons (Minishi et al., (2008)). It is not concerned with the formation of molecules (although much of the Physics is identical) nor does it examine atoms in a solid state as condensed matter. It is concerned with processes such as ionization and excitation by photons or collisions with atomic particles, by this consideration atomic Physics provides the underlying theory in plasma Physics and atmospheric Physics even though both deal with huge numbers of atoms.

The secondary school Physics course pays special attention to the needs of the majority of the learners who may terminate their Physics studies at the end of secondary school level and become general citizens with Physics general knowledge for example; environmental
conservation, road safety measures among others. It also caters for the needs of learners who may pursue their studies in the subject and the related disciplines hence using Physics for vocational and career needs. Secondary school Physics course also caters for those who want to advance their knowledge in Physics in higher institutions of learning like universities hence becoming practising physicists. Emphasis is laid on the understanding of the Physics basic and integrated process skills requiring application, analysis, synthesis and evaluation. This necessitates a great variety of learning experiences in contrast to the talk and chalk methods.

The chain of events which occur one after the other in class, each occupying only a small segment of time is referred to as classroom interaction. The analysis of classroom interaction according to Nurmasita (2010:89),

May be defined as an instrument which is designed to record categories of verbal interaction during, or from, recorded teaching/learning sessions. It is a technique for capturing qualitative and quantitative dimensions of teachers’ verbal behaviour in the classroom. It can be used for studying the chain of classroom events in such a fashion that each event is taken into consideration.

Galloway (1976), also observed that verbal language assumes a tremendous burden for coherency of communication between human beings and verbal language serves well for it is obvious to state that teachers rely overwhelmingly upon words to state and clarify ideas and meanings to students. According to Omar (1996:81),

No matter how well a material is organised for class presentation, if the teacher does not have the skill to initiate student participation, it will be impossible to create an atmosphere conducive to learning. Developing such a skill is very personal and individual task.
Although there might be several aspects which determine the teachers’ effectiveness in the classroom, one of the most important is probably, classroom teacher-student interaction. Effectiveness of teaching and learning may be determined by the type and quality of classroom interaction between the teacher and the students. The type and quality of classroom verbal interaction may determine not only the effectiveness of the learning situation, but also the attitude, interest and in part, even the personality of pupils. In a classroom, the psychological atmosphere found inside is of extreme importance in moulding the character of students and determining the efficiency with which learning takes place. This atmosphere is mainly determined by the teacher who can make a classroom conducive for students to learn, by using pupils as a rich source of enthusiasm, (Muthwii, (1987)).

McFarland (1971), added his voice also by saying students will tend to like teachers who try to talk to them and understand their problems in the classroom. When the students are motivated and reinforced equally (evenly), most of them will feel free and learning will be enhanced, unlike classes where teachers do not accommodate weaknesses, feelings and ideas of students. According to McFarland, (1971:105),

In traditional classroom, one stipulation was shared among teachers which guided and dictated the teaching method. Wisdom and knowledge were supposed to flow from the teacher to the pupil, whereas the teacher was the final authority with regard to the acquisition of knowledge, the pupils were supposed to remain passive as they listen to the person presenting the knowledge. The interaction of the teacher and pupil, which is an important aspect of the educative process, was and may still be one of the most neglected aspects,

On the account of the above arguments, there arises a need for some research to expound on the role of classroom verbal interaction in learner’s academic achievement especially in
Baringo Central Sub-County, Kenya where student performance in Physics has been relatively poor over the years.

Education matters in a County are managed by County Directors of Education while at Sub-County level are managed by Sub-County Education Boards whose secretary is Sub-County Education Officers (S.C.E.Os).

Data obtained from Sub-County Education’s office Baringo Central Sub-County indicated that student performance in Physics in KCSE has been dismal as shown in table 1.1

<table>
<thead>
<tr>
<th>YEAR</th>
<th>MEAN SCORE (%)</th>
<th>MEAN GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>31.63</td>
<td>D+</td>
</tr>
<tr>
<td>2007</td>
<td>35.70</td>
<td>D+</td>
</tr>
<tr>
<td>2006</td>
<td>36.69</td>
<td>C-</td>
</tr>
</tbody>
</table>

Source: Sub-County Education Office Baringo Central Sub-County.
The student performance in KCSE Physics country wide may not be very different from Baringo’s.

Table 1.2: National Candidates Performance in KCSE (2006-2008).

<table>
<thead>
<tr>
<th>Subject Name</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry</td>
<td>Mean%</td>
<td>Entry</td>
<td>Mean%</td>
</tr>
<tr>
<td>Biology</td>
<td>217928</td>
<td>27.42</td>
<td>245911</td>
</tr>
<tr>
<td>Physics</td>
<td>72499</td>
<td>39.95</td>
<td>83273</td>
</tr>
<tr>
<td>Chemistry</td>
<td>236901</td>
<td>24.79</td>
<td>266761</td>
</tr>
</tbody>
</table>


NB. KNEC Examination is “NORM REFERENCED” hence difficult to know the grades which the percentages in table 1.1 would actually correspond to.

From Table 1.2, it is clear that student performance in KCSE (Physics) was below average for the three years. It is also notable that although Physics appears to have been done generally better than Chemistry and Biology, its enrolment is much lower meaning Physics scores could have been lower if the enrolment was comparable to Chemistry and Biology. Biology and Chemistry was brought in because they are also sciences hence there was need to compare student performance in Physics and the other sciences. Scores from table 1.1 and 1.2 show that student performance in Physics in Baringo Central Sub-County and in the entire Country is comparable. The question therefore is “what can be done to change this”? According to Maritim (1983), part of the answer to this question may be to improve teacher-student classroom verbal interaction. Teachers themselves may be frequently
responsible for discouraging some students by interacting with them in a way that makes
the students to develop negative attitude towards the teacher and the subject leading to low
achievement.

1.2 Statement of the Problem

The study of Physics is important in all aspects of life. In Kenya, Physics is a key subject
for advancement in science and technology and needed for most professional careers.
These careers include both health sciences (Medicine, Nursing, Laboratory technology)
and Engineering.

There has been a tendency to teach with established methods of classroom interaction and
approaches of teaching which are largely expository. The tendency has been the same with
Physics teaching as far as classroom interaction is concerned (Kiviu, (1985)). Physics is an
optional subject as from third year of secondary education cycle (Form Three); at this
point the choice of the subject may be influenced by the prior interaction patterns between
the teacher and students which in turn help to create interest in the subject since learners
usually take teachers as persons with authority in a given academic field including Physics.

Many African countries envision being industrialized by the year 2030 and Kenya is no
exception. However, looking at the student performance in mathematics and science
subjects at Secondary education level in Kenya, the vision to be industrialised is in doubt
because the performance in these subjects has been poor. Improving the performance of
Mathematics and Science education is a great societal need in Kenya not only for
industrialization of the country but also for producing scientifically empowered citizens.
Research done by one of the key stakeholders in secondary education in Kenya, the Strengthening of Mathematics and Science in Secondary Education (SMASSE) project in 1998 has shown that consistent failure and negative attitude by students, towards Physics and Mathematics, continues to characterize the classroom learning. Based on this same research, teachers have been found to present lessons that are teacher-centred with the teacher being the main actor and sometimes the only actor in the classroom as students remain passive recipients. Mathematics and Science lessons have been found to be difficult, boring and lacking in effective teaching/learning materials (SMASSE, (1998)). This is the practice also widely employed in Africa. The challenge thus has been how to make Physics more “alive”, more “real” and more “accessible”. ASEI and PDSI approaches advocated for by SMASSE have not yielded much. Njuguna (2000), argues that students’ involvement during lessons must be enhanced to increase motivation, effective teaching/learning materials used and lessons should be made more interesting.

Statistics obtained from County Director of Education (CDE’s) office Baringo indicate that student performance in Physics has been ranging between grades D+ and C-, since the year 2006 to date (refer to table 1.1). Countrywide student performance in Physics Kenya Certificate of Secondary Education (KCSE) Examination is below average (Kenya National Examination Council Report, (2008)). It is with this in mind that the researcher investigated the classroom interaction patterns in boys’, girls and mixed schools, to find out if there is a significant difference in the interaction patterns in different categories of schools in relation to student performance in Physics. The researcher was interested in investigating how direct and indirect verbal interaction patterns relate to student performance in Physics.
In this study, the independent variable is verbal classroom interaction patterns while the dependent variable is student performance. The investigator did not in any way influence verbal interaction patterns but studied and reported how various verbal interaction patterns relate with student performance in Physics.

1.3 Purpose of the study

The purpose of the study was to investigate classroom verbal interaction patterns in relation to student performance in Physics in Baringo Central Sub-County.

1.4 Objectives of the study

The study was guided by the following objectives:

   a) To investigate the relationship between verbal interaction patterns and the level of learners’ participation in learning activities in Physics classrooms.

   b) To establish the ratio of teachers’ direct to indirect behaviour based on verbal interactions in Physics classrooms.

   c) To investigate the relationship between classroom verbal interaction patterns and student performance in Physics.

1.5 Research Questions

a) How do verbal interaction patterns and the learners’ participation in Secondary School Physics learning activities relate?

b) What proportion of teachers depicts direct or indirect behaviour based on verbal interactions in Physics classrooms?
c) To what extent do various classroom interaction patterns relate to students’ performance in Physics?

1.6 Significance of the Study

The study findings would be beneficial to the following:

a) Physics Teachers

Teachers are the implementers of any school curriculum. The research findings may stimulate Physics Teachers at secondary school level to improve their teaching behaviour in order to maximize students’ learning in Physics.

b) Quality Assurance and Standards Officers(QASO’S)

The research findings will assist the secondary school Quality Assurance and Standards Officers in their day to day monitoring of learning in secondary schools to lay more emphasis on appropriate classroom verbal interaction patterns when advising secondary school Physics teachers.

c) Physics Teacher Trainers

The results of the research would be used to sensitize teacher trainers on appropriate classroom interaction patterns and their effects on Physics performance. This would enable them in the process of preparing Physics teachers to emphasise the topic of classroom interaction patterns in the unit of Physics teaching methods for undergraduate students and diploma teachers training colleges.
d) **Physics Curriculum Developers at KICD**

The findings of this research would enable Physics curriculum developers and all those charged with developing Physics curriculum to identify specific classroom verbal interaction patterns for various topics of secondary school Physics and be put in the syllabus and teachers guide text books.

1.7 **Scope and Limitations**

1.7.1 **Scope**

The study focused on students and teachers in stratified randomly sampled public secondary schools in Baringo Central Sub- County. Baringo Central Sub- County was used because it had a suitable sample due to its dynamic cultural diversity.

1.7.2 **Limitations**

The main limitation of the study was resources (time). Inadequate time for the programme (one year research work) limited the extension of the research to other parts of the country.

1.8 **Basic Assumptions of the Study**

It was assumed that:

a) The sample used was a representative of the wider population of secondary school students and teachers in Baringo Central Sub- County.

b) There was relationship between variables identified in the study and student achievement in Physics.

c) Most of the Physics teachers were trained and qualified.
d) All secondary schools investigated adhere to a uniform Physics syllabus.

1.9 Theoretical Framework

This study was based on theories that propagate the need for learners to take a greater role in the learning process as teachers act as facilitators. Many claims for learning by discovery and learners participation in classroom activities are made in educational psychology as enumerated by various theories for example Gestalt psychologists and educational philosophies like pragmatism.

Main Proponents of inquiry-discovery method were Pestalozzi, Montessori and Dewey. According to Dietar (1990), knowledge of the nature of a child is essential to best instruction and the methods of interaction could vastly aid or retard education, hence most valuable lessons are to be learnt through direct experiences and participation of the learner. This laid basis for classroom interaction and learner centered approach of teaching/learning strategies. Physics is a subject that requires full participation of learners both in theory and practical lessons. This study was therefore not only looking at classroom verbal interactions but also trying to determine whether these verbal interactions relate to student performance in Physics.
1.10 Conceptual framework

The conceptual framework shows the correlates of student performance in Physics. The independent variables are verbal interaction patterns. These independent variables interact with each other and eventually influence student performance in Physics which is the dependent variable. The intervening variables are teaching/learning resources, teachers’ attitude and teachers’ awareness of verbal interaction patterns. Bloom (1984), noted that the blame for the failure of students rested on poor classroom practices and not the inability of the students to learn. Classroom verbal interaction patterns is one of the classroom practices and based on Bloom’s assumption, the researcher endeavoured to find out whether these classroom practices which include verbal interaction patterns relates to student performance in Physics. Figure 1.1 is the summary of the conceptual framework

**Figure 1.1 Conceptual framework of the study**

1.11 Definition of Terms

In this study, the following words were used for the purpose of and with the intention as explained below.

**Achievement Test:** It is a test developed primarily to find out how much students have learnt in a given area of curriculum such as the secondary school Physics curriculum for Kenya.

**Attitude Scale:** It is an instrument purporting to measure emotions, values and feelings related to a particular discipline or subject like Physics.

**Autocratic Teacher Behaviour:** It is a teacher’s verbal behaviour whereby the pupils’ feelings are not considered and the teacher dominates the talk or discussion. A student simply listens and obeys orders from the teacher.

**Classroom Interaction:** It is a chain of events which occur in the classroom, one after the other, each occupying only a small segment of time.

**Democratic Teacher Behaviour:** Refers to classroom teachers’ verbal behaviour whereby the pupils are allowed to share or contribute a lot and feel free in a discussion.

**Form Two:** refers to the second year of secondary school. At the end of this year Physics becomes optional.

**Form Three:** refers to the third year of secondary school.

**$\frac{I}{D}$ Ratio:** Refers to the ratio of all categories (tally totals) falling under indirect verbal influence of teacher divided by the categories falling under direct verbal influence of a teacher.
**Interaction Analysis Tool:** This is an instrument which is designed to record categories of verbal interaction during, or from, recorded teaching learning sessions. It is a technique for capturing qualitative and quantitative dimensions of teacher’s verbal behaviour in the class-room. It can be used for studying the chain of classroom events in such a fashion that each event is taken into consideration.

**Observation System:** Refers to any technique designed for the purposes of identifying, examining, classifying and /or quantifying specific interacting variables of a given instructional / learning situation.

**Pattern:** It is a short chain of events that can be identified and occurs frequently enough to be of interest, and can be given a label.

**Indirect/Integrative Behaviour Pattern:** This is a pattern of the behaviour which accepts, clarifies and support the ideas, feelings of students, Praises and encourages students, asks questions to stimulate students’ participation in decision making and asks questions to orient students to classroom work.

**Direct/Diminutive Behaviour Pattern:** This is a pattern of teacher behaviour which expresses or lectures about one’s own ideas or knowledge, Gives directions or orders to students, Criticizes or depreciates students’ behaviour with intent to change it and Justifies his/her own position.

**Time Sampling Unit:** This refers to the number of observations made per minute. 

The chapter that follows presents a review of literature related to the study.
CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this chapter, the researcher presents a review of literature related to the study. The chapter covers literature on importance of interaction, approaches used in classroom interaction among others. It finally covers measurement of classroom interaction.

2.2 General objectives of secondary school Physics curriculum

The general objectives of secondary school Physics curriculum (Kenya Certificate of Secondary Education syllabus, (2002)) are to:

1. Help learners to discover and understand the order of the physical environment.

2. Make the learners aware of the effects of scientific knowledge in everyday life through application to the management and conservation of the environment, the utilisation of resources and production of goods.

3. Enable the learner to acquire knowledge and skills for solving problems.

4. Enable the learner to reason critically in any given situation.

5. Enable the learner to appreciate the responsibility of a scientist to the society.

6. Inculcate in the learner a willingness to co-operate in using scientific knowledge to foster development in the society.

7. Prepare the learner for further studies and/or vocational training.

The Kenya Certificate of Secondary Education (KCSE) is an Examination done at the end of fourth year of the Secondary education system. The examination is set adhering to the objectives of every subject. The seven objectives above are considered when setting
Physics examination at all levels; they guide the teaching of Physics in secondary schools in Kenya.

2.3 Classroom Interaction

Interaction occurs every day in the classroom activities between the teacher and the learners. Interaction is commonly defined as a kind of action that occurs as two or more objects have an effect upon one another. The idea of a two-way effect is essential in the concept of interaction, as opposed to a one-way causal effect (www.wikipedia.com).

Education with its correlated activities of teaching and learning process involves interaction between teacher and students as channels of realizing its objectives. Interaction occurs every day in teaching and learning process. It is managed by everyone, not only by the teacher in the classroom, but also the students. This interaction is usually used to express their ideas together. Allwright and Bailey (1991), stated that Interaction is viewed as significant because it is argued that:

a) Only through interaction, the learner can break down the Teaching/Learning structures and derive meaning from classroom events.

b) Interaction gives learners the opportunities to incorporate Teaching/Learning structures into their own speech (the scaffolding principles) and

c) The meaningfulness for learners of classroom events of any kind, whether thought of as interactive or not will depend on the extent to which communication has been jointly constructed between the teacher and learners.
2.4 Importance of Interaction in the classroom

Teacher–student interaction is very important in the teaching and learning process because students benefit from this interaction at both the social and academic level (Beyazkurk and Kesner, (2005)). Such interaction is referred to as “classroom interaction” and is defined as the process of face-to-face interaction (Robinson, (1994)).

A fundamental problem in classroom interaction is that teachers try every day to encourage students to participate effectively in classroom discussions but unfortunately these efforts may fall flat (Moguel, (2004)). According to Beyazkurk and Kesner (2005), elementary school students benefit from encouraging relationships and positive interaction with their teachers. Also, students in early childhood educational settings are more socially competent and do better in their classes as a result of positive interactions with their teachers (Egeland and Hiester, (1995)).

Previous research done by Cazden (1986), on classroom interaction focused mostly on pedagogical methodology, and on teachers' actions during the lesson by Edwards and Westgate (1994), although teachers engage in a great deal of interaction with their students while in the classroom, most teachers have difficulties remembering these interactions (Good and Brophy, (1994)). However, teachers could make ‘mental notes’ to record which students interact more, interact less or do not interact at all. Such mental notes will help teachers to encourage students to interact appropriately and improve learning (Willson, (1999)).
2.5 Approaches used in Classroom observation of Interaction

The main approaches that have been used for classroom observation are the structured and the unstructured approaches. Some researchers have used rating scales and checklists.

2.5.1 The Structured or Systematic Approach

This involves using pre-conceived structured schedule which is used for coding classroom behaviour to provide data which is quantified and then used for discussion (Muthwii, (1987)) and (Opie, (2004)). Power (1977) quoted in Muthwii (1987), noted over 200 structured or systematic observation systems which had been produced for this purpose. The reason which he gave to explain why so many schedules had been produced was because of the complexity of classroom behaviour. According to Ober (1971), to acquire an understanding of what an observer is about to witness and to learn the necessary techniques require that at least the basic conditions be met.

a) The observer needs to know precisely what s/he is looking for. S/he must have clearly in mind his or her own personal conceptualization of what constitutes the instructional-learning situation. S/he must be able to recognise and identify the role of each.

b) In order to develop a plan of action for observing the classroom setting, the observer needs to be able to see variables both as separate, discrete phenomenon and as they interact with each other within the dynamics of classroom operation. Both conceptualization of what classroom setting is and the development of a plan of action can be boosted by systematic observation. Systematic observation represents a useful means of identifying, studying, classifying and measuring specific variables as they interact within the instructional-learning situation (Wragg, (1994)). Operationally, systematic observation
adds meaning and precision to observational experiences (Opie, 2004). By using observational techniques that are provided by systematic observation approaches, the observer is able to conceptualize the interaction of the variables that make up the instructional situation, finally s/he is able to study the interacting variables in a line or ongoing situation (Ober, 1971). Systematic observation is an acceptable method of organizing observed teaching acts in a manner which allows any trained person who follows stated procedures to observe, record and analyze interaction with the assurance that others viewing the same situation would agree to a great extend with his or her recorded sequence of behaviours in the same way though viewing a wide variety of classroom or interaction settings. The basic purpose of systematic observation is to help operationalize teaching objectives in teaching strategies. Direct observation should and can be used in the search for effective patterns of teaching learning behaviours (Wragg, 1994). Observation allows individual teachers to study and analyze their own teaching strategies in the privacy of the classroom and home. Systematic observation provides the opportunity for continuous monitoring of teaching behaviour—the examination of class-relevant variables in the light of activities necessary to teach as planned.

2.5.2 The Unstructured Approach

Here the structure has no previously designed schedule which is used for coding behaviour (Wragg and Opie, 2004). It’s quite informal in nature since the observer has no pre determined method of coding some specific events. S/he selects at random what she thinks is useful and available for description and discussion. His/her beliefs, attitudes and interpretive framework play an important role in determining what is selected (Power, 1977) quoted in Muthwii (1987).
2.5.3 Rating Scales

These are alternative approaches which have been used by researchers such as (Sutherland, (1997)). However their validity and reliability have been questioned (Wragg and Opie, (2004)).

2.5.4 The Criticism of the Structured and unstructured approach.

Those who criticize the use of structured approach such as Robinson (1975), argue that the true reliability of classroom life as perceived by the teachers and pupils is distorted when the structured approach is used for studying classroom interaction because categories contribute only a small portion of the total classroom events. This happen especially when events are coded only once per given period or time sampling unit. The actual language used in the intellectual transactions between the teacher and pupils is not recorded and there is loss of sequence in classroom events when recorded. This is termed as “reductionism” (Ajeyalemi, (1983)) quoted in Muthwii (1987).

The advocates of the unstructured approach argue that an experienced and sensitive observer can capture what’s important of the essential qualities of classroom events, s/he randomly chooses what s/he judges to be important. The result of such an observation is liable to distortion bias or reduction (Power, (1977)) quoted in Muthwii (1987). Power (1977), also disagreed with the informal approach because of its random nature of data selection. This cannot be useful due to the complexity and rapidity of classroom events. In fact it also suffers from the weaknesses of the structure method of losing the sequence and the complete record of discourse events.
2.6 Approaches to the Teaching of Physics

A teaching approach involves all the ways and steps a teacher uses when presenting lesson content. According to Ornstein (1995: xix):

“The key role of teachers is to teach students learning strategies that will increase students’ chances for achievement and reduce the loss of human potential which is so pervasive in our society today. Helping students to learn is the goal of the teacher. The extent to which this is done is influenced by how well the teacher can select suitable methods of teaching the skills employed and the level of preparation”.

Maundu, Muthwii and Sambili (2005), suggest that the two common approaches of teaching sciences are the expository approach and the inquiry approach. This agrees with Sutherland (1997), who argues that there are three teaching approaches in science: Problem solving, informing and inquiring approaches, though enquiries and problem-solving can be categorised under learner-centred approaches while informing falls under teacher-centred approaches.

2.6.1 Expository Approaches

This involves the kind of classroom teaching which is characterised by the predominance of the teacher (Maundu et al., (2005)). The teacher gives facts, explains concepts, illustrations and applications. The learner’s participation in learning is in listening and answering teachers’ questions. This approach limits the verbal interaction in the classroom and therefore it is not useful in the presentation of Physics as a practical science subject.

Lang, Mc Beath and Hebert (1995), agree with Maundu et al. (2005), that there are some cases which call for the use of this method while teaching. Rugiri and Magondu (2004), assert that the expository approach is not very effective in teaching sciences although some topics call for its use because of their very nature, which is they are difficult to teach practically. Lang, Mc Beath and Hebert (1995), observe that direct instruction can draw
largely teacher-centred strategies that are particularly effective for presenting declarative information in a step – by – step way, through lecture, explanation and the provision of guided practice through oral drills or written seatwork. Twoli (2006), observed that there should be less emphasis on the expository type of methods while teaching sciences and hence more emphasis should be put on the discovery/heuristic approaches.

2.6.2 Inquiry Approach

Lang, Mc Beath and Hebert (1995), observe that inquiry approach encourages learners to investigate a range of topics, thus taking responsibility for their own learning. They also argue that this approach consists of two main branches which are the guided inquiry and the un-guided inquiry. Maundu et al. (2005), argue that the inquiry approach is also referred to as the scientific or discovery approach. Learning is by discovery. It trains the learners to follow instructions carefully and it is characterised by development of the scientific skills such as the ability to make observations, collecting and presenting data, drawing conclusions, inferring and the ability to use the skill of manipulating apparatus.

2.6.3 Guided Inquiry Approach

The guided inquiry has its own advantages, guided inquiry is a useful strategy for moving students gradually from direct to indirect instruction. The teacher asks questions and uses prompts, cues and probes to obtain thoughtful responses; this creates adequate verbal interaction in the classroom (Lang, Mc Beath and Hebert (1995)). Maundu et al. (2005), suggest that this interaction motivates the learners because of their co-operation with the expert that is the teacher. The presence of the expert also makes work proceed on relatively fast and this saves time. Twoli (2006), notes that heuristic/discovery approaches
put a high demand on resources and time but this cannot be compared with the rewards it brings to learners in terms of meaningful learning with more motivational orientation. He further adds that, in the teaching of Chemistry and any other Science, application of inquiry approaches should be done.

2.6.4 Un-guided inquiry

Lang (1995), asserted that un-guided inquiry is an open-ended teaching strategy that targets raising both students’ interest in learning and the degree of personal responsibility they take for the learning process. While using the unguided approach, the teacher gives the learners some opportunities to interact verbally through making discoveries and then questioning and exploring what they have observed. Lang, Mc Beath and Hebert (1995), agree with Maundu et al. (2005), that the unguided inquiry approach sharpens the students’ skills on how to plan their own investigations and how to solve problems with less dependence on the teacher. Challenging inquiries can stimulate classroom discussions in a Physics classroom as well as every other school subject.

Sutherland (1997), advocates for learning by experience as this gives the learner a better base for later thinking since the concepts will be accurate and there will be a room for further development. Sutherland (1997), further argues that scientific principles are not learned from text books or by watching other people’s experiments but they are what the individual has discovered by initiating activities, observing and interpreting their results.

Although most of the writers come to a consensus that the inquiry approach is better placed in the teaching of sciences, they again agree on the fact that the approach is time consuming. Inquiry approaches of teaching Physics encourages indirect classroom verbal
interaction (Sutherland, (1997)). Teachers should try as much as possible to increase verbal interactions during the teaching-learning process. The indirect instructional strategies involve the learners more as compared to the direct instructional strategies.

2.7 Factors Influencing Classroom Interaction

The nature of classroom interaction is often influenced by students' Homes, neighbourhoods and culture (Eggen and Kauchak, (1997)). Many students come from cultures in which adults and children interact in ways that differ from that found in most classrooms (Eggen and Kauchak, (1997)). According to Helgesen and Brown (1994), each culture has different ‘rules’ about how students should act in the classroom. In some countries, it is regarded as beneficial – and important – to answer the teacher's questions and interrupt him/her when something is not understood. However, in other countries, students are expected to listen; only the teacher should speak in class. For example, most Japanese students are taught to listen and not to question a teacher in class and therefore have little or no experience with in-class interaction with the teacher, such as questioning, commenting or giving feedback. Students are usually taught to be quiet and respectfully listen to the teacher (Snell, (1999)). It is suggested that Hawaiian students in the USA do not interact effectively in regular classroom lessons; either they do not participate at all, or they participate in inappropriate ways, such as breaking in or interrupting other participants. These behaviour patterns and their consequences often result in lower achievement and do not promote learning (Saleh, Lazonder and de Jong, (2007)).
2.8 Classroom Interaction and Achievement in Europe

Younger, Warrington and Williams (1999) findings regarding the relationship between interaction and achievement revealed that high-achieving students initiated more interactions than low-achieving ones. Their study also found that the nature of interactions among high achievers differed from those of low achievers. High achievers initiated interactions to volunteer answers, whereas low achievers interacted primarily to seek help.

Professionals in the field of education consider teacher–student interaction fundamental to the learning process. Student involvement in classroom discussions can be a major element in effective instruction. Verbally active students are more likely to be high achievers, and student–teacher interaction can help students develop their cognitive skills (Jones and Gerig, 1994). Various studies on classroom interaction revealed that these students control interaction because they are more active in the learning process and participate more willingly than others (Willson, 1999).

2.9 Classroom Interaction and Gender

Research done in Europe by Younger, Warrington and Williams (1999), found that more girls than boys take the opportunity to initiate questions, seek clarification on work-related matters, make best use of the support of the teacher. Shomoossi, Amouzadeh and Ketabi (2008) indicated that girls participated less in class than boys and took less verbal initiative in their interaction with the teacher. They are more ‘passive’ than boys in the classroom and less persistent than them in their non-compliance with the teacher. Kramer (1985) indicated that high-achieving girls avoided answering teachers’ questions in class and
offered comments less frequently than boys. Others have found that boys do not dominate classroom talk and teacher time (Swann and Graddol, (1988)).

A number of studies have shown gender bias in teacher-initiated interaction in the classroom (Kerr, (1991)), (Sadker and Sadker, (1985)) and (Younger, Warrington and Williams, (1999)). While some researchers like Sadker and Sadker (1985), found that teachers responded differently to boys and girls in the class, with boys tending to dominate classroom interactions and teachers accepting their dominance. Comfort (1996), indicated that girls received more positive feedback from their teachers. Although Comfort (1996) found that teachers initiated more contact with, and directed more questions to boys than girls, they criticised boys more than girls. In fact, girls received more positive reinforcement.

2.10 Status of Classroom Verbal Interaction in Third World Countries

The teaching-learning process at the secondary level in Third world countries is mostly based on memorization (UNDP, (1997)). There is little provision for the development of intellectual and thinking skills among students who are given less time for active participation and interaction, and the teacher seems to have a very dominant role in the class. Unfortunately, a poorly structured classroom quickly deteriorates into a vacuous waste of time (UNDP, (1997)). Based on a large-scale meta-analysis conducted by Walberg (1991), research indicates that the following seven factors are key elements to the effectiveness of teaching: engaged academic learning time, use of positive reinforcement, cooperative learning activities, positive class atmosphere, higher-order questioning, cues and feedback, and use of advance organizers.
Maritim (1983), found that the quality of teacher-pupil interaction correlates positively and significantly with the pupil performance. He further points out that academic achievement depends upon self concept, school facilities, socio-economic background, teachers’ personality, biological factors, motivation, rewards and punishment and previous learning. He further noted that if lack of classroom participation persists, eventually the pupil’s academic self concept will diminish and subsequently his or her performance. To save the pupil from developing this defeatist attitude the teachers must play a simulative role in the classroom.

WaSanga (1982), investigated and analysed the classroom interaction of Kenyan secondary school teachers and their undesirable behaviours and found that there was a positive relationship between teacher’s way of teaching and his/her undesirable behaviour as given by students. Using Flanders technique for observing the classroom teaching, teachers found to have poor classroom teaching were also found to have much undesirable behaviour which was characterised by criticizing, non appreciation and punishments. S/he observed that those teachers who establish good working relationship with most of their individual students and consider their students as human beings are usually effective teachers (those whose students learn more in their classrooms). It was realised that teachers have many undesirable behaviours and poor teaching habits like unnecessary criticisms, calling on only few students from a whole class failing to use students’ ideas and not rewarding students.

Tuckman (1972), states that some teachers teaching approaches are more of student centred, some are more of teacher centred, some ask more questions, others do more lecturing, some are warmer, some are more formal, some are task oriented some emphasise
social emotional spheres. This implies that sources of variability in classroom are represented by; the teachers’ philosophy or orientation, the manner in which the teacher manages the classroom and how teachers behave towards students.

Flanders (1970), originally developed a research tool, named the Flanders Interaction Analysis (FIA), which became a widely used coding system to analyze and improve teaching skills. As a result of research with his coding instrument, Flanders uncovered the two-thirds rule: about two-thirds of classroom time is devoted to talking, about two-thirds of this time the person talking is the teacher, and two-thirds of the teacher’s talk is “direct” (that is, lecturing, giving directions, and controlling students). The two-thirds rule is actually three related two-thirds rule that serves to substantiate that typically teachers verbally dominate the classroom. Teacher verbal domination of the classroom conditions makes students to become passive and dependent on the teacher. This dependency has adverse effects on students’ attitudes toward learning and students’ performance in school. Flanders in his observation technique found that when teachers are trained they become aware of the importance of language in the classroom, their verbal monopoly decreases.

To use the Flanders Interaction Analysis, one codes the verbal interaction in one of ten categories in the Flanders Interaction Analysis Coding Instrument (Flanders, 1970).

There has been much research on teacher talk (Long and Sato, 1983). Issues such as the amount and type of teacher talk, speech modifications made by teachers, instructions and explanations, error correction and questions have been more or less the centre of attention. Questions have also been cited as very important ingredients of classroom interactions.

Lynch (1991) characterizes a question as an utterance with a particular illocutionary force. He defined a question as a semantic class used to seek information on a specific subject.
Long and Sato (1983) and Brock (1986) investigated the role of questions in second language learning in the classroom environment. They worked on the role of teacher's question types (especially display and referential questions) and their facilitation to learning. Brock (1986), contends that referential questions increase the amount of learner output; therefore, an increased use of referential questions by teachers may create discourse which can produce a flow of information from students to the teacher, and may create a more near-normal speech. However, it is believed that display questions require short or even one-word answers and hence are less likely to get learners to produce large amounts of speech. Lynch quotes a number of researchers who investigated the balance between referential questions and display questions in the foreign language classroom.

Onduru (2002), did research on cognitive level of classroom instructional questions and their implications on student achievement in Biology, and found that question levels asked in class could not be the factor responsible for the high or low achievement in Biology. Teachers observed involved in activities such as explaining biological concepts, drawing diagrams on the board and giving or dictating notes to the students thus reducing the interaction of teacher and students through questioning. Comprehension questions formed the bulk of the questions followed by knowledge questions in the end of term examination. Analysis questions were very rare in most of the examinations done during and at the end of term.

### 2.11 Status of Classroom Verbal Interaction in Kenya.

While research has been done in other aspects of classroom interaction for example verbal classroom interaction patterns of selected secondary school Home science with their
students in Nairobi by Njuguna (2000), Analysis of classroom interaction patterns in Kenyan secondary schools Chemistry teachers and their undesirable behaviours by Wasanga (1982), and Verbal interactions in Physics classrooms in Kangundo District by Muteti (2009). Very little or none has been done in Classroom verbal interaction patterns in relation to student performance in Physics, hence the need for the present study.

The 1998 SMASSE baseline study documented several factors that directly or indirectly contributed to the poor performance in science and Mathematics. Some of them being: Poor attitude towards Sciences and Mathematics, lack of practical teaching and learning approach, poor teacher preparation etc. Considering these factors, it cannot be lost on any keen observer that the teaching/learning of these subjects needs a new orientation in terms of approaches and methodologies and in terms of priorities and policies. The prevailing situations where it is either little or no concern as to whether quality teaching/learning of sciences takes place or outright negative attitude needs to be altered. Attitude has far reaching influence in almost every aspect of a person’s mode of operation. It influences perspective and hence decision and actions. A positive attitude is an asset while a neutral and negative attitude is a drawback (Njuguna, (2000)).

Preferred teaching behaviour/styles may promote positive attitude towards learning of Physics concepts which is likely to improve student performance in Physics. This study sought to find out the above immediate statement.

The present secondary school Physics curriculum is built on the conception of science as both product and process. As a process, Physics has to do with the skills that are called into play by scientists in carrying out scientific investigation. This implies adopting an enquiry method in the teaching of Physics at the secondary school level. As a product
Physics is viewed as consisting of scientific facts, principles, laws and generalizations derived from scientific investigations. The new curriculum of science (Physics) adopts a child-centred approach, which requires that the teacher provides guidance to the students as the students participate actively in the teaching-learning process. Teaching of science, especially Physics, and performance of students at the secondary school level have been the concern of government and parents (Onah, (2010)).

2.12 Measuring Classroom Interaction

The present study involved observing Physics teachers when teaching. It was however, not possible to sit in a classroom and describe accurately what was happening because of the complexity of the spontaneous class behaviour. This view was also expressed by Flanders (1970), who observed that, even trained observers struggle with the same biases that distort the testimony of a witness at the scene of an accident. Too often the observers’ preconceptions of what s/he thinks should happen to allow him to perceive certain behaviours but prevent him from perceiving others. Interaction analysis is however an observation schedule designed to minimize these difficulties by permitting systematic record of spontaneous acts and scrutinizing the process of instruction by taking into account small bits of interaction that take place in classroom instruction.

Classroom interaction is particularly concerned with the influence patterns of the teachers’ behaviour. This might be considered biased, but it is bias in terms of pre determined concepts. The concepts in this case refer to teachers’ control of students’ freedom of action. Flanders (1970), Stated that it is not possible to record every detail of what happened hence more research was devoted to teacher and student talk. The advantage of
taking more interest only in verbal behaviour was because of its relative easiness to record. The major reason for lack of concern with non-verbal behaviours can be traced from the difficulties in categorisation, the elusiveness of meaning on non-verbal messages and seemingly the subordinate function the non-verbal behaviour plays in classroom settings. Flanders Interaction analysis Category (FIAC) is a ten category system for categorising teacher-student talk. There are other over 150 category systems used in the United States of America, many of which are expansion of the Flanders system. The Flanders system however was considered to be the most suitable observation system for this study because it is flexible, easy to record observations and gives room for modification. The researcher modified the FIAC instrument so as to make it useful in Physics where demonstrations and practicals are Central to the teaching of the subject. Flanders Scale for interaction analysis, Category Five was split into three parts namely: Lecture only, Lecture with illustrations and lecture with demonstrations.

2.13 Gaps in literature review

Most of the research done dealt with classroom interaction and gender, Others have concentrated on interaction patterns in primary and pre primary school pupils, Some extensive research has also been done on interaction in special education classrooms. Little research has been done on classroom verbal interaction patterns in relation to student performance. Research on classroom verbal interaction patterns in relation to student performance in Physics is not extensive. As at the time of my research, there was no evidence of research on classroom verbal interaction patterns in relation to student performance in Physics in Baringo Central Sub-County. This study hoped to fill the
intellectual gap existing in classroom verbal interaction patterns in relation to student performance in Physics in the said Sub-County.

In this chapter the investigator attempted to highlight what various scholars and Researchers have done on Classroom Verbal interaction patterns and their findings. The next chapter outlines the methodology of the study.
CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

This chapter described the methodology or procedures that were followed in conducting this study. The following issues are discussed:

i) Design of the study

ii) Target Population

iii) Sampling and Sample size

iv) Research instruments

v) Type of data and its analysis.

3.2. The Study Design

The study is a survey study design which allows for data collection from wide geographical coverage, and a large sample. In addition, the survey design entails the study of situations in their natural settings without manipulation of variables (Mugenda and Mugenda, (2003)). The researcher observed what was actually happening in the classrooms in the teaching of Physics as he coded and tabulated the data through FIAC. The study adopted Quantitative approach. The process is summarised in figure 3.1
The problem

Research target population: Secondary schools in Baringo

Sample

Randomly selected schools: Physics Teachers and Form 3 Students

Piloting

Instruments: SPAT, AS, PTQ, and FIAC

Data collection

Revised instruments

Data analysis and presentation of results

Conclusion and Recommendations

Source: Adopted from Cohen and Manion (2011:89), Research Methods in Education
3.3 Target Population

The target population was 12000 public secondary school Physics students and 60 Physics teachers of Baringo Central Sub-County.

A list obtained from the Sub-County education office showed that the Sub-County has 18 public secondary schools. (See appendix D)

The distribution of schools in Baringo Central Sub-County is shown in table 3.1

Table 3.1: Distribution of Schools in Baringo Central Sub-County.

<table>
<thead>
<tr>
<th>School Category</th>
<th>Type of school</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Mixed</td>
<td>Total</td>
</tr>
<tr>
<td>County Schools</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Sub-County Schools</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>18</td>
</tr>
</tbody>
</table>

Source: Sub-County Education Office, Baringo Central.

3.3.1 Sample Description

The primary sources of information in the study were:
a) Form three students in the stratified randomly sampled secondary schools in Baringo Central Sub-County. Form ones and twos were considered not adequately exposed to secondary school Physics curriculum. Form Fours were busy preparing for KCSE. Form Threes were therefore ideal as learners have decided to take Physics at KCSE level.

b) Some secondary school Physics teachers in the sampled schools and classes participated in the survey as they were considered to play a pivotal role in curriculum implementation. Purposive sampling was used to ensure that qualified teachers were selected; thereafter simple random sampling was used in schools with more than one stream.

3.3.2 Sample Selection Techniques

This selection explains how the sample was obtained.

a) Sub-County: Baringo Central Sub- County is selected purposely because it is among the Counties in Rift Valley with a cosmopolitan population and has been registering poor student performance in Physics.

b) School Category: The study was restricted to public secondary schools because they follow a common curriculum.

c) School Type: Stratified sampling technique was chosen because it guaranteed desired representation of relevant sub groups thus increasing the efficiency of population estimate. Schools in Kenya are classified into three: mixed, boys and girls schools. To ensure the above representation, stratified sampling is therefore favoured over random sampling.

d) Individual Schools: The schools were first divided into three strata; these are boys, girls and mixed schools. The schools were further sub-divided into County and Sub-
County secondary schools. In each category two schools were sampled (as shown in table 3.2) using ‘lucky dip’ type of simple random technique for categories to avoid bias.

e) Physics Teachers: Purposive sampling was used. Those teaching Form Three were chosen and if there was more than one stream, simple random sampling was used in order to get one Teacher.

f) Students: One class in each sampled school was used. Purposive sampling was used to select a Form Three class, and if there was more than one stream, simple random sampling was used to select one class. A class had between forty and sixty students.

3.3.3 The Sample Size

This section describes the methods used in determining the sample size used in the study.

a) Number of Schools: Baringo Central Sub- County has 18 public secondary schools (CDE’s office Baringo). Six public secondary schools were considered in this study as shown in table 3.2.

<table>
<thead>
<tr>
<th>Table 3.2: Sampling Grid for Schools.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School Category</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>County Schools</td>
</tr>
<tr>
<td>District Schools</td>
</tr>
</tbody>
</table>
c) Number of Students who participated

The sample of respondent was determined using the formula adapted from Mugenda and Mugenda (2003). Thus

\[ n = \frac{Z^2pq}{d^2} \]

Where:

n is the sample size

Z is coefficient of the standard score in a normal distribution.

P is proportion in the target population estimated to have characteristics being measured and is assumed to be 50% i.e. 0.5

q = 1-p

d is the significance level of this study which would be taken to be 0.05.

\[ n = \frac{(1.96)(1.96)(0.50)(0.50)}{(0.05)(0.05)} = 363. \]
This implies that 363 students sat for Students Physics Achievement Test (SPAT) and also filled the Attitude Scale (AS) questionnaire.

e) **Number of Teachers:** Four lessons of one Physics teacher from each sampled school were observed, this means a total of 6 Physics teachers and 24 lessons were observed, and all Physics teachers in the sampled secondary schools filled the Physics Teachers Questionnaires (PTQ).

### 3.4 Research Instruments

The study used four sets of instruments

#### 3.4.1 Students Physics Achievement Test (SPAT) (Appendix A)

It was constructed with items adopted from KNEC (2009). The test was designed to aid in evaluating the performance of learners in different Physics areas.

#### 3.4.2 Physics Teachers’ Questionnaire (PTQ) (Appendix B).

This instrument attempted to document the academic and teaching qualifications of teachers, their teaching experience, work load and their opinion towards the teaching of Physics.

#### 3.4.3 Flanders Interaction Analysis Category (FIAC) (Appendix C)

This was the main instrument for the study. The researcher, a non- participatory observer, sat at the back of the classroom and coded up every 3 seconds verbal exchanges between teacher and students by means of a structured set of observational categories.
3.4.4 Attitude Scale for Students (AS) (Appendix D)

This instrument was adapted from Flanders (1970), it sought information on student’s attitudes and values towards learning of Physics.

3.5 Piloting the Instruments.

The instruments were piloted in one mixed school (public) in Baringo Central Sub-County in order to refine them and enhance their validity and reliability.

The refined instruments were then administered to the sample respondents in the main study. The process of refinement was necessary in order to determine the difficulty of the items in the instruments, check appropriateness and level of language used, estimate the time allocation for items and enhance the validity and reliability of the items.

3.6 Reliability and Validity of Research Instrument

Before the actual data was collected, the researcher conducted a pilot study in a mixed public secondary school in Baringo Central Sub-County among 2 Physics teachers and 41 Physics students giving a total of 43 cases, which is within the minimum number of cases required for conducting statistical analysis as recommended by Mugenda and Mugenda (2003). The purpose of the pilot study was to enable the researcher to ascertain the reliability and validity of the instruments, and to familiarize himself with the administration of the questionnaires and Flanders Interaction Analysis Category (FIAC).

The respondents were requested to comment on the language and length of the questionnaire. The questionnaires were revised accordingly after the pilot study, ready to be administered to the respondents in the main study.
3.6.1 Validity

Key (1997), defines validity as the degree to which a test measures what it is supposed to measure. Conversely, validity in research refers to the extent to whether the outcome of the study is a function of the program or approach being tested rather than the results of other causes not systematically dealt with in the study, and whether the results obtained would apply in the real world to similar programs (Babbie and Mouton, (2001)).

Mugenda and Mugenda (2003), defined validity as the accuracy and meaningfulness of inferences, which are based on research results. Content validity was used as a measure of the degree to which data obtained from the research instruments meaningfully and accurately reflect or represent theoretical concept. Validity, according to Borg and Gall (1989) is the degree to which a test measures what it purports to measure. All assessments of validity are subjective opinions based on the judgment of the researcher (Wiersma, (1995)). The pilot study helped to improve face validity of the instruments.

According to Borg and Gall (1989), content validity of an instrument is improved through expert judgment. As such, the researcher sought assistance of his supervisors, who, as experts in research, helped improve content validity of the instrument. To establish the validity of the research instrument for this study the researcher gave copies of the questionnaire to the supervisors of the department of Educational Communication and Technology, Kenyatta University to check if it represented all the objectives of the study. Several typographical errors and omissions detected were corrected and the instrument confirmed to be adequate for use in the main study.
3.6.2 Reliability

Mugenda and Mugenda (2003), defined reliability as a measure of the degree to which a research instrument yields consistent results or data after repeated trial. According to Mugenda and Mugenda (2003), reliability is the accuracy and meaningfulness of inferences which are based on research results that is the degree to which results obtained from the analysis of the data actually represent the phenomena under study. Key (1997), asserts that the reliability of a research instrument concerns the extent to which the instrument yields the same results on repeated trials. The instrument was administered in a consistent fashion to enhance reliability of the measurement instrument.

The pilot study enabled the researcher to assess the clarity of the questionnaire items so that those items found to be inadequate or vague were modified to improve the quality of the research instrument thus increasing its reliability. The instruments were administered once to Physics teachers and students and Cronbach’s Coefficient Alpha was computed for the questionnaire to determine the reliability of the research instrument. A reliability coefficient of 0.7 or over was assumed to reflect the internal reliability of the instruments (Fraenkel and Wallen, 2000). This is because likert type questions are best tested for reliability using Cronbach’s Coefficient Alpha which combines all the items and advises on which item to discard if it does not capture what it is intended to capture (Neuman, 2000). From the results the Cronbach’s Coefficient Alpha was found to be 0.881 and showed that the research instrument was consistent.
3.7 Data Collection Procedure

This involved actual administration of the research instruments; it was preceded by the researchers preliminary visits to the schools sampled out in the study. During these visits the researcher sought to strike rapport with school authorities and to explain the purpose of the study verbally and to make necessary arrangements for the actual administration of the research instruments and data collection.

The researcher organised to meet the teachers one week prior to the lesson to create a rapport, request and encourage the particular Physics teachers to teach normally despite the researcher’s presence, so as to reduce anxiety and the observer effect. Also to minimize the same effect no data was collected for the first three classroom visits (lessons). This assumed that the teacher was allowed to teach as he normally did because the researcher had become familiar with him/her and also with the students. During each time of visit the researcher talked freely with both teacher and students in and outside classroom whenever time allowed. Doing this, the researcher was still trying to make himself more familiar hence minimizing more observer effect.

Borg and Gall (1993), qualified the observer effect when they argued that unless he is concealed the observer is likely to have an impact on the observed, for example an observer entering classroom for first time probably would arouse the curiosity of the students and possibly the teacher, resulting into inattentiveness of the students to the teacher. This may not reflect his usual behaviour and thus may provide non – representative data. To prevent this situation the observer should not record any observation for the first time he is in classroom.
The other instrument, SPAT, aided in evaluating student performance in relation to various verbal interaction patterns. PTQ attempted to document the academic and teaching qualifications of teachers, their teaching experience, work load and their opinion towards the teaching of Physics. AS sought information on attitudes and values of learners towards the learning of Physics. SPAT, PTQ and AS were administered with the assistance of Physics teachers. (Refer to appendices A to E in Pages 96-103). The results obtained are presented in the next chapter which also contains analysis of the said data.

CHAPTER FOUR: DATA ANALYSIS, RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

This chapter presents data analysis and the research findings on classroom verbal interaction patterns in relation to student performance in Physics in Baringo Central Sub-County, Kenya. The data for this study was collected through direct contact Observation and questionnaires, of which the resulting data were analyzed through descriptive (frequencies, percentages) and inferential statistics. The data was presented in tables, bar graphs and Pie charts. The data was analyzed to enable the researcher achieve the following research objectives;

a) To investigate the relationship between verbal interaction patterns and the level of learners’ participation in learning activities in Physics classrooms.

b) To establish the ratio of teachers direct to indirect behaviour based on verbal interactions in Physics classrooms.
c) To investigate the relationship between classroom verbal interaction patterns and student performance in Physics.

### 4.2 Background Information

The background information was obtained on the students’ and teachers’ gender, type of school and category of the school, as well as the teachers professional qualifications, teaching experience, classes they teach and teaching/Learning method used when teaching Physics.

#### 4.2.1 Data Analysis

It entailed analysis of the results of the study. The data collected was analysed using SPSS computer software. Data collected through FIAC was tabulated and coded. Each table was analysed and interpreted using percentages. In order to calculate, all the categories from 1 to 10 were added and the mean of 10 categories for 6 secondary classes calculated. In order to calculate the talk time, frequencies from categories 1 to 9 were added and converted into percentages by dividing the frequencies with total time of interaction. To calculate the teacher’s talk time, frequencies from categories 1 to 7 were added and converted into percentages by dividing the frequencies with total talk time. To calculate the teacher’s direct talk time, frequencies from categories 5 to 7 were added and converted into percentages by dividing the frequencies with teacher’s talk time. To calculate the teacher’s indirect talk time, frequencies from categories 1 to 4 were added and converted into percentages by dividing the frequencies with teacher’s talk time.

Inferential statistics of Pearson correlation was used to determine the relationship between classroom interaction pattern and student performance in Physics. Qualitative data from
the Likert scale was analysed quantitatively by considering inferences that were made from opinions of the respondents which assisted the researcher to answer the research questions and the objectives of the study.

4.2.2 Respondents by Gender

The gender of teachers and pupils who participated in the study was varied as summarized in Figure 4.1. Majority of the teachers (88.9%) and (50.4%) of the students were male, while (11.1%) teachers and (49.6%) students were female. This showed that majority of teachers and students involved in the study were males, thus there was gender disparity in the distribution of respondents in the study area. The Figure 4.1 shows Respondents by Gender
Figure 4.1 Respondents by Gender

From the bar graph, it can be seen that there is a very high gender disparity among the secondary school Physics teachers. Female teachers are too few (11.1%) as compared to their male counterparts, this implies that girls in secondary schools may not have enough role models in as far as Physics is concern, and this may have made the number of girls who take Physics to be lower than for boys. These findings agree with the findings of Muteti (2009), who did research on verbal interactions in Physics classrooms in some selected secondary schools in Kangundo Sub-County of Machakos County, and found that eighty percent (80%) of the Physics teachers were male, meaning that female Physics teachers were few.

4.2.3 Teacher and Student Population across the Type of Schools

The type of school teachers and students were drawn from Boys’, Girls’ and mixed boarding schools. The results were varied as shown in table 4.2. It is seen that 38.9% teachers and 33.1% students were from boys’ school, with 33.3% teachers and 33.9% students from mixed boarding schools and 27.8% teachers and 33.1% students from girls’ schools. These findings indicate that majority of the teachers were from boys schools followed by teachers from mixed boarding schools. The students’ distribution was comparable in all the three categories of schools. Table 4.2 shows the type of schools which were involved in the research.

Table 4.1: Teacher and Student Population across the Type of Schools

<table>
<thead>
<tr>
<th>Type of school</th>
<th>Teachers</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>Boys</td>
<td>7</td>
<td>38.9</td>
</tr>
<tr>
<td>Girls</td>
<td>5</td>
<td>27.8</td>
</tr>
<tr>
<td>Mixed Boarding</td>
<td>6</td>
<td>33.3</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>100.0</td>
</tr>
</tbody>
</table>

From table 4.1, it is notable that Physics teachers in girls, boys and mixed boarding schools were comparable. The number of students involved in this research was almost the same in all the three categories of schools, this is because a stream of the Physics Form Three classes was sampled in every school hence each stream has almost equal number of students, However this does not mean that Physics students were equal in all the schools involved in this research. It was also found that boys studying Physics in mixed boarding schools are more than girls. It is therefore implied that the number of boys studying Physics is greater than the number of girls in Baringo Central Sub-County. The findings agree with Kenya National Examination Council (2009) KCSE report which showed that out of the total number of students who sat for Physics exam in 2009, majority were boys. The reason for small number of girls can be attributed to the type of interaction pattern which is dominant in their classrooms, this agrees with Sadker and Sadker (1985), who found that teachers responded differently to boys and girls in the class, with boys tending to dominate classroom interactions and teachers accepting their dominance by accepting boys’ feelings, reinforcing and accepting their ideas. This gave a democratic climate to boys and an autocratic climate to the girls inhibiting girls’ participation in class causing
discouragement and making most of them to drop Physics at Form Two. Muteti (2009), in his research on verbal interactions in Physics classrooms in some selected secondary schools in Kangundo district found that Girls schools were the most affected by use of direct teaching methods. However this was refuted by the findings of Njuguna (2000), who found that in girls schools teachers accepted students’ feelings, reinforced and accepted students ideas hence giving students opportunity to participate freely in the classroom discussion, this gave rise to democratic classroom climate causing positive attitude to the teacher and the subject.

4.2.4 Professional Qualification of Physics Teacher

This study sought to establish the highest qualification of the Physics teachers and the findings are as presented in Figure 4.2. Majority of the teachers (72.2%) had bachelor’s degree and 22.2% had Masters Degree in Education. One teacher had post graduate diploma in education (PGDE). The findings indicate that all Physics teaches in the selected schools had relevant professional training. Figure 4.2 shows Professional Qualifications of Physics Teachers who participated in the Research.
The pie chart above shows that majority of the Physics teachers were B.Ed graduates. M.Ed graduates were relatively few; this could be attributed to the fact that M.Ed graduates are employed as Tutors and lecturers in middle level colleges and universities respectively. Teachers’ Service Commission has stopped employing P.G.D.E. graduates and this may explain why very few of them are teaching Physics in secondary schools.

**4.2.5 Teaching Experience of Physics Teachers**

The more a teacher is experienced the more he or she knows how to handle the learners and teach them Physics effectively. The teaching experience of teachers was varied, as shown in the Figure 4.3. Majority (8 out of 18) teachers had between 11 and 15 years teaching experience and 6(33.3%) had between 3 and 6 years teaching experience.
Figure 4.3: Teaching Experience of Physics Teachers

Only one teacher had 7-10 years teaching experience. Three teachers representing 16.7% had 16 - 20 years teaching experience. The findings indicate that most of the teachers had above 11 years teaching experience; therefore they were in a good position to teach Physics effectively based on their experience.

4.2.6 Classes Taught by Physics Teachers

From the study 6(33.3%) of the teachers taught Physics all forms (form 1 to 4), with 4(22.2%) teaching forms 1,2,3 and 3(16.7%) teaching form 3 and 4 and forms 2,3 and 4. Table 4.2 shows Classes taught by Physics teachers.
Table 4.2 Classes Taught by Physics Teachers

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form 3</td>
<td>1</td>
<td>5.6</td>
<td>5.6</td>
<td>5.6</td>
</tr>
<tr>
<td>Form 1,2,3</td>
<td>4</td>
<td>22.2</td>
<td>22.2</td>
<td>27.8</td>
</tr>
<tr>
<td>Form 3&amp;4</td>
<td>3</td>
<td>16.7</td>
<td>16.7</td>
<td>44.4</td>
</tr>
<tr>
<td>All forms (1-4)</td>
<td>6</td>
<td>33.3</td>
<td>33.3</td>
<td>77.8</td>
</tr>
<tr>
<td>Form 2,3&amp;4</td>
<td>3</td>
<td>16.7</td>
<td>16.7</td>
<td>94.4</td>
</tr>
<tr>
<td>Form 1,3&amp;4</td>
<td>1</td>
<td>5.6</td>
<td>5.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

The findings indicate that most of the Physics teachers teach all classes in their schools. The teachers who teach Physics to all forms could be teaching one stream in each of the four forms or have specialised in teaching Physics, this is common in schools with four or more streams. Teachers who teach Physics one class only could mean they do teach another subject apart from Physics. It is a requirement by TSC that every secondary school teacher must have trained in at least two teaching subjects.

4.2.7 Main Teaching/Learning method used in teaching Physics

Various methods were used by Physics teachers while teaching Physics as summarized in Figure 4.4. Majority of the teachers (66.7%) used lecture method while those who used demonstration and question - answer method are 16.7% each.
Figure 4.4: Main Teaching/Learning Method used in Teaching Physics

The high use of lecture method implies that teachers dominated the classroom talk. This teaching method is extremely expository in approach and can inhibit student participation in classroom activities. This according to Maundu et al. (2005), involves the kind of classroom teaching which is characterised by the predominance of the teacher, the teacher gives facts, explains concepts, gives illustrations and applications. The learner’s participation in learning is in listening and answering teachers’ questions. This approach limits the verbal interaction in the classroom and therefore it is not useful in the presentation of Physics as a practical science subject. Twoli (2006), observed that there should be less emphasis on the expository type of methods while teaching sciences and hence more emphasis should be put on the discovery/heuristic approaches.

The findings of this research agree with Muthwii (1987), who found that eighty percent (80%) of the time in class is spent on lecturing by the teacher and recommended that there was need to involve learners fully while teaching. The researcher attempted to ask the
teachers why they preferred using lecture method the answer was that the topics they were handling at the time did not have practical hence lecture method was the most suitable method, this agreed with Lang, Mc Beath and Hebert (1995) and with Maundu et al. (2005), that there are some cases which call for the use of lecture method while teaching. Rurigi and Magondu (2004), also asserted that the expository approach is not very effective in teaching sciences although some topics call for its use because of their very nature, that is, they are difficult to teach practically.

4.2.8 Category of School

Majority of the students 243 (66.9%) involved in the study were drawn from County schools, while 120 (33.1%) were from district schools. This indicates that majority of the students involved in this research are the students whose entry behaviour was high when joining secondary school. Figure 4.5 shows Category of schools students involved in the research process.
From the pie chart it can be seen that majority of the students involved in this research are from county schools, this is because few students choose Physics in district/Sub-County schools. There are no national schools in Baringo Central Sub-County.
4.3 Relationship between Verbal Interaction Patterns and the Learner’s Participation in Physics Learning Activities as analysed from FIAC

The entries of all the 10 categories for each teacher for the total 4 observations were recorded in table 4.3 and the percentage observations of each category calculated.

<table>
<thead>
<tr>
<th>Teachers</th>
<th>Teacher A</th>
<th>Teacher B</th>
<th>Teacher C</th>
<th>Teacher D</th>
<th>Teacher E</th>
<th>Teacher F</th>
<th>Total observations</th>
<th>% of total observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>0</td>
<td>33</td>
<td>6</td>
<td>1</td>
<td>34</td>
<td>76</td>
<td>0.44</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
<td>21</td>
<td>101</td>
<td>24</td>
<td>29</td>
<td>112</td>
<td>306</td>
<td>1.78</td>
</tr>
<tr>
<td>3</td>
<td>98</td>
<td>87</td>
<td>150</td>
<td>99</td>
<td>89</td>
<td>173</td>
<td>696</td>
<td>4.04</td>
</tr>
<tr>
<td>4</td>
<td>512</td>
<td>497</td>
<td>1120</td>
<td>504</td>
<td>513</td>
<td>1003</td>
<td>4149</td>
<td>24.08</td>
</tr>
<tr>
<td>5a</td>
<td>1141</td>
<td>1166</td>
<td>30</td>
<td>1139</td>
<td>1099</td>
<td>21</td>
<td>4596</td>
<td>26.68</td>
</tr>
<tr>
<td>5b</td>
<td>27</td>
<td>31</td>
<td>36</td>
<td>31</td>
<td>28</td>
<td>35</td>
<td>188</td>
<td>1.09</td>
</tr>
<tr>
<td>5c</td>
<td>91</td>
<td>98</td>
<td>109</td>
<td>89</td>
<td>93</td>
<td>121</td>
<td>601</td>
<td>3.49</td>
</tr>
<tr>
<td>6</td>
<td>273</td>
<td>274</td>
<td>5</td>
<td>281</td>
<td>275</td>
<td>7</td>
<td>1115</td>
<td>6.47</td>
</tr>
<tr>
<td>7</td>
<td>365</td>
<td>348</td>
<td>0</td>
<td>351</td>
<td>350</td>
<td>3</td>
<td>1417</td>
<td>8.23</td>
</tr>
<tr>
<td>8</td>
<td>121</td>
<td>127</td>
<td>1021</td>
<td>123</td>
<td>128</td>
<td>1007</td>
<td>2527</td>
<td>14.67</td>
</tr>
<tr>
<td>9</td>
<td>67</td>
<td>68</td>
<td>512</td>
<td>71</td>
<td>69</td>
<td>601</td>
<td>1388</td>
<td>8.06</td>
</tr>
<tr>
<td>10</td>
<td>36</td>
<td>50</td>
<td>1</td>
<td>38</td>
<td>40</td>
<td>3</td>
<td>168</td>
<td>0.98</td>
</tr>
<tr>
<td>Total</td>
<td>2752</td>
<td>2767</td>
<td>3118</td>
<td>2756</td>
<td>2714</td>
<td>3120</td>
<td>17227</td>
<td>100.00</td>
</tr>
</tbody>
</table>
From Table 4.3, it can be seen that category 5a (lecture only) was most commonly used by Physics teachers in Baringo Central Sub-County. Most of the Physics lessons were characterised by use of direct teaching behaviour (direct verbal interaction patterns) as shown by total percentage observations of categories 5 to 7 with a total of 45.96% which was followed by indirect teaching behaviour (indirect verbal interaction patterns) with total percentage observations of categories 1 to 4 of 30.34%. Student talk had the least total percentage observations as recorded in categories 8 to 10 with a total observations of 23.71%.

Majority of the teachers except teacher C and F mainly used direct classroom verbal interaction patterns, this inhibited student talk as it is seen that teachers with higher observations in categories 5 to 7 had lower percentage observations in categories 8 to 10. Conversely teachers with higher total percentage observations in categories 1 to 4 also had higher total percentage observations in categories 8 to 10; therefore total percentage observations of categories 1 to 4 were directly proportional to total percentage observations of categories 8 to 10. It can therefore be concluded that use of indirect classroom verbal interaction patterns elicited student talk and student participation in Physics classrooms while direct classroom interaction patterns inhibited student talk and participation in Physics classrooms.

4.3.1 Teachers Views’ on Learner’s Participation in Learning Activities

The teachers’ views on Learners’ participation in learning activities were varied during the study as summarized in table 4.4. Most of the teachers 13(72.2%) agree that students don’t ask for clarity in areas they don’t understand and they don’t participate actively in
classroom activities, with 5(17.8%) disagreeing that students don’t ask for clarity in areas they don’t understand and they don’t participate actively in classroom activities. Most of the teachers 13(72.2%) agree that students do not ask questions during Physics lessons and they remain quiet many at times during Physics lessons. Table 4.4 summarizes this scenario.

Table 4.4 Teachers’ Views on Learner’s Participation in Learning Activities

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students don’t ask for clarity in areas they don’t understand</td>
<td>11 61.1</td>
<td>2 11.1</td>
<td>2 11.1</td>
<td>3 16.7</td>
</tr>
<tr>
<td>Students don’t participate actively in classroom activities</td>
<td>8 44.4</td>
<td>5 27.8</td>
<td>2 11.1</td>
<td>3 16.7</td>
</tr>
<tr>
<td>Students do not ask questions during Physics lessons</td>
<td>6 33.3</td>
<td>7 38.9</td>
<td>2 11.1</td>
<td>3 16.7</td>
</tr>
<tr>
<td>Students remain quiet many times during Physics lessons</td>
<td>9 50.0</td>
<td>4 22.2</td>
<td>0 0</td>
<td>5 27.8</td>
</tr>
</tbody>
</table>
From Table 4.4, it is seen that most of the teachers agree that students don’t ask for clarity in areas they don’t understand and don’t participate actively in classroom activities. Most of the teachers agree that students do not ask questions during Physics lessons and they remain quiet. This finding may have been contributed by high use of lecture method in teaching Physics.

4.3.2 Students’ Views on Learner’s Participation in Learning Activities

The student’s views on learner’s participation in learning activities were varied during the study as summarized in Table 4.5. Most of the students 225(62%) disagree that most of the students ask questions during Physics lessons with 136(37.2%) agreeing that most of the students ask questions during Physics lessons. Most of the students 228(62.8%) agree that much of the time in the lesson is dominated by the teacher talking. Most of the students 228(62.8%) agree that students keep quiet when asked questions by the teacher during Physics lessons with 129(36%) disagreeing that much of the time in the lesson is dominated by the teacher talking. About half of the students agree that students keep quiet when asked questions by the teacher during Physics lessons. About (48%) disagree. Approximately half the numbers of students fear answering questions in class. Table 4.5 has the details.
Table 4.5: Students’ Views on Learner’s Participation in Learning Activities

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Undecided</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>Most of the students ask questions during Physics lessons</td>
<td>75</td>
<td>20.7</td>
<td>60</td>
<td>16.5</td>
<td>3</td>
</tr>
<tr>
<td>Much of the time in the lesson is dominated by the teacher talking</td>
<td>144</td>
<td>39.7</td>
<td>84</td>
<td>23.1</td>
<td>6</td>
</tr>
<tr>
<td>Students keep quiet when asked questions by the teacher during Physics lessons</td>
<td>69</td>
<td>19.0</td>
<td>114</td>
<td>31.4</td>
<td>6</td>
</tr>
<tr>
<td>Students fear answering questions</td>
<td>75</td>
<td>20.7</td>
<td>105</td>
<td>28.9</td>
<td>27</td>
</tr>
</tbody>
</table>

Table 4.5 shows that 39.7% of the students agree that much of the time in the lesson is dominated by the teacher talking and they keep quiet when asked questions by the teacher.
during Physics lessons. Majority of Students do not agree on the statement saying most of the students ask questions during Physics lessons.

It is realised from both teachers and students’ views on learners’ participation as shown in table 4.4 and 4.5 that students’ participation in Physics classrooms is very minimal. The views of both teachers and students concur. This results might have been caused by an autocratic type of climate in the Physics classrooms which agrees with Njui (1989), who carried out research on the immediate feedback on teaching behaviour patterns of secondary school music teachers and observed that music teachers used more of drill teaching behaviour patterns against problem solving teaching methods, irrespective of feedback to them to try and change their behaviour pattern. She found that teachers took control of the class as students’ freedom remained limited, being denied opportunities to be creative. The teachers dominated the classroom talk and most of the time they controlled interchange using category 6 of FIAC which deals with giving directions to the students on what to do or say. This behaviour inhibited students’ participation in classroom activities. Muteti (2009) also found that most of the teachers in boys, mixed and girls schools use direct teaching methods like lecture method, the teachers talk dominated almost all the lessons, creating autocratic climate in the classroom, and same sentiments are supported by the findings of this research.

4.3.3 Verbal Interaction Patterns

The Verbal interaction patterns were sought in the study in order to determine its relationship with learner’s participation in learning activities as summarised in table 4.6. The findings showed that majority of the students 201(55.4%) agree that teachers ask
questions during Physics lessons and 162(44.7%) disagree that teachers ask questions during Physics lessons.

Most of the students 189(52%) disagree that Physics teachers encourage students to ask questions during and after the lesson and 168(46.3%) agree that Physics teacher encourage students to ask questions during and after the lesson. Most of the students 207(57%) disagree that Physics teacher redirects questions asked by students to other students for answers and 129(35.5%) agree that Physics teacher redirects questions asked by students to other students for answers. Table 4.6 gives the Students views on Verbal interaction patterns.
<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Undecided</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>The teacher asks questions during Physics lessons</td>
<td>135</td>
<td>37.2</td>
<td>66</td>
<td>18.2</td>
<td>0</td>
</tr>
<tr>
<td>Physics teacher encourage students to ask questions during and after the lesson</td>
<td>108</td>
<td>29.8</td>
<td>60</td>
<td>16.5</td>
<td>6</td>
</tr>
<tr>
<td>Teacher redirects questions asked by students to other students for answers</td>
<td>72</td>
<td>19.8</td>
<td>57</td>
<td>15.7</td>
<td>27</td>
</tr>
</tbody>
</table>
Table 4.6 shows that the dominant type of interaction pattern is direct teaching behaviour characterised by lecturing, reciting facts, asking questions and criticizing.

### 4.3.4 Physics Teachers Spend Most of the Time in Class Giving Directions

The verbal interaction patterns were sought from the teachers using their response on how they spend most of the time in class giving directions as shown in Figure 4.6. The findings showed that majority 13(72.2%) of Physics teachers agree that they spend most of the time in class giving directions while only 5(27.8%) disagree. Figure 4.5 shows ratings of Physics teachers’ time spend on giving instructions.

![Figure 4.6: Ratings of Physics Teachers’ Time Spend on Giving Instructions](image)

The bar graphs in figure 4.6 shows that most of the teachers in class spent much time giving out instructions to students. This agreed with Njuguna (2000), who found that in
boys’ schools classrooms the teacher did most of the teaching, the teacher was active agent while the students were passive. There was very little participation in the lesson and most of the students just listened and obeyed teachers’ orders. This gave rise to autocratic classroom climate. The teachers dominated the lesson and limited the opportunity for students to participate freely in classroom talk.

4.4 The Relationship between Verbal Interaction Patterns and the Learner’s Participation in Learning Activities

During the analysis of the study, the Pearson correlation was used to establish relationship between verbal interaction patterns and the learner’s participation in learning activities. The correlation analysis was used to establish the relationship between two variables in a linear fashion. It was appropriate to use the technique for interval and ratio-scaled variables and determine the relationship between one variable and another. This was achieved by correlating verbal interaction patterns and the learner’s participation in learning activities. From Pearson’s Correlation results, there was a strong positive relationship between learner’s participation and indirect verbal interaction patterns ($r = 0.960$ and 2 tailed) (PTQ). The findings showed that verbal interaction had an influence on the learner’s participation as seen in the (PTQ) analysis. (Table 4.7)
Table 4.7: Relationship between Verbal Interaction Patterns and Learner’s Participation as Seen in (PTQ) Analysis

<table>
<thead>
<tr>
<th></th>
<th>Participation (PTQ)</th>
<th>Verbal Interaction (Indirect)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation (PTQ)</td>
<td>Pearson Correlation</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig.(2-tailed)</td>
<td></td>
</tr>
<tr>
<td>Verbal Interaction</td>
<td>Pearson Correlation</td>
<td>0.960**</td>
</tr>
<tr>
<td></td>
<td>Sig.(2-tailed)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed)

b. List wise N = 18

Table 4.7 shows results from Physics teachers’ questionnaires (PTQ), which is suggesting that indirect verbal interaction has strong positive influence on participation of the learners.

4.4.1 Relationship between Verbal Interaction Patterns and Learner’s Participation as Analysed from Attitude Scale (AS)

Pearson correlation was used to establish verbal interaction patterns and Student participation. From Pearson’s Correlation results there was a strong negative relationship between direct teaching behaviour and Student participation ($r = -0.788$ and 2 tailed). The findings showed that direct behaviour had a negative influence on Student participation in Physics lessons. This means the dominant use of indirect behaviour in Physics class maximizes student participation in Physics lessons.
Table 4.8: Relationship between Verbal Interaction Patterns and Learner’s Participation as Analysed from Attitude Scale (AS)

<table>
<thead>
<tr>
<th>Participation (PTQ)</th>
<th>Pearson Correlation</th>
<th>Sig.(2-tailed)</th>
<th>Verbal Interaction (Direct)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation (PTQ)</td>
<td>Pearson Correlation</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Verbal Interaction (Direct)</td>
<td>Pearson Correlation</td>
<td>-0.788**</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig.(2-tailed)</td>
<td>0.000</td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed)

b. List wise N = 363

The students opinions as analysed in table 4.8 show that direct behaviour has a strong negative influence on learners participation. This means dominant use of direct behaviour in physics class minimizes student participation in physics lessons.

4.4.2 Relationship between Verbal Interaction and Learner’s Participation as Analysed from FIAC

Pearson correlation was used to establish the relationship between Verbal interaction and learner’s Participation (Student talk) of FIAC. From Pearson’s Correlation results there was a strong negative relationship between learner’s participation and direct Verbal interaction (r = -0.986), however there was a strong positive relationship between (r = 0.927) participation and indirect Verbal interaction. Direct verbal interaction had a negative influence on the student Participation (Student talk) while indirect verbal interaction had a positive influence on learner’s Participation
Table 4.9: Relationship between Verbal Interaction and Participation (Student talk)

<table>
<thead>
<tr>
<th></th>
<th>Participation</th>
<th>Indirect</th>
<th>Verbal Interaction (Direct)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td>Pearson Correlation</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig.(2-tailed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect</td>
<td>Pearson Correlation</td>
<td>0.927**</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig.(2-tailed)</td>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>Pearson Correlation</td>
<td>-0.986**</td>
<td>-0.970**</td>
</tr>
<tr>
<td></td>
<td>Sig.(2-tailed)</td>
<td>0.000</td>
<td>0.001</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed)

b. List wise N = 6

Results from tables 4.7, 4.8 and 4.9 agree that direct teaching behaviour inhibits student participation while indirect teaching behaviour encourages student participation in Physics lessons. Tables 4.7, 4.8 and 4.9 were obtained from analysis of data from PTQ, AS and FIAC instruments respectively. The findings agree with Muteti (2009), who researched on verbal interactions in Physics classrooms in some selected secondary schools in Kangundo district and found that, the student interaction pattern were characterised by teachers use of more directions and criticisms to guide students actions in class than teachers acceptance of student feelings, attitudes, praise, encouragement of students actions and acceptance of students’ ideas. This gave rise to autocratic classroom climate where the teachers
dominated the teaching-learning process and limited the opportunities for students to participate freely in the classroom activities.

4.5 The Ratio of Teachers Direct to Indirect Behaviour Based on Verbal Interactions in Physics Classrooms.

The second objective of the study was to establish the ratio of teachers’ direct to indirect behaviour based on verbal interactions in Physics classrooms. This was found to be important in order to determine the ratio of teachers direct to indirect behaviour based on verbal interactions in Physics classrooms. The mean of the teacher’s indirect and direct behaviour based on verbal interactions in Physics classrooms was used to address this objective.

4.5.1 Descriptive Statistics on Teachers Indirect Influence

From the study the indirect behaviour based on verbal interactions in Physics classrooms was found to highly use asking of questions, followed by using accepting or using ideas of students in their Physics lessons as shown in Table 4.10.
Table 4.10: Descriptive Statistics on Teachers Indirect Influence

<table>
<thead>
<tr>
<th>No of observation</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accept feelings</td>
<td>6</td>
<td>0.04</td>
<td>1.23</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.57</td>
</tr>
<tr>
<td>Praises or encourages</td>
<td>6</td>
<td>0.18</td>
<td>4.78</td>
<td>1.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.24</td>
</tr>
<tr>
<td>Accepts or uses ideas of students</td>
<td>6</td>
<td>0.28</td>
<td>12.94</td>
<td>5.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.67</td>
</tr>
<tr>
<td>Ask questions</td>
<td>6</td>
<td>4.46</td>
<td>15.55</td>
<td>11.38</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.17</td>
</tr>
</tbody>
</table>

The summary of the study in Table 4.11 showed that the direct behaviour based on verbal interactions in Physics classrooms was dominated by lecture with mean of 34.19, followed distantly by criticizing or justifying authority (7.96), third in the list is giving directions (6.22) followed closely by lectures with illustrations (4.83). The least used category was lectures with demonstrations registering the smallest mean of 0.82.
Table 4.11: Descriptive Statistics on Teachers Direct Influence

<table>
<thead>
<tr>
<th></th>
<th>No of observation</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures only</td>
<td>6</td>
<td>11.69</td>
<td>49.91</td>
<td>34.19</td>
<td>17.57</td>
</tr>
<tr>
<td>Lectures with illustrations</td>
<td>6</td>
<td>0.47</td>
<td>12.72</td>
<td>4.83</td>
<td>5.79</td>
</tr>
<tr>
<td>Lectures with demonstrations</td>
<td>6</td>
<td>0.02</td>
<td>1.95</td>
<td>0.82</td>
<td>0.74</td>
</tr>
<tr>
<td>Giving directions</td>
<td>6</td>
<td>1.21</td>
<td>11.81</td>
<td>6.22</td>
<td>4.49</td>
</tr>
<tr>
<td>Criticizing or justifying authority</td>
<td>6</td>
<td>0.27</td>
<td>22.63</td>
<td>7.96</td>
<td>8.50</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From table 4.11, it is evident that the use of lecture method in Physics classrooms is quite high with a mean of 34.19, implying that 63% of the lesson is spent by lecturing only. The percentage is however less than what was found by Muthwii (1987), who researched on verbal interaction in Chemistry classrooms and found that 80% of the time is spent in lecturing by the teacher and recommended that there was need to involve learners fully during lessons.
Table 4.12: Descriptive Statistics on Ratio of Indirect to Direct Behaviour Based on Verbal Interactions in Physics Classrooms

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Error</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect</td>
<td>6</td>
<td>1.26</td>
<td>7.24</td>
<td>4.8638</td>
<td>.91516</td>
<td>2.24169</td>
</tr>
<tr>
<td>Direct</td>
<td>6</td>
<td>5.39</td>
<td>16.61</td>
<td>10.8003</td>
<td>1.80890</td>
<td>4.43088</td>
</tr>
</tbody>
</table>

The ratio of indirect to direct behaviour based on verbal interactions in Physics classrooms was achieved by finding tally totals of categories falling under indirect verbal influence of teachers divided by the categories falling under direct verbal influence \( \frac{I}{D} \). From the summary in table 4.12, it is seen that most teachers used direct verbal interaction behaviour during Physics lessons, while a few used indirect verbal interaction. Ratio of indirect to direct verbal interaction was found to be 1:2. (Ratio of mean statistic 4.8638 to 10.8003), this implies that 69% of Physics teachers in Baringo Central Sub-County use direct teaching behaviour in their classrooms while 31% use indirect teaching behaviour. It is revealed that there is a lot of use of direct teaching behaviour in Physics lessons and teachers talk dominates most of the lessons which could lead to an autocratic teaching climate. The findings agree with Muteti (2009) who researched on verbal interactions in Physics classrooms in some selected secondary schools in Kangundo district and found that teachers in all categories of schools rarely use the indirect methods of teaching while teaching Physics.
4.6 Relationship between Various Classroom Verbal Interaction Patterns and Student Performance in Physics

The third objective of the study was to establish the relationship between various classroom verbal interaction patterns and student performance in Physics. This was found to be important in order to determine the influence of classroom verbal interaction patterns on student performance in Physics. The mean performance of each verbal interaction method and the Pearson correlation on relationship between various classroom verbal interaction patterns and student performance in Physics was used to check this objective.

4.6.1 Classroom Verbal Interaction Patterns and Student Performance in Physics

From the study the mean Physics achievement was found to vary in all the schools under study as summarized in table 4.13. The student performance mean of indirect verbal interaction dominated classes was higher than that of direct verbal interaction dominated classes. The findings showed that a school which used indirect verbal interaction performed higher as seen in schools A and C as compared to those schools which used direct verbal interaction such as school E and F.
Table 4.13 Classroom Verbal Interaction Patterns and Student Performance (Achievement) in Physics

<table>
<thead>
<tr>
<th>Name of school</th>
<th>Mean of verbal interaction patterns</th>
<th>Physics achievement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Indirect</td>
<td>Direct</td>
</tr>
<tr>
<td>A</td>
<td>1.26</td>
<td>16.61</td>
</tr>
<tr>
<td>B</td>
<td>4.96</td>
<td>11.68</td>
</tr>
<tr>
<td>C</td>
<td>7.24</td>
<td>5.63</td>
</tr>
<tr>
<td>D</td>
<td>4.68</td>
<td>12.65</td>
</tr>
<tr>
<td>E</td>
<td>3.85</td>
<td>12.84</td>
</tr>
<tr>
<td>F</td>
<td>7.2</td>
<td>5.39</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.13 shows that the mean achievement of all the schools observed was slightly above average (53.33%) with schools with higher direct behaviour patterns scoring low. Schools with low direct behaviour patterns have higher scores. Schools C and F had higher mean of indirect verbal interaction patterns and had higher scores in the Physics achievement test while schools A, B, D, and E had higher mean in direct verbal interaction patterns and registered lower scores in the Physics achievement test.
4.6.2 Pearson Correlation between Classroom Verbal Interaction Patterns and Physics Achievement

Pearson correlation was used to establish the relationship between various classroom verbal interaction patterns and student performance in Physics. From Pearson’s Correlation results there was a strong negative relationship ($r = -0.975$) between direct Verbal interaction and student performance in Physics, however the there was a strong positive relationship ($r = 0.980$) between indirect verbal interaction patterns and student performance in Physics. From the study, indirect classroom verbal interaction patterns had a positive influence on student performance in Physics. However, direct classroom verbal interaction patterns had negative influence on student performance in Physics.

**Table 4.14 Pearson Correlation between Classroom Verbal Interaction Patterns and Physics Achievement**

<table>
<thead>
<tr>
<th></th>
<th>Participation</th>
<th>Indirect</th>
<th>Verbal Interaction (Direct)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participation</strong></td>
<td>Pearson Correlation</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sig.(2-tailed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indirect</strong></td>
<td>Pearson Correlation</td>
<td>0.980**</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig.(2-tailed)</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td><strong>Direct</strong></td>
<td>Pearson Correlation</td>
<td>-0.975**</td>
<td>-0.970**</td>
</tr>
<tr>
<td></td>
<td>Sig.(2-tailed)</td>
<td>0.001</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
It can be implied from Table 4.14 that there is a tendency of students taught through indirect behaviour to perform better than those taught through direct behaviour. This is because when classroom instruction is characterised by direct teaching behaviour, the learning climate is autocratic and student participation is inhibited. Indirect behaviour facilitates democratic teaching and learning climate where the teacher guides the learning process and learners participate fully in the learning process. The findings of this research agree with the findings of Njogu (1993), who researched on implications of classroom interaction on performance in Biology and found out that learners perform better in cases where they are allowed to participate more in class. Wasanga (1982), also observed that teachers who establish good working relationship with most of their individual students and consider their students as human beings are usually effective teachers and their students learn more in their classrooms.
CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings of the main study, conclusions and Recommendations arrived at. It also gives suggestions for further studies.

5.2 Summary

The title of the study is classroom verbal interaction patterns in relation to student performance in Physics in Baringo Central Sub-County. A total of 363 students and 18 teachers participated in the study. On respondents by gender, the findings showed that majority of teachers and students involved in the study were male, thus there was gender disparity in the distribution of respondents in the study area. It was notable that Physics teachers in girls’ schools were few compared to the number in boys’ and mixed boarding schools. This is attributed to small number of students who chose Physics in girls’ schools.

On the qualification of teachers, the findings indicate that all Physics teachers in the selected schools had relevant professional training and should be able to teach Physics well. The commonly used method of teaching Physics was lecture method; this implied that teachers dominated the classroom talk. Lecture method is extremely expository in approach and it inhibited student participation in classroom activities.

The first objective of the study was to investigate the relationship between verbal interaction patterns and the level of learners’ participation in learning activities in the Physics classrooms. Most of the teachers 13(72.2%) agreed that students do not ask questions during Physics lessons and they remain quiet many a times during Physics lessons. Most of the students 228(62.8%) agreed that much of the time in the lesson is
dominated by the teacher talking. It was realized from both teachers and students’ views that students’ participation in Physics classrooms was very minimal. The views of both teachers and students concurred. Observations from FIAC showed that use of indirect classroom verbal interaction patterns elicited student talk and student participation in Physics classrooms, while use of direct classroom verbal interaction patterns inhibited student talk and student participation in Physics classrooms.

Findings from students attitude scale (AS) questionnaire showed that 189(52%) of students disagree that Physics teachers encourage students to ask questions during and after the lesson. The dominant type of interaction pattern was direct teaching behaviour characterized by lecturing, reciting facts, asking questions and criticizing. The findings showed that (72.2%) of Physics teachers agree that they spend most of the time in class giving directions. There was very little participation in the lessons and most of the students just listened and obeyed teachers’ orders. This gave rise to autocratic classroom climate. The teachers dominated the lesson and limited the opportunity for students to participate freely in classroom talk.

From Pearson’s Correlation results there was a strong positive relationship between learner’s participation and indirect verbal interaction patterns ($r = 0.960$ and 2 tailed) as revealed in the Physics Teachers Questionnaire (PTQ). The findings showed that verbal interaction had an influence on the learner’s participation. Direct verbal interaction had a negative influence on the student Participation (Student talk) while indirect verbal interaction had a positive influence on learner’s Participation. Results from all the three instruments used agree that direct teaching behaviour tends to inhibit student participation while indirect teaching behaviour encourages student participation in Physics lessons.
The second objective of the study was to establish the ratio of teachers direct to indirect behaviour based on verbal interactions in Physics classrooms. The findings showed that most teachers used direct verbal interaction behaviour during Physics lessons, while a few used indirect verbal interaction. Ratio of indirect to direct verbal interaction was found to be 1:2. (Ratio of mean statistic 4.8638 to 10.8003), this implied that 69% of Physics teachers in Baringo Central Sub-County used direct teaching behaviour in their classrooms while 31% use indirect teaching behaviour. It is revealed that there is a lot of use of direct teaching behaviour in Physics lessons and teachers talk dominated most of the lessons which lead to an autocratic teaching climate.

The third objective of the study was to establish the relationship between classroom verbal interaction patterns and student performance in Physics. The student performance mean of indirect verbal interaction dominated classes was higher compared to that of direct verbal interaction dominated classes. The findings showed that schools which used indirect verbal interaction scored higher compared to those schools which used direct verbal interaction.

From Pearson’s Correlation results there was a strong negative relationship between direct Verbal interaction and student performance in Physics ($r = -0.975$), however there was a strong positive relationship between indirect verbal interaction patterns and student performance in Physics ($r = 0.980$). Findings from the research showed that indirect classroom verbal interaction patterns had a positive influence on student performance in Physics but direct classroom verbal interaction patterns was negatively associated with student performance in Physics.
5.3 Conclusions

Based on the findings of the study as summarized above, it can be concluded that classroom verbal interaction patterns have some relationship to student participation in Physics lessons and student performance in Physics.

The findings obtained showed that teachers whose Physics classrooms were dominated by indirect verbal interaction patterns had their students participating more than those of teachers whose Physics lessons were dominated by direct verbal interaction patterns. Verbal interaction patterns therefore had an influence on the learner’s participation.

The study also showed that most teachers used direct verbal interaction when teaching Physics, while a few used indirect verbal interactions. The ratio of indirect to direct verbal interaction was found to be 1:2.

It was also found from the study that student performance mean of indirect verbal interaction dominated classes was higher than that of direct verbal interaction dominated classes. Further findings showed that schools which used indirect verbal interaction performed better in Physics compared to those schools which used direct verbal interaction.
5.4 Recommendations

Based on the analysis of the study, the researcher wishes to make the following Recommendations:

1. a) The topic of classroom interaction should be emphasised at undergraduate teacher training (B.Ed) and post graduate (M.Ed) training since teachers of Physics at secondary school level fall into these two categories, although the majority are B.Ed graduates.

   b) The topic of classroom interaction should be emphasised also at in-service teacher training level to keep the teachers abreast with current professional requirements.

2. The Ministry of Education Science and Technology, through the department of Quality Assurance and Standards, should advise Physics teachers to adopt indirect verbal teaching behaviour. This is necessary since the study revealed that the majority (67%) of the classroom teachers use direct interaction teaching behaviour which does not augur well to good student performance.
5.5 Areas for Further Research

The researcher suggests that;

1. A study should be conducted on classroom verbal interaction patterns in relation to student performance in Physics in Baringo County and the rest of the counties in Kenya because this research was conducted in Baringo Central Sub-County only. This study is important because indirect classroom verbal interaction patterns have a positive relationship while direct classroom verbal interaction patterns have a negative relationship to student performance in Physics. It is necessary to find out if similar results hold true in the other parts of Kenya.

2. A study should be conducted on classroom verbal interaction patterns in relation to student performance in other subjects like languages, humanities, technical subjects and other sciences because little has been done in these areas.
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APPENDICES

APPENDIX A: Students’ Physics Achievement Test (SPAT)

Instruction: Answer All Questions in the Space Provided

Time: 25 minutes

1. What is the micrometer screw gauge reading shown in the diagram below? (2mks)

   ![Diagram of micrometer screw gauge reading]

2. Smoke particles in air when strongly illuminated were observed to describe continuous, random haphazard movements. Explain what would be observed when the air temperature is decreased (2mks)

   ![Diagram of smoke movement]

3. Figure 4 shows a uniform wooden plank which weighs 10N. The plank is balanced at 0.8m from one end by a mass of 2.5kg

   ![Diagram of wooden plank and mass]

*fig. 4*
What is the length of the wooden plank in metres? (3mks)

4. State what is meant by “critical angle” as applied in refraction of light waves. (1mk)

5. State three factors that affect the resistance of a metallic conductor (3mks)

6. The U- tube below shows two immiscible liquids P and Q. Calculate the density of liquid P if the density of liquid Q is 1.5g/cm³ (3 mks)

7. Distinguish between speed and velocity (2 mks)
8. A water pipe of diameter 5.2 cm is connected to another pipe of diameter 1.3 cm. The speed of water in the smaller pipe is 3 ms\(^{-1}\). Calculate the speed of the water in the larger pipe  (3mks)

Adapted from KCSE Paper 1, 2009
APPENDIX B: Physics Teachers Questionnaire (PTQ) on Classroom Interaction in Physics Lessons.

Good participation and performance in Science is a very important factor in national economic development and social wellbeing. Kenya’s vision 2030 for industrialization may not be realised without the input of science. It is believed Science will play a pivotal role in making this dream a reality.

This study hopes to identify some of the factors, which influence Student performance in Physics with a view to suggesting intervention strategies where needed.

To help in doing this, you are requested to fill this questionnaire as honestly as you can. The information you give will be kept confidential and will be used for purposes of this study only. Thank you in advance.

SECTION 1: Background Information

1. Name of school…………………………………………………………………………………

2. Gender (i) Male □       (ii) Female □       (tick one)

3. Type of school (i) Boys□       (ii) Girls□       (iii) Mixed Boarding □

4. Professional qualification

(i) B. Ed □

(ii) PGDE □

(iii) DipEd □

(iv) S1 □
98

(v) MEd □

(vi) Others (Specify) ..............................................................

5. Teaching experience

(i) 0-2 years □

(ii) 3-6 years □

(iii) 7-10 years □

(iv) 11-15 years □

(v) 16-20 years □

(vi) 21-30 years □

(vii) 30 years and above □

6. Which classes do you teach Physics?

(i) Form 1 □ (ii) Form 2 □ (iii) Form 3 □ (iv) Form 4 □

7. Main Teaching/Learning method you use when teaching Physics

(i) Demonstration □ (ii) Lecture □ (iii) Question/Answer □

(iv) Others (specify) .........................
**SECTION II: Questions:**

a). Performance in Physics in national examinations has remained generally low. Below are some of the reasons given for this? Against each reason are letters SA (for strongly agree), A (for agree), NS (for not sure), D (for disagree), SD (for strongly disagree) Tick the appropriate box.

<table>
<thead>
<tr>
<th>Reasons</th>
<th>SA</th>
<th>A</th>
<th>NS</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Students fear Physics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Students don’t ask for clarity in areas they don’t understand</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11. Students don’t participate actively in classroom activities</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Students do not ask questions during Physics lessons</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Students remain quiet many at times during Physics lessons</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>14. Poor entry behaviour is responsible for poor performance in Physics</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>15. Complicated formulas makes students despair in Physics</td>
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<tr>
<td>16. Abstract topics make Physics difficult for students</td>
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</tr>
<tr>
<td>17. Physics teachers spend most of the time in class giving directions</td>
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</tr>
<tr>
<td>18. Lack of resources makes students fail</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### APPENDIX C: FLANDERS SCALE FOR INTERACTION ANALYSIS

<table>
<thead>
<tr>
<th>Teacher influence</th>
<th>1. Accept feelings: Accepts and clarifies the feeling tone of the students in a non threatening manner. Feelings may be positive or negative predicting or recalling feelings are included.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher indirect influence</td>
<td>2. Praises or encourages: praises or encourages students’ action or behaviour. Jokes that release tension, but not at the expense of another individual, nodding head or saying “um hm” or “go on” are included.</td>
</tr>
<tr>
<td>Teacher indirect influence</td>
<td>3. Accepts or uses ideas of students: clarifying, building or developing ideas suggested by a student. As teacher brings more of his own ideas into play, shift to the category five.</td>
</tr>
<tr>
<td>Teacher indirect influence</td>
<td>4. Ask questions: asking a question about content or procedure with the intent that student answers.</td>
</tr>
<tr>
<td>Teacher direct influence</td>
<td>5. a) Lectures only: Involves talks by the teacher without any Aids to enhance the points</td>
</tr>
<tr>
<td>Teacher direct influence</td>
<td>b) Lectures with illustrations: The lecture combines use of charts, flash cards, Real objects and chalkboard</td>
</tr>
<tr>
<td>Teacher direct influence</td>
<td>c) Lectures with demonstrations: This is where the teacher performs an</td>
</tr>
<tr>
<td><strong>Student talk</strong></td>
<td>1. <strong>Experiment or a practical</strong> to enhance part of the lesson</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>6. <strong>Giving directions:</strong> directions commands or orders to which a student is expected to comply.</td>
</tr>
<tr>
<td></td>
<td>7. <strong>Criticizing or justifying authority:</strong> statement intended to change students behaviour from non acceptable, power bawling someone out, stating why the teacher is doing what he is doing and extreme reference.</td>
</tr>
<tr>
<td></td>
<td>8. <strong>Student talk-response:</strong> talk by student in response to teacher. Teacher initiates or solicits student statement.</td>
</tr>
<tr>
<td></td>
<td>9. <strong>Student talk-initiation:</strong> talk by student which they initiate. If “calling on” student is only to indicate who may talk next, observer must decide whether student wanted to talk, if he did use this category.</td>
</tr>
<tr>
<td></td>
<td>10. <strong>Silence or confusion:</strong> pauses short periods of silence and periods of confusion in which communication cannot be understood by the observer.</td>
</tr>
</tbody>
</table>
APPENDIX D: Attitude Scale for Students (AS)

Instructions

We are interested in knowing how you feel about the Physics you are doing at school. Answer all the questions as honestly as possible. Your answers will be used for this research only and no other person will see it.

Section 1: Personal and general information

1. Name of your school………………………………… class .............

2. Gender (i) Male   (ii) Female   (tick one)

3. Type of school  (i) Boys    (ii) Girls (iii) Mixed (tick one)

4. Category of the school  (i) County school  (ii) District school

SECTION II

Read the following statements about Physics. Against each reason are letters SA (for strongly agree), A (for agree), NS (for not sure), D (for disagree), SD (for strongly disagree) tick the appropriate letters depending on what you feel about each statement.

a) Interest in Physics

5. I like Physics

(SA)  (A)  (NS)  (D)  (SD)

6. Physics is an enjoyable subject

(SA)  (A)  (NS)  (D)  (SD)
7. The Physics taught in school is interesting

(SA) (A) (NS) (D) (SD)

8. Physics theory lessons are enjoyable than practical lessons

(SA) (A) (NS) (D) (SD)

b) Classroom interaction pattern in Physics lessons.

9. The teacher asks questions during Physics lessons

(SA) (A) (NS) (D) (SD)

10. Most of the students ask questions during Physics lessons

(SA) (A) (NS) (D) (SD)

11. Much of the time in the lesson is dominated by the teacher talking

(SA) (A) (NS) (D) (SD)

12. Students keep quiet when asked questions by the teacher during Physics lessons

(SA) (A) (NS) (D) (SD)

13. Students fear answering questions

(SA) (A) (NS) (D) (SD)

14. Physics teacher encourage students to ask questions during and after the lesson

(SA) (A) (NS) (D) (SD)
15. Some students sleep during Physics lessons

(SA) (A) (NS) (D) (SD)

16. Teacher redirects questions asked by students to other students for answers

(SA) (A) (NS) (D) (SD)

17. Bright students are more participative in class than the others

(SA) (A) (NS) (D) (SD)

18. Teacher directs questions to bright students more often than average ones.

SA) (A) (NS) (D) (SD)

c) Difficulties in learning Physics

19. Physics is a difficult subject

(SA) (A) (NS) (D) (SD)

20. Physics calculations are more difficult than non-calculation questions

(SA) (A) (NS) (D) (SD)

d) Career interest in Physics

21. To get a job in future requires knowledge of Physics

(SA) (A) (NS) (D) (SD)
22. People who understand Physics are better off in the society

(SA) (A) (NS) (D) (SD)

23. Some of the best jobs in the world require Physics knowledge

(SA) (A) (NS) (D) (SD)

24. I apply the Physics learned in school in my day to day life at Home and elsewhere.

(SA) (A) (NS) (D) (SD)
SECTION III

25. What would you like to be when you finish schooling?

Teacher

Lawyer

Doctor

Engineer

Others (specify) .................................................................Thank you for your cooperation.
APPENDIX E: Map of Baringo County

Source: https://www.googlemaps/baringocountymap
APPENDIX F: List of Public Secondary Schools in Baringo Central Sub-County.

1. Tenges boys high school
2. Sangarau girls secondary school
3. A.I.C. Kapkelelwa mixed secondary school
4. Timboiwo day secondary school
5. Tabagon girls high school
6. Oinopmoi boys high school
7. Philemon Chelagat girls secondary school
8. Kipsoit day secondary school
9. Kabarnet boys high school
10. Kapropita girls high school
11. Kapchomuso day secondary school
12. Talai mixed secondary school
13. Pemwai girls high school
14. Kituro mixed high school
15. Ng’etmoi girls secondary school
16. Kaptimbor day secondary school
17. Kabarnet hurt day secondary school
18. Kapkawa boys secondary school

Source: Sub-County Education office Baringo Central.

NACOSTI/P/14/7621/999

Daniel Kiprono Cheruiyot
Kenyatta University
P.O.Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “Classroom verbal interaction patterns in relation to student performance in physics in Baringo County, Kenya.” I am pleased to inform you that you have been authorized to undertake research in Baringo County for a period ending 30th June, 2014.

You are advised to report to the County Commissioner and the County Director of Education, Baringo County before embarking on the research project.

On completion of the research, you are expected to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.

DR. M. K. RUGUTI, PhD, HSC.
FOR: SECRETARY/CEO

Copy to:

The County Commissioner
The County Director of Education
Baringo County.

Date: 12th March, 2014

REPUBLIC OF KENYA

MINISTRY OF EDUCATION, SCIENCE & TECHNOLOGY
STATE DEPARTMENT OF EDUCATION
OFFICE OF THE COUNTY DIRECTOR
(BARINGO COUNTY).

Our Email: countyedubaringo@gmail.com
Tel / Fax: 053/21282

REF: BAR/CDE/RESEARCH GEN/TRAIN/VOL.1/NO. 27/50

21/03/2014

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION

This office has received a letter requesting for authority to allow you carry out research on “Classroom verbal interaction patterns in relation to student performance in physics in Baringo County, Kenya” schools within Baringo central sub - county.

We wish to inform you that the request has been granted for a period ending 30th June, 2014. The authorities concerned are therefore requested to give you maximum support.

We take this opportunity to wish you well during this research.

DANIEL K. K. MOSBEI
COUNTY DIRECTOR OF EDUCATION
BARINGO.

CC
- Sub – County Education Officer - Baringo Central

OFFICE OF THE PRESIDENT

MINISTRY OF INTERIOR
AND CO-ORDINATION
OF NATIONAL GOVERNMENT

COUNTY COMMISSIONER'S OFFICE
BARIINGO COUNTY,
P.O. BOX 1,
KABARNET.

21st March, 2014

Daniel Kiprono Cheruiyot,
Kenyatta University,
P.O. BOX 43844-00100,
NAIROBI.

RE: RESEARCH AUTHORIZATION

Reference is made to your letter Ref. No. NACOSTI/P/14/7621/999 dated 12th March, 2014 from the Secretary of National Commission for Science, Technology and Innovation regarding the above subject matter.

You are hereby authorized to carry out a research on “Classroom verbal interaction pattern in relation to student performance in Physics in Baringo County for a period ending 30th June, 2014.

N.K. TONUI
FOR: COUNTY COMMISSIONER
BARINGO COUNTY